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INTEGRATED ECO-CULTURAL ARCHITECTURE FRAMEWORK FOR SUSTAINABLE HOUSING DESIGN IN JORDAN

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INTEGRATED ECO-CULTURAL ARCHITECTURE FRAMEWORK FOR SUSTAINABLE HOUSING DESIGN IN JORDAN

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A thesis submitted for the degree of Doctor of Philosophy

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Abstract

The interest in sustainable architecture continues to grow in recent years. However, research and practice within the built environment are limited to the tangible indicators of sustainable buildings. Therefore, there remains a gap in understanding the socio-cultural indicators of sustainability and their role in delivering sustainable built environments. Vernacular architecture once represented buildings that were culturally, economically, and environmentally adequate to their context. A coherent understanding of the indicators that inform this vernacular-inspired sustainable architecture is thus required. However, few studies specifically incorporate relatively intangible indicators such as the vernacular buildings' historical and cultural development in the sustainable architecture discourse. This research aimed to bridge the gap between the built environment's tangible and intangible indicators by proposing an eco-cultural approach for sustainable architecture that integrates cultural, social, and ecological variables. This study investigated lessons of sustainability from vernacular architecture as a model for this integration. The research also aimed to create and test a decision support tool that can help with the deployment of this eco-cultural design process in Jordan and the wider region.

As a concept, eco-cultural design is the physical interpretation of a region's context and culture based on sustainable architecture principles that are economically viable. An eco-cultural design also adapts, uses, and maximises the technological performance for locally specific needs and socio-cultural system. An eco-cultural logic in architecture calls to examine the reuse of lessons from vernacular architecture as a base for socio-cultural integration within the built environment. The research first critically reviewed recent literature on sustainability and vernacular architecture to understand and map the tangible and intangible indicators that can help the renaissance of a critical regional architecture as a dynamic eco-cultural design. Following that, the research applied a qualitative approach that consisted of 81 semi-structured interviews with inhabitants of residential dwellings of various typologies from two case study areas in Jordan, each representing a historical and a contemporary case. The framework and thematic analyses guided the analytical and synthesis stage.

The research results showed that participants prioritised design factors related to socio-cultural appropriation and linked them to their sustainability point of view. It was also found that due to its intangibility and complexity, most sustainability frameworks in the built environment only focus on the environmental criteria and have failed to integrate cultural indicators. Results also showed that vernacular architecture design elements such as privacy, semi-private open spaces, and the hierarchy of spaces are significant features that still have the potentials to create a balance between social interaction, culture, and enhanced climatic conditions. The fieldwork stage results were combined with other principles of sustainability and integrated as guides to spatial metrics. These were consolidated as an eco-cultural design tool with which to validate the efficacy of the research findings. A panel of experts and professionals also evaluated the accuracy, practicality, and usability of the tool. The tool and its underpinning theoretical contribution made it possible to enhance the Jordan Green Building Guide (JoGBG) to assure an eco-cultural design strategy.

This study makes a significant theoretical and practical contribution by proposing tangible metrics relating to intangible cultural factors so that this can be effectively incorporated into existing sustainable building assessment. Additionally, the research paradigm and approach are repeatable for other contexts and regions. These outputs represent new precedence in research for Jordan and beyond. It dealt with less discussed issues within sustainable building research discourse, such as the loss of many vernacular architectures and local design qualities that informed the production of the built environment. It also resolves the theoretical and applied influence of socio-cultural factors in sustainable design. Contextual design indicators maximise building environmental performance while meeting residents' socio-cultural needs based on locally specific needs. In practice, the tool was deemed useful and usable to integrate socio-cultural indicators within Jordan's architectural practice.

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Glossary of terms

Adaptable design: Adaptability in architecture refers to the ability to use a space or a building in a variety of ways without much modification to its physical form.

Affordable housing: Affordable housing is government-subsidized housing for low-income people.

Bioclimatic architecture: The architecture that seeks to ensure thermal comfort and minimize the negative environmental impact of buildings based on the local climate, efficiency in the use of materials, energy, space and the ecosystem at large.

Built environment: All the physical parts of where we live and work, including homes, buildings, streets, open spaces, and infrastructure.

Conceptual Framework: A supporting and structured model which something can be built around.

Critical regionalism: The approach of architectural practice to embraces modern architecture critically for its universal unifying qualities while simultaneously responding to social, cultural, and climatic contexts of the region in which it is being built.

Cultural sustainability: The maintaining of cultural beliefs, cultural practices, heritage conservation, culture as its entity, and attempts to answer the question of whether or not any given cultures will exist in the context of the future.

Culture: An exclusive system for humans that vary from one location to another. It consists of traditions and customs invented and passed down in society through decades of interactions with the natural world. Culture is based on unique social aspects that interact with the context to produce behavioural patterns.

Development: Evolution, growth, expansion, enlargement, advance, progress, improvement, or simply advancement of the management and use of natural resources to satisfy human needs and improve the quality of human life.

Dwelling: A house, flat, or any other type of residence.

Eco-cultural architecture: An approach toward sustainability in the built environment based on society, culture, context, and vernacular architecture of a region as well as ecological principles that are economically viable.

Economic sustainability: Refers to practices that support long-term economic growth without negatively impacting social, environmental, and cultural aspects of the community.

Environmental sustainability: Refers to maintaining rates of renewable natural resource harvest, pollution creation, and non-renewable resource depletion that can be continued indefinitely while supporting all living organisms.

Flexible design: Flexibility in architecture refers to the ability to modify and implement physical changes to a building.

Gentrification: The process by which higher-income households displace lower-income residents of a neighbourhood, changing the pre-existing character of that place.

Globalisation: The growing interdependence of countries worldwide through the increasing volume and variety of cross-border transactions in goods and services, and also through the more rapid and widespread diffusion of technology. It describes the changes in societies and the world economy that result from dramatically increased international trade and cultural exchange due to the falling of barriers and the interdependence of countries.

Heritage Conservation or preservation: all of the processes of looking after a place to retain its cultural significance.

Housing Affordability: Housing affordability is the general level of housing prices relative to the general level of household or family incomes, often measured by dividing median home prices by median family incomes.

Human well-being: A concept used to refer and describe aspects and issues that are assessed in the evaluation of people's life situation and quality.

Indicators: Quantified information which helps to represent factors of a topic and explain how they are changing over time.

Industrialisation: The development of industry on an extensive scale; a process of social and economic change whereby a human society is transformed from a pre-industrial to an industrial state. This social and economic change is closely intertwined with technological innovation, particularly the development of large-scale energy production and metallurgy.

Intangible: What is impossible to touch, to describe exactly, or to give an exact value and can only be experienced and measured qualitatively.

Integration: The process of improving the understanding of real-world problems by synthesising relevant knowledge from diverse disciplines and stakeholders.

Modernisation: The process of changing the conditions of society according to modern technology or modern knowledge. It involves an interlocking set of social, economic, political and cultural processes and relationships.

Regional architecture: The approaches to counter the lack of identity in modern buildings using the contextual factors that surround their geographical location.

Social sustainability: A process for creating sustainable, successful places that promote wellbeing, by understanding what people need from the places they live and work. Social sustainability occurs when the formal and informal processes; systems; structures; and relationships actively support the capacity of current and future generations to create healthy and liveable communities.

Socio-cultural (Social/Cultural) Systems: The intangible human networks that connect individuals in a neighbourhood to create a community. Often, these systems take shape in familiar places, barbershops and local businesses, parks, community centres, entertainment venues, etc.

Socio-cultural wellbeing: Refers to and describe the aspects and issues that asses' people social and cultural wellbeing and qualities

Stakeholder: Those with a stake, involvement or some sort of investment in an object.

Sustainability assessment frameworks: Collections of processes, measures, procedures and principles that guide sustainability assessment practices.

Sustainability assessment methods: Analytical and evaluation tools methods that assist in decision-making or in finding potential solutions to specific problems or areas within larger sustainability assessment frameworks sphere

Sustainability assessment: Those processes and techniques focused on predicting the potential impact of activities before their execution and thus can direct decision-making towards sustainability

Sustainability dimensions: Are sustainable development goals, such as economic development, social development, and environmental protection.

Sustainability indicators: Are those used for assessment as they represent the environmental, economic, social and cultural factors of sustainability.

Sustainability: Is the capacity to endure in a relatively ongoing way across various domains of life.

Sustainable architectural design: The process of making the built environment achieve high levels of ecological balance through merging the natural, minimum resource conditioning solutions of the past (daylight, solar heat, and natural ventilation) with the innovative technologies of the present, into an integrated system that supports, long-term viability and humanisation of architecture.

Sustainable building assessment: Is the process of gathering and reporting sustainability-related information for decision-making during different phases of the building, design, construction, use and possibly demolition of a building or a group of buildings.

Sustainable Building Rating Systems: Also called green building rating systems and certificates. A type of sustainable building assessment methods that are used to assess a range of economic, environmental, and social performance indicators for a building or a construction project.

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet theirs and without degrading or endangering natural environmental systems and balance

Tangible: The real and able to be shown and touched. Only physical things can be touched; therefore, all physical things are tangible.

Urbanisation: The process by which a country's population changes from primarily rural to urban. It is caused by the migration of people from the countryside to the city in search of better jobs and living conditions and natural population growth rates. It can represent a level of the urban population relative to the total population of the area, or the rate at which the urban proportion is increasing. Both can be expressed in percentage terms.

Vernacular architecture: Those traditional buildings constructed outside the architecture academic and professional fields of an area, used typically for houses, cottages and farm buildings and constructed of the locally available materials to meet specific regional needs.

Weighting: Assigning levels of importance to components. indicators or dimensions of an evaluated system to indicate their importance.

1 Chapter One. Introduction

1.1 Introduction

The United Nations identifies rapid urbanisation as one of the most severe challenges imposed by the modern built environment and its related industries worldwide. Around 55% of the global population live in cities compared to 30% in the 1950s. This percentage will exceed 60% by 2050 as urbanisation is still increasing in developing countries (United Nations, 2018). This trend creates many social, cultural and economic changes in these developing countries and establishes the need for quick and new construction methods to meet this demand for housing (Waas *et al.*, 2014). Researchers now refer to and pair these changes with globalisation (Eldemery 2009; Salman 2018). The immediate and rapid need for housing has forced many societies to switch their vernacular architecture with a contemporary or regional style based on western architecture and which utilises imported technologies and building materials (Oliver 2007).

These changes bring three critical issues; **First** is the loss of many qualities that inform the production of an extant image of the built environment based on the relationship between the building and its surrounding (Tweed and Sutherland 2007; Nocca 2017). **Second** is regarding the pressure that urbanisation puts on the environment (Ross *et al*. 2015). **Third**, is the impact of the loss of localisation and identity on user experience and quality of life (Abdelsalam and Rihan 2013; Håkansson 2017). These issues result from the application of imported architectural forms and solutions that are inconsistent with context and norms (mostly western imported) to address problems of the built environment in these developing regions (Waterson 2012; Tawasyha *et al*. 2019). The built environment also utilise 40% of the world's energy, 50% of natural resources and contribute to 40% of carbon dioxide emissions (Abergel *et al*. 2017). The United Nations estimates that these figures are even higher in developing countries where housing demand is higher (Seto *et al*. 2014; United Nations 2018).

These critical issues establish the need for sustainable development, as well as the need for more sustainable architecture that requires fewer resources and less energy to function (Keiner 2005). Interest in sustainability and its assessment within architectural research has grown expansively in the past decade (Lozano 2011; Loo and Mahdavinejad 2017). The quest for sustainability in the built environment also inspires numerous researchers studying vernacular architecture qualities, arguing that these buildings are very energy efficient and sustainable (Nguyen *et al*. 2019). In essence, sustainable development in any field is recognised as a holistic approach to the adaptation of environmental, economic, and social concerns. In theory, a sustainable built environment is achieved once all these aspects have been considered during the entire design and construction and life span of the building.

The widespread attention to sustainable development is primarily concerned with environmental, economic, and functional requirements rather than social and cultural dimensions (Wu et al. 2016; Dessein et al. 2015; Al-Jamea 2014; Atanda and Öztürk 2018; Zarghami et al. 2017). Architects and researchers have started to realise that sustainability, in a conceptual context, involves finding ways to combine intangible and tangible socio-cultural, economic, and environmental goals. It also involves integrating multiple disciplines from all sectors of society, government to business, communities and individuals (Surf and Saied 2014). For this reason, the study adopted an eco-cultural approach that emphasises regional and traditional principles of design and is based upon ecological requirements of its context to maximise the building performance for locally specific needs (Abel 1993). The emblematic issue is the notion that truly sustainable buildings need to more wholly relate to the notion of localisation and context (Guy and Farmer 2001). This approach also helped investigate the potential for better integration of the tangible and the non-tangible aspects of the environment and human context for sustainable developments.

1.2 Research background

The following review illustrates definitions of sustainability, its aspects, and the challenges and current state within sustainability assessment models. The review also stresses the significance of vernacular architecture to address the challenges of globalisation and urbanisation.

1.2.1 Sustainable development in the built environment

The concept of sustainability concerning the built environment is not new. This concept first evolved in response to environmental awareness movements of the 1970s and has taken on increased importance in the past three decades as the impacts of human activity on a global scale become more apparent (Surf and Saied 2014; Ameen and Mourshed 2019). Sustainability can be defined as the capacity to endure in a relatively ongoing way across various domains of life (James 2015). The term sustainable development has come to the forefront in the past few decades that it has become essential and inseparable to research regarding sustainability in all fields (Correia 2015). Nowadays, the term sustainable development is more widely used to describe and point to sustainability and its progress (Moldan et al. 2012). The most used definition of sustainable development is the one presented by the World Commission on Environment and Development (WCED) which defined it as development which 'meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED 1987).

Within the built environment, sustainable architectural design refers to the process of making the built environment achieve high levels of ecological balance through merging the natural, minimum resource conditioning solutions of the past (daylight, solar heat, and natural ventilation) with the innovative technologies of the present, into an integrated system that supports, long-term viability and humanisation of architecture (Loftness 2013). Currently, the United Nations' three pillars of sustainable development (environmental, social, and economic) are the most widespread and intensively used framework by governments, businesses and civil society (Clune and Zehnder 2018). This framework guides countries and agencies to integrate sustainability into policy and institutional decision making. It is also widely accepted as an essential conceptual framework providing context and a base for architectural planning and research (Bennetts *et al*. 2003).

The three pillars framework aims to transcend the tangible and intangible themes of social, environmental and economics as well as institutional and regulatory factors. It also provides a useful categorisation of sustainability's relevant dimensions (Dessein *et al*. 2015; Wu *et al*. 2016). This framework's significance also comes from its consideration, not just with the natural environment but also with the social, cultural, and economic aspects. The three pillars concept also indicate that sustainable development can only be achieved when each pillar is promoted in agreement with the other two (Zarghami *et al.* 2017).

The three pillars identify sustainability as a measurable aspect of development that consists of various "indicators" or metrics interacting together (Cutaia 2016; Clune and Zehnder 2018). Indicators are quantified information that help to explain how things are changing over time (Bell and Morse 2012). Sustainability indicators are useful for assessment as they represent the environmental, economic, social and cultural factors of sustainability (Mansour and Radford, 2014). Therefore, indicators should be present in every type of assessment-oriented framework (Guzmán *et al.,* 2017). Nowadays, many governmental and non-governmental bodies have proposed similar indicator-based sustainability assessment frameworks and tools for various sectors and activities, primarily to help reduce environmental impact (Moldan *et al*. 2012).

Within the field of the built environment, the three dimensions of sustainability form the basis for green and sustainable building assessment and rating systems. Sustainability assessment is considered a keystone for sustainable development within the built environment (Awadh 2017). Among these sustainability assessment tools are green building rating systems such as LEED (USA), CASBEE (Japan), BREEAM (UK) and SBTool (international). These tools are the product of the

combination of domestic and international policies and the commercial need for environmentally assessed and sound products (Haapio and Viitaniemi 2008). These assessment tools aim to promote sustainable development and follow broader legislative frameworks (Ness *et al*. 2007; Srinivasan *et al*. 2011).

However, measuring and integrating holistic sustainability still represents a significant challenge and a field for debate about implementing sustainable solutions in the built environment (Wu *et al*. 2016; Wan and Ng 2018). Mainly because there is no universally agreed method or list of indicators for implementing and measuring sustainable outcomes (Atanda 2019). Moreover, assessment methods such as life-cycle, material-flow analysis, green building rating systems, and guides might not be enough to measure such a broad topic as sustainability (Verma and Raghubanshi 2018). Most of these assessment methods ignore critical human-related factors in the built environment, such as preserving local identity, social relationship, human wellbeing and comfort in and outside of dwellings (Wu *et al*. 2016).

The call to examine sustainable design practices and methods, and their relationship to regional values and norms, is growing louder (Amoozad Mahdiraji *et al*. 2018). It is accompanied by a call for interdisciplinary cooperation in meeting the complexity of problems connected to global sustainable development (Tanguay *et al*. 2010). The built environment works through an interconnected, interdependent web of dynamic factors, including eco-system, socio-cultural, energy, and economic factors, among many (Kohon 2015). Thus, an approach to sustainable development requires an integrated, revised, and holistic architectural design research methodology that aims to integrate all these tangible and intangible factors of both natural and human-made environments.

1.2.2   Vernacular architecture

Vernacular architecture can be defined as those buildings constructed outside the architecture academic and professional fields (Caves 2005). This term contains a wide range and variety of architectural styles, with different construction methods, from all over the world, both historical and extant (Rapoport 2006). Vernacular architecture adapted to specific social and cultural contexts and needs; is constrained by locally available materials; and reflected local traditions and cultural practices (Supic 1982). They are the expression of a reality slowly elaborated during centuries, executed with local techniques and means, expressing precise functions and satisfying social, cultural and economic needs (Rapoport 1969). What characterises the architecture called vernacular is, which is more or less a synonym of traditional, rural, pre-industrial, provincial, indigenous, or especially without architects (Rudofsky 1987). Vernacular architecture is a tremendous cultural heritage resource that can play an essential role in defining contemporary sustainable architectural design (Songel 2020; Correia 2015)

The term vernacular architecture was the focus of work for prominent figures such as Bernard Rudofsky (1987), Amos Rapoport (1969) and Paul Oliver (1997; 1987). Their approach emphasises the importance of the anthropological and cultural parameters in creating vernacular architecture. Vernacular architecture stayed the dominant type of architecture around the world until the industrial revolution (Guengerich 2014), where a globalised version of post-world war modernism started gradually to replace them after the 1950s (Komez-Daglioglu *et al*. 2017).

The architectural community has had a keen and continuing interest in sustainability lessons from traditional and vernacular architecture (Widera 2021). The simplicity in which the vernacular architecture expresses its context has led to architects and researchers considering it as a source of analysis, inspiration, and a reference for ethnic and aesthetic studies. Pierre Frey's (2010) definition includes the architecture of territory and geographic locality or for a human ethnic group, who commonly uses local materials. Architects, including Hassan Fathy and Charles Correa, have advocated using vernacular building forms, materials and techniques (Serageldin 2007; Mahmoud 2016). They also believed that reviving vernacular architecture can revive people's faith in their culture while providing an ingenious localised bioclimatic solution (Fathy 1973).

In addition to its cultural, social, and aesthetic qualities, vernacular architecture represents the product of centuries of continuous optimisation to provide comfortable dwellings utilising available materials and construction techniques only (Bodach *et al*. 2014; Nguyen *et al*. 2019). Modern interest in vernacular architecture and its environmental benefits has grown significantly in the past years, and there has been renewed interest and awareness of vernacular architecture (Songel 2020). This is due to the need to develop an architecture that works with both human and natural contexts to create sustainable buildings (Abusafieh 2019). Earlier research and publications on vernacular architecture have followed an anthropological or archaeological approach. Such research includes the work of (Supic c1982; Oliver 1987; Rapoport 1969). In contrast, more recent research regarding vernacular buildings focused on the climatic and environmental sustainability lessons from these buildings, such as ; (Chandel *et al*. 2016; Semahi *et al*. 2019; Eybye 2020).

Vernacular architecture has many environmental sustainability traits, such as resource and energy savings and prolonging the lifespan. However, the reason for the sustainability of vernacular architecture comes not only from its bioclimatic and environmental traits. The strength of vernacular architecture and its sustainability comes from its ability to blend buildings into various settings so that they engender adaptability and harmony between the context and the people (Brown and Maudlin 2012; Sayigh and Marafia 1998). Therefore, it becomes necessary to understand the reasons for vernacular architecture decline in order to integrate its valuable lessons in modern design.

1.2.3   Regional architecture and critical regionalism

The term regional architecture was first coined by the architectural theorists' Alexander Tzonis and Liane Lefaivre (Lefaivre and Tzonis 1981) and, with a slightly different meaning as critical regionalism presented by Kenneth Frampton (Frampton 1985). Regional architecture refers to the approaches to counter the lack of identity in modern buildings using the contextual factors that surround their geographical location (Lefaivre and Tzonis 2012). Critical regionalism, on the other hand, is the approach of architectural practice to embraces modern architecture critically for its universal unifying qualities while simultaneously responding to social, cultural, and climatic contexts of the region in which it is being built (Frampton 1985). The regional approach in architecture regularly engages in binary oppositions: east/ west, traditional/modern, natural/technology (Eggener 2002). This is more visible in developing countries where Lim (2004), and Abel (2000) argue that regional architecture has different meanings due to modernism's effect. According to them, it becomes a way of imposing ideas and forced decisions on what should fit or should not. Therefore, a critical regionalism approach is more suitable for addressing both changes to vernacular architecture and contextual features essential for the development of eco-cultural architecture.

Critical regionalism is most associated with both the continuity of vernacular architecture in a given society and the architecture that is native to a region or country (Tzonis et al. 2001). It highlights the concept of applying architecture to reflect the identity of the people living in a geographic location (Lefavire & Tzonis, 2003). Critical regionalism approach is intensively evidence in the research literature. Sotoudeh et al. (2012); Ibrahim (2016); Mansy (2001); Mortada (2016); Adwan & Abu Muhsen (2016), argue that a critical regional-based movement would enhance local image among other characteristics and must be incorporated into contemporary practice. Several descriptions of the main aspects of sustainable building design development, especially housing, can also be seen in the literature. Researchers advocate that modern architecture can achieve sustainability if more consideration is given to socio-cultural needs and other contextual factors during the design stage of a building, and in particular to that of the lifestyle of local people the future users of a building. (Canizaro 2012) However, this method is complicated, and research is still grappling with optimum methods to carry it out to test its appropriateness.

For example, building harmony with local context using local materials and local technology are two frequently discussed factors within regional architectural research (Meng and Li 2012). However, it appears that there is little agreement among researchers about what are local materials. On one side, some authors define local materials as only those indigenous to a specific region (Pan et al. 2013). Others consider that local materials mean those which are locally available, which extend to any modern ones produced locally (Meng and Li 2012).

Boussora (2013), on the other hand, does not distinguish between locally available materials and those that are imported; as both local and imported materials are to be found today, in most places. They argue that it is sometimes cheaper to import certain materials than it is to use locally produced ones. Similarly, there is no general agreement about precisely what is meant by local elements of architecture, and how they should be used in new buildings to achieve regionalist architecture. There is also divided opinions on using imported elements from another context to respond to similar modern problems within the built environment and its needs (Heath 2009). Furthermore, some regions craftsmen with traditional skills of local materials and elements no longer exist (Canizaro 2012).

Another limitation is that some researchers interpret the geographical context with mainly climate and topography. Climate appears to be a rich theme, and some authors consider it as the main determining factor in regional architecture and critical regionalism. This latter view usually derives from the belief that vernacular architecture in the past was shaped by climatic conditions (Abderezak and Tahar 2004). Furthermore, some architects and researchers treated context and culture with rather a pragmatic approach and overlooked it when it goes against their design philosophies (Heath 2009). These limitations are underpinned by the disconnection between research, context, sustainable architecture and its sub-settings such as culture. The result is an effort that focuses on either one aspect of sustainability, but hardly ever into all. Researchers and architects are trying to overcome these limitations and to account for all aspects of context and sustainability through a wide range of goal-oriented assessment tools and frameworks.

1.3   Research context and current approaches

Following the decades of debate regarding the priorities and definitions of sustainable development, the diverse meanings of sustainability created various approaches to its delivery. Guy (2005) and Wines (2000) noticed that sustainable architecture approaches ranged from modern advances in technology to lessons from architecture history. These approaches include the use of historical forms, materials, of techniques, up to the employment of the immediate physical environment of typography, weather, plants, and the ground itself as a way to expand sustainable buildings.

However, mimicking vernacular architecture out of sentiment or purely for environmental concern can be ill-fated with cited examples, including Hassan Fathy's project in New Gourna village (Mahmoud 2016). Supic (1982); Foruzanmehr and Vellinga (2011); Tomasi (2015) and Eybye (2020) reviewed and analysed the relationships between a wide range of vernacular architecture examples and various economic, socio-cultural, economic, and environmental themes. These studies found that it is rare for all the climatic data to have the same level of importance in a single architectural design. Indeed, vernacular architecture's biggest lessons lie within its contexts and the genuine expression of human consciousness.

Kenneth Frampton (1985), argued that vernacular architecture should not be restricted to neurologic or emotional thinking of localisation but, once studied thoroughly, could provide more stable and contemporary solutions. Paul Oliver (2003) stated that the world's lack of affordable accommodation could be solved if context-based ways were applied, harnessing localised materials and skills. In response, researchers analysed vernacular buildings in various ways and means. Some scholars investigated vernacular buildings based on energy efficiency and ecological aspects (Adwan and Abu Muhsen 2016; Daoudi et al. 2019; Amro and Ammar 2020). Others

researched the suitability and practicality of vernacular architecture elements and techniques for contemporary life requirements (Foruzanmehr and Vellinga 2011; Seo et al. 2021).

The environment indeed represents one vital aspect of sustainability but not the only one. Sustainable development requires more than just going after material types or breakthrough technology. When pioneer architects and scholars like Hasan Fathy and Charles Correa promoted traditional methods and construction practices as a means of sustainability, they did so as a means to emphasise the local culture and overcome environmental challenges (Guitart 2014; Fathy 1973). Sustainability is even more complicated when we consider the different contexts and regions found across the world (Ameen and Mourshed 2019).

Indeed, ethics compels us to build according to the context and its inhabitants, using suitable methods (Reychav *et al.* 2017; Purvis *et al.* 2019). However, the ever-growing rates of city sprawl and improvement in current construction methods are responsible for the state of standardisation of architecture everywhere and the consequences on culture and societies (Azarshahr *et al.* 2013). A disconnection between the procedures of building design and the local context has emerged. This is most notable in 'developing nations,' which often choose imported solutions that were conceived for different contexts (Fatourehchi and Zarghami 2020). Vernacular architecture is the product of an extended time of experimenting and presents evidence of these builders' sensitivity and applied information within their reality (Vellinga 2014). A similar approach can thus provide a good starting point for generating sustainable living that facilitates the integration of eco-cultural qualities relevant to the specifics of the place.

1.4   Gaps in knowledge

As presented in the previous section, the past decades saw an exhilarated awareness of vernacular architecture's importance and a growing awareness of the importance of its lessons regarding sustainability. However, The International Council on Monuments and Sites (ICOMOS) declared vernacular buildings as a suffering cultural heritage and an excessive threat of deterioration or vanishing. Prieto (2005) noted that more and more vernacular buildings are vanishing at a fast pace. The global heritage fund (2010) also argued that the vernacular architecture is threatened by either urban development, natural disasters, or most importantly, the modifications in local's viewpoints on living and lifestyle. Vellinga (2014) stated that vernacular architecture and the knowledge, skills, and traditions that once informed its creation are disappearing worldwide.

Given the diverse and interlocking fields related to finding a solution for the critical socio-cultural, sustainability and urbanisation issues in the global context, some notable gaps appear in studies related to vernacular architecture and sustainability assessment. These include the following:

1. **There is a limitation in understanding the concept of sustainability in relation to vernacular architecture.** Research on vernacular architecture remains mostly concerned with its thermal performance and technological lessons. However, sustainability, at its core, requires a holistic approach that balances all of its aspects. Research regarding sustainable and vernacular architecture usually focuses on technical and environmental performance and overlooks other sustainability aspects. Significantly, Halicioglu 2012; Zhai & Previtali 2010; Motealleh *et al.*2016; Ozorhon & Ozorhon 2014 and Kırbaş & Hızlı 2016 regarded the ecological impact of vernacular architecture, forgetting to capture its true essence or suitability.
2. Studies regarding bioclimatic lessons of vernacular architecture such as Singh (2011); Semahi (2019); Kırbaş and Hızlı (2016); and Daoudi (2019) **assume vernacular architecture elements are practical for contemporary use, without much effort to understand where the disconnection happened between old and contemporary practice which rendered these elements obsolete.**
3. **Research and projects regarding the modern take on a vernacular architecture treat its elements separately from the context** that they were initially created in and impose the

designers or researcher's opinion on what should or should not belong there (Kazimee 2009; Adwan and Abu Muhsen 2016; Weber 2013; Foruzanmehr and Vellinga 2011).

4. **There is a limitation in investigating cultural and regional related indicators of sustainability or how sustainability indicators should be adapted for different contexts**(Doan et al. 2017; Gou 2019; Lazar and Chithra 2020).

5. Finally, **participation in most research regarding the sustainable built environment is limited to experts and professionals** and can often exclude other stakeholders such as the residents and users of residential units (Atanda and Öztürk 2020; Ashley *et al*. 2015; Olakitan Atanda 2019).

These gaps in knowledge define the opportunities for the theoretical contributions in this thesis. The gaps persist because of the negligence of socio-cultural considerations for delivering sustainable contextual design. This research emphasised the importance of incorporating intangible indicators that are related to culture. Few studies dealt explicitly with intangible topics such as culture and localisation in combination with environmental sustainability (Zarghami *et al.* 2017; Guy 2010). An integrated approach of socio-cultural and environmental indicators has not been widely discussed (Foruzanmehr and Vellinga 2011), as successful integration requires the proper understanding of complex and sensitive aspects of the natural environment (Widera 2014). The next sections highlight the research questions, aims, and objectives used to address these gaps and issues with the current sustainability assessment in the built environment.

The second dimension of this research addresses the gaps associated with the delivery of sustainable housing. This is because the prevalent sustainability assessment frameworks and tools have the same limitations. The contributions are to address practical gaps and issues as follows:

- Methods and frameworks for sustainability assessment in architecture still focus primarily on environmental, physical issues, ignoring contextual and socio-cultural aspects surrounding sustainable design (Guzmán *et al.*2017). The focus on environmentally tangible factors is driven by the pressing need for practical solutions to address ecological crises (Fatourehchi and Zarghami 2020). It also may be related to the fact that the socio-cultural aspects are harder to identify and implement (Dessein et al. 2015). Green building rating systems also represent a commercially oriented stream of sustainability integration and assessment (Lazar and Chithra 2020), which in its turn contain some issues and have faced criticism for the following reasons:

- Most assessment tools are expert-driven and do not sufficiently involve all stakeholders (Wen *et al*. 2020). Involvement is usually limited to planners, architects and decision-makers and ignore residents and building users (James 2015)

- Most green building rating systems lack a post-occupancy assessment that is targeted to building users. Instead, they assess buildings at the time of their construction without paying attention to how the performance affects or is affected by users and their behaviour (Ameen *et al*. 2015; Doan *et al*. 2017).

- Commercially oriented assessment frameworks raise concerns about the extent to which they support or contradict design practice, clients and developers' commercial interests, or their subjectivity in measuring sustainability (Teng *et al*. 2019).

- Most international rating and assessment methods do not consider regional priorities or locality considerations (Díaz López *et al*. 2019).

1.5   Research problem and rationale

Sustainability has been identified worldwide as a necessity and the application of sustainable design methods is vital for the survival of natural resources for future generations. Housing demand in Jordan, as in many developing countries, is increasing rapidly and the housing construction market is facing immense shortages of adequate housing (Abu Al Haija 2012). Jordan also has unique challenges facing the application of sustainability to housing that is related to contextual factors. However, as the country is still developing this type of research is still not a

priority. It is vital to develop research, such as this one, which can guide stakeholders and policymakers in Jordan to make sustainable decisions related to the housing sector. The following problems are presented as the main rationale for this research:

- There is a lack of understanding and research towards local context and culture and their role in a sustainable built environment (Wu et al. 2016; Opoku 2015; Rosaleny Gamón 2020). This study aims to contribute to this frequently overlooked area of research by finding solutions for this problem.
- There is a lack of understanding and integration of socio-cultural dimensions and indicators within sustainability frameworks (Wu et al. 2016; Abousaeidi and Hakimian 2020).
- How to measure and quantify these intangible indicators still represent a source for debate and a major challenge for the implementation of sustainable solutions in the built environment (Dessein et al. 2015; Lazar and Chithra 2020).
- There is no universally agreed list of indicators as intangible indicators are hard to measure, notice or connected to practical sustainability frameworks or the physically built environment (James 2015; Verma and A. S. Raghubanshi 2018).

Therefore, it is the rationale of this research to define and interpret the most critical indicators required to holistically integrate sustainability in housing design in Jordan, and the adaptation of the unique socio-cultural sustainability requirements of the context of Jordan into the design of sustainable housing.

1.6 Research aim, questions, and objectives

This research aims to propose a new eco-cultural design approach for sustainable housing schemes that build on vernacular architecture lessons as a model to integrate cultural, social, and ecological variables. This new approach will facilitate sustainability through the continuity of traditions and the formulation of tools and techniques to enhance critical regionalism in architectural design and implementation. Such an approach requires input from various stakeholders in the assessment stages, significantly, end-users of the building who are often omitted from the design decisions process. Therefore, this research's outputs support the interpretation and integration of the socio-cultural aspects into sustainable building developments based on value metrics defined by occupants and residents. The following research questions are defined to achieve the research aim:

- What tangible and intangible indicators inform the eco-cultural sustainability of housing?
- How can these indicators be measured and connected to the physical attributes of the built environment?
- How can the measurable and quantified indicators inform the creation of context-based guidelines for the design of sustainable housing developments?
- How can these findings be pragmatically applied to preserve and transform lessons from vernacular architecture into contemporary housing design and development?

An understanding of why it is necessary to develop a holistic, sustainable approach in contexts where sustainability is not yet widely implemented is necessary to answer these research questions. Few studies concern themself explicitly with intangible indicators such as culture in conjunction with technological and other sustainability factors. The following research objectives are proposed to answer these questions, which aim to:

1. Define the most relevant tangible and intangible eco-cultural indicators that affect contemporary and vernacular architecture within regional contexts.
2. Refine and evaluate the efficacy, appropriation, and measurement methods/tools for applying these indicators within a contemporary sustainable housing scheme in Jordan based on regional architectural principles..
3. Propose and evaluate an eco-cultural framework with relevant user-defined eco-cultural indicators for sustainable housing in Jordan.

4. Apply the multi-factorial, multi-stakeholder eco-cultural framework to propose and validate an eco-cultural design assessment tool for sustainable housing design in Jordan. Enumerate the theoretical and practical contributions and recommendations based on these findings.

1.7 Frame, scale, and scope of the study

To answer the research questions and achieve the objectives of this study, the research started by building on the previous literature of sustainable and vernacular architecture with a focus on human context and how it affects the production of the physical sustainable built environment. The scope of this research thus embraced the following themes and topics:

- **Investigating indicators and factors for eco-cultural architecture:** This includes topics related to sustainable development, sustainable architecture, regional architecture, critical regionalism as well as vernacular architecture with reference to cultural sustainability in dwellings. The investigation also aims to affirm and refine the indicators in relation to architectural sustainability, environmental conditions, cultural values, and occupants' lifestyle within the context of Jordan.
- **Sustainable assessment frameworks and methods within the built environment:** Sustainable assessment methods employ indicators to enable policymakers to integrate their decision-making on projects, plans, policies, and programs so that they are consistent with sustainability principles. Green building assessment methods and tools were investigated for their compatibility to integrate eco-cultural and context-based indicators and their appropriateness to be applied to buildings in Jordan.
- **The production of an eco-cultural design integration framework and tool.** The framework aid in integrating socio-cultural design indicators into sustainable housing developments and assessment methods. The framework complements previous bodies of work on assessment tools and frameworks with socio-cultural aspects and their link to sustainable practice and physical solutions which has been largely ignored.

This research is considered new precedence within research in general and for Jordan and the region. It also dealt with issues and queries intended for both academic research and practical application. For academic resolutions, the investigation of research objectives will enable researchers to further understand the role of socio-cultural aspects and implement this in sustainable housing design in relation to an ever-changing context. In practice, the discussed indicators will be incorporated into a tool to design sustainable housing schemes.

1.8 Overview of methodology

The study applied a qualitative approach. This builds on previous quantitative findings and combined architectural, social approaches of fieldwork and direct interviews with users. This approach helped bridge the gap between the tangible and intangible relationship in sustainable housing production. Figure 1.1 illustrate the research design and phases. The qualitative research approach was utilised as follows:

1. Literature review to define and classify existing indicators, sustainability assessment tools and design quality schemes.

2. Case study and interviews with residents from two locations in Jordan (from modern development and vernacular buildings) were utilised to establish and refine the theoretical model and indicators into user-defined eco-cultural indicators.

3. Participants' views were coded, clustered, and analysed to determine the relationship and importance between these indicators.

4. The resulting indicators are incorporated into a working framework and tool.

5. Finally, the produced tool and framework were refined and evaluated with a panel of experts and architects from Jordan.
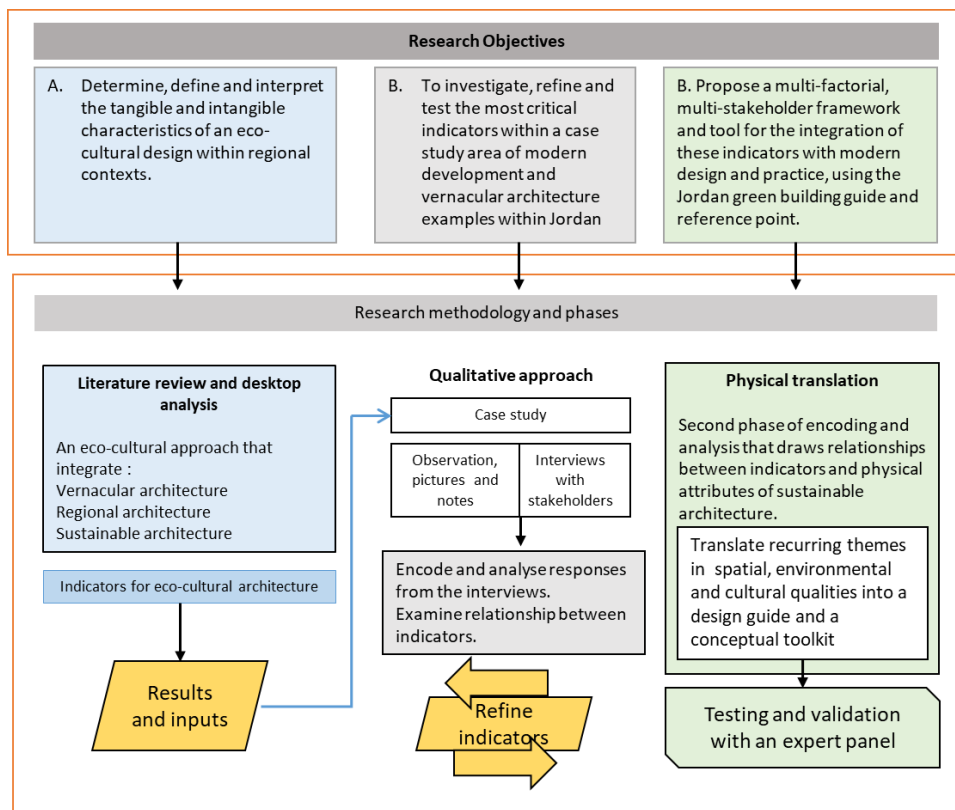
Figure 1.1 Outline of the research process

1.9 Thesis structure

The thesis is presented in two parts, following this general introduction to topics related to socio-cultural integration with sustainable design. In **Part One**, the overall purpose and literature review of the study takes form, and the conceptual framework is constructed. **Part Two** of the thesis is concerned with constructing and testing the practical framework and tool. This thesis takes the form of eight chapters, including this introductory chapter (**Chapter One**). Part one consists of chapters one to four of the thesis, while Part Two covers chapters five to eight.

Chapter Two presents the theoretical background of the research. This chapter starts by exploring the morphology and possible core lessons from vernacular architecture as a model for contemporary sustainable context design. After that, it highlights the concept of "eco-cultural" design through sub-related topics such as socio-cultural sustainability and its indicators. It concludes by summarising the challenges and potentials of an eco-cultural framework, the research gaps in more detail, and the approach for generating sustainable living that facilitates the synergy of socio-climatic qualities relevant to the specifics of the context.

Chapter Three reviews the different sustainability assessment frameworks and tools within the built environment. An overview of the integrated design process for socio-cultural qualities within current frameworks is also presented with a focus on the context of Jordan.

Chapter Four is concerned with the methodological approach and research design. It starts with outlining the different theoretical paradigms and research approaches. It also addresses a detailed framework for the study and the different phases, methods, and techniques that are adopted for answering research questions. The methodological review also targets the ways indicators can be measured and utilised in the form of a tool.

Chapter Five investigates the socio-cultural and sustainable qualities and indicators of residential buildings in Jordan. It presents the analysis and discussion for the data collected from different resources, such as observations, interviews, and questionnaires.

Chapter Six develop the case study findings from Chapter Five as an eco-cultural design framework and tool. This framework outlines the influential factors and indicators to aid the production of modern, sustainable, yet contextual buildings. This chapter also tests and evaluate the developed eco-cultural framework and tool based on feedback from architects who specialise in the design of residential dwellings in Jordan.

Chapter Seven discusses the main findings and results from this thesis and links them to the research questions and objectives. It also explains the novelty of research in the context of the literature, provide a critical reflection on the project and discusses the limitations.

Chapter Eight presents a summary of the findings, the research conclusions, contribution to knowledge, practical applications and implications, and future studies recommendations.

1.10 List of publications

The following papers have been published according to the results of this research:
1. Qtaishat, Y.; Adeyeye, K.; Emmitt, S. (2017) Towards an integrated eco-cultural regional architecture. *Proceedings of the International Conference on Advances on Sustainable Cities and Buildings Development (SB-LAB 2017) Green Lines Institute for Sustainable Development*. Porto, Portugal, 15-17 November 2017.
2. Qtaishat, Y.; Emmitt, S.; Adeyeye, K. Exploring the socio-cultural sustainability of old and new housing: Two cases from Jordan. *Sustainable Cities and Society*. 2020, 61, 102250, doi: https://doi.org/10.1016/j.scs.2020.102250.
3. Qtaishat Y, Adeyeye K, Emmitt S. Eco-Cultural Design Assessment Framework and Tool for Sustainable Housing Schemes. *Urban Science*. 2020; 4(4):65. doi: https://doi.org/10.3390/urbansci4040065

2 Chapter Two. Eco-cultural Architecture

2.1 Introduction

The three pillars of sustainability call for economic activities that are not destructive of either the ecological web of life or the social web of life we are a part of and upon which we depend for our health, wellbeing, and quality of life (Clune and Zehnder 2018). Therefore, it is crucial to understand that both social and environmental sustainability require a system of economic activity with which it is compatible (Purvis *et al*. 2019). Also, any discussion of an environmentally sustainable built environment must include a discussion of the community's wellbeing and the economic system to preserve its sustainability.

According to the three pillars of sustainable development, environmental sustainability, together with economic growth and social cohesion, form sustainable development components that target human wellbeing. Human well-being is a concept used to refer to and describe aspects and issues that are assessed in the evaluation of people's life situations and quality (McGillivray 2007). An umbrella of different terms has appeared in the research literature, along with well-being. The most common ones include quality of life, living standards and human development. Others include welfare, social welfare, well-living, utility, life satisfaction, prosperity, needs fulfilment, development, empowerment, capability expansion, among others (Helne and Hirvilammi 2015). Some have distinct meanings, but there are great similarities between their meanings (Gasper 2007). Individual studies tend to adopt a particular term, others use different terms interchanged

(McGillivray 2007). For the sake of this research, wellbeing is used to describe the availability of not just environmental design indicators but also socio-cultural one.

The headline literature reviewed for this study is summarised in Table 2.1. Since the publication of the World Commission on Environment and Development (WCED) report in 1987, the discussion was mainly confined to the economic and natural aspects of development. The UN report of 1987 implies that progress towards sustainable development requires the promotion of socially and culturally determined values and indicators that encourage ecological practices (Brundtland 1987). However, the socio-cultural dimensions of sustainability have received considerably less attention than economic and environmental dimensions, and it was neither fully explored nor widely recognised (Stender and Walter 2019; Olakitan Atanda 2019; Danivska *et al*. 2019; Fatourehchi and Zarghami 2020; Abed 2017). In recent years, some scholars also argue that the three-pillar model of sustainable development is fundamentally flawed by the absence of culture (Dessein et al. 2015; Wu et al. 2016).

Table 2.1 Literature review summary

Title	Author(s) / year	Source	Main themes
Architecture and Identity: responses to cultural and technological change	Abel (2000; 1993)	*Editorial book*	Examines the possibility for authentic regional architecture by placing eco-culture in the centre of the design process's focus. Abel presented historical records of how local culture shaped architecture as much as the local environment did.
Redefining architecture to accommodate cultural difference: designing for cultural sustainability	(Rapoport 2006)	*Editorial book*	Discussed the status of vernacular architecture in the 21 century and asserting that people have very different attitudes and ideas in response to varied physical environments. These responses vary from place to place because of changes and differences in the interplay of social., cultural, ritual, economic and physical factors.
Built to meet needs: Cultural issues in vernacular architecture Dwellings: the house across the world	(Oliver 2007; Oliver 2003)	*Encyclopedia Book*	The pioneering study of Oliver explores the characteristics of domestic buildings in various regions and the many social and cultural factors that have contributed to their evolution
Impact of Daylighting Design Strategies on Social Sustainability Through the Built Environment	(Zarghami *et al*. 2017)	*Sustainable Development*	This paper discussed and interpreted indoor human comfort as a highly negotiable socio-cultural construct. It also argued that social and technical trajectories in housing design could be ultimately unsustainable
Culture in, for and as sustainable development: Conclusions from the COST Action project	Dessein *et al.* (2015)	*Editorial book*	This book provides conclusions from the COST Action project that investigated cultural sustainability in the built environment
Incorporating culture into sustainable development: A cultural sustainability index framework for green buildings	(Wu *et al.*2016)	*Journal of Sustainable Development*	This study added cultural sustainability for green buildings by recognising the role of culture in sustainable development as the fourth pillar for sustainability.
The three dimensions: defining sustainable development	(UNIDO, 2005)	*United Nations Publication*	The main framework presented by the United Nations asserting sustainability as three pillars (social, environmental and economic) that became widely accepted among researchers and working frameworks of various countries and industries
Various research papers on social and cultural sustainability Indicators and frameworks.	(Stender and Walter 2019; Abed 2017; Wan and Ng 2018; Larsen and Jensen	*Various Journals*	These papers argued that policies on the economic use of natural resources require consideration of social and cultural values in order to make those concrete in planning and building contexts. They also identified and

Title	Author(s) / year	Source	Main themes
	2019; Atanda and Öztürk 2018)		interpreted various social and cultural indicators and matched them with verified practical variables.
Vernacular Elements as Indicators for Sustainable Interior Environment: Housing in Jordan and, Vernacular architecture: Questions of comfort and practicability	(Amro and Ammar 2020), and (Foruzanmehr and Vellinga 2011)	*Green Buildings and Renewable Energy And, Journal Of Building Research & Information.*	These papers examined whether vernacular architecture elements are suitable and practicable for providing a comfortable contemporary indoor environment.
Various building and urban sustainability framework	(Alsubeh 2013; Ahmad and Thaheem 2017; Mahmoud *et al.* 2019; Ameen and Mourshed 2019; Abousaeidi and Hakimian 2020)	*Sustainable Cities and Society*	This research quantified the environmental impacts of building construction with the debate around a framework for developing domestic sustainable building and assessment criteria and Indicators.
Various sustainability building assessment tools	(Omar *et al.* 2016; Mattoni *et al.* 2018; Doan *et al.* 2017; Awadh 2017; Wen *et al.* 2020; Lazar and Chithra 2020)	*Various Journals*	These papers discuss and illustrate some of the differences and approaches toward Sustainable building assessment in some of the most used green building tools available in the international market.
Various research studies regarding sustainability and vernacular architecture	(Al-Jokhadar and Jabi 2017; Habibi 2019; Ghosh *et al.* 2019; Motealleh *et al.* 2016; Songel 2020; Danja *et al.* 2017; Sayigh 2019; Daoudi *et al.* 2019; Zune *et al.* 2020; Abdel-Azim and Osman 2018; Nguyen *et al.* 2019)	*Various Journals*	These studies highlight various social, economic, and environmental design lessons from vernacular architecture to solve current environmental and urban-related issues that face the construction and building sector.

This chapter aims to establish the theoretical background and framework for eco-cultural architecture. The chapter starts by presenting an in-depth overview of the concept of culture, its interpretations, and its role in formulating both the built environment and its sustainability. Then, it discusses the eco-cultural potentials of vernacular architecture; and its relationship to the four circles of sustainable development. Finally, the most significant tangible and intangible sustainability factors and indicators that influence the development of eco-cultural architecture are explored.

The numerous factors and metrics affecting a dwelling are complex phenomena that can also have variations even in a single context or region. People with very different attitudes and ideals respond to varied physical environments in different ways. These interactions also differ depending on the region because of changes and differences in the social, cultural, ritual, economic, and physical factors (Jenkins *et al.* 2006). This chapter illustrates this complexity by drawing the relationship between these indicators as a basis for the integration of eco-cultural design in residential buildings.

2.2   The missing dimension: Cultural sustainability

Architecture does not only consist of mechanical and structural configurations. Architecture represents an inherited, intangible and tangible set of data that should be understood and experienced dependently based on the context (Xiaoyu and Beisi 2015). According to the Cambridge dictionary (Walter 2008), intangible is what is impossible to touch, to describe exactly, or to give an exact value and can only be experienced and measured qualitatively. Intangible is that which can be only experienced In the field of the built environment intangible represents ideas, emotions, social norms, identities, traditions and a system of culture that evolves, translate and manifest as built forms and architectural design, principles, qualities and elements (Fireman 2001). The Cambridge dictionary defines tangible as the real and able to be shown and touched. Only physical things can be touched; therefore, all physical things are tangible. In the built environment, tangible represents the physical objects and elements that form the built environment and that architecture. Intangible, however, is only part of the whole, the physical built environment, when studied, helps inform the original intangible aspects that manifested it and help gives reasoning for intangible experiences and reasoning (Tweed and Sutherland 2007).

These definitions echo the core of sustainable architecture that is concerned with the context, both human and natural, and with improving the quality of life (Zarghami *et al*. 2017). Thus, the United Nations definition of sustainable development has been widely criticised for lacking many intangible and human cultural aspects, which has a significant influence on human life and wellbeing (Memmott and Keys 2015; Wen *et al*. 2020). It was also criticised for being loosely defined and too conceptual (Purvis *et al*. 2019).

According to Deetz (1996), culture is an exclusive system for humans that vary from one location to another. It consists of traditions and customs invented and passed down in society through decades of interactions with the natural world. Culture is based on unique social aspects that interact with the context to produce behavioural patterns (Tao *et al*. 2018). Culture is what affects the self-image of an individual within an environment. This statement gives further credence that the environment's cultural and social aspects inform the shape, occupation, and form of space while demonstrating the effect of values and heritage. Culture represents a mental map that guides us in our relations with our context and other people (Rapoport 2019).

One of the earliest mentions of culture in relationship to sustainability was introduced by the World Commission on Culture and Development (WCCD) in 1995. The WCCD defined cultural sustainability as intra-generational access to cultural resources and heritage. Cultural heritage is defined as the entire corpus of material signs, either artistic or symbolic, handed on by the past to each culture and, therefore, to the whole of humankind (Wilson 1997). Material cultural heritage includes tangible monuments of architectural, sculptural, painted, archaeological, and other human-made landscapes (UNIDO 2005). Symbolic cultural heritage includes intangible practices, representations, expressions, knowledge, skills, as well as the instruments, objects, artefacts, and cultural spaces associated with them (Kurin 2004). There have been many attempts to include culture in development frameworks. For example, the four fundamental pillars in Gross National Happiness include conservation and promotion of a vibrant culture (Ura *et al*. 2012). Culture has also been the focus topic of dozens of international policy frameworks in recent decades. Examples include the Hangzhou Declaration, which placed culture at the heart of sustainable development policies, the Florence Declaration, which provided recommendations on maximising culture's role to achieve sustainable development goals and the COST Action investigation of cultural sustainability (2015).

There is a further significant link between culture and sustainability. With its rules, values, beliefs, and norms, culture carries the community's sustainability and vitality (Rosaleny Gamón 2020). Culture also matters in sustainable development because social and economic activities reflect cultural values and decisions at their roots and human behaviour and actions. Solutions are, therefore, likely to be also culturally based (Rapoport, 2019). Dessein *et al.* (2015) highlight the

need for a new modern view for sustainable development that considered culture and nature as two equal entities. They presented cultural aspects as one of four circles of sustainability that also includes economics, environmental, and social factors. They also classified cultural indicators and their relationships to sustainable development into three themes: "in, for and as" sustainable development. The "in" represents the role of culture in sustainability. It considers culture as more tangible and functional rather than an intangible heritage and sentiment approach. Culture "for" sustainable development becomes the framework, context, and regulator for the other three pillars. Culture "as" sustainable development sees culture as an essential foundation for integrating achieving and assessing sustainability.

Despite these efforts, sustainability frameworks within the built environment still lack the cultural dimension (Wu *et al*. 2016). Cultural sustainability and its indicators were also neither fully explored nor widely recognised within sustainability assessment in architecture, its tools, nor in its rating systems (Al-Kodmany 2018). The environmental and economic points of view are still the most popular parameters for sustainability and in determining both the properties and the creation of homes (Memmott and Keys 2015). The debate about the role that culture plays in architecture is not new. Supic (1982) argued that socio-cultural factors had more determinations on the production of vernacular architecture than climatic, technological, or environmental factors. According to Rapoport (1969, 2019), culture is involved in creating the identity of people in a geographical region, as much as it actively determined shape, typology and even the technology applied in architecture, especially in building vernacular dwellings. Further, Abel (1993; 2000) elaborated that architecture is comprised of differentiated regional culture based on ecological principles and eco-cultural values. He explained that the performance of architecture should meet locally specific needs and socio-cultural systems.

In the same way, the general form and quality of a region's modern architecture are also shaped by favoured socio-cultural indicators and strategies, having direct and lasting effects on the choice of dwellings patterns, building types, technology and modes of production (Rapoport 2006). The built environment is considered as one of the tangible forms of culture (Salman 2018). Culture is also transmitted through architecture, material, technology, function, and other physical elements of the built environment (Songel 2020).

Oliver goes further to explain that the cultural and social alienation associated with modernisation and globalisation has led to the introduction of unsuitable building forms and methods to the context of developing regions. The loss of local control over cultural forces has presently affected all dimensions (social, environmental and economic) of sustainable built environment in those regions (Oliver 2007; Rapoport 1969). Therefore, it would be unrealistic to expect any general improvement in the sustainability of the built environment without the understanding and consideration of the changes in these cultural factors and their relationship to the three pillars of sustainability. Culture thus determines behaviours, preferences and choices that affect housing design, which also shapes sustainability.

The limitations in applying and researching cultural sustainability call for adopting and emphasising the role that culture plays in sustainable development and architecture as a self-standing fourth pillar. In this model, culture is viewed similarly to the social, economic, or environmental dimensions. It is treated as a capital that needs to be invested in and preserved for current and future generations. Treating culture as a fourth dimension of sustainable development (Figure 2.1) requires it to be translated and treated as a tangible and functional aspect besides its intangibility (Dessein et al. 2015).
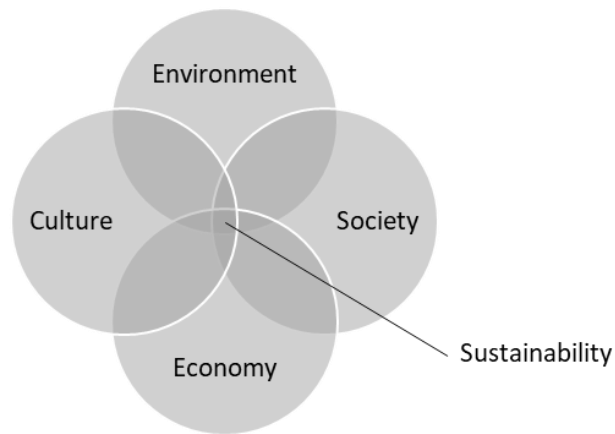
Figure 2.1 The relationship between the pillars of sustainability

Abel (1993), was one of the first to describe and discuss a cultural approach toward sustainability based on climate, culture, and context in what he called an eco-cultural design. Eco-cultural architecture is the physical interpretation of the culture of a region based on ecological principles that are economically viable (Abel 2000). Eco-cultural architecture is that one that adapts, uses and maximises the technological performance for locally specific needs (Rapoport 2006). Eco-cultural architecture thus requires a hybrid mix of local culture, material, and resources, combined with modern ideas and technologies adapted to local conditions that were once available in vernacular architecture (Abel 1993).

Rapoport (1969; 2019) also calls for an eco-cultural architecture that is based on vernacular architectural values. Moreover, the performance of sustainable architecture should aim to mimic that of vernacular architecture and meet locally specific needs besides the ecological, environmental ones (Chappells and Shove 2005; Guy 2005; Rosaleny Gamón 2020). Thus, an eco-cultural approach in architecture needs first to examine, transform, and reuse lessons from vernacular architecture, its techniques, typologies as an expression of cultural sustainability. The study of vernacular architecture could also help in adopting a critical regionalism architectural design approach. This approach intends to respect climate and sustain the culture of the region by considering the existing architectural features, lifestyles, and cultural issues of a region. The following sections discuss the sustainable qualities of vernacular architecture projected to the three pillars of sustainability and the newly introduced cultural sphere.

2.3   Vernacular architecture in Jordan

This study focuses on addressing issues that face sustainable residential buildings in the context of Jordan and the Middle East and North Africa (MENA) region. Jordan is a country that lies in a subregion historically known as the fertile crescent. Due to its central position between the east and west of the Arab world, vernacular architecture in Jordan is considered an extension of the vernacular architecture found all over the MENA region with small contextual variation (Al-Jokhadar 2018). Most countries across this region share the same social and cultural values, local traditions, living patterns, lifestyles and share a similar hot arid climate (Al-Jokhadar and Jabi 2017). Most existing vernacular architecture in Jordan dates back between the 17 and 19 centuries (Khammash and Mhire 1986). Vernacular architecture in Jordan had consisted of hundreds of villages spread mainly on the mountainous and plateaus areas east of the Jordan valley within a narrow strip of land (50 km east to west and 250 km north to south). Al-Nammari (2003) classified Jordan's vernacular architecture based on bioclimatic regions of Jordan into three types (Figure 2.2).

1. The Jordan valley dwelling is characterised by sun-dried mud for construction and the use of what is known locally as the "Ghouri" style of domes. A type of arched pointed domes used as a passive cooling system for a scorching summer in the valley.

2. The desert-dwelling; is characterised by the use of traditional Bedouin tents.
3. The highland region represents the prevailing type of vernacular architecture that uses local stones as the primary building material, courtyard-style dwellings, elaborate detailing, vaulted and flat roof systems.
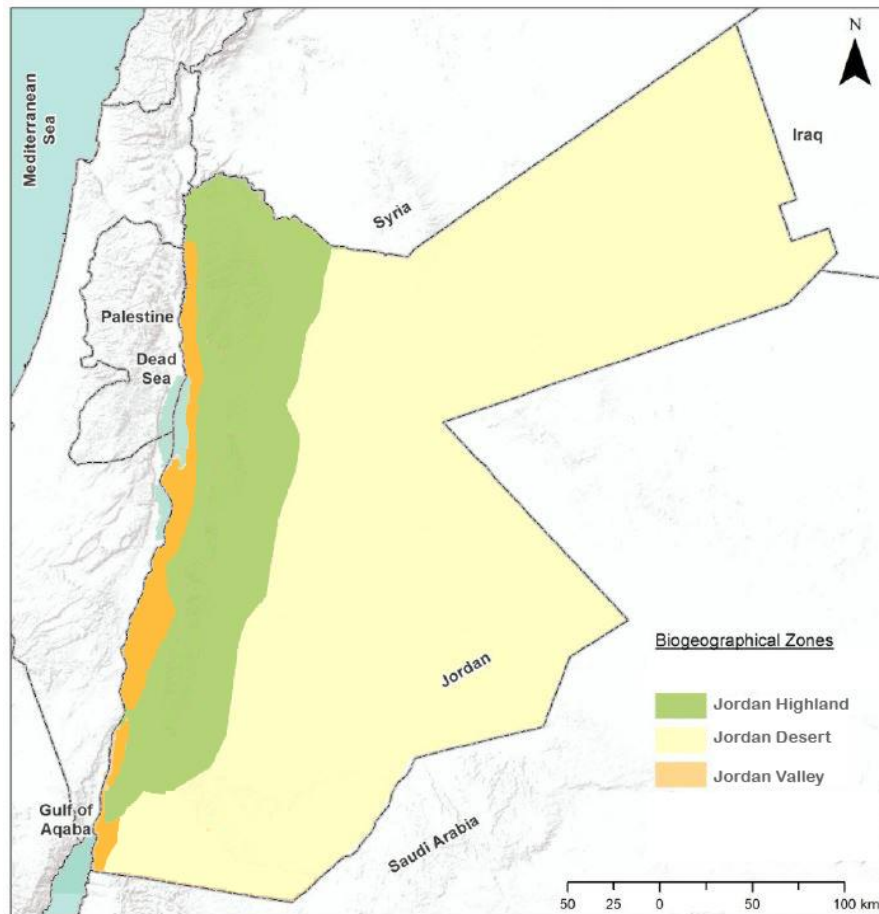
Figure 2.2 Jordan's three main biogeographical zones (RJCN 2016)

2.3.1 The Jordan desert dwelling

The vernacular dwelling of the population who lived in the desert known as the Bedouin people was the tent (Attia 2014). Bedouin tents come in variable sizes and depending on the size and wealth of the family, were divided into several rooms. While they may have a variety of uses such as hosting temporary guests, yet they did not have a fixed use. (Baglioni 2015). Tents were made from goats wool and other animal-fibre cloth which was supported by wooden poles (Abu Ganemeh *et al*. 2011). The purpose of the tent was to protect the inhabitants from harsh weather conditions such as torrential rainfall and scorching temperatures (Baglioni 2015). When it was no longer necessary to protect the interior from sand storms, one of the longer sides of the tent could be opened to provide a natural method of ventilation (Attia 2014). This type of dwelling represents the nomadic and temporary dwelling lifestyle that is going extinct throughout Jordan and has little connection to contemporary architecture in Jordan. Therefore, this study will not use these examples in the research design process.

Figure 2.3 Example of a Bedouin tent from Wadi Rum south of Jordan (Picture was taken by the researcher in summer 2016)

2.3.2   The Jordan Valley dwelling

Vernacular dwellings of the Jordan Valley were typically vaulted and cupula style-roofed of a single story and less common of two or more (Na'amneh *et al*. 2013). They are built with moulded mud sun-dried bricks which were suitable to maintain a comfortable temperature within the dwelling when temperatures have the potential to reach almost 50 °C (Labin and Aldeek, 2017). The walls are generally at least 50-100 cm thick to provide insulation, and the dwelling would consist of 2-5 rooms arranged one next to the other in various shapes to provide shading where required (Baglioni 2015). The main section often had small windows and a single-entry point to reduce heat transfer and increase the mud structure stability (Khammash and Mhire 1986). Besides the difference in roof shape and the use of mud bricks instead of stone, Jordan valley houses were more or less identical in shape, function and typologies to the ones found in rest of Jordan villages in the highlands. Unfortunately, very few examples are left which are scattered around the Jordan valley which makes it difficult for this typology to be study and research upon.
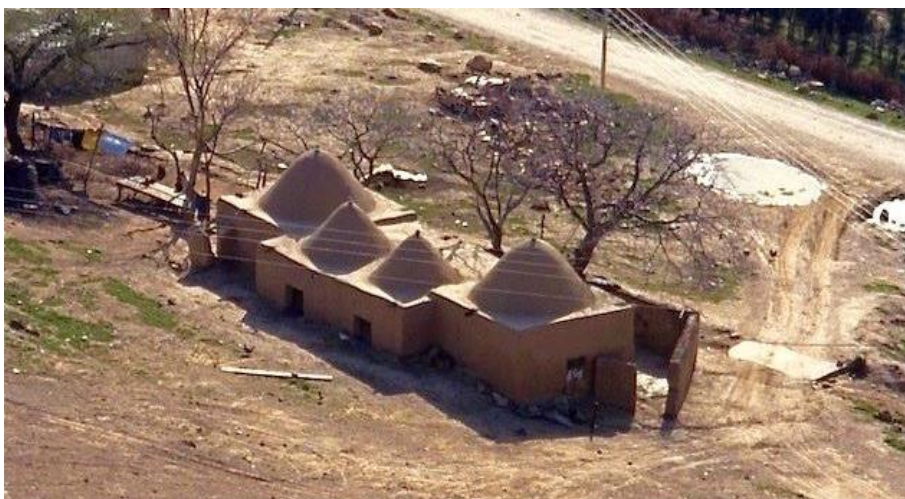
Figure 2.4 The cupola style domes of Jordan valley vernacular dwelling (personal communication with Ammar Khammash)

2.3.3   Vernacular dwellings in the highlands

Most agricultural traditional communities in Jordan lived on the high plateaus west of Jordan, where fertile lands are located (Khammash and Mhire 1986). Vernacular dwellings there had vaulted or flat roof systems with more elaborate detailing than that in the Jordan valley (Baglioni

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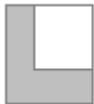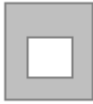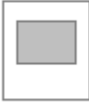
2015). These dwellings were typically built following a modular system built on the repetition of one a hall, or a room (usually 400 cm x 600 cm) that was expanded whenever the family grow in size or these rooms were needed (Na'amneh *et al*. 2013). The resulting shape of this dwelling would depend on the village fabric density or the site typography.

Figure 2.5 An abandoned highland style vernacular dwelling from Shatana village north of Jordan (Picture was taken by the researcher in summer 2015)

Table 2.2 present the main vernacular dwelling typologies found in much of Jordan and the middle east. The outside area of these rooms consisted of a courtyard or enclosed outdoor area of the dwelling which switched functions between hosting guests, cooking, preserving domesticated animals, small scale farming and other daily chores (Abass *et al*. 2016).

Table 2.2 layout and typology of vernacular dwellings in Jordan and MENA region; adapted by the researcher, after (Ebadi *et al*. 2014; Abu Ganemeh, Haddad and Shebool, 2011; Al-Jokhadar, 2018)

Typology	Linear type	L shape type	Courtyard	Four-Sided Garden	Atriums/clustered
Plan layout					
Characteristics	The rooms are organised parallel to the outdoor area. The open space has an intimate character as it is enclosed from the four sides. It is ideally suitable for dense urban housing developments.	These rooms layout offers maximum daylight exposure and economical use of space.	The courtyard is the spatial centre of the dwelling. It serves as a circulation zone, recreational space and access to adjacent rooms.	It is ideally suitable for townhouses to offer daylight exposure and air circulation between adjacent dwellings.	It utilises several small courtyards cut out of the building volume, to naturally light the floor space and create interesting spatial relationships. Ideal for extended families

Structurally, vernacular dwelling walls consisted of three layers, the outer layers made of dry-stone line and the filler layer, which consisted of compacted earth mixed with smaller stones (Rjoub 2016). The roof is usually laid on an arch-wall often built with stone (Labin and Aldeek 2017). The thickness could vary from 50 to 100 cm (Alhaddad and Alshboul, 2010). Wood logs that span the length of the room were placed at a space of about one meter to cover the roof (Figure 2.6). In later phases, wood logs were replaced by iron beams (Na'amneh *et al*. 2013). A layer of stacked reeds was installed on top of the logs, then a layer of dry plants. The uppermost layer was

mud mixed with straws and in later periods were replaced by a concrete slab (Abu Ganemeh *et al*. 2011).
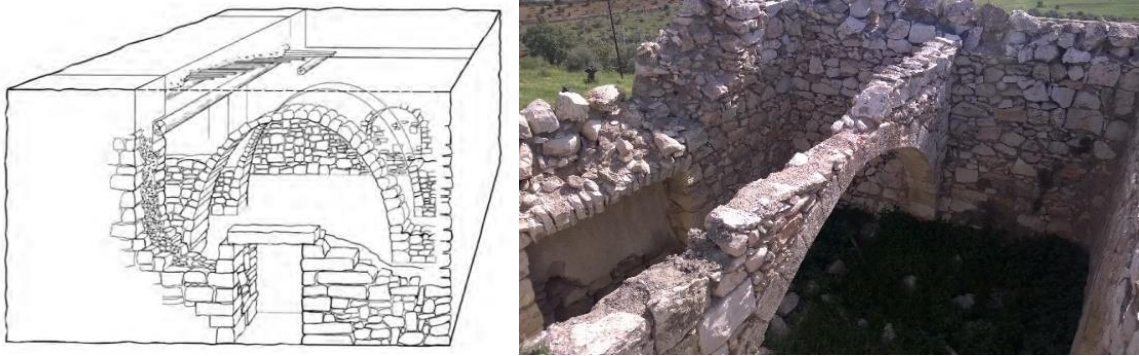
Figure 2.6 An example of the stone arch system that characterised many Vernacular dwellings (Diagram is by Labin and Aldeek (2017), the picture was taken by the author

Cross and keyed vaults structural systems were also popular; however, they were more labour intensive and required skillful craftsmen who at the time were particularly residents in bigger towns such As-Salt city (Na'amneh *et al*. 2013). The cross and keyed vaults room consisted of two arches intersecting in the middle of the room, reaching a height of about 3m and dominated the highest coldest areas of Jordan (Khammash and Mhire 1986). Many of these vernacular architectural types used rough stones, mud and wooden frameworks which were easily accessible in these areas (Alzoubi and Almalkawi 2019). Depending on structural variations, the previously discussed typologies can also be classified into 5 main types of vernacular dwellings: Floor on an arch, cross and keyed vaults, Barrel vaults, flat slabs, and cupola roof. These types were further divided according to the material of construction, roofing, roofing layers, availability of courtyard, and the number of stories. Figure 2.7 illustrates these typologies.
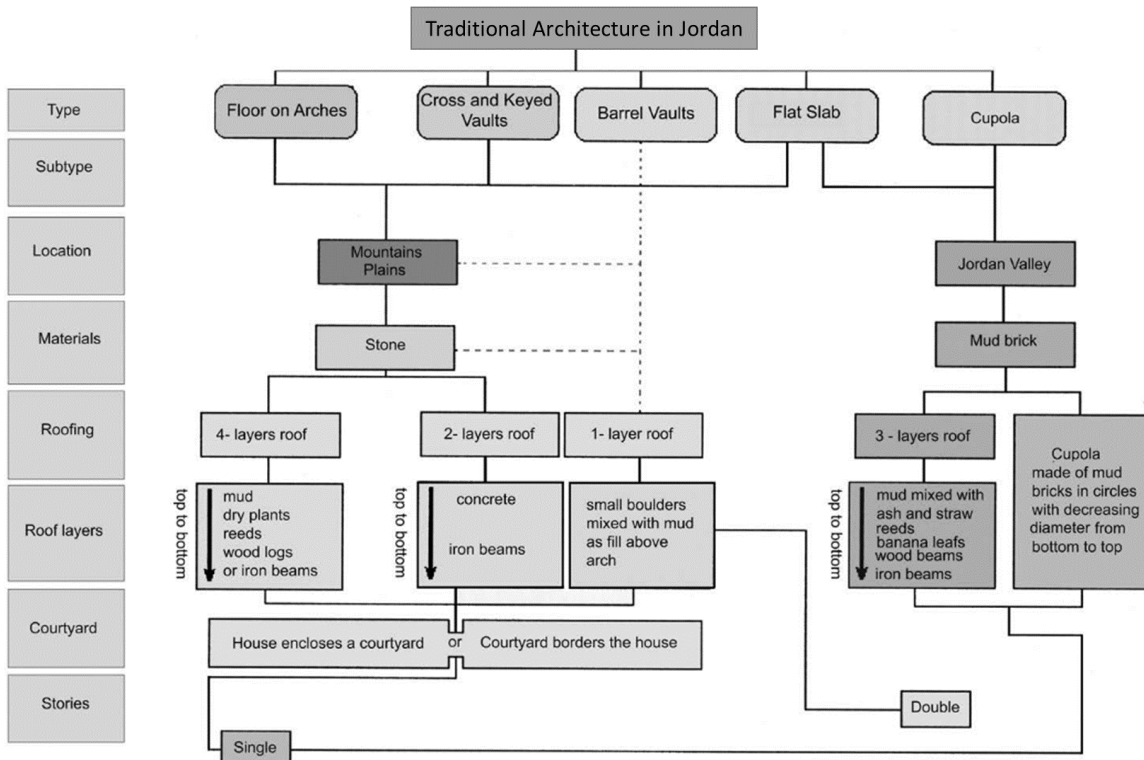
Figure 2.7 The typology of vernacular architecture in Jordan (Na'amneh et al. 2013)

The size, number of rooms, as well as the courtyard, depended on the socio-economic status of the owners (Zakarneh, 2000). Most Jordanian vernacular dwellings were inhabited by several nuclear families that together form an extended household, which consists of an older married couple, their married sons and wives, and the unmarried children of both the older couple and

their married sons (Petruccioli, 2006). The extended living arrangement was the most common type at the time; in most cases, each nuclear family would occupy a separate room/hall (Khammash and Mhire 1986). Aesthetics and architectural styles also varied between small villages and larger towns such as Madaba, Irbid and As-salt where an urban lifestyle, better socio-economic status and the presence of skilled craftsmanship led to more elaborate styles (Figure 2.8) (Abu Ganemeh *et al.* 2011; Na'amneh *et al.* 2013).

Figure 2.8 The elaborate stone carving styles found in As-salt, Madaba and Irbid cities (By the author)

Among these three types of vernacular architecture in Jordan, the stone-built highland dwelling is the most prevalent and most recognisable in Jordan (Baglioni 2015). These dwellings were constructed through the use of limestones that were brought from local quarries around these villages. These buildings were simple masonry one-storied structures with either flat or domed roofs and they were extended, when required to, using wooden logs and during the late 19th century and the beginning of the 20th century, using iron beams. Other notable sustainability principles and characteristics of the Jordanian vernacular dwelling include the following:

1. Vernacular architecture in Jordan emerged and aligned with the needs of its people and was flexible and adaptable to their requirements such as the need for more rooms and spaces. The result of such architecture was compact shapes that reflect the generational growth of the dwelling (Labin and Aldeek 2017).

2. Local building materials were used in vernacular architecture, and they were carried from close surrounding places, This aspect was so important in studying sustainable building materials, no energy consumed in transportation, no energy consumed in manufacturing, and the material is fully recyclable after the end of its assumed operation period (Alhaddad and Alshboul 2010).

3. A vital design element in the vernacular residential dwellings in the Jordanian villages are big semi-includes private open spaces called "Housh", used for growing trees, plants, and daily life activities (Khammash, 1986).

4. Shading devices and Shutters are placed on the windows of the building so that they appear as part of the windows to allow the viewer to see through, while the view from outside is restricted.

5. Thermal mass walls, the perimeter walls are made of dry-stone masonries, fitted without mortar. They are very thick walls, consisting of three layers (two external and one filler). The outsides layers are in stone masonry whereas the filler is of compacted earth mixed with smaller stones (Marino and Lodino, 1999). This allowed for the construction of an environmentally responsible and resource-efficient structure throughout a building's life cycle.

6. Those dwellings built by farmers were built using a modular typology consisted of big "arch-walls", called ritual or "Kantara" (Al Haija, 2012), These arches occupy the whole extension of the room and allowed for the construction of larger, flexible spaces that accommodated the

same building style and quality of living among different socio-economic backgrounds (Baglioni 2015).

7. Compact forms are preferable to achieve thermal comfort and minimize heating and cooling loads for all climatic regions in Jordan, specifically, compact form is preferable for the desert region in winter while the rectangular form is better in summer.

8. Buildings were orientated with the southern, preferable direction of the sun. They were also built on the original level of the ground with little grading of the land and along the natural contour lines of the site especially in hilly areas to avoid the formation of water streams when it rains (Al-ZUBI and KOURA 2010). This adaptation also meant that all buildings were built on the same hights with little abstraction to sunlight and away from overlooking the main rooms and outdoor spaces of their neighbours (Ghanimeh et al. 2010).

9. The Jordanian vernacular dwelling was characterised by a private layout with few small openings, most of which were directed toward the enclosed yard or "Housh" to provide as much privacy as possible for women to carry out their daily indoor choirs. Also, this private, protective layout is partly the result of the relatively short daily presence of men inside these dwellings, as they spend most of their time grazing their livestock or in the farming fields far from the village (Abu Al Haija 2012).

10. The dwelling was modular and consisted of a core single-cell unit. This unit is considered as the basis for later expansion depending on an increase in the number of family components and on financial capacity (Rjoub 2016).

11. Other essential unique architectural elements of the vernacular dwelling in Jordan include Al-Mastabeh which is higher than the level of the Housh, and it was used as a sleeping area at night and a living space during the day (Shawash 2003). Further significant elements are; "Al-Rawyeh" and "Al-Qwarah" that was used for storing the grains; since the dwellers worked with cultivation. Al-Rawyeh is found in the big vernacular dwelling in the village. It was constructed from the mud, between two structural stone arcs, and it was used as a storage space for the grains. It was filled from the upper parts and the occupants can get the grains from an opening in the lower part. Above Al-Rawyeh was used to set up blankets and clothes (Alsubeh 2013).

Nowadays, only a few inhabited vernacular dwellings usually belong to the poorest and most vulnerable sectors of the population, such as immigrants and underprivileged households or, are inhabited by senior individuals and suffer from lack of maintenance. Most dwellings have been abandoned and are gradually turning into ruins (Al-Nammari 2003; Al Rabady 2013). Others are used solely as an animal shelter, and commercial storage with the more elaborate styled ones are turned into restaurants and guesthouses (Daher 2005).

This state of abandonment of vernacular architecture in Jordan can be primarily traced back to choices made by the original inhabitants to live closer to major cities or in modern dwellings. Moreover, government bad policy and management promoted certain demolitions of vernacular architecture and subsequent allocation to newer modern dwellings in order to free archaeological sites of interest which had been re-inhabited by the local population (Daher, 1999). The preservation of sustainability lessons of vernacular architecture requires researching cultural and socio-economic meanings and qualities of these dwellings as well as changes in people attitudes toward them.

2.4   Contemporary architecture practice in Jordan

Similar to what happened in most developing countries, Jordan experienced many demographic, social, and cultural changes that accompanied the spread of the Industrial Revolution, resulting in

a construction boom starting from 1920 (Khammash and Mhire 1986). In more recent times, due to the effect of modernisation and globalisation, most of the vernacular buildings in Jordan are now abandoned, as they represented a way of life that no longer exists in our modern-day (Baglioni 2015). Locals have replaced the agriculture-based economy with industrial and service-based occupations that provided better income sources or have moved to the cities, seeking better income (Mahadin 1994). This urban transformation led to a search for a modern dwelling with modern facilities and appropriate for modern life (Khammash and Mhire 1986). Therefore, Jordan's construction practices were shifted toward modern building systems to cope with the modernisation style of living. They replaced mud and stone as traditional primary materials with concrete, glass and steel to become dominant construction materials and systems. The result was generally low-quality architecture due to widespread poverty, standardised materials, and imported globalised architecture detached from the region's socio-cultural and climate context.

This process of change and evolution of architectural practice In Jordan was initiated by the independence and the formation of modern Jordan in 1920. During this period, vernacular buildings continued to exist in Jordan's villages and towns alongside a modernised version of vernacular buildings influenced by examples found across the eastern Mediterranean (Al-Rifae 1987; Jarrar 2013). Throughout the '30s up to the '60s, Jordan in general and Amman, in particular, started hosting new types of specialised buildings such as governmental, cinemas, schools, with a rather modernist logic showing concrete qualities and new design aesthetics (Daher 2005).

The '50s marked a new era of architecture in Jordan. It saw the return of several newly graduated Jordanian architects from Europe (Daher 2008). Furthermore, the new radical change in lifestyle due to socio-economic changes added to the complexity of life in the Jordanian city (Al-Faqih 1993). The influence and the vision of returning architects were merged with local traditions of masons and the art of building to produce a regionalised modern style. The International style was introduced to Amman as early as the 1960s with many buildings following the high-rise heavy glassed façade of the international sky scrapper (Jarrar 2013).

Later approaches toward modern architecture in Jordan was limited to the final product, which was characterised by adaptability to local functional purposes, simplicity, devotion to abstract forms, anti-ornamentation, and valued direct economic return over anything else (Mahadin 1994). This approach produced modernist, alienated looking buildings that were generally of bad quality but was cheap and built quickly and were far less labour intensive than the vernacular style but required a lot of active heating and cooling (Al-Faqih 1993). In general, buildings throughout the '50s to '60s and even contemporary, and despite their sensitivity and sympathy to local materials and building traditions, do not reflect local cultural values nor the climatic condition of Jordan (Jarrar 2013).

Al-Faqih (1993) argued that contemporary buildings in Jordan are so original in their designs that they disregard the tradition, the culture and the context they exist in. Embracing urban modernist planning theories marginalised the importance of the old city centre with its central mosque and market and imposed a mechanical grid system of similar blocks connected by wide streets that is auto-centric in purpose (Jarrar 2013). Mahadin (1994) believes that the state of blind imitation of imported architecture was due to the weak educational and cultural background of both the local architects and the clients.

During the '70s up to the '80s, Jordan experienced the transformation into the new notion of postmodernity. The transformation from the architectural thought of modernism into that of postmodernism took place within the framework of the international theories without serious intellectual effort to query the local architectural uses of modernism (Jarrar 2013). According to Salama (2007), the conversion was simply switching from following international Modernism to following international Postmodernism with little critical reflection into what and what not suits the context of Jordan.

A regional architecture that is inspired by historical non-domestic Islamic eras monumental examples became the mainstream to be adopted by most architects practising in Jordan and the Middle East in the 1980s and 1990s (Kultermann 1991; Jarrar 2013). Interpretation of local context and cultural values took different forms. On one hand, emphasis was put on eclectic historical revivalism of elements and styles. It promoted a nostalgic view towards Islamic and vernacular architecture; as architects perceived it as a set of enduring values that transcend time and space, and thus critical thinking (Arkoun 1992). Bin and Rasdi (2008) argued that the mindless employment of revivalism and eclecticism has introduced culture as an unprogressive and dogmatic term, with no ability to fulfil contemporary users' needs.

Nowadays, planners classify land as planned and unplanned, and then the planned land is divided into residential zones by master plans (Zagha 2003). Residential planning standards related to planned land specified minimum levels for plot area, the amount of ventilation space around the dwelling, and the amount of frontage to the plot. The number of stories, the occupancy ratio to the plot and building height were specified at maximum level. Further, Jordan is highly dependent on its poor environment, which requires it to use its natural resources such as water, soil, plants, and energy sustainably, as one of the most urgent obligations to the principle of sustainable development. Currently, the building sector in Jordan accounts for 40 % of the country's energy use, 40 % of waste products (JDOS 2019).

For Jordan, issues of urbanisation, identity, and vernacular architecture arise when the built environment fails to meet the increasing demands on scarce resources. The construction sector is under increasing pressure to meet a rapidly growing need for housing and commercial space. However, so far, the focus with regard to efficiency has been on raising the awareness of households regarding water and energy efficiency (Omar et al. 2016). These are minor measures that will not produce large-scale improvements in efficiency unless they are complemented by sustainable design practices that cover the entire life cycle of buildings (Alsubeh 2013). Sustainability building assessment, together with sustainable technologies, has evolved quickly in recent years. Their potential should be incorporated into the construction and architectural practice and policy management in Jordan to meet sustainable development agendas and goals. There is also potential to learn lessons of sustainable design from vernacular architecture from all climatic regions of Jordan. There is increasing recognition that vernacular architectural heritage in Jordan presents valuable examples and lessons for holistic sustainability and bioclimatic design.

2.5   Sustainability of vernacular architecture

Vernacular architecture has been intensively researched in different subject areas (Weber 2013; Vellinga 2013). This includes studies that emphasise their valuable role to provide numerous lessons to draw on in modern sustainable architecture (Foruzanmehr and Vellinga 2011; Abdel-Azim and Osman 2018; Songel 2020). Paul Oliver argued that most of the residential dwelling units' shortage could be met if self-help means were applied, using localised materials and technologies and not by using high technologies and specialised methods (Kazimee 2009; Oliver 2003).

The reason for vernacular architecture sustainability comes not only from its bioclimatic and environmental traits only. The strength of vernacular architecture and its sustainability comes from its ability to blends buildings into various settings so that there are adaptability and harmony between context and people living there (Brown and Maudlin 2012; Sayigh 2019). However, researchers studying vernacular architecture mainly focuses on its bioclimatic characteristics, such as energy efficiency and thermal comfort (Daoudi *et al.*, 2019; Adwan and Abu Muhsen, 2016; Semahi *et al.*, 2019). Others research vernacular architecture as a cultural heritage conservation project that is required to preserve the identity and history of a country or a region (Rjoub 2016; Nocca 2017). On the other hand, few have researched problems related to socio-cultural topics of vernacular architecture, such as comfort and practicality to use in modern life (Balbo 2013; Mahmoud Bayoumi 2018; Rosaleny Gamón 2020).

The following section summarises the sustainability qualities of vernacular architecture. The discussion also illustrates the potential and impacts of the three dimensions of sustainability: social-cultural, environmental, and economic dimensions.

2.5.1 Vernacular architecture and environmental sustainability

Vernacular architecture encompasses many tangible design qualities that contributed to their environmental sustainability (Motealleh *et al.*, 2016; Kırbaş and Hızlı, 2016; Kashani 2013). It is suggested that many of these qualities can have potential in modern-day sustainable design (Adwan and Abu Muhsen 2016; Semahi et al. 2019; Al-Sallal 2001; Singh et al. 2009; Singh et al. 2011). These environmental traits of vernacular architecture, generally, fall within three main categories:

2.5.1.1 *Site topographic, geology and context-sensitivity*

One of the key environmental advantages of vernacular architecture lies in its site and situation (Mahmoud Bayoumi 2018). Factors related to the site for the development of vernacular settlements include water availability, defence potentialities, building material, fuel supply, and food farming land (Semahi *et al*. 2019). They also include consideration and treatment in response to many regional recurring natural disasters such as flooding, earthquakes, and extreme cold and heat conditions (Mortada 2016). Another critical consideration of vernacular architecture toward site situation is its relationship to other nearby buildings and the whole settlement's urban fabric (Guitart 2014).

2.5.1.2 *Passive bioclimatic based techniques*

Bioclimatic qualities of vernacular architecture are one of their most praised and studied qualities (Foruzanmehr and Vellinga 2011). Bioclimatic solutions in vernacular architecture vary between passive heating and passive cooling measures depending on the region's climate (Semahi *et al*. 2019). Passive and bioclimatic design strategies in vernacular architecture include the use of suitable orientation, plants, and shading devices to minimise or maximise sunlight exposure and solar gain (Mahmoud Bayoumi 2018). These measures also include properties of the building envelop and its characteristics such as thermal mass, insulating, massing, typology (Paunović Žarić *et al*. 2016). Furthermore, vernacular architecture used distinctive architectural elements to enhance or reduce desirable ventilation, such as courtyards and semi-open spaces, galleries and arcades, as well as wind towers and tunnels used to aid the flow of cooling breezes through the dwelling (Widera 2021; Daoudi *et al*. 2019; Adwan and Abu Muhsen 2016).

2.5.1.3 *Low embodied carbon emissions and energy, material efficiency*

Vernacular architecture used natural materials, which were renewable and biodegradable, with a life cycle similar to the modern concept of cradle to cradle (Fernandes *et al*. 2013). Although they required much maintenance, they needed fewer materials and had less impact on the environment during that process (Motealleh *et al*. 2016). For instance, earthen materials also resulted in less waste from the process of construction (Chandel *et al*. 2016). Earth construction systems have proven to be very efficient in the maintenance of thermal comfort due to thermal insulation properties (Benardos *et al*. 2014). Vernacular architecture used locally sourced earthen materials for construction that were obtained from the same place as the building or nearby (Mileto *et al.* 2014). Earthen materials again required little or no transportation, which meant less energy-intensive production processes and consequently could lower embodied energy and CO_2 emissions (Gupta 2014).

2.5.2 Vernacular architecture and social sustainability

Vernacular dwellings were built to serve various social functions based on their occupant's lifestyle and respond to climate conditions and create comfortable conditions for their daily life (Al-Jokhadar and Jabi 2017). Several studies, conducted by architects, planners and sociologists, outlined different social sustainability traits of vernacular architecture (Al-Haroun 2015;

Mahmoud Bayoumi 2018; Kazimee 2008; Vellinga 2014; Al-Jokhadar 2018; Kamalipour and Zaroudi 2014; Foruzanmehr and Vellinga 2011). In projection to the modern understanding of social sustainability, vernacular architecture provided for their inhabitants' health and wellbeing (Al-Haroun 2015). Vernacular architecture was also distinctive for adapting to collective behaviour in terms of social structure, socialising norms, family, gender role, and governance systems. The main social advantages and impacts of vernacular dwellings in terms of sustainable development include the following:

2.5.2.1 *Adaptability* to daily life needs.

Vernacular architecture in many regions were modest-sized dwellings, with most of the outdoor area used mainly for agricultural and animal care activities (Supic 1982). This required maximum use of space inside the dwelling where functions were derived from the needs of inhabitants in their daily life (Rosaleny Gamón 2020). As a result, there is a reason behind every room, and spaces inside dwellings were neither small nor exaggerated relative to their actual use (Danja *et al*. 2017). Mixed-purposed spaces were one of the main features of vernacular dwellings. Many rooms provided different purposes at different times of the day and throughout the seasons (Abusafieh 2019; Al-Jokhadar and Jabi 2016). The fluidity of different living activities for agriculture, cooking, and animal care used to take place in-between this combinational spatial structure (Kamalipour and Zaroudi 2014).

2.5.2.2 *Enhancing social* interaction *and relationships*

In vernacular dwellings, there are several spaces in the dwelling and the alleys surrounding it, that are dedicated to facilitating social behaviours and communication (Mahmoud Bayoumi 2018). In large dwellings, sharing a room between two or three families is common in the city, and such shared spaces like the courtyard could provide more social support (Abass *et al*. 2016). Moreover, vernacular architecture provided the support and control for this interaction between guests and various inhabitants, and sometimes, between the same family members (e.g. male and female) (Balbo 2013).

2.5.2.3 *Wellbeing,* security*, and safety*

Vernacular architecture also maintained wellbeing for its inhabitants by attending to any potential harm, danger, or risk that the site or context could impose. For example, the elevated vernacular dwellings in the Malays provided a haven from any sudden flooding (Ghaffarianhoseini *et al*. 2014). Another popular example is the use of the courtyard within a dwelling or group of dwellings which provided safe, private space for all the family to perform their daily life chores (Agung Budi Sardjono, Gagoek Hardiman 2016). Such an open space, within the dense fabric of dwellings, could increase safety and security from crime as well as from natural disasters (Mahmoud Bayoumi 2018; Loo and Mahdavinejad 2017; Al-Jokhadar and Jabi 2017).Participation in decision making

Vernacular architecture successfully reflected and sustained a delicate relationship between natural, social and built environments by following a collaborative, participatory design and construction paradigm that enabled them to address the many social and cultural needs of their users (Guillaud *et al*. 2014; Aranha 2002). For many, Vernacular architecture represented a form of architecture without architects or even people's architecture where the inhabitants of these dwellings were also their builders (Oliver, 2003). This view contrasts with professional-made architecture, where only a few architects have embraced the idea of user participation (De Graaf 2016). Valladares (2017) argued that the advancement of democratic values and decentralisation of decision-making in the last decades has led to the wide recognition that the successful design of housing, neighbourhood, and cities requires residents' engagement and participation.

Vernacular architecture was also able to promote a standard level of living for all individuals within the community while maintaining the ecosystems (Weber 2013; Tawayha *et al*. 2019). Maintaining the environment meant that vernacular dwellings could provide the basic needs of current inhabitants and preserve rights, resources and needs for future generations (Mileto *et al.* 2014).

To preserve current and future generational needs is one of the most critical objectives for sustainable development. These social attributes of the vernacular architecture gave rise to the dynamic and adaptable capacity to accommodate everyday life practices in these buildings. It also points to the importance of resilient and adaptability to peoples' lifestyle as a significant determinant for the sustainability and durability of dwellings.

2.5.3 Vernacular architecture and economic sustainability

Vernacular architecture represented an economically viable structure for their inhabitants due to many of their intangible social and tangible environmental qualities. For instance, vernacular dwellings were built using locally available technologies and materials (earth, rocks, wood and water), making them available and affordable to build for most people throughout all social classes (Oliver 2003). Also, vernacular dwellings were usually built by their inhabitants, or they were community built, which significantly reduced the effort and cost of construction (Prieto 2005). They also required little costs to operate for energy and water due to their thermal efficiency and climatic properties (Kırbaş and Hızlı 2016; Niroumand *et al*. 2013).

Moreover, vernacular dwellings provided the ability to be expanded horizontally by adding rooms on the sides of the courtyard or vertically by adding floors or using the roof to create additional living or sleeping spaces (Al-Jokhadar and Jabi 2017). However, this vertical expansion was limited by the structural system and the construction materials. Despite the need for periodic maintenance to ensure their durability, these structures did not entail a high cost for their owners (Chandel *et al*. 2016; Philokyprou and Michael 2020).

2.5.4 Vernacular architecture and cultural sustainability

The role of culture in vernacular architecture's sustainability is often discussed within the broader context of social sustainability rather than being discussed as a separate dimension (Wu *et al*. 2016; Kazimee 2008; Pocock *et al*. 2016). This limitation results in neglect and overlooking the vital role that culture plays in sustainability (Hadi Zare and Kazemian 2015). Nevertheless, cultural sustainability traits of vernacular architecture are visible throughout the following domains:

1. Vernacular architecture embodies both tangible and intangible indicators of local culture, which once helped sustain and forge the identity of their people (Mangut *et al*. 2020; Halicioglu 2012). On tangibility, vernacular architecture represents unique human-built objects, instruments, landscapes and architectural like monuments for their regions (Rosaleny Gamón 2020). On the intangible side, vernacular architecture contained a specific set of practices, expressions, knowledge, skills required to build them and reflected the aesthetic values of that culture that were handed down through generations (Axelsson *et al*. 2013; Chiu 2004).
2. Vernacular architecture was also appropriate and adaptable to the local socio-cultural values and status of people who lived in them (Boussaa 2014; Moore 2019). The later argument reflects the essence of the vernacular architecture cultural sustainability, which addresses the local needs of the users and is based on the social and cultural values of that society and regional context.
3. Vernacular architecture hosted a behavioural shift toward an environmental culture and values in the consciousness of the society that produced them (Guy 2005; Bronner 2005; Wu *et al*. 2016). Cultural sustainability here reflects the argument saying that the degree of sustainability of any built environment is affected by how the society interacts with and affect the natural environment (Hadi Zare and Kazemian 2015). For example, Rapoport (2001), said that various environmental values lead to differences in resource allocation; and trade-offs associated with the design of vernacular dwellings and their location within the settlement. On the other hand, Memmott and Keys (2015) argued that sustainable behaviours were enabled by specific design features of vernacular architecture.

2.6   The eco-cultural potentials of vernacular architecture

In the hot arid regions of the Jordan and the Middle East, physical spaces in most vernacular dwellings employed design techniques, such as changes in floor levels, the movement directions inside the dwelling, various degrees of openness to the sky, and the contrast of wide and narrow in windows design (Balbo 2013; Mahmoud Bayoumi 2018; Al-Jokhadar and Jabi 2016). These variations existed to accommodate different climatic, social, cultural and context related forces. For example, the courtyard dwellingrepresents a popular type of vernacular dwelling, which hosted a unique eco-cultural experience. Courtyards also provided a social space where the diversity of life comes together with family and society at its centre (Adwan and Abu Muhsen 2016). The courtyard serves as a place where all types of domestic activities can be organised as needed: a place for cooking family dinners, a place for adults to socialise, a private meeting place, a safe playground for the young children under close supervision by adults (Lewis *et al*. 2018). The courtyard itself functions as an extension of interior rooms, or it can become a spacious room in itself, enabling it to host many members of the family and society at the same time (Abu Ganemeh *et al*. 2011; Rjoub 2016).

The courtyard also provided many climatic advantages. It provides shelter against the sun in hot climates and filters the outside dust (Zarghami *et al*. 2017). Many courtyards have fountains, water pools, trees, shrubs, and are decorated with flowers, foliage, and edible plants that moderate the microclimate and provide a pleasant home environment (Adwan and Abu Muhsen 2016). The compact shape and openness to the inside of the court shaded most of the day also helped regulate temperature and provide suitable space for everyday life (Abass *et al*. 2016). Vernacular dwellings could also have semi-outdoor spaces such as corridors, courts and balconies, which connect the indoor and outdoor environments spatially while providing privacy for the family (Al-Jokhadar and Jabi 2017). These unique vernacular zones had dual purposes as transitional spaces between public and private areas and offered environmental rewards (Tomah *et al*. 2016; Zarghami *et al*. 2019). Tables 2.3 summarise the literature findings on the main spatial elements of vernacular dwellings and settlements in Jordan and the nearby region in terms of, functions, spatial characteristics, and climatic advantage.

Table 2.3 Architectural elements of vernacular architecture in Jordan and the MENA region. Classified according to socio-cultural and environmental benefits (Amro and Ammar 2020; Alzoubi and Almalkawi 2019; Almatarneh 2013; Alhaddad and Alshboul 2010; LABIN and ALDEEK 2017; Na'amneh *et al*. 2013; Al-Jokhadar 2018; Abass *et al*. 2016)

Vernacular architecture elements	Socio-cultural benefits	Environmental benefits
- A large courtyard between a group of buildings. - Irregular and narrow covered Pathways. - Surrounded walls in public and private spaces. - Dense fabric.	-The courtyard serves as the village square, where people can celebrate and meet. - Eliminate wasted spaces between buildings. - Appreciate cultural identity. -Create protected outdoor spaces that enhance interaction between families and children. - A visual barrier to maintain privacy, avoid disputes with neighbours and increase the sense of community.	-Eliminate external heat gain or loss. - Provide shade. - Block excessive air movement, which carries sand and dust.
- Avoid entrances facing each other (the principle of staggered entrances). - Windows of neighbours are not supposed to allow a view into the adjacent yards. - Houses are built wall-to-wall with introverted courtyards (dense grouping of courtyard houses), and sometimes there are setbacks.	- To maintain privacy between neighbours. - To block the direct view and access.	- Eliminate external heat gain or loss. - Provide shade.

Vernacular architecture elements	Socio-cultural benefits	Environmental benefits
- The use of balconies and extended. - The use of shading devices such as "Mashrabieh". - Clustered Rooms on different levels and clustered .	- Provide an outdoor setting area where a courtyard was not available. - Provide visual privacy where large windows are needed and located on the street or alley - Entered from the central covered hall - small windows to ensure privacy and protect the female body of the house. - People sitting on the floor could lookout by opening the shutters or by manipulating minuscule hatch built into the shutter.	- Shading the house from excess solar radiation and heat. - Shading from solar radiation while allowing fresh cooler air to come inside the house. - A flexible 'individual daylight regulation' system consists of a small window (just above floor level) with double shutters. - A fixed light source (2 to 3 meters above the small window) consisting of two circular eyes, with two layers of stained-glass mosaic or wooden "Mashrabieh", which exclude any visual intrusion while permitting the sun to penetrate and maintain dim daylight in the room, even with closed window shutters.

Physical features of houses, in general, reflect the identity of the family, their social and cultural needs, and the different requirements of each space. Thus, there is a reason behind every space in the house (Goethert 2010). Vernacular architecture thus presents valuable knowledge for holistic research regarding the relationship between culture and environmental sustainability. Accordingly, embracing the socio-cultural and local environmental conditions of a region is required to address the local needs for an integrated sustainable built environment. Indeed, vernacular architecture has been the focus of many research projects. Research resources do indeed imply them as a learning source of which current issues can be addressed, whether these lessons are related to culture and context (Balbo 2013) or technology and bioclimatic lessons (Hărmănescu and Enache 2016).

However, researchers seldom try to modernise vernacular elements for modern practical, nor do they pay attention to practicality issues or appropriate for modern daily use (Foruzanmehr and Vellinga 2011; Songel 2020). Moreover, vernacular architecture has often been treated as just a romantic expression or reminder of old times and antiquities (Vellinga 2014). An eco-cultural approach in sustainable design calls for advances and progresses, where the ecological realm, social, and cultural, can be combined to achieve the harmonious coexistence of people and the environment. The next section highlights this term in working literature, its limitation and its importance for an eco-cultural approach.

2.7 Toward a modern eco-cultural design

The literature review establishes that every culture exists within a unique context. Context features and local culture influences building types and techniques. Furthermore, vernacular architecture builders treated the collective of environmental, social, cultural, and economic conditions that surround their context as a force that directed the condition, shape, and function of their dwelling rather than obstacles to overcome. This understanding is vital to promote eco-cultural architecture.

An eco-cultural approach also calls to recognise issues of convenience and practicality associated with the modern use of vernacular architectural elements and techniques. These design methods could indeed help soften harsh climatic conditions and achieve environmental sustainability, but they might not be economically or culturally suitable for today's standard of living. Nowadays, vernacular architecture in many regions of the world is often associated with underdevelopment, backwardness, and poverty, which makes them less desirable than their contemporary modern counterparts (Foruzanmehr and Vellinga 2011). Moreover, sustainability integration or

assessment schemes might not succeed if socio-cultural indicators were not considered. Similarly, repeating a successful sustainability project or imitating a popular framework from other regions without regard to the specifics of that context can lead to the failure of these projects.

An eco-cultural approach aims not to turn architects into working anthropologists but instead calls for more responsibility and sensitivity for context. Also, cultural and ecological accommodation should not rely only on professionals or expert decision-makers exclusively. It needs to involve the participation of the building users to be embraced in an enduring, culturally and socially relevant way. Figure 2.9 illustrates the mechanism that is required to forms an eco-cultural design model as following.
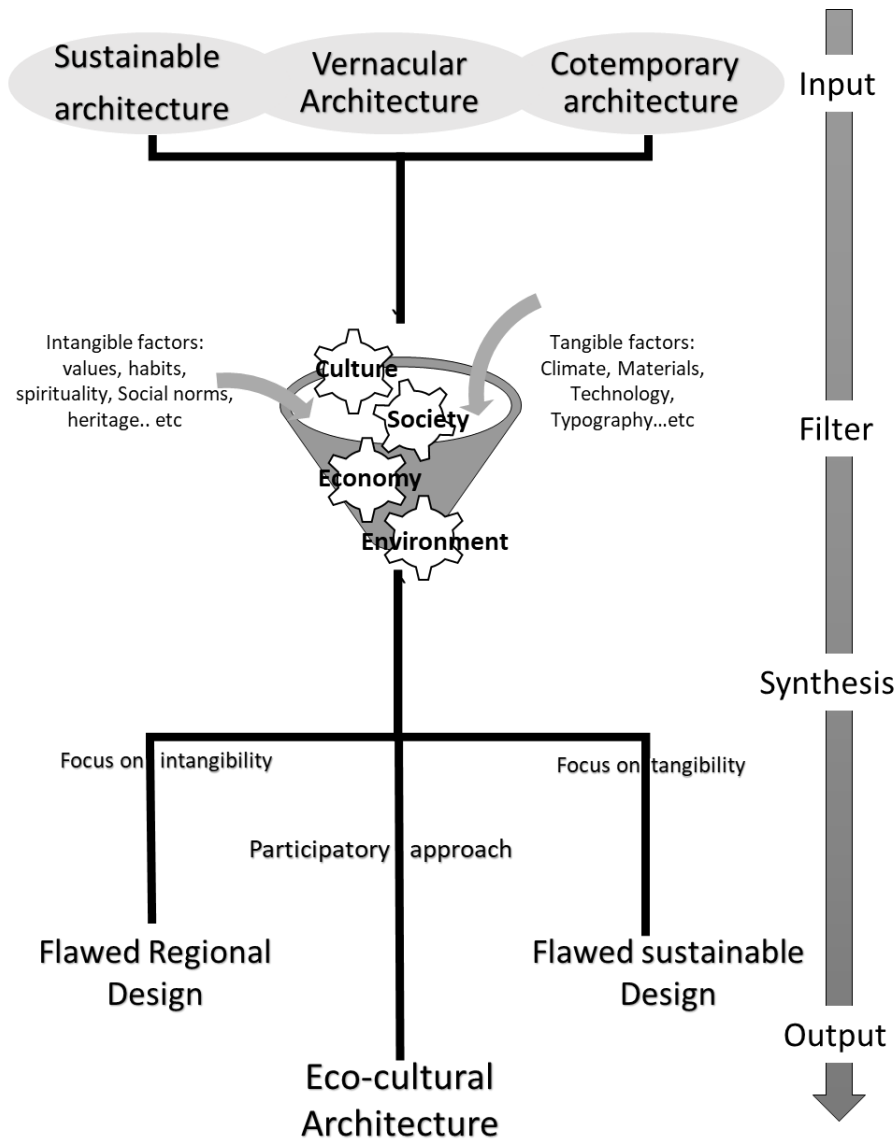
Figure 2.9 Eco-cultural design Model (adapted by the author from Heath (2009)

First, an eco-cultural approach needs to acknowledge the range of forces and factors acting on a particular society and context that affects the production of the built environment in that region. These indicators include various cultural, social, historical, environmental, political, economic and religious factors. These common indicators work as the regional filter or the eco-cultural design process mechanism (Figure 2.9).

Located above the regional filters are the frameworks, knowledge and principles of vernacular, modern, and sustainable architecture. These categories represent the basis of an eco-cultural design. They are drawn together because they have overlapping spheres of influence. However, each represents a standing conceptual framework of its own that consists of many cross-

disciplinary topics. The overlapping condition also represents how most built environments are today determined given globalised architecture formed from the interaction between them.

An eco-cultural approach employs vernacular architecture as a model to influence the current building design practice of that region and be continuous within it. Also, practical solutions for securing critical regionalism and sustainability are needed. An eco-cultural approach does not reject modernity nor technological advances. However, it aims to form sustainability integration and a better connection between vernacular, contemporary, and sustainable architecture.

The result and the success of this integration process would greatly depend on the inputs used for the filtration process. Depending on the context, the built environment will change and interact with these forces in various ways (see the last tier of Figure 2.9). If the filtration process did not account for all the contextual factors, this could lead to one of three scenarios depending on the input:

- In the first scenario, more attention is given to socio-cultural indicators or emphasis is directed toward regional and vernacular architecture with little consideration to environmental sustainability in the design process. The result would consist of a flawed regionalised design in terms of environmental sustainability. In some cases, this produced architecture would not achieve all socio-cultural needs, mainly if vernacular architecture were employed out of nostalgic requirements only.
- In the second scenario, more tangible environmental indicators are used, or emphasis is geared toward sustainability with little or no regard to socio-cultural context. In this case, the resulting architecture might be environmentally sustainable but would not fit within its human context. In some cases, the conflict between cultural and social norms might affect the environmental status of the project due to changes in the structure or unaccounted user behaviour patterns.
- In the third scenario, most of the critical regional forces are considered, and balance is achieved between all three vernacular, sustainable, and contemporary architecture domains within that context.

An eco-cultural design is the result of collective participation from stakeholders and cohesive framing of ideas that build upon previous knowledge through a consideration of regional forces and factors. However, some expressions of human behaviour and socio-cultural indicators may remain elusive and hard to study or notice. Mieg (2012) argued that the challenge of any indicator-based approach includes the problems of incompleteness. Indicators are essential for this study and could serve as a basis for future research as well.

This study defines eco-cultural housing design as "the physical interpretation of the society and its culture of a region that is environmentally economic economically viable and are based on lessons from previous vernacular housing and the comparative experience of building users".

2.8 Indicators of an eco-cultural architecture

An indicator is the operational representation of an attribute (quality, characteristic, property) of a given system by a quantitative or qualitative variable (for example, numbers, graphics, colours, symbols) (or function of variables), including its value, related to a reference value (Waas *et al*. 2014). Various indicators influence architecture development, which also contributes to rendering it culturally and ecologically sustainable. The indicators affecting a dwelling are a complex phenomenon, which can also have variations even in a single context or region (Wu *et al*. 2016). Dessein *et al*. (2015) pointed out that existing culturally sensitive indicators are limited from working sustainability frameworks. They also change and evolve slowly within the same context over long periods (Rapoport 1969). Moreover, defining the quantifiable and measurable cultural sustainability indicators can be challenging. The indicators that affect the built environment are numerous, and many have only emerged in the past few years (Wu *et al*. 2016).

The literature on vernacular, regional and sustainable architecture points mainly to factors that relate to the physical dimensions of sustainable architecture. Tangible attributes, like energy-related components of a building, can seem more significant and essential and thus more researched upon, whereas intangible parameters are not always appreciated or studied (Salama 2006; Mangut *et al*. 2020). However, tangible indicators alone do not capture people's overall perceptions of the built environment. Perceptions have complicated or subtle relationships to physical features, making it challenging to incorporate vernacular architecture lessons and sustainable features in modern design (Ewing and Handy 2009; Songel 2020). Social and cultural dimensions are not easy to define or measure, and their inclusion in architectural planning and design is not well developed (Cappai *et al*. 2018). The relation between the tangible and the intangible is also hard to distinguish and could easily be missed in favour of focusing on tangible attributes of architecture (Dessein et al. 2015).

Many research and practice fields from different contexts need to be interpreted to choose suitable eco-cultural indicators (Mikusiński *et al*., 2013). Defining and measuring suitable indicators can inform planning decisions and sheds light on the possible impacts of these decisions (Axelsson *et al*. 2013). Table 2.4 presents a summary of indicators that influenced sustainability and the production of vernacular architecture found in key literature.

Table 2.4 Indicators for sustainable vernacular architecture derived from the literature review

Source(s)	Identified Indicators
(Habibi 2019)	Available materials. Role of aesthetics. External influences. Location geography. Structure of society. Social relations. History. Economic. Lifestyle. Behaviour habits. Privacy. Expansion and growth patterns. History.
(Michiani and Asano 2016)	Behaviour pattern. Social relations. Available materials. Economic. Adapting to modern needs. Size of the dwelling. Climate.
(Talib and Sulieman 2012)	Lifestyle. Faith and religion. Layout and function. Role of aesthetics. Colours. Privacy. Available materials. Motivations for dwelling's shape and form.
(Kamalipour and Zaroudi 2014)	Economic. Climate. Behaviour habits. Social relationships. Structure of society. Governance system. Lifestyle. Technology. Systems of belief.
(Agung Budi Sardjono, Gagoek Hardiman, 2016)	Systems of belief. Professions. Motivations for dwelling's shape and form. History.
(Ghosh et al. 2019)	Layout and function. Caste and class hierarchy. Security requirement. Special functions and requirements, Colonial influences. Aesthetics values. Lifestyles. History. Geological position. Social interaction. Local townscape. Settlement density. Technology. Climate and energy responsiveness.
(Al-Kodmany 2018)	Population density and crowding. Required hierarchy of spaces. Social interaction and area of living spaces. Human comfort. Personal factors. Accessibility. Privacy. Spirituality. Health and hygiene. Exterior site influences.
(Mahmoud Bayoumi 2018; Semahi et al. 2019; Adwan and Abu Muhsen 2016; Manzano-Agugliaro et al. 2015; Bodach et al. 2014)	These sources only identified bioclimatic and thermal comfort Indicators
(Al-Jokhadar and Jabi 2017)	Structure and rules of society. Social relations. Personality. Values. Faith and ritual. Gender roles. Site and location. Available materials. Climate. External influences. Governance system.
(Shahran et al. 2017)	Climatic conditions of the region. Local cultural requirements. Local materials. Local traditional construction methods. Local Aesthetics and ornament. Adaptation to the local context. Plot optimisation. Living conditions. Urban setting.

(Abusafieh 2019)	Available materials. Climate. Structure and rules of society. Profession. Layout and function. Adaption to everyday use. Privacy. Dwelling size. Gender role. Form and influence.
(Guengerich 2014)	Available materials. Location and geography. Structure of society. Social relations. History. Economic. Lifestyle. Behaviour habits. Expansion and growth patterns. History.
(Lawrence 1983; Supic 1982)	Available materials. Location geography. Structure of society. Social relations. History. Economic. Lifestyle. Behaviour habits. Expansion and growth patterns. History. Affordability.
(Danja et al. 2017)	Lifestyle. Structure of society. Social relations. Behaviour habits. System of beliefs. External influences. Available material.
(Abdel-Azim and Osman 2018)	Geography and location. Climate. Structure of society. Social relations. Behaviour habits. Available materials. Climate structure of society. Social relations. System of beliefs. Privacy. Available materials. Technology.
(Al-Haroun 2015)	Psychological needs. Aesthetic goals. Human comfort. Lifestyle. Local climate, social structure and religious beliefs, technological expertise, economics, taste, precedents and models. Community's cultural values. Identity. Human perception towards local context and nature.

The local context comprises a variety of tangible and intangible elements and a set of values, each of which affects the evolution of culture and the built environment. For the purpose of this research, these indicators are classified and presented as two interdependent variables: tangible and intangible influencers of sustainability and the built environment. Tangible indicators are the ones that could be measured or quantified empirically (Ewing and Handy, 2009). On the other hand, intangible indicators represent measurements that can mainly be measured qualitatively (Canizaro 2012). Intangible indicators include socio-cultural indicators, such as family structures and gender roles. Tangible components include physical/natural factors like site geology, available materials, and climate (Rongdong 2015).

There is also a need to define relationships between tangible and intangible indicators and their role in sustainability. The complicated and broad ideas of culture have led to the fact that every human activity can only be understood within an associated cultural context (Wahid *et al.* 2017). The intangible factors help explain the ecological reasoning behind the vernacular architecture and how we can integrate sustainability better in contemporary residential dwellings. In this model, the built environment is perceived as the physical interpretation of the relationship between tangible and intangible indicators. The following section interprets and defines indicators for the development of the sustainable vernacular environment, with the aim to propose an integrated eco-cultural approach for sustainable architecture in residential buildings. The outputs will endeavour to link specific physical features and design quality with these intangible cultural and social related traits.

2.8.1   Tangible indicators

Tangible indicators represent the physical influences on the built environment, which provides quantifiable measurements of sustainability. Once studied, these indicators are valuable in achieving the environmental and economic dimensions of sustainability. The most discussed tangible indicators mentioned in the literate review includes the following:

2.8.1.1   Site *boundary*, region, and geography

A region is a large area with boundaries determined by a range of cultural and natural criteria (Canizaro 2012). Natural physical determinants of sites and regions include a wide range of sub-indicators such as topography, earth geology, soil specifications, native vegetation, and water availability (Zune *et al.* 2020). These geographical and site features play a significant role in determining the typology and morphology of the built environment (Danja *et al.* 2017).

The integration of site geographical features and requirements is essential for eco-cultural architecture. Site indicators should be treated as a force that directs the design process rather than as an obstacle to overcome. For example, vernacular architecture considered the efficient and more logical location of dwellings in relation to the site topography. When positioning buildings, vernacular architecture builders adapt their buildings to terrains. Buildings would be positioned in a way that required minimum alterations to the original site (Kazimee 2009; Daoudi *et al*. 2019). In some other cases, site location might be chosen to preserve agricultural land, similar to what is seen in the high-raised vernacular dwellings of Shibam in Yemen (Al-Sallal 2001; Abdel-Azim and Osman 2018).

2.8.1.2 Climate and weather

Climate refers to the pattern of weather and its elements such as temperature, rain quantity and wind conditions which are dominant in a particular region (Kashani 2013; Zune *et al*. 2020). Local climate is considered to be one of the most influential factors for architecture and is a leading priority for sustainability development in architecture (Hák *et al*. 2016). This latter view usually derives from the belief that climatic conditions once shaped vernacular architecture. Climate-wise, some activities in which protection from the weather would seem to be particularly critical, such as cooking and sleeping, would take place in some areas either in the open or indoors decently on the dominant weather (Foruzanmehr and Vellinga 2011; Al-Jokhadar 2018). Climatic and site components have been widely accepted in architecture to achieve sustainability and are frequently studied as essential for sustainability (Mansy 2001; Al-Kodmany 2018). Some researchers call vernacular architecture an old form of climatic design to draw solutions for modern climate-related problems (Widera 2014). The underlying philosophy of climate responsive design lies in the evaluation of climatic indicators and the optimisation of building performance accordingly to these factors (Motealleh *et al*. 2016; Kırbaş and Hızlı 2016). In other words, the climatic design aims to minimise resource consumption and environmental impact through cooperation with the external climate. The combination of climate and site requirements influences architectural design and construction elements unique to the region and the culture that produced them.

2.8.1.3 Indoor environment

Indoor thermal and physical comfort indicators include heat transfer, air temperature, mean radiation temperature, relative humidity, light intensity, and air velocity (Yadegaridehkordi *et al*. 2020). Modern concepts for achieving indoor comfort have been dominated by the use of air-conditioning and other mechanical control systems, which are very unsustainable for the environment (Chappells and Shove 2005). It has also been recently debated that such human-centric comfort design also has an effect on social sustainability in the built environment context (Nabavi *et al*., 2013; Zarghami *et al*. 2017).

Therefore, an eco-cultural approach for sustainable design requires developing energy-efficient structures by attending to thermal comfort and ventilation indicators through natural systems and passive design of residential buildings and neighbourhoods. Such indicators vary differently depending on the context and climatic zone. For instance, in a hot arid climate, the design of vernacular architecture needed to offer shaded alleys, open spaces, and green areas that are protected from the direct sun whilst simultaneously allowing the penetration of natural ventilation and lighting (Al-Jokhadar and Jabi 2017). Other indicators that impact thermal comfort are the area of glazed facades and the availability of unique treatments, such as shading devices, louvres, screens, water features, and the presence of greenery.

2.8.1.4 Building materials

The use of local materials is a shared feature between different examples of vernacular architecture in various contexts (Motealleh *et al*. 2016). These materials serve as an identity factor and a matter of convenience at supplying demand (Fernandes *et al*. 2013). With the industrial

revolution, and later with modernist architecture, the increasing use of new industrially produced materials led to the prevalence of standardised materials and construction approaches. Their wide dissemination meant that the use of these materials became predominant and traditional techniques and materials fell into disuse (Khammash and Mhire 1986). Many new materials provided adequate conditions and eliminated many inconveniences related to the use of vernacular earthen materials (Håkansson 2017). However, modern and industrially produced materials present new issues relating to the use of imported materials from different contexts. Such problems include low thermal resistance, a high energy requirement and poor indoor thermal conditions (Fernandes *et al*. 2013). On the other hand, natural and local materials such as locally produced timber have positive impacts on the overall life-cycle assessment as they need less energy to manufacture or transport (Mileto *et al*. 2014a). Some resources, such as trees and bamboo, are renewable; some resources, such as stone and sand, are so abundant that they are considered endless resources. Materials as indicators for an eco-cultural design require creating a balance between what is local and imported, affordability and what can be reused or recycled for the sake of the wellbeing for residents and their environment.

2.8.1.5   Building technology

The form of vernacular buildings and technology has developed in a way that was highly congruent and reflective of local inhabitants' socio-cultural requirements. Building technology was also influenced by the type and availability of materials (Fernandes *et al*., 2013). It developed in response to local environmental conditions, especially the site's climate and geographical properties (Habibi 2019). Economic and environmental costs are also low, as these technologies require less labour and less processing than their modern counterpart (Mateus *et al* 2019).

For many generations, technologies used by a specific community have determined the character of buildings and gave buildings a native identity. Many people also consider earthen materials and the skills and craftsmanship they require to be pleasant and desirable (Pacheco-Torgal and Jalali 2012; Ben-Alon *et al*. 2020), since stone, clay, and brick would give the building an authentic sense of belonging to the region, it originated. Vernacular building technologies are also seen as indicative of the way in which cultures have evolved appropriate technologies to adapt to their particular physical and social environment. Guy (2005) suggested that sustainable architectural approaches should move away from universal acceptance to high-tech technological-based design as they often fail to coincide with a particular place or people's cultural values. This includes attempts made by architects to use environmentally friendly but culturally unsustainable technical fixes in green buildings.

The eco-cultural architecture emphasizes the concern for cultural continuity expressed through the transformation and reuse of traditional construction techniques, building typologies, and urban settlement patterns, only after socio-cultural evaluation for contemporary use. Adding insulation made from synthetic materials or imitating vernacular architectural elements such as wind towers as objects in a building does not integrate a sustainable solution in terms of cultural sustainability.

2.8.1.6   Affordability and affordance

Economic sustainability raises issues of affordability and affordable housing. According to Milligan and Gilmour (2012), affordable housing units are housing that is provided at a rent or purchase price that does not exceed a designated standard of affordability. Affordability is usually defined by measuring whether housing costs exceed a fixed proportion of household income and whether household income is sufficient to meet other necessary living costs after allowing for housing costs (Anacker 2019). Further sustainability and affordability are often not correlated with each other because "more sustainable" often means "less affordable" (Gan *et al*. 2017). Also, affordable housing in some regions of the world has been associated with poor living conditions (Pocock *et al*. 2016). This is mainly due to ignoring the socio-cultural dimensions of sustainability and focusing on financial returns (Pomeroy 2014; Wood 2008; Anacker 2019). An eco-cultural approach is

about creating a balance between cost, maintenance, financial outcome and rewards for both developers and residents of that project. Developers can incorporate various recreational facilities and mixed-use schemes to harmonise the indoor environment to their marketing campaign, where sustainability can be developed, and residents' satisfaction can improve.

2.8.1.7   Adaptability and flexibility

In modern sustainable housing design, researchers and architects use the term flexible to discuss the ability to modify and implement physical changes to a building and use the term adaptable to discuss the varieties of ways to use a space or a building without much modification to its physical form (Estaji 2017; Ujam and Stevenson 1996). Adaptability and flexibility are two qualities that are also often associated with vernacular architecture. Vernacular structures and forms were also modular (Al-Jokhadar and Jabi, 2017). Modular vernacular dwellings enabled their residents to modify and develop the physical space and add more rooms to the structure in a flexible way over extended periods and in response to any sudden social, economic or natural changes.

In recent times there is still an ever-changing socio-economic situation accompanied by fast advancement of technical innovations, which could impose changes on the lifestyles of people and eventually the design of their dwelling. Therefore, flexibility and adaptability are essential indicators for the production of an eco-cultural architecture. Dwellings should be evaluated to cope with new lifestyle requirements, for example, increasing the size of a family and economic changes.

2.8.2   Intangible indicators

Intangible indicators seek to explain the built form as a manifestation of socio-cultural institutions, which are locked into a dynamic relationship of nurturing and complementing tangible indicators. The complicated and broad conception of culture requires us to describe, analyse, and define every human activity within its socio-cultural context (Wahid *et al*. 2017). Intangible indicators also mediate, orientate and frame various aspects of everyday life practices which profoundly affect the built environment (Wu *et al*. 2016). In this understanding, the main intangible indicators that affect the production of an eco-cultural architecture includes the following:

2.8.2.1   Human comfort

Human comfort is cited as one of the most influential factors that affect the quality of life and sustainable design of dwellings. Ghaffarianhoseini *et al*. (2018) suggested that the answer to a high quality of life is based on consideration of the socio-cultural and environmental indicators within functional spaces. The relationship between human comfort, the dwelling and the environment is also repeatedly cited in studies about vernacular architecture. According to Amro and Ammar (2020), the interior spaces of vernacular dwellings represent and incorporate characteristics of the local environment, daily functions and lifestyle of the people of that region, which directly influences their quality of life. Furthermore, GhaffarianHoseini *et al*. (2014) argued that the failure of many contemporary residential architectures in developing countries was due to the vernacular architecture of the region and its cultural indicators not being given enough consideration.

The spatial characteristics of a dwelling are significantly crucial for assessing the quality of living. Similarly, occupants' perception based on the spatial characteristics of a house according to their actual demands is a fundamental aspect (Dekker *et al*. 2011). Therefore, human comfort inside dwellings is not only affected by thermal, light and acoustics properties but also determined by indicators such as the size of the family, appropriateness to daily life, local customs and traditions. These indicators affect spatial design principles both indoors and outdoors, which includes the arrangement of transitional spaces, internal circulation, location of entrance passageway from the street and the number and relationships between rooms inside the dwelling.

2.8.2.2 Privacy

The notion of privacy is considered to be a vital factor that impacts the built environment (Al-Kodmany, 2018). Values and attitudes towards privacy also vary differently from context to context and culture to culture (Al-Haroun 2015). Privacy was also a dominant factor in the space planning of vernacular architecture in many regions of the world (Al-Jokhadar and Jabi 2017). The spaces inside vernacular dwellings were usually categorised into public, private and semi-private; spaces were aligned based on the level of required privacy (Gou 2019; Tomah *et al*. 2016). For example, in many middle eastern vernacular dwellings, the dwelling was enclosed to the interior, where most windows would be directed toward an inner courtyard. The courtyard was, therefore, away from anyone outside of the dwelling. It was used for guests waiting for the owners to direct them to one of the guest hosting rooms or as a hosting space if weather conditions allowed (Kamalipour and Zaroudi 2014). Privacy is also affected by the relationship between genders in different cultures. When comparing cultures, there will be considerable variations in defining privacy, how privacy is achieved and which critical considerations are viewed as most important (Ismail 2012; Balbo 2013).

2.8.2.3 Spirituality

Spirituality forms an essential part of most cultures, and it is an essential topic in discussing the symbolic nature of buildings and the built environment (Khalaf 2012). This discussion goes through various scales of city, neighbourhoods, dwellings, spaces inside dwellings and furniture in them (Abusafieh 2019). In some designs, the orientation of spaces inside dwellings could have a symbolic and specific spiritual focus (Al-Jokhadar 2018). Moreover, unique treatment is given for sleeping areas, dining rooms, and bathrooms. Furthermore, the availability of fountains, trees and green areas also plays an essential role in creating a spiritual atmosphere and comfort for residents.

For example, the ritual orientation of the dwelling, which is found in many cultures, is a function of cultural and religious attitudes rather than tangible factors (Danja *et al*. 2017). Even when the two coincide, as, in the case of Feng Shui, comfort will have to give way if it is at odds with the religion (Khalaf 2012). The impact of spirituality on culture and the built environment is very significant and essential for understanding individual needs for privacy, interaction, and spatial configuration (Al-Haroun 2015). Therefore, there is a need for beliefs to be further installed into research, whether it relates to analysing vernacular building or creating eco-cultural architecture.

2.8.2.4 Social structure and relationships

Social interaction between neighbours could enhance social support, sharing and a sense of community (Goethert 2010). Such issues could be easily encouraged by offering gathering spaces and shared areas between dwellings, where residents and children can meet, talk and play. Moreover, the availability of living spaces that have an appropriate area relative to the size of the family offers a comfortable space for daily living activities (Al-Jokhadar 2018). A vernacular dwelling is claimed to be coherent with social relationships and society (Majid *et al*., 2012). There is significant evidence of how family structures and social relationships shaped vernacular dwellings. For example, having an extended family living in one building could lead to using a courtyard dwelling where various rooms and living spaces are clustered around a central courtyard (Khalaf, 2012). Mixing residential units with other functions and services would also connect buildings with the context and reduce the use of polluting vehicles. Secondly, distributing open spaces and providing alternative pedestrianised paths and routes for the residents could encourage social interaction between them.

2.8.2.5 Security and Safety

Al-Jokhadar and Jabi (2017) argued that having access to the outdoor environment and enjoying a connection with social life on the street are critical factors in the overall sustainability of residential dwellings. This indicator could be achieved by offering safe open spaces, terraces, and

balconies that are connected directly with the outside context. However, providing secure and safe open spaces for children and families is also an essential issue in residential environments. Such a priority could be achieved by offering fences on balconies and terraces, secure gates for dwellings and buildings with proper maintenance for open spaces and common areas that are connected with the outside context.

2.9   A conceptual framework for an eco-cultural architecture

A theoretical or conceptual framework is a tool that can help researchers structure their theories and ideas and bring a sense of 'coherence' to the research (Ravitch and Riggan 2017), thus helping to generate meta-theoretical congruence (Maxwell 2012). They are a form of an intelligent platform that helps ensure ontological and epistemological consistency by underpinning and contextualizing all dimensions of the research process (Rocco and Plakhotnik 2009). They also illustrate the relationship between philosophical assumptions, theory, and the study area (Ravitch and Riggan 2017).

The previous literature review on vernacular, critical regionalism and sustainable architecture mainly points to indicators that could inform the physical and performance of architecture, such as energy performance and thermal properties and while intangible human-related indicators remain largely ignored. However, the literature review also established that the tangible and intangible are inseparable in creating contemporary and vernacular architecture alike and are essential for a critical regionalism and eco-cultural approach.

Physical and tangible indicators are indeed crucial in informing the built environment. However, the vast differences in architectural pattern morphologies within similar climatic or geographical zones presents evidence that the local culture had more influence in producing vernacular architecture. This is the case in places like old and New Delhi, the old and new parts of Fez or Marrakesh, and certain Latin American cities (Kashani 2013). Intangible indicators and factors in these cases resulted in the diverse forms and typologies present in vernacular architecture around the globe. Table 2.5 below reinterprets tangible and intangible indicators as a projection to the four spheres of sustainability.

Table 2.5 Indicators for vernacular architecture are found in the literature

Aspect	Identified Indicators	Measurement metrics
Social Sustainability	Structure of society. Social relations. Lifestyle appropriateness. Behaviour habits. Governance system. Profession and employment. Family structure. Health, safety, security. Adequate building standard.	A quantitative and qualitative approach Direct survey and interviews
Cultural Sustainability	Local Customs and Values. Belief systems. Role of aesthetics. Gender role. Cultural preferences in dwelling specifications. Perceptual.	Theoretical background on spatial planning/ Space Syntax and policies relation
Environmental Sustainability	Geographical area. Landscape available technologies, available materials. Climate and weather. Energy performance. Thermal comfort. Indoor environment.	Observation of physical conditions and building material. Empirical studies. Lab work computer simulation
Economic sustainability	Running bills, Construction costs. Maintenance. Life cycle. Construction coasts	Observation of the residents' habits. Questionnaire /interview. Case study/samples and comparison of chosen samples.

The local environment comprises a variety of tangible and intangible indicators and a set of values that influence the development and progress of culture (Al-Kodmany 2018). They incorporate not only the immediate but the broader context of the building into the design. Intangible components might include religion, the natural world, community habits, its economy, order within the family unit, and gender position. Tangible components include archaeological remains, old buildings and monuments, physical or natural indicators like soil, available materials, and climate (Rongdong 2015). Due to that, architecture should be perceived as the physical incarnation of the cultural and social world. Figure 2.10 illustrates the mechanism and the relationship that bounds the tangible and intangible indicators required to achieve the holistic sustainability of architecture.
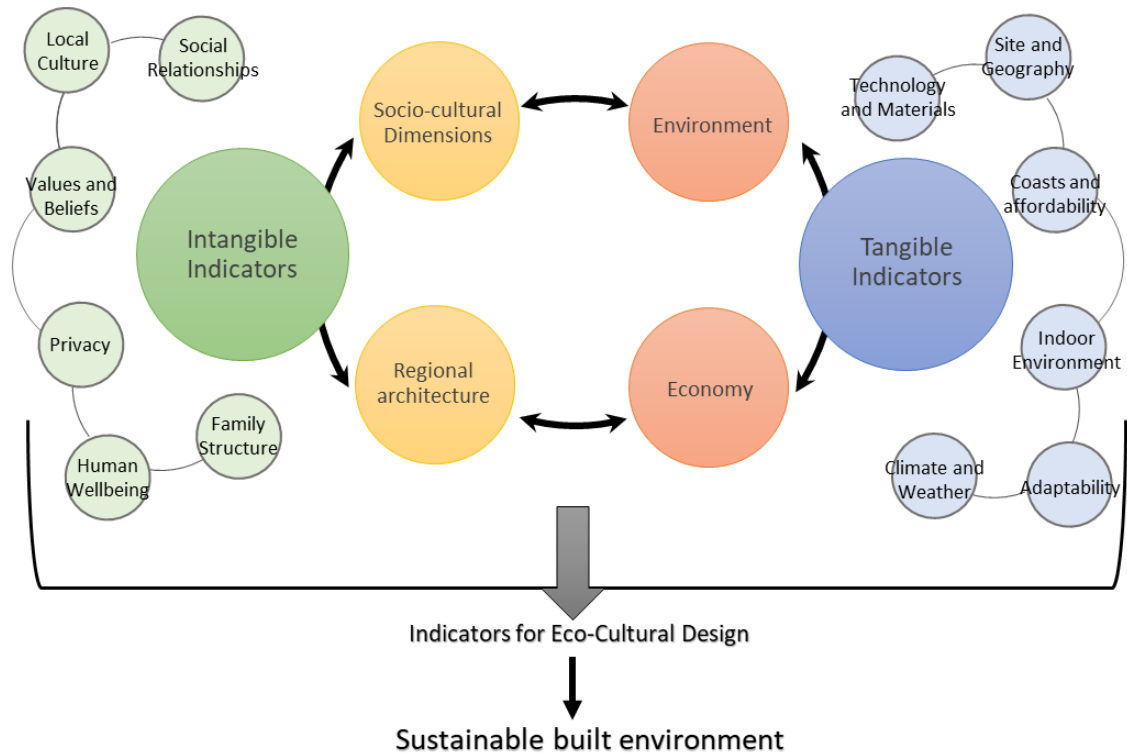
Figure 2.10 Conceptual framework for relationships between eco-cultural design indicators

As seen in Figure 2.10, Tangible indicators are only part of the built environment that can provide quantifiable building performance measurements. Once studied, it is valuable to achieve the environmental and economic circles of sustainability. Intangible indicators, on the other side, seek to explain the built environment as a demonstrator of distinctive human-related characteristics. They represent unquantified measurements that can only be measured qualitatively. The complicated and broad ideas of culture have led to the fact that every human and social activity could only be understood within an associated cultural context (Wahid *et al*. 2017). Both the tangible and intangible indicators represent a unique phenomenon that, once studied and examined, described the built environment within a particular context.

Studying and understanding Intangible indicators and architecture features can help designers manage optimal indoor temperatures and reduce energy demand and reduce carbon emissions. However, the sustainability of architecture is determined by technological indicators and, to a large extent, depends on other socio-cultural indicators. Indicators such as cultural values and norms, local customs, social relationships, and family structures all have an intricate relationship to eco-cultural architecture. They determine what materials are used, which form and typology are chosen and how space is used. These factors are, therefore, crucial in determining whether a form of architecture is sustainable or not. Even within a region with similar geography and bio-climatic factors, a small variation in intangible factors could result in a vast diversity of architectural construction and form, which would be considered native and suitable to its context.

However, given the diverse and interlocking fields related to vernacular and sustainable architecture globally, the techniques or technology-based research on vernacular architecture remains mostly limited to performance-based examples (e.g. Daoudi *et al*. 2019; Motealleh *et al*. 2016; Adwan and Abu Muhsen 2016). Few reasons could have generated this limitation, one being related deeply to the assumption that vernacular architecture is sustainable and integrable by default into modern buildings. This study argues that these issues are what caused a paradoxical situation, where vernacular buildings are abandoned and replaced by contemporary counterparts, although academics praise them as a source of sophisticated, sensitive, and smart environmental design.

Indeed, vernacular architecture and the change in building from old to new, its process, and reasons are not often discussed. The tangible indicators of vernacular architecture and its environmental-related topics are increasingly undertaken in research studies. However, vernacular architecture intangible parameters are not always appreciated or notice to be studied (Salman 2018). The question about the decline of vernacular traditions is essential to ask because it leads to a better understanding of the everyday use and meaning of such traditions.

By limiting attention to the technological and environmental performance of buildings, the importance of the cultural embodiment of architecture can be neglected. It also makes the understanding of how architecture relates to its context and environment partial and distorted. Equally, the scope of modern sustainable architecture needs to include socio-cultural and other intangible sustainability indicators instead of solely focusing on environmental ones. The importance of historical and cultural context to inform our understanding of vernacular architecture has been commonly accepted, yet it has not been widely discussed or implemented in contemporary practice. Only then will it be possible to understand why traditions that appear sustainable from an environmental perspective might be abandoned.

The indicators in Figure 2.10 show how vernacular architecture had the strength to accommodate its residents' tangible and intangible needs. Physically, it represents centuries worth of learning in indicators like climate, building materials, orientation, and construction techniques. Vernacular architecture indicators contribute to all dimensions of sustainability, including intangible parameters and factors such as cultural identity, the satisfaction of humans, societal needs, well-being, and a sense of belonging. Researching socio-cultural indicators alongside environmental ones will help produce architecture and urban planning that accommodate time and place. The limitation set by local resources and the unique requirements allowed the development of local building technologies, context-sensitive and ingenious forms that are both environmentally sustainable and culturally adaptive. What becomes necessary, therefore, is the relationship and identity between human behaviour and the urban environment. The role of culture in general and in contemporary and future architecture has not always been clearly defined in the social-related literature of architectural sustainability.

The critical point here is that employed environmentally sustainable design practices that are consistent with the local, economic, cultural and practical factors of the society. Thus, practical solutions for securing critical regionalism and sustainability are needed. This includes technological approaches for meeting the human l related indicators of sustainability. Rather than searching for a singular optimal technological pathway from building and sustainable design experts, we must learn to recognize and listen to other voices and striving to frame the debate and the visions they express of alternative sustainable places. This includes building end-users and the residents of these buildings over their lifespan.

An eco-cultural approach emphasizes the reorientation of values to engage with both environmental and cultural concerns. The typical issue here is that genuinely sustainable buildings need to relate more and fully to the concept of locality and place. It firstly draws inspiration from its account of the environment and revives vernacular concepts of dwelling with an emphasis on

relearning a sense of place. This unique sense of identity evolves subjectively from within nature and its local characteristics.

As a design strategy, an eco-cultural approach also draws inspiration from vernacular architectural approaches. These buildings served as indicative of how rooted cultures have naturally evolved appropriately. This approach could help provide more social constraints of old and new definitions and evolution to understand this integration process better. They also could help in generating modern sustainable design and construction. Furthermore, this study argues that vernacular architecture's sustainability is not based purely on isolated performance indicators such as thermal comfort and energy effeminacy. Cultural and social indicators had more influence on the production of vernacular architecture than the local climate and natural environment. Environmental and cultural factors interrelate in a dynamic, complex and context-dependent way. This makes it difficult to identify the extent to which particular indicators play an essential role over others.

In addition to revealing the main research gap, issues and premises, the literature review phase was essential in understanding the different approaches in research toward a sustainable build environment. The literature review also helped to define the required approach to address the limitations and gaps of current sustainability research trends and formulate the research initial eco-cultural conceptual framework. The eco-cultural approach addresses many of the research gaps and objectives by:

- Establishing the importance of integrating indicators of both human-related and environmental sustainability (Al-Jokhadar and Jabi 2017).
- Emphasising the role that various stakeholders play in synthesising sustainable development goals and requirements (Goodwin et al. 2019).
- Asserting the importance of studying intangible sustainability lessons from vernacular architecture besides tangible ones (Xiaoyu and Beisi 2015). Studying lessons from vernacular architecture does not mean rejecting contemporary design paradigms (Foruzanmehr and Vellinga 2011; Poon 2019).Critically reviewing vernacular architectural elements to determine which are suitable for modern use and which need to be adapted to meet current residents' requirements (Abdel-Azim and Osman 2018).

There were few issues with conducting a literature review as a cornerstone for formulating the conceptual framework of the research. It was first hard to review all possible related bodies of work related to the topic. This promoted the fear of a selection bias where the included studies are not representative of the evidence base (McDonagh et al. 2013). To avoid any unattended or unwanted bias, this study started by determining the objectives and scope of the review, this helped in setting the boundaries and focus the keyword selections used in conducting the literature review. The literature review stages were structured into sections to address specific areas and specific research questions (e.g. reviewing vernacular architecture and related topics. Selecting the initial list of tangible and intangible indicators). The next step was to identify multiple sources for the reference materials to obtain a more comprehensive collection of information. Multiple research databases were used such as ScienceDirect, Scopus, and Engineering Village. The selection of reviewed articles and other sources was comprehensive and included various topics to help avoid cherry-picking articles that only support certain views. The quality of studies and research sources was the main assessment factor for the inclusion and exclusion criteria. This research was focused on selecting published peer-reviewed papers in well-known journals and doctoral dissertations (Winchester and Salji 2016).

2.10 Chapter conclusion

This chapter presented an overview of the metrics that informs the production of an eco-cultural built environment informed by vernacular architecture. The next chapter further investigates the

existence or absence of these indicators within current international sustainability assessment frameworks and the built environment methods. Focus is also given to the case study's research context, where a further review of vernacular and sustainable architecture in Jordan is presented to refine these indicators in preparation for the fieldwork stage of the study.

Sustainability is usually treated in architectural research as a set of physical attributes and a matter of innovation of technology or materials. There has been extensive research regarding vernacular architecture and its innovation relating to sustainability, highlighting its ability to create an extant image and be sensitive to the environment and context. These intangible indicators of the vernacular architecture should thus be included within more research in order to understand how both the tangible and intangible affected and still affect the degree of harmony between vernacular architecture and its context.

The literature review also revealed two critical conclusions. Firstly, although the culture that produced vernacular architecture has changed over time, the influences and indicators that shape it still exist in a transformed way. Secondly, with few exceptions, many of the previously discussed indicators were highlighted as necessary in literature for the sake of sustainability. However, most were not further measured or investigated. Their importance was merely asserted against concerns about vernacular architecture's environmental characteristics, which explains some of the reasons that prevented the integration of vernacular lessons into contemporary sustainable design. This chapter also presented the conceptual framework of the study. It aimed to introduce eco-cultural architecture's critical components as a logical data source, adaptation elements, methods, and effects. The proposed conceptual framework required further development and validation stages.

3   Chapter Three. Sustainability Assessment in the Built Environment

3.1   Introduction

The term sustainability assessment dates to the release of the influential Brundtland report at the 1992 United Nations' Rio de Janeiro summit. Its agenda for the 21st Century (commonly referred to as Agenda 21) identified sustainability as a measurable development aspect (Cutaia 2016, Clune and Zehnder 2018). Sustainability assessment refers to those processes and techniques focused on predicting the potential impact of activities prior to their execution and thus can direct decision-making towards sustainability (Morrison-Saunders *et al.* 2014). Sustainability assessment aims to: (1) contribute to a better understanding of sustainability and its contextual interpretation (James 2015); (2) integrate sustainability issues into decision-making by identifying and assessing sustainability impacts (Dizdaroglu 2017), and; (3) foster sustainable development policies (Waas *et al.* 2014).

Sustainability assessment is now an established field of research and practice that has emerged in many different forms across the world (Pope *et al.* 2004; Dizdaroglu 2017). Sustainable development and its assessment are considered a cornerstone in achieving sustainability, and research regarding them has received much attention (Mahmoud *et al.* 2019). Various terminologies and approaches are used, including sustainability appraisal (particularly in the UK), integrated assessment, integrated sustainability assessment, and sustainability impact assessment (Sala *et al.* 2015). Moreover, assessments methods are currently used to support policymaking and are turning into a standard procedure in planning. Concepts such as "Integrated Assessment" and "Sustainability Assessment" are introduced to offer new perspectives to impact assessment geared towards planning and decision-making on sustainable development (Ameen *et al.* 2015).

Sustainable building assessment is a term that started to emerge a few decades ago to measure sustainable development goals and environmental performance in the built environment and enhanced it at the same time (Ameen and Mourshed 2019). Sustainability assessment within the built environment is a complex field of research that does not include cross-field subjects such as the ecological, economic and socio-cultural dimensions of the human context that are rather qualitative in their nature (Sala *et al.* 2015).

Measuring and assessing sustainability still represents a significant challenge and a field for debate about what it means and implementing the processes for conducting them. This is the case because it entails multidisciplinary dimensions (Environmental, economic, and social) and cultural and human value-based indicators (Hák *et al.* 2016). There are no universally agreed indicators that characterise the natural environment and its interactions with social, cultural, economic and technical dimensions of sustainable development (Giannetti *et al.* 2010; Ahmad and Thaheem 2017). This disagreement might be partly due to the lack of a unified accepted definition of sustainable development that includes cultural and human context factors against methods that focus on quantifiable factors and indicators of sustainability, or even when connecting the quantitative indicators to the qualitative one (Wu *et al.* 2016).

This chapter reviews the role of sustainability assessments and indicators in achieving sustainability within the built environment. It presents and compares some of the most used Sustainable building assessment and rating tools (methods) to determine how they integrate the previously discussed eco-cultural indicators of the sustainable built environment. The review aims to present and compare some of the standard sustainability assessment methodologies and tools to determine how they integrate the fourth sustainability dimension (especially Socio-cultural), which the scope of the built environment. Sources of information include key research papers, policy papers, and assessment tools.

Sustainable building assessment Sustainable building assessment tools and methods are a useful starting point for this research as they represent state of the art in frameworks for sustainable buildings. Holistic sustainability requires that the progress toward sustainable building development is measured in a way that provides quick feedback and constant update to meet ever changing sustainability requirements. Sustainable building assessment tools and methods provide the most current strategy as they are regularly reviewed and updated. They represent the most popular and researched upon methods of sustainability assessment within the built environment. Sustainable building assessment methods also provide a unique opportunity for this research to critically review, how the qualitative dimensions of sustainable building design can be quantified and embedded as applicable and acceptable design requirements during the assessment's stages.

This study also posits that a customised framework and tool should be designed to suit Jordan's built environment. This framework should be developed in ways that overcome the gaps and shortcomings of other existing methods. Achieving this aim required the review of common international assessment frameworks. Sustainable building assessment methods also provide unique opportunity for this research to study the extent of qualitative intangible indicators of sustainability and how can they be transformed into practical quantifiable measurements towards sustainability. The review dealt with finding answers to the following questions:

a) Which methodologies and frameworks supported social and cultural dimensions of sustainability and how?

b) Which levels or categories do assessment methods comes in?

c) What are the leading indicators explored and what metrics are used?

d) to which degree are these tools able to incorporate the different dimensions of sustainability?

e) What are the differences, commonalities, strengths, weaknesses, successes, and failures of these methods?

f) What are the various problems and challenges that sustainable building assessment are grappling with?

3.2 Sustainable building assessment

Sustainable building assessment approaches may be categorised based on the hierarchical structure in their application to either framework, methods or indicators (Figure 3.1). In other words, these approaches can be assessed using frameworks or structured protocols to study several options within the framework using analytical methods and to define such project occurrences using indicators (Morrison-Saunders *et al*. 2014). The first level category includes the assessment frameworks. These are integrated and structured assessment models that aid in the comparison of various alternatives for projects and policies (Bond *et al*. 2012). Examples include Environmental Impact Assessment (EIA) and Strategic Environmental Accounting (SEA).

Environmental assessment frameworks aim to protect the environment by ensuring coherence between various local planning authorities when deciding whether to grant planning permission for a project, which is likely to affect the environment (Ramos 2019). significantly. Frameworks set out a procedure and objective list to identify the aspects of the projects that can affect the sustainability of the environment and assess, consult, and come to a decision on those projects that are likely to have significant environmental effects (Morrison-Saunders *et al*. 2014). The framework uses a step-by-step, methodological approach through mapping policy or projects, making them relevant to sustainability assessment.
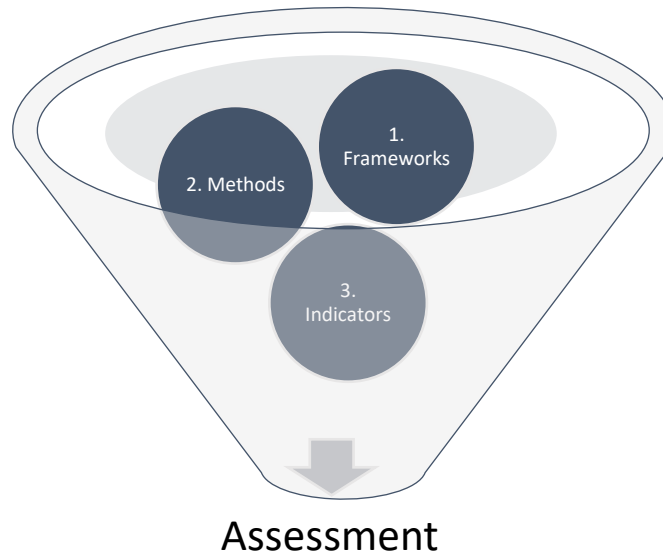
Assessment

The second level category is comprised of analytical evaluation methods that assist in decision-making or in finding potential solutions to specific problems within the framework sphere (Pope *et al*. 2017). (Srinivasan *et al*. 2011; Pope *et al*. 2017), classified assessment tools into two main classes:

1. Qualitative tools based on scores and criteria, and quantitative tools using a physical life cycle approach with quantitative input and output data on the flow of matter and energy (example: lifecycle assessment tools and energy modelling software)
2. Qualitative methods are often based on auditing of buildings, putting a score to each investigated parameter resulting in one or several overall scores of the development.

Third level category include indicators. Indicators are required at all levels of results-oriented development goals. These indicators provide the necessary information for measuring environmental, economic and social progress (Böhringer and Jochem 2007). Indicators help achieve sustainability targets and inform policymakers and the public about the current state of the environment, their weaknesses and strengths, and bring out the priority areas (Pupphachai and Zuidema 2017; Verma and A. S. Raghubanshi 2018). Indicators not only validate a framework but also provide an insight into the phenomena being monitored (Guzmán *et al*. 2017). Dizdaroglu (2015), Verma and Raghubanshi (2018) stated that indicator-based sustainability assessment contributes to the following four ways:

1. By indicating the state of local sustainability.
2. By quantifying sustainability.
3. By providing feedback on policies during implementation; and By finding the best policy measures for sustainability.

Sustainability frameworks are crucial to guiding associated planning, decision-making, monitoring and implementation activities within the built environment, such as extensive infrastructure work, rehabilitation, conservation, to name a few (Sala *et al*. 2015). Such sustainability frameworks and standards are recognised internationally and include the EIA, a legal and obligatory requirement for evaluating many other schemes and guidelines (Morrison-Saunders *et al*. 2014). Despite this apparent breadth, James (2014), suggested that sustainability assessment frameworks may not be sufficient, as they tend to be generalised and lack specialisation depending on the field of the project they assess. The literature is devoted to establishing generalised frameworks, processes, indices and indicators for measuring sustainability, which are all examples of bird's-eye, expert-driven processes (Ameen *et al*. 2015). Therefore, there remains a need for specific assessment frameworks and methods for specific issues and on a smaller and more focussed scale, such as in the built environment.

The purpose of building sustainability assessments is to gather and report information for decision-making during different phases of the building, design, construction, use and possibly demolition of a building (Bragança *et al.* 2010). They aim to establish an objective and comprehensive methodology for assessing a broad range of environmental impacts caused by a building or even a group of buildings on the built environment consistently and comparably, concerning pre-established standards, guidelines, indicators, or criteria (Poveda and Lipsett 2011). Measuring sustainable development in urban areas remains the most significant challenge in implementing sustainable development in cities, which requires comparable information about the social, economic and environmental dimensions of sustainability (Verma and Raghubanshi 2018).

Sustainable building assessment methods can be oriented to different scales of analysis, such as building material, building product, construction phases (Bragança *et al.* 2010). They usually follow larger scale legal and assessment frameworks in the region they originated in (Olakitan 2019). By analysing the scopes of the most widely used sustainable building assessment methods, it is possible to distinguish two main types of assessment methods. The first type is quantitative-based methods that apply physical Life-cycle assessment (LCA) systems input and output data on the flow of matter and energy (Sharma *et al.* 2011). The second type is qualitative assessment methods that are generally based on the auditing of buildings, followed by a rating (or scoring) of a pre-determined list of criteria, which results in an overall rating for the building performance (Mattoni *et al.* 2018). Qualitative based assessment methods include green building rating and certification systems such as LEED and BREEAM.

3.2.1   Life-Cycle Assessment of buildings

Life Cycle Assessment (LCA) is a method for evaluating and quantifying the environmental load and impact of processes and products throughout their life cycle from the cradle to the grave (Ortiz, Castells *et al.* 2009). In life cycle assessment, quantitative systematic and individual energy flows and environmental impacts assessment is performed on raw material acquisition, processing, manufacturing, use and finally its disposal of products and services (Finnveden *et al.* 2009). In the building sector, the life-cycle assessment of a building project starts before any physical construction activities and ends after its usable life. LCA methodological framework comprises four stages: life cycle inventory analysis, life cycle impact assessment, and life cycle interpretation and as shown in Figure 3.2.
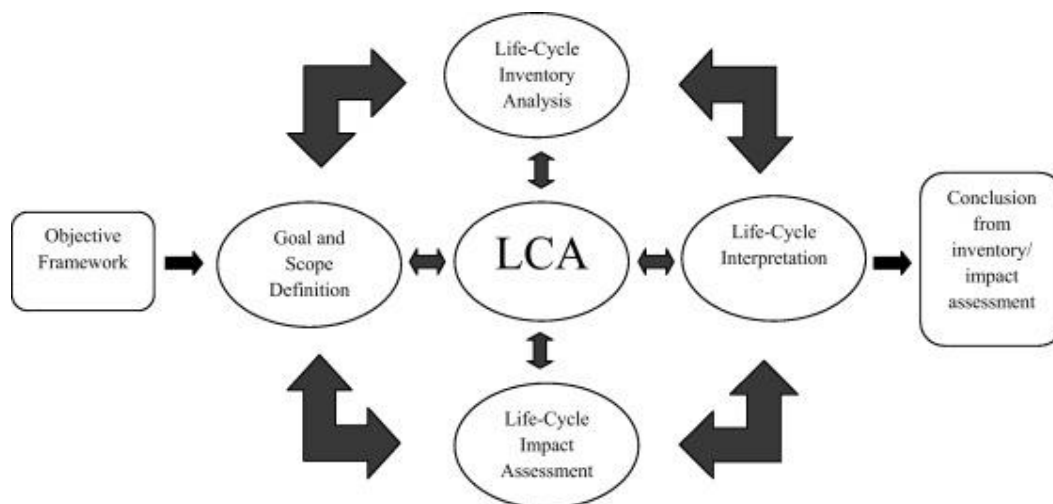
Figure 3.2 Stages of life cycle analysis (Sharma *et al.* 2011)

The adoption of environmental LCA in buildings is a complicated task. It incorporates a dozen individual processes in a supply chain, such as the extraction of raw resources, various primary and secondary production processes, transportation, as well as hundreds of tracked substances (Sharma *et al.* 2011). Furthermore, the expected life cycle of a building is exceptionally long that

can reach up to tens or hundreds of years (Geng *et al*. 2017). The more rigorous the LCA methods are, the more data-intensive they are (Bahramian and Yetilmezsoy 2020). Therefore, the assessment process can involve high costs of collecting data and keeping it updated, particularly in a period of considerable changes in materials manufacturing processes. Some data needed for the LCA is expensive and difficult to obtain and is most often kept confidential by those manufacturers that undertake the studies (James 2015). Life cycle assessment is arguably more complex, time and resources consuming than multi-criteria approaches (Bernardi *et al*. 2017).

Criticisms levelled against the LCA approach for sustainability assessment of buildings, including the limited user and stakeholders contribution (Bahramian and Yetilmezsoy 2020). As a solely quantitative method, LCA falls behind other tools that incorporate user input (Bragança et al. 2010) and does not integrate the socio-cultural aspects of sustainable development. Moreover, LCA assumes a frozen future, with no new technology changes, the building use, no new environmental constraints, and no new demands on the building or land use (Moffatt and Kohler 2008; Berardi 2012). Although some studies have started making use of Life Cycle Cost (LCC) analysis to cover the economic side of sustainability, the social sustainability dimension remains mostly unaddressed in LCA based assessment systems for buildings (Ahmad and Thaheem 2017)

3.2.2   Sustainable Building Rating Systems

Sustainable building rating systems are multi-criteria credit assessment methods where credits are assigned to various predetermined indicators (Bragança *et al*. 2010). These indicators cover a set of specific themes and categories that are considered to impact the overall building sustainability (Ameen *et al*. 2015). Sustainable and green building rating systems remain the most comprehensive multi-criteria approach and the most widely used assessment methods for the built environment (Mattoni *et al*. 2018). These systems aim to establish an objective and comprehensive method for evaluating a broad range of sustainability performances throughout building design, construction, operation, maintenance, and sometimes disassembly or deconstruction (James 2015). They measure the performance of a building in a consistent and harmonised manner using pre-established standards, guidelines, factors, or criteria (Awadh 2017). Scoring methods are used to create rating systems to assess the environmental sustainability of buildings, which are based on four major components (Doan *et al*. 2017):

- **Categories**: these form a specific set of items relating to the environmental performance considered during the assessment
- **Scoring system**: this is a performance measurement system that cumulates the number of possible points or credits that can be earned by achieving a given level of performance in several analysed indicators
- **Weighting system**: this represents the relevance assigned to each specific category within the overall scoring system
- **Output:** this aims at showing, directly and comprehensively, the results of the environmental performance obtained during the scoring phase.

Criteria and categories-based assessment methods provide some significant benefits to end-users and other stakeholders in the building process. They promote substantial improvements in the overall performance of the building, encourages the use of construction solutions that better fit the use of the building, and promotes a better understanding and communication of client and user requirements (Bragança *et al*. 2010). They can also foster better integration of environmental, social, functional, and cultural concerns compared to quantitative-based tools such as In LCA methods (Teng *et al*. 2019). There has been an increasing interest in environmental assessments of the built environment, and today there are a significant number of tools available in the market to assist this goal. The following sections review some of the most adopted and prominent sustainable building methods and rating systems for the built environment worldwide and in the context of Jordan.

3.3 Current Sustainable building rating systems

Sustainable building rating systems or green building rating systems are specialised for addressing sustainability in different building types, such as industrial buildings or residential, and different project scales from one building to a neighbourhood or even urban level (Berardi 2011; Monno 2012). The concept of environmental green building assessment rating and certification methods emerged with the introduction of BREEAM in the 1990s. Subsequently, many nations recognised the importance of such a tool to assist construction stakeholders to evaluate their projects concerning sustainable development principles (Wong and Abe 2014; Banani *et al*. 2016).

Since the introduction of BREEAM, the evolution of building rating systems concerning both quantifiable and qualitative dimensions of sustainability have been significant. Nowadays, green or sustainable building assessment systems are considered a keystone for sustainable development within the built environment (Awadh 2017). Globally, many governmental and non-governmental bodies have proposed their own sustainable building assessment methods, such as LEED (USA), CASBEE (Japan), and SBTool (international), and the Jordanian Green Building Guide and rating systems (JoGBG). These methods are the product of the combination of domestic and international policies and the commercial need for environmentally assessed and sound products (Haapio and Viitaniemi 2008). The assessment methods also follow the United Nations three spheres of sustainability and sustainable development goals (Srinivasan *et al*. 2011).

The following sustainable building rating systems were chosen because they are recognised as the most well-reputed and reliable internationally applied tools. In addition, Jordan's green building rating system also represents the national rating system of the research case study. These tools were analysed to highlight which factors and indicators most influence the final performance of the building. Analysis of the availability and integration of sustainable development socio-cultural indicators is also included to provide useful suggestions for improvement. The original and latest editions of these rating systems were considered, and only residential buildings and neighbourhood assessment schemes are discussed. The review focuses on well-known and reputed methods with a qualitative methodology covering both human and ecological systems of the built environment. Only sustainable building rating systems were considered as energy modelling, and life cycle assessment methods deal strictly with quantifiable data like energy consumption and transfer, material properties (Forsberg and Von Malmborg 2004).

3.3.1 BREEAM

The Building Research Establishment Environmental Assessment Method (BREEAM) was launched by the Building Research Establishment (BRE) to set the standards for best practices in sustainable building design and operation (BRE, 2017). BREEAM utilises a weighting and rating system that involves comparing key indicators with predictable practices and performance level, after which credits are then awarded in ten categories (Alyami *et al*. 2015). Each category has several differently allocated criteria, with pre-weighted credits that can either be cumulative or dependent on performance against EIA frameworks as legislated by the UK government and the European Union (EIA-UK 2009). These credits are then added together to produce a single overall score on a scale of Pass, Good, Very Good, Excellent and Outstanding (BREEAM, 2017).

At first, BREEAM-NC was only concerned with the assessment of newly constructed single building projects (BRE, 2013). In 2009, the scope was extended in BREEAM Communities (BREEAM-Co) towards community assessment and sustainable assessment of urban areas. These two schemes vary in their objectives and categories. Table 3.1 compares the main categories and weights in both schemes.

Table 3.1 Main categories in BREAAM Communities and new construction schemes (BRE 2016; BRE 2009)

BREEAM New construction 2016		BREEAM Communities 2016	
Category, credits, and weight	Indicators	Category, credits, and weight	Indicators
Governance, 8 Points, (9.3%)	GO 01 Consultation plan GO 02 - Consultation and engagement GO 03 - Design review GO 04 - Community management of facilities	Management 22 (19.5%)	-Project brief and design -Life cycle cost and service life planning -Responsible construction practices -Commissioning and handover -Aftercare
Social and Economic, 47 (42.7%) divided into: -Locale economy. (14.8%) -Social wellbeing (17.1%) -Environmental conditions: (10.8%)	SE 01 - Economic impact SE 17 - Training and skills SE 02 - Demographic needs and priorities SE 05 - Housing provision SE 06 - services, facilities, and amenities SE 07- Public realm SE 09-Utilities SE 11-Green infrastructure SE 12- Local parking SE 14 - Local vernacular SE 15 - Inclusive design SE 03 - Flood risk assessment SE 04 - Noise pollution SE 08-Microclimate SE 10 - Adapting to climate change SE 13 - Flood risk management SE 16- Light pollution	Health and wellbeing 10 (9%)	-Visual comfort -Indoor air quality -Safe containment in laboratories -Thermal comfort -Acoustic performance -Safety and security
Sources and Energy 31 (21.6%)	RE 01 - Energy strategy RE 02 - Existing buildings and infrastructure RE 03-Water strategy RE 04 - Sustainable buildings RE 05 - Low impact materials RE 06 - Resource efficiency RE 07 -Transport carbon emissions	Energy 30 (26.5%)	-Reduction of energy use and carbon emissions -Energy monitoring -External lighting -Low carbon design -Energy-efficient cold storage -Energy-efficient transportation systems -Energy-efficient laboratory systems -Drying space
Land Use and Ecology 18 (12.6%)	LE 01 - Ecology strategy LE 02 - Land use LE 03 - Water pollution LE 04 - Enhancement of ecological value LE 05 - Landscape LE 06 - Rainwater harvesting	Transport 9 (8%)	-Public transport accessibility -Proximity to amenities -Cyclist facilities -Maximum car parking capacity -Travel plan
Transport and Movement 15 (13.8%)	TM 01 - Transport assessment TM 02 - Safe and appealing streets TM 03 - Cycling network TM 04 - Access to public transport TM 05 - Cycling facilities TM 06 - Public transport facilities	Water 9 (8%)	-Water consumption -Water monitoring -Water leak detection -Water-efficient equipment
		Materials 12 (11%)	-Life cycle impacts -Hard landscaping and boundary protection -Responsible sourcing of materials -Insulation -Designing for durability and resilience -Material efficiency
		Waste 7 (6%)	-Construction waste management -Recycled aggregates -Operational waste -Speculative floor and ceiling finishes -Adaptation to climate change -Functional adaptability
		Land use and ecology 10 (9%)	-Site selection -Ecological value of site and protection of ecological features -Minimising impact on existing site ecology -Enhancing site ecology -Long term impact on biodiversity

BREEAM New construction 2016		BREEAM Communities 2016	
Category, credits, and weight	Indicators	Category, credits, and weight	Indicators
		Pollution 13 (11.5%)	-Impact of refrigerants - -NOx emissions -Surface water run-off -Reduction of night-time light pollution -Reduction of noise pollution

The assessment process in BREEAM is divided into three steps being in line with the different phases of the planning, design, and construction of new developments. When a building passes or exceeds a baseline indicator in the green building assessment and classification, the corresponding scores are obtained. The ranking grade is then calculated based on the final BREEAM scores. The maximum credits in this system are 150. Six grades are used in BREEAM rating benchmarks according to the percentage score: Outstanding (≥85%), Excellent (≥70%), Very Good (≥55%), Good (≥45%), Pass (≥30%), and Unclassified (<30%).

It was observed that energy and ecological indicators accumulated the highest score in BREEAM (45% in BREEAM-NC and more than 50 in BREEAM-CO). BREEAM-NC have considerably included more social sustainability indicators such as demographic needs, housing provision services, facilities, amenities, public real and inclusive design. BREEAM-CO on the other hand included more human wellbeing factors. However, it remains mostly concerned with indoor environment wellbeing indicators such as air quality and thermal comfort.

Except for local vernacular and inclusive design, neither BREAAM-NC nor BREEAAM-CO has included any culturally related indicators where it is very lacking. Both variations o BREEAM also do not award any points for specific regional requirements or challenges. BREEAM is more focused on water monitoring, flooding, and stormwater, which are significant concerns where the system is developed in the UK but might not be relevant to other regions. Furthermore, BREEAM requires a pre-set plan for public management of facilities, but it does not include any requirement for resident's involvement in the project design and construction. Therefore, the harm that might be inflected by the project on certain stakeholders might not be known early enough in the design stages to be avoided.

3.3.2 LEED

Leadership in Energy and Environmental Design (LEED) was developed by the US Green Building Council (USGBC 2016). LEED focuses on improving the performance in five main areas in the environment and human health:
- Energy efficiency,
- The quality of the indoor environment,
- Choosing materials,
- Water-saving
- And the development of sustainable sites (USGBC, 2017).

LEED is a tool of sustainable building that also deals with the life cycle assessment (LCA). It also has a specific classification system that applies to all types of structures, including dwellings, schools, healthcare facilities and retail and provides another variation for neighbourhood planning and design. Table 3.2 summarises the categories included in the LEED New Constructions (LEED-NC) and LEED Neighbourhood Design (LEED-ND) assessment schemes.

Almost all LEED schemes present mandatory prerequisites (marked as "r" in Table 3.2), and non-compulsory credits which can be selected according to the project objectives. The summation of points for each credit generates the evaluation outcome. All the credits receive a single weight according to a precisely defined scoring system (USGBC 2014). The scoring system has a maximum score of 100 points, plus there are up to 10 additional bonus points. Out of the possible total of

100 points, a minimum of 40 points should be obtained to pass the basic evaluation. Building rankings are classified into four levels: certified (40-49), silver (50-59), gold (60-79), and platinum (80-above) (LEED, 2013).

Table 3.2 The main themes and criteria in LEED neighbourhood and buildings scheme (USGBC,2017) Values between brackets indicate the weight of points allocated (r) indicated that this is obligatory requirement

LEED Neighbourhood design		LEED New construction and buildings V4	
Category/credits and weight	Indicators	Category/credits and weight	Indicators
Smart location and linkage (41)	Smart location (r) Imperilled species & eco-communities (r) Wetland & water body conservation (r) Agricultural land conservation (r) Flood plain avoidance (r) Preferred locations (10) Brownfield remediation (2) Access to quality transit (7) Bicycle facilities (2) Housing and jobs proximity (3) Steep slope protection (1) Conservation, restoration and management of habitat or wetland and water bodies (3)	Location and transportation (32)	Site selection (r) Sensitive land protection (2) High-priority site 3 Density and diverse uses (6) Access to trans (6) Bicycle facilities (1) Reduced parking footprint (1) Electric vehicles (1)
Neighbourhood pattern and design (28)	Walkable streets (r) + (9) Compact development (r) + (6) Connected & open community (r) +(2) Mixed-use neighbourhoods (4) Housing types and affordability (7) Affordable housing (3) Reduced parking footprint (1) Transit facilities (1) Access to recreation facilities (2) Visitability and universal design (1) Community outreach and involvement (2) Local food production (1) Tree-lined and shaded streetscapes (2) Neighbourhood schools (1)	Sustainable sites (10)	Pollution prevention (r) Site assessment (r) Protect or restore habitat (2) Open space (1) Rainwater management (3) Heat island reduction (2) Light pollution reduction (1)
		Water efficiency (11)	Outdoor and outdoor water use reduction (r) Total water metering (1)
Green Infrastructure and buildings (31)	Certified green buildings (R)+(5) Minimum building energy performance (R) Water use reduction (R) + (3) Construction activity pollution Prevention (R) +(1) Optimise building energy performance (2) Building reuse (1) Historic resource preservation and adaptive reuse (2) Rainwater management (4) Heat island reduction (1) Heat island reduction (1) Renewable energy production (3) District heating and cooling (2) Infrastructure energy efficiency (1) Wastewater management (2) Recycled and reused infrastructure (1) Solid waste management (1) Light pollution reduction (1)	Energy and atmosphere (31)	Annual energy use (r) Minimum energy performance (r) Building-level energy metering (r)+ (1) Optimise energy performance (20) Renewable energy (5)

LEED Neighbourhood design		LEED New construction and buildings V4	
Category/credits and weight	Indicators	Category/credits and weight	Indicators
Innovation & Design Process (6)	Innovation 5 Exemplary Performance 1	Materials and resources (13)	Durability and flexibility design 1 Environmentally preferable products and materials 5 Construction waste and demolitions 3 Building life-cycle impact reduction 6
Regional Priority Credits (4)	Specific environmental, social equity, or public health priorities	Indoor Environmental Quality (16)	Indoor air quality (r) +(5) Acoustic performance (r) (1) Low-emitting materials (3) Enhanced natural ventilation 2 Enhanced pollutant control 1 Thermal comfort (r) +(1) Interior lighting (1) Enhanced daylight (3) Quality views (1)
		Innovation 5 integrative process 12	Innovation (5) Integrative process (12)

LEED-NC is mainly concerned with physical environmental indicators and pay little to no attention to social and cultural dimensions. LEED-ND on the other hand includes more social sustainability indicators and allocate more than 30 points in total for them. However, the available social indicators are still mainly related to traditional social sustainability ones such as education and mixed-use developments. LEED does, however, include different indicators for affordable housing, typology, and affordability, which is rarely seen in other building sustainability frameworks. LEED also allocated credit to innovation indicators with 17 points in total. However, it allocated 4 points only for regional priorities which might not be encouraging for developers and designers to produce a sensible impact. LEED also prioritises indoor environmental quality and have no mention of more qualitative, cultural or wellbeing indicators.

3.3.3 CASBEE

The Japanese Sustainable Building Consortium (JSBC) is the developer of the Comprehensive Assessment System for Built Environment Efficiency (CASBEE). This system is applicable in various stages of a buildings life cycle (design, new construction, existing buildings, and renovation projects). It is based on the concept of a closed ecosystem to evaluate and rank buildings in terms of their environmental performance (Cappai *et al*. 2018). CASBEE for urban design (CASBEE-UD) was launched in 2007 as a joint product between the Japan Sustainable Building Consortium and the Japanese Green Building Council (JGBC) to cover urban development (town and city development) (Reed *et al*., 2011).

CASBEE assessment of building projects is quite different from the other rating systems. It is done by using a metric called Building Environmental Efficiency (BEE), which is given by the ratio between the two metrics of built environmental quality (Q) and built environmental load (LR):

$$BEE = \frac{Q}{LR}$$

Q calculates the improvement in everyday amenities for the building users within the virtual enclosed space boundary. LR quantifies the negative aspects of the environmental impact that go beyond the local environment (Bernardi *et al*. 2017). Q and LR range between 0 to 100 and are computed based on three subcategories, tabulated on a score sheet, as reported in Table 3.3.

Table 3.3 CASBEE subcategories sheet (IBEC, 2017)

Scoring for Q	Scoring for LR
Q1: Indoor environment	LR1: Energy
Q2: Quality service	LR2: Resources and materials
Q3: Outdoor environment on site	LR3: Off-site environment

The weight is connected to every category (quality of service, outdoor environment on-site, indoor environment, resources & material, off-site environment, and energy). Each category is streamlined under headings such as serviceability, building thermal load, lightning, and illumination. It also contains sub-issues such as ventilation rate, CO2 monitoring, and adaptability of the floor plate, as seen in Tables 3.4, 3.5 (Endo *et al.* 2007; Saunders 2008). Each category is scored from level 1 to level 5, with level 1 (the lowest point) and level 5 (the highest point of accomplishment). The score and rating are displayed in different ways, which makes it more flexible on how the information can be used.

Table 3.4 The main themes and criteria in CASBEE

Major Category	Minor Category	Sub-category
Q1. Environmental aspects	Q1.1 Nature conservation	Q1.1.1 Natural land use
	Q1.2 Environmental quality	Q1.2.1 Air quality
		Q1.2.2 Water quality
		Q1.2.3 Noise
	Q1.3 Resource recycling	Q1.3.1 Recycling of waste
	Q1.4 Environmental measures	Q1.4.1 Efforts and policies for the environment and biodiversity
Q2. Social aspects	Q2.1 Living environment	Q2.1.1 Quality of housing
		Q2.1.2 Parks and other facilities
		Q2.1.3 Sewage systems
		Q2.1.4 Traffic safety
		Q2.1.5 Crime prevention
	Q2.2 Social services	Q2.2.1 Education services
		Q2.2.2 Cultural services
		Q2.2.3 Medical services
		Q2.2.4 Childcare services
		Q2.2.5 Services for the disabled
		Q2.2.6 Services for the elderly
	Q2.3 Social vitality	Q2.3.1 Rate of population change due to births and deaths
		Q2.3.2 Rate of population change due to migration
		Q2.3.3 Efforts and policies injecting vitality into society
Q3. Economic aspects	Q3.1 Industrial vitality	Q3.1.1 Gross regional products
		Q3.1.2 Number of employees
	Q3.2 Economic exchanges	Q3.2.1 Index equivalent to the number of people visiting the city
		Q3.2.2 Public transportation
	Q3.3 Financial viability	Q3.3.1 Tax revenues
		Q3.3.2 Outstanding local bonds

Table 3.5: Comparative summary between CASBEE UD and CASBEE NC

CASBEE-Urban Design (2016)				CASBEE New constructions (2014)			
Tool/Criteria or indicators	No. of indicators	Weight/ points	%	Tool/Criteria or indicators	No. of indicators	Weight/ points	%
Natural environment (microclimates and ecosystems).	17	N/A	N/A	Indoor environment quality	17	N/A	N/A
Service functions for the designated area	15	N/A	N/A	Services, durability and flexibility	15	N/A	N/A
Contribution to the local community (history, culture, scenery and revaluation)	7	N/A	N/A	The site and outdoor characteristics	7	N/A	N/A
Environmental impact on microclimates. facade and landscape	14	N/A	N/A	Building thermal load	20	N/A	N/A
Social infrastructure	14	N/A	N/A	Water resources	14	N/A	N/A
Management of the local environment	13	N/A	N/A	Surrounding environmental consideration	14	N/A	N/A

From the quantitative point of view CASBEE, allocated the highest importance to environmental dimensions. CASBEE-UD have included some criteria for mixed-use development. Since mixed-use development affects other sustainability issues such as energy, amenities and transportation. Towards inclusion of social and cultural indicators, there are fewer social criteria in CASBEE than in other methods. furthermore, just 6% of CASBEE-UD's criteria address social and community well-being criteria.

CASBEE-UD provided a very comprehensive framework for social sustainability. However, it was limited to traditional social sustainability indicators of security, employment and health. Both CASBEE UD and NC limited cultural dimensions to the availability of cultural tangible resources. CASBEE have put a lot of emphasis on economic dimensions which few methods have been addressed thoroughly. CASBEE also did not include any credit or indicators for special site and regain requirements nor did it leave any credit for residents or stakeholders' involvement.

3.3.4 SBTool

SBTool (Sustainable Building Tool) is managed by IISBE (International Initiative for a Sustainable Built Environment). It consists of a software implementation of the Sustainable Building Challenge (SBC) assessment method that has been under development by a group of 14 countries as the Green Building Challenge process since 1996. The unique feature of SBTool is that it was designed from the outset to reflect the different priorities, technologies, building traditions and cultural values of different regions and countries (Bernardi *et al*. 2017).

The SBTool embraces projects from a single building to an urban scale and has been adapted to several countries. Its system is designed to easily insert local criteria and language, besides adjusting the weight of indicators based on regional priorities and conditions (IISBE 2015). The tool focuses on seven categories: site selection, project planning and development; environmental loadings; energy and resource consumption; indoor environmental quality; functionality & controllability of building system, long-term performance, and social and economic indicators (IISBE 2017). Table 3.6 summarises SBTool categories and indicators. In SBTool, categories are pre-weighted, by values ranging from 1 to 5, according to increasing significance for the individuals, society, and nature.

Table 3.6 Some of the categories and indicators in SBTool (IISBE 2017)

Category	Sub- Categories	Number of indicators
S. Location, Services and Site Characteristics	S1 Site Location and Context	12
	S2 Off-site services available	9
	S3 Site Characteristics	14
A. Site Regeneration and Development, Urban Design and Infrastructure	A1 Site Regeneration and Development	13
	A2 Urban Design	6
	A3 Project Infrastructure and Services	16
B Energy and Resource Consumption	B1 Total Life Cycle Non-Renewable Energy	5
	B2 Electrical peak demand	2
	B3 Use of Materials	6
	B4 Use of potable water, stormwater and greywater	4
C Environmental Loadings	C1 Greenhouse Gas Emissions	4
	C2 Other Atmospheric Emissions	3
	C3 Solid and Liquid Wastes	5
	C4 Impacts on Project Site	5
	C5 Other Local and Regional Impacts	8
D Indoor Environmental Quality	D1 Indoor Air Quality and Ventilation	10
	D2 Air Temperature and Relative Humidity	2
	D3 Daylighting and Illumination	3
	D4 Noise and Acoustics	4
	D5 Control of electromagnetic emissions	1
E Service Quality	E1 Safety and Security	10
	E2 Functionality efficiency	8
	E3 Controllability	4
	E4 Flexibility and Adaptability	5
	E5 Optimisation and Maintenance of Operating Performance	9
F Social, Cultural and Perceptual Aspects	F1 Social Aspects	5
	F2 Culture and Heritage	6
	F3 Perceptual	7
G Cost and Economic Aspects	G1 Cost and Economics	8

Unlike the other weighting systems and to provide more consistency in the assignment of weighting points, the SBTool includes an algorithm that automatically assigns a weighting score based on the relevance of significant impact categories, as well as factors for the probable intensity, duration and extent of performance effects (Figure 3.2).

Figure 3.3 Weighting system in the SBTool (IISBE 2017)

SBTool has a similar number of credits and indicators among all its categories. SBtool also allocated more indicators and credit weight to socio-cultural indicators than any other reviewed method. The tool was also a pioneer in including rarely discussed indicators such as privacy, functionality, flexibility and adaptability, perceptual. The tool also included a whole section dedicated to studying the impact on-site and regional impacts. The tool weighing system and indicators list can also be modified to accommodate specific context needs and requirements by omitting or prioritising specific indicators. It was also among few assessment methods to mention well-being in separation to indoor environmental indicators and requirements

3.3.5 The Jordanian Green Building Guide

The Jordanian Green Building Guide is a non-mandatory guide and rating system developed by the Jordanian Royal Scientific Society (JRSS) and Jordan National Building Council (JNBC) in 2012 (Awadallah *et al*. 2011). The green building manual in Jordan aims to accomplish the following:

- To reduce the amount of water used in buildings
- Reduce the energy consumption of buildings
- Reduce the environmental impact of buildings
- Reduce the amount of material used in the construction and occupation phases
- Encourage recycling these materials
- Create a starting point for preparing a green building code in Jordan; and
- Create sustainable, environmentally friendly, high-efficient low-cost buildings.

The Green building guideline contains parameters and credits aimed at Jordan's climate, resources, legislation, policies, policies instrument, building techniques and strategies. This guideline is attached to a voluntary rating system (Alsubeh 2013; Tarrad and Sqour 2020). The green building guideline approach is to understand the building's total impact on the environment in six categories as a foundation for green building design. The water efficiency part has a 35% scoring within the scoring system, followed by the energy efficiency at 33% of the total points given to a green building. This weighting reflects the limited availability of water and energy resources in Jordan (Awadallah *et al*. 2011). Table 3.7 presents the main categories and assigned credits.

Table 3.7 The main chapters and scoring weight for the Jordanian Green Building guide

Chapter	Credit available	Weight
Green Building Management	20	6%
Site Sustainability	24	8%
Water Efficiency	110	35%
Energy Efficiency	98	33%
Healthy Indoor Environment	24	8%
Materials and resources	32	10%
total	308	100%

The previously mentioned categories are further sub-divided into indicators distributed on three requirement levels:

1) *Legal Requirements (LR):* Requirements that are taken from related Jordanian codes and regulations and applied to the green application of the credit. No points are awarded.
2) *Obligatory (rewarded) Requirements (OR):* Requirements that are not mentioned in Jordanian codes of practice as mandatory minimum requirements but are essential for green building practice. Therefore, these requirements are obligatory for a building to pursue a green building certification, and they are rewarded with points when achieved.

3) *Voluntary Requirements (VR):* These are various requirements for specific building types and specifications, and additional points are awarded for benefitting the building with these additional criteria.

Buildings are qualified as green in this scheme if the obligatory requirements are implemented. Depending on the overall sum of points and grades granted, the building will qualify as A (over 80 credits), B, C or D (50–59 credits) grade. The manual is applied to four building types: single residential, multifamily residential, commercial/offices and educational. These are then sub-divided into air-conditioned and non-air-conditioned buildings. Additionally, a candidate building can claim extra credits for efficient building systems (elevators, escalators, swimming pools), open spaces, or for retrofitting. Each chapter in the Jordanian Green Building Guide has a similar layout to the example shown in Figure 3.3. Each chapter starts with a brief introduction and then presents definitions, abbreviations, and English to Arabic terms used in that chapter.

Figure 3.4 Sample translated page from the Jordanian Green Building guide (translated by author)

In the Jordanian Green Building Guide, each indicator is measured either by simulations programs, mathematical calculations, or documented plans. Through a checklist, the guide evaluates a broad and diverse range of criteria, mixing requirements of both quantitative and qualitative data inputs as follows (Matar *et al*. 2015);

a) *Credits based on performance goals:* This type of method is usually a list of standards (that form the evaluation criteria). The indicator sets are distinguished mainly by the type of criterion evaluated and the development activities they support. Furthermore, noted indicators generally measure the operational performance of a building, while checklists are intended to measure a project or a plan performance.

b) *Credits based on computer programs (simulation or modelling):* Computer programs usually support the connection between input and output data in this kind of system. They are based on input and output models. They deal predominantly with quantitative data.

c) *Credits based on monitoring (Post-occupancy evaluation (POE), commissioning and monitoring):* Credits based on extensive monitoring of energy flows, including lighting loads, HVAC loads and plug loads, for a minimum of one year. Analysis can be used to compare real performance with that predicted to manage substantial savings (either energy cost or energy use).

The Jordan's Green building assessment method represents a conservative type of sustainable building assessment like those seen in earlier versions of LEED and BREEAM. This might be due to the fact it is the newest among them. Furthermore, the highest number and weight of credits allocation were given to water efficiency. This is due to the significant water stress situation that Jordan faces. Within this method, however, physical environmental indicators still receive the most attention. There is little mention of social sustainability and no including of cultural related indicators and dimensions. Furthermore, besides the priority given to water-saving within the framework, other dimensions requirements are still very generic and like those found in other international assessment methods with no specific modification towards Jordan's context.

3.4   Discussion

Despite having many similarities, and a common objective towards sustainability, the review demonstrates that sustainable building assessment methods utilise disparate methods and indicators. This can be traced back to the various definitions and approaches toward sustainable development (Tanguay *et al*. 2010). Each sustainable building assessment method uses a different set of themes of categories with different allocated weightings and points according to the relative importance and priorities set by the developing organisation. Each of these themes or main categories are further sub-divided into more indicators and parameters used to assess the contribution of a project to achieve the required sustainability objective.

LEED, BREEAM, and CASBEE have specific schemes and variations of their tools to assess different types of buildings such as residential or offices building or to assess different scales of projects such as neighbourhoods or building blocks. For the purpose of this analysis, Table 3.8 was created to present the differences in methodology, themes and weighting across the previously discussed building rating and assessment tools. Table 3.9 is also presented to compare the available indicators and their weighting across building and neighbourhood sustainability assessment tools (BREEAM, CASBEE, LEED, BREEAM-Communities, LEED-ND and CASBEE-UD). Based on the previous review and Tables 3.8 and 3.9, the following observations and issues arise with the studied building sustainability assessment meth

Table 3.8 Summary of the five sustainable building assessment methods

Method	BREEAM Communities (2012)	LEED-ND v4.1 (2019)	CASBEE-UD (2016)	SBTool (2016)	The Jordanian Green Building Guide (2014)
Institution	Build research Establishment (BRE)	US Green Building Council (USGBC)	Japan Sustainable Building Consortium (JSBC) and Institute for Building Environment and Energy Conservation（IBEC）	International Initiative for Sustainable Built Environment (IIS)	Royal Jordanian Scientific Society (RJSS) and Jordan Building Council (JBC)
Country of Origin	United Kingdom	USA	Japan	International	Jordan
Type of Method	Rating system on the form of Excel Pre-assessment estimators	Sustainable building rating system on the form of PDF format and Excel checklists	Assessment software and technical manuals	Software and rating system	Design guide and suggestions for passive design. Non-mandatory rating system
Stages of Evaluation	Design phase (outline and detailed designs)	Planning, design and completion phases	Planning, design and completion phases	Design phase (outline and detailed designs)	Planning, design and completion phases
Scale of focus	Building and neighbourhood scale new, refurbished and existing	Buildings and neighbourhood and district. New, refurbished and existing buildings	Building, neighbourhood, district and city. New and existing buildings	New, refurbished and existing buildings	New constructions only
Rating approach	Pre-weighted categories	Pre-weighted categories	BEE ranking chart based on ratio ranking	Logarithm weighting system	Pre-weighted categories
Main categories and weighting	Governance 8 Social and economic wellbeing 31 Resources and energy 47 Land Use and ecology 18 Transport and movement 158	Smart location and linkage 41 Neighbourhood pattern and design 28 Green infrastructure and buildings 31 Innovation & design process 6 Regional priority credits 4	The tool consists of 80 sub-criteria, which are further re-categorised into two main groups: Q (Environmental Quality), and separate assessment points for L (Environmental Loadings). The final score of the project (BEE) is calculated as follow for a total score of: $$BEE = \frac{(BuildingEnvironmentalQuality}{(BuildingEnvironmentalLoadings}$$	Site Selection, project planning & development 8 Energy and resource consumption 21 Environmental loadings 25 Indoor environment quality 21 Service quality 15 Social & economic aspects 5 Cultural & perceptual aspects 5 (-+5% based on context and third-party requirement)	Green building management 20 Site sustainability 24 Water efficiency 110 Energy efficiency 98 Healthy indoor environment 24 Materials & resources 32
Performance Rating Scale	Outstanding = >85% Excellent = 70-84% Very good = 55 - 69% Good = 40 - 54% Pass = 25 - 39%	Platinum = 80% Gold = 60-79% Silver = 50- 59% Certified = 40 -49%	Poor: BEE <0.5 Fairy Poor: BEE = 0.5–1.0 Good: BEE = 1–1.5 Very good: BEE = 1.5–3; or BEE ≥3 and Q < 5 Excellent: BEE ≥3 and Q ≤ 5	-1 Poor 0 1 3 5 Excellent	Green Building A= 80% B =70 - 79% C = 60 - 69% D = 50- 59%

Table 3.9 Summary between sustainable building and neighbourhood assessment methods

Tool/Criteria or indicators	No of indicators	Weight/points	%	Tool/Criteria or indicators	No of indicators	Weight/ points	%
BREEAM Communities (2016)				BREEAM international (2016)			
Governance	4	8	7%	Management	5	23	17%
Social and economic well being	17	31	26%	Health and well being	8	23	17%
Resources and energy	7	47	39%	Energy	7	27	20%
Land use and ecology	6	18	15%	Transport	5	11	8%
Transport and movement	5	15	13%	Water	4	10	7%
				Materials	4	12	9%
				Waste	5	8	6%
				Land and Ecology	4	10	7%
				Pollution	4	12	9%
Total	*40*	*119*		*Total*	*46*	*136*	
LEED-Neighbourhood Design V4.1				LEED Buildings and new constriction V4.1			
Smart location and linkage	9	27	25%	Location and transportation	4	15	16%
Neighbourhood pattern and design	15	44	40%	Sustainable Sites	3	7	7%
Green infrastructure & buildings	21	29	26%	Water efficiency	1	12	13%
Innovation and design process	2	6	5%	Energy and atmosphere	3	37	39%
Regional priority credit	1	4	4%	Materials	3	9	10%
				Indoor Environmental quality	6	14	15%
Total	*56*	*110*		*Total*	*20*	*94*	
CASBEE-Urban Design (2016)				CASBEE New constructions (2014)			
Natural environment (microclimates and ecosystems).	17	N/A	N/A	Indoor environment quality	17	N/A	N/A
Service functions for the designated area	15	N/A	N/A	Services, durability and flexibility	15	N/A	N/A
Contribution to the local community (history, culture, scenery and revaluation)	7	N/A	N/A	Site and outdoor characteristics	7	N/A	N/A
Environmental impact on	14	N/A	N/A	Building thermal load	20	N/A	N/A

Tool/Criteria or indicators	No of indicators	Weight/points	%	Tool/Criteria or indicators	No of indicators	Weight/ points	%
microclimates. facade and landscape							
Social infrastructure	14	N/A	N/A	Water resources	14	N/A	N/A
Management of the local environment	13	N/A	N/A	Surrounding environmental consideration	14	N/A	N/A
Total	*80*		_	*Total*	*81*		

3.4.1   Differences in the weighting of indicators

Tables 3.8 and 3.9 indicate that the discussed sustainable building rating methods are biased toward tangible and quantifiable environmental criteria. Energy, water, and other resources indicators dominate the intangible socio-cultural issues. Furthermore, environmental performance categories were frequently repeated between all five assessment tools: albeit with different terminology. For example, they manifested in BREEAM as resources, energy, land use and transport. In LEED, they are mentioned under location and transportation, water, and energy efficiency. While in Jordan GBG, they were mentioned as site sustainability, energy and water efficiency, materials, and resources.

Environmental sustainability factors also comprise the majority of sub-indicators and the weighting of points available. For example, in BREEAM-NC, environmental categories such as energy, transport and materials account for more than 70% of both the total weight of points and the total number of sub-indicators. In BREEAM-Co, the resources and energy category account for about 39% of the total available weight of points. Similarly, in LEED-NC, energy accounts for 40% of the total points. In Jordan's green building guide, energy and water make up more than two-thirds of the available points. In CASBEE, energy efficiency indicators represent 25% of the overall weight of points.

3.4.2   Inclusion of socio-cultural indicators

The studied methods do not have a similar approach to the inclusion of socio-cultural indicators. For instance, the inclusion of social sustainability criteria in CASBEE-UD and CASBEE-NC were limited. Only 6% of CASBEE-UD's indicators address social and community wellbeing, while CASBEE-UD had only 14 social infrastructure indicators out of the total 80 available. In BREEAM-Co, the social and economic wellbeing category account for 26% of the total weight of points. Among all the discussed methods, Jordan GBG had the least number and weighting assigned to socio-cultural criteria. LEED, on the other hand, puts the most emphasis on social sustainability indicators. In LEED-ND, the category neighbourhood design pattern includes 15 social sustainability indicators and allocates these indicators 40% of the total score.

Table 3.9 presents the socio-cultural sustainability indicators found in the studied sustainable building assessment methods. In addition to the limited inclusion of weighting and credits assigned to social indicators, these methods also lack many socio-cultural dimensions of both human and sustainable development. Moreover, the available non-environmental indicators focus mainly on socio-economic sustainability issues such as the delivery of services, facilities and amenities, access to public transport, crime prevention, and economic impact.

Table 3.10 Available socio-cultural indicators in each method

Assessment method	Available socio-cultural indicators	Number of indicators	Points' Weight
BREEAM-communities	Demographic needs and priorities. Housing provision. Delivery of services, facilities, and amenities. Public realm. Safety and walkability. Access to public transport. Local vernacular. Inclusive design. Community management	9	28
LEED-ND	Housing and job proximity. Compact and mixed-use development. Access to transit. Walkable streets. Neighbourhood schools. Connection and open community. Tree-lined and shaded streetscapes. Housing type and affordability Access to civic and public space. Access to recreation facilities. Visibility and universal design. Community outreach and involvement.	15	46
CASBEE-UD	Access to amenities, facilities and parks. Transportation. Safety and security and crime prevention. Cultural and educational facilities. Access to health and commercial facilities. Quality of housing. Management of the local society.	7	N/A
SBTool	Universal access on-site and within the building. Access to direct sunlight from living areas of dwelling units. Visual privacy in principal areas of dwelling units. Access to private open space from dwelling units. Involvement of residents in project management. Compatibility of urban design with local cultural values. Provision of public open space compatible with local cultural values. Impact of the design on existing streetscapes. Use of traditional local materials and techniques. Maintenance of the heritage value of the exterior of an existing facility. Maintenance of the heritage value of the interior of an existing facility. Impact of tall structure(s) on existing view corridors. Quality of views from tall structures. Sway of tall buildings in high wind conditions. Perceptual quality of site development. Aesthetic quality of facility exterior. Aesthetic quality of facility interior. Access to exterior views from the interior.	19	22
Jordan GBG	Project aesthetics. Project landscaping. Social connection. Transportation provision of open spaces.	5	11

Nevertheless, there were few significant cultural indicators included in the assessment methods. BREEAM includes demographical priorities and preserving local or vernacular design characteristics. LEED includes indicators such as walkable streets, visibility and universal design. CASBEE's notion of cultural indicators were significantly weaker than the other international methods as it only included the availability of public spaces and cultural centres. Jordan GBG has the least number of social sustainability indicators and the least weight assigned to them among all five assessment methods. It should be noted that all five assessment tools included indoor or housing quality categories. However, these categories are only concerned with quantitative indicators of the indoor environment, such as thermal comfort, illumination, and humidity.

It is also worth mentioning that some of the methods included criteria for affordable housing, affordability, and inclusive communities. These should be distinguished from each assessment method because affordability does not necessarily mean inclusiveness and affordable housing is not the same as affordability and vice-versa (Anacker 2019). While CASBEE-UD has no criteria for affordable housing and inclusive communities, LEED was the only tool that differentiated between affordability and affordable housing and their relationship to housing typology.

SBTool was the only method with a sophisticated and robust focus on eco-cultural issues such as flexibility and adaptability, perceptual and cultural indicators of housing design. Its indicators, such as compatibility of design with local cultural values and visual privacy in principal areas of dwelling units, are unique amongst all the tools in considering purely qualitative indicators of the human-built environment. Although SBTool has a higher number of unique socio-cultural indicators, the weight assigned to each one was lower than most other methods. SBTool has only one credit assigned to each socio-cultural indicator, while both BREAAM and LEED assigned 3 points for each socio-cultural indicator on average.

For the achievement of sustainability, all the dimensions should be balanced and addressed simultaneously. Under current assessment methods, a building project might acquire a sustainability certificate without adequately addressing sustainable development dimensions. Also, while social and cultural sustainability are recognised as the two pillars of sustainable development, none of the methods has required cultural indicators to fulfil cultural indicators as a mandatory requirement. More emphasis should be put on linking environmental practices to residents' social and cultural welfare and their needs as it is a vital consideration for sustainability in housing projects.

3.4.3 Contextualisation and adaptation to the locality

Another issue that persists with building assessment methods is the lack of specific context-related indicators and flexible weightings based on the locality's specific needs. Developed countries such as the United States, Japan and the United Kingdom are more conscious about sustainable development. They have achieved significant environmental, social, and economic management progress by developing sustainable frameworks and assessment methods (Ali and Al Nsairat, 2009). On the other hand, developing countries like Jordan are still progressing to achieve many dimensions of sustainability. Additionally, sustainable development objectives and priorities are likely to be different for developing countries. Sustainable development objectives in developing countries are still exclusively related to physical and environmental indicators with little or no consideration of more sophisticated criteria and indicators related to the country's own cultural and social context. This gap is due to the widespread use of imported sustainability frameworks and assessment methods (James, 2014). The indicators in these international assessment methods are designed based on their origin countries' priorities and conditions only.

LEED almost applies the same weightings and benchmarks in all of its versions dedicated to being used internationally or in specific regions, and the developer can only acquire four additional credits for regional priorities (Ameen *et al*. 2015). BREEAM Communities has addressed this issue partially by using compliant assessment methodology and by applying regional weighting coefficients. All the acquired points are multiplied against corresponding regional weightings, specified for nine regions, to provide the BREEAM Communities score available for that particular local area (Awadh 2017). The Jordanian Green Building Guide applies regional specific criteria based on which climatic region of Jordan the project is situated in (i.e., the Jordanian desert, highlands, or valley), but it only applies energy efficiency and site treatments issues.

SBTool has the most adaptable and flexible system among all methods. It allows regional authorities to modify the method's weighting values and may also increase or reduce the resulting weights to a maximum of 10% +/- difference (Chew and Das, 2008). This flexibility is designed to enable users to react to the different priorities, technologies, building traditions, and cultural values existing in the various regions and countries involved in the assessment process (Chang *et al*., 2007, Lee and Burnett, 2006). SBTool also provides an open framework, which authorises regional users to insert local context values, performance benchmarks and targets to suit certain building types.

However, while building sustainability assessment methods do not apply credit for context-specific issues, they acknowledge the significance of innovation. Innovation ability is seen as a core element of all sustainability strategies (Gleich,2007). Innovation improves the adaptability,

flexibility, and the method's capability of incremental improvement. LEED-ND, CASBEE, BREEAM Communities and SBTool award points for innovative ideas.

While each country should develop its sustainable building assessment method, this might be impossible due to various constraints. In such situations, the adopted method must be flexible to customise using a suitable assessment framework. Therefore, context-specific criteria should be included, and weightings should be assigned according to values relevant to specific communities.

3.4.4 Stakeholders and user participation

An issue that is apparent with the previously discussed green building rating systems concerns the significance of community and user involvement during different building stages, for example, the planning stage, design stage and assessment stage. Users can be involved in the development of sustainable building assessment methods in three main ways:

- Users and citizens can be involved at the time of defining the sustainability targets and identifying the core criteria and indicators that are going to be assessed (Zhou and Zhang 2015). James (2015), also suggested that citizen and community initiatives provide creative and transferable solutions to seemingly intractable social and environmental challenges. Enabling the residents to identify and design measurements systems for where they live is beneficial because they will be more invested in the reliability and accuracy of data collected (Sharifi and Murayama 2013). Consensus-based measurement systems can serve to diffuse conflicts within a community and establish a basis for mutual understanding and improved decision-making (Seltzer *et al.*, 2010; Bauler *et al.*, 2007).
- Users can also be involved during the weighing of different criteria. Having a consensus-based weighting for different categories of indicators can improve the assessment process (Alwaer *et al.*, 2008; Bauler *et al.*, 2007; Koellner *et al.*, 2005).
- Citizens can participate by providing feedback that helps planners update the system. By using user feedback, planners and developers can decide when development changes will be required to align economic development activity with ecological limits and social needs (Haapio and Viitaniemi 2008; Sharifi and Murayama 2013).

CASBEE and SBTool took a step towards adopting a consensus-based approach. However, they have reduced the stakeholders to industry, government, and academia (Ameen *et al*. 2015). Furthermore, most of the methods have not provided an arena for the involvement of residents in weighting and feedback processes. Building assessment tools still represents expert oriented weighting systems, and the interests of users are not considered.

3.5 Chapter conclusion

In this chapter, five sustainable building assessment methods were analysed in terms of themes, criteria, processes and procedures, weighting, and availability of sustainability indicators. Sustainable building assessment methods emerged a few decades ago to meet the need for a commercial and institutional method to measure the environmental performance of the built environment and to enhance it at the same time (Mahgoub, 2017). This was driven by the sheer importance of quantifiable sustainability indicators to measure and implement the performance of buildings. The priorities of these sustainability indicators are different based on context and countries, particularly in developing countries. However, sustainable building rating tools are similar in that they are typically composed of a checklist of mainly optional criteria. Some criteria are weighed higher against the specified benchmarks decided by the publishing organisation. The process of criteria selection and weighting assignment are also often subjective.

Despite using a mixture of quantitative and qualitative indicators, the current sustainable building assessment methods emphasises the ecological and physical factors over socio-cultural ones. The focus on environmentally tangible factors is driven by the pressing need for practical solutions to address ecological crises. It also may be related to the fact that the socio-cultural indicators are harder to implement. Furthermore, the views on the socio-cultural dimensions of sustainability

remain bounded with a traditional view of society's requirements and social sustainability. This could include employment, commuting time, crime, health and safety and social activities. Little is mentioned of the suitability of design to local culture or daily life of the residents and occupiers. In addition, little is also mentioned in environmental management and design prospects in developing countries.

Headline conclusions of this chapter agree with those reported by Sharifi and Murayama (2013), suggesting that there remains a lack of balance between different sustainability dimensions. This imbalance indicates that the issue of integrated sustainability is not yet well addressed within the framework of current sustainable building assessment methods. Additionally, the environmental dimension still largely dominates other less tangible dimensions. While tangible indicators are essential for achieving environmental and ecological objectives of sustainability, other indicators and their essential role in the fulfilment of intragenerational and social equity have been overlooked.

Table 3.11 presents a comparison between eco-cultural indicators found in the literature review and those found in sustainable building assessment methods. Table 3.11 indicates that many human and cultural development indicators are not included in sustainable building rating tools. Cultural sustainability indicators were only discussed in the broader aim of preserving and sustaining human capital, which is accepted today as part of social sustainability. Measuring the social aspect of sustainable development could include its impact on factors such as the unemployment rate, female labour force participation rate, relative poverty (e.g. percentage of the population below a particular income), literacy rate, average commute time, and violent crimes to name a few (Ameen *et al.* 2015). While these sustainability measures are universally applicable, other cultural and human sustainability development indicators are yet to be considered.

Table 3.11 Comparison of indicators found within literature and sustainable building assessment methods

Dimension	Indicators from sustainable building assessment methods	indicators from the literature review
Social	Safety in the streets	Values and customs.
	Proximity to services, facilities, and amenities	Social relationships
	Public transportation	Spirituality
	Walkable streets	History and vernacular architecture
	Public spaces	Privacy
	Heritage valuation (Local vernacular) and landscapes	Gender roles
	Quality of housing	Hospitality
	Parks and facilities	
	Childcare services	
	Elderly and disable consideration	
	Demographic needs and priorities	
	Acoustics and noise	
	Lighting	
Economic	Economic viability	Economic conditions
	Local economy	Affordability of housing
	Employability	Cost of environmental modifications
	Taxes	
	Economic impact	Cost of construction
	Training and skills	Laws and regulation
Environmental	Natural land use	Climate and weather
	Population density	Energy saving
	Compact and mix-used development	Recycled materials
	Reuse of urban areas	High technology
	Built environment rehabilitation	Water-saving and harvesting
	Distribution of green spaces	Ventilation required
	Air quality	Lighting
	Energy efficiency	

Dimension	Indicators from sustainable building assessment methods	indicators from the literature review
	Renewable energy	Active systems
	Passive solar planning	Passive design
	Centralised management of energy	Geography and location
	Consumption and quality of water	Available materials.
	Management of wastewater	Available technology
	Adapting to climate change	Details and craftsman
	Sustainable materials	Lighting desired
	Recycling	
	Construction and demolition waste	

Moreover, the perception of cultural sustainability in sustainable building assessment methods is still vague. The focus on key environmental and social factors as well as differences in multicultural dimensions and different contexts have limited the amount of research in social and cultural sustainability and its effect on sustainable building assessment. Also, the lack of a compelling, unified, systematic framework for assessing and relating intangible human needs to design features makes the socio-cultural sustainability indicators complex (Fatourehchi and Zarghami 2020; Olakitan Atanda 2019).

Wu *et al*. (2016) emphasised the importance of incorporating intangible cultural indicators that are related to culture. However, this requires the input of various stakeholders in the assessment stages and, most importantly, the final users of the building. Currently, most of the sustainable building assessment methods represent expert-oriented viewpoint while other stakeholders in the community that have different, if not conflicting, values, needs, and priorities are not adequately involved in the judgment about which elements to include, the assignment of weightings and strategies for providing feedback. Without user and citizen participation, there will be insufficient interpretation and integration of the socio-cultural indicators into sustainable building developments.

Other recurring issues in sustainable building assessment methods include the usability and usefulness of generalising tools in various contexts and regions. There is still a need for a more customisable assessment tool for addressing geographically specific environmental, social, or cultural priorities. Experts and specialists who have an essential role in determining the indicators need to consider the local standards and the ways to increase community participation. Table 3.12 summarises the eco-cultural indicators and metrics found in the literature review, which will be further investigated in the next stages of this study.

Table 3.12 Main indicators and categories for the formation of an eco-cultural design

Dimension	Suggested indicators
Cultural	Vernacular architecture relevance; Cultural services; Relevance to local culture; Faith and spirituality; Privacy; Population density; Size and scale; Function and circulation Semi-outdoor zones; Surroundings of the building; Local materials and techniques Visual qualities; Adaptability over time
Social	Indoor qualities; Quality of housing; Car parking; Health; Neighbourhood; Proximity to work and amenities; Safety and security; Traffic and walkability; Design to promote social interaction; Compact and multiuse development; Stakeholder's participation; Demographic needs and priorities
Economic	Economic conditions; Affordability of housing; Cost of environmental modifications; Cost of construction; Laws and regulation; Taxation revenue
Environmental	Energy; Energy Performance; Renewable Technologies; HVAC; Light pollution; Noise, Pollution; Emissions; Thermal comfort; Water management and sewage; Waste management; Recycled materials; High technology;

With the increase in the rate of building assessment tool development, the perception of social and cultural sustainability is still vague (Forsberg and Von Malmborg 2004; Todd et al. 2001; Díaz López et al. 2019; Olakitan Atanda 2019; Poveda and Lipsett 2011). Basic key factors have hindered this - the difference in multicultural dimensions, different context, the limited amount of research in social and cultural sustainability relating to building assessment tools in the built environment in general and the building sector. Also, the lack of a compelling, systematic framework for assessing and relating human outcomes to the design features makes the social aspect complex (Axelsson et al. 2013; Kaur and Garg 2019; Doan et al. 2017; Eizenberg and Jabareen 2017; Atanda & Öztürk, 2018).

Currently, there are no universally agreed metrics that characterize the natural environment and its interactions with social, cultural, economic and technical dimensions of sustainable development (Sharifi and Murayama 2012). This might be partly due to the lack of a unified accepted definition of sustainable development that includes cultural and human context factors against methods that focus on quantifiable factors and indicators of Sustainability or even connecting the quantitative indicators to the qualitative one.

The following methodology chapter will highlight how the used methods helped improve and refine the categories and indicators found in this chapter into a practical framework for assessing the integration of eco-cultural indicators in buildings. This framework will serve to assist and support new and existing green building assessment tools and enable government agencies to achieve sustainability in the built environment. This starts by selecting and identifying indicators, criteria and questions used for measuring eco-cultural design. Such criteria are useful for the translation of the different socio-cultural, environmental indicators into spatial qualities that could be integrated into the design of future assessment method.

4 Chapter Four. Research Methodology and Methods

4.1 Introduction

This chapter presents an overview of the research paradigm and the rationale behind the adopted research methodological approach. Approaching research starts with the philosophical assumptions as well as the intersection of research philosophy, design, and the specific methods required to follow these assumptions or worldviews (Creswell and Creswell 2017). Although these philosophical ideas usually remain hidden in the research and its methodology, they still influence the practice of research and need to be identified (Slife and Williams 1995). This study followed Creswell (2017); Groat and Wang (2013) framework for conceptualising research approach and design by addressing:

- The philosophical worldview (or paradigms) proposed in the study (Lincoln *et al.* 2011); epistemologies and ontologies (Crotty 1998), or broadly conceived research methodologies (Neuman 2009);
- A definition of the basic ideas of that worldview; and
- How the worldview shaped the research approach and the selection of research methods.
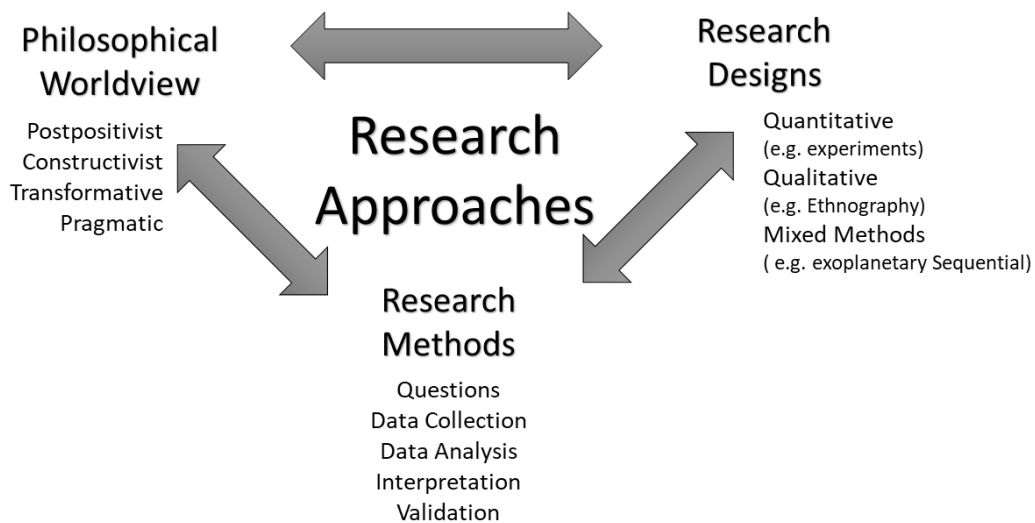
Figure 4.1 The interconnection of research paradigm (philosophical worldview), design, and methods (Creswell and Creswell 2017)

As illustrated in Figure 4.1, a research approach is seen as the plan, structure, and strategy of investigation to find answers to research questions as validly, objectively, accurately, and economically as possible (Creswell 2007; Liu 2008). However, a research approach does not set out to provide solutions as it is not the same as a method. Instead, a methodology offers the theoretical underpinning for understanding which set of methods can be applied to a specific study based on the research questions aims and purposes.

The sequence of sections in this chapter reflects the relationships between research paradigm, methodology and methods as presented in Figure 1.1. The chapter begins with an overview of the research framework and purpose. Then, it presents the reasoning behind adopting the research philosophical worldview and methodology, alongside the definition of its related concepts. The final section of this chapter covers the phases of the study and research methods.

4.1.1 Research epistemology: social constructivism

Constructivism or social constructivism is a theory of knowledge that originated from the works of Berger and Luekmann's (1967) and Lincoln and Guba's (1985). According to Leeds-Hurwitz (2009), social constructivists believe that individuals seek an understanding of the world in which they live and work by developing subjective meanings of their experiences directed toward particular objects or things based on shared assumptions constructed between these individuals.

The constructivist approach seeks to explore in-depth insights and interpretations of a given setting from the perspectives of the individuals who experience that environment, phenomenon or issue being studied (Creswell and Creswell 2017). The researcher typically forges discussions or interactions with these participants, and the questions asked becomes broad and general so that they can express and construct the meaning of the subject (Guba and Lincoln 1994). Maxwell (2012) advises that the more open-ended the questioning, the better, as the researcher listens carefully to what people say or do in their life settings. Furthermore, constructivist researchers also focus on context to understand the participants' social, historical, and cultural settings (Groat and Wang 2013). For example, in discussing constructivism, Crotty (1998) identified several assumptions that proved crucial for this study:

1. Human beings construct meanings as they engage with the world they are interpreting. Researchers tend to use open-ended questions so that the participants can share their views.
2. Human beings engage with their world and make sense of it based on their historical and social perspectives—we are all born into a world of meaning bestowed upon us by our culture. Thus, researchers seek to understand the context or setting of participants by visiting this context and employing an ethnographic approach for gathering information personally. They also interpret what they find, an interpretation shaped by the researcher's own experiences and background.
3. The primary generation of meaning is always social, arising in and out of interaction with a human community. The process of such research is mainly inductive; the inquirer generates meaning from the data collected in the field.

4.1.2 Qualitative research methodology

Denzin and Lincoln (2008) defined qualitative research as a multi-method multi-tactics methodology that aims to interpret, explore, or explain unstructured and non-numerical data. It is concerned with studying things in their natural settings, attempting to make sense of, or interpret phenomena in terms of the meanings people bring to them. Qualitative research provides universal, detailed attempts to study the compound, circumstantial characteristics of the social world (Salkind 2010). Furthermore, it facilitates the profound and thorough study of issues using open 'what' and 'why' questions (Creswell 2011).

- This type of research originated in ethnography, sociology, and humanities (Creswell 2014), and falls under the constructivist worldview. Qualitative research was instrumental in this study as the researcher did not fully know the critical variables to be examined. Researchers who engage in this type of study rely on their skills to receive information and uncover its meaning through an inductive style, with descriptive, exploratory, or explanatory procedures (Maxwell 2012).

Other issues that informed the use of a qualitative approach included reliability, validity, and practicality. The reliability of a research technique means that it is consistent and stable, hence predictable and accurate (Kumar 2019). A method could be reliable if it is suitable for its time, and when other researchers could use it again and produce the same results (Bryman 2016). In general, quantitative methods are perceived to provide higher reliability as it produces standardised data in a statistical form (Kumar 2019). However, qualitative research does not claim to be representative because it does not draw from a large sample of a given category of respondents. Instead, it seeks to acquire in-depth information about a smaller group of participants (Denzin and Lincoln, 2005). Qualitative researchers work with words rather than numbers and statics and are interested in depth rather than breadth since words, in contrast to numbers, have multiple meanings (Robinson 2014). Qualitative research highlights the situated and meaningful character of social interactions and seeks new understanding. Therefore, it was particularly well suited to tackling a problem on several analysis levels, such as in the case of this research. In order to counter any possible reliability and validity issues, this study followed Sandelowski (2001) and Ferrer, Ruiz, & Mars (2015) guidelines to employ a triangulation of data

sources. Therefore, a case study research design was employed to obtain the overall picture of two residential environments within the study area of Jordan, as described in detail below.

4.1.3 Ethnography and qualitative architectural research

Ethnography in research could be defined as that qualitative approach in which the researcher pursues the understanding of the social world or phenomenon from the perspective of an individual related to that context (Guber, 2001). Ethnography is related to qualitative research with it being very concerned with the exploration of setting, the details of context, and its dependence on unpreceded information (Groat and Wang 2013; Silverman 2015; Bryman 2016). In ethnographic studies, researchers study in-depth the life of a group study the life of a group of individuals in specific settings, to observe behaviours and listen to what is said, ask questions, engage in conversations, and develop an understanding about that context, and collect information about participants and settings (Groat and Wang 2013). It gives insight into the core of the cultural-social world by placing the researcher in the shoes of an individual or a group of people.

Ethnography methodology emerged at the beginning of the last century at the hands of few pioneer humanitarian researchers to find a way to understand better the natural order of human society and its culture (Maxwell and Miller 2008). Sources of data in this type of research include interviews, observations, field notes, documents, records, photographs, and maps (Creswell and Creswell 2017; Bryman 2016). The ethnographical approach includes observing the studied group for a period of time and closely. This is carried out most commonly using participant observation. The ethnographer observes the lifestyle and pattern of the people while interviewing them to understand the motives behind the interactions, values, and mentality (Creswell 2018).

Few studies concerned themselves with the combination of ethnography and architecture (Tomasi 2015, Vellinga 2005). However, since the early of the last century, vernacular architecture have been studied within the fields of ethnography, cultural geography and building culture. The pioneering work of Oliver and Rapoport (Rapoport 2006; Oliver 2007) recognised relations between architecture and other areas of cultural-based research. The study of architecture (whether it was old or new) has always included subjects such as ethnography, cultural anthropology, cultural geography, and social history (Brown and Maudlin 2012). In this study, the ethnographic approach provided two main advantages:

1. Ethnography was an appropriate approach to evade personal interpretations and perceptions to understand hidden factors that influence the production of the built environment and architectural elements within different contexts.
2. Ethnography was essential and sensitive to capture the interrelation between tangible and intangible indicators of architectural settings, which was one of the main aims of this research.

4.1.4 Case study research design

Research designs are inquiry types within qualitative, quantitative, and mixed methods that provide specific direction for research design procedures (Groat and Wang 2013). Where case studies are used, the researcher explores a bounded system (a case) or multiple bounded systems (cases) (Yin 2009). A case often represents a phenomenon, event, activity, process of one or more individuals bound by time and space and has unique and rich information (Maxwell and Miller 2008). Using this tool, researchers can develop an in-depth analysis of the selected area of study by gathering information and data over time (Creswell 2019).

Feagin (1991) explained that a case study is ideal when a profound investigation of a particular problem is required. This technique was therefore chosen because the research objectives sought clarifications, e.g., how or why. The case study approach allowed for an ethnographic approach for studying part of an entire socio-culture sharing group (Creswell 2018). It also enabled a focus on a single or interlaced issue that is bounded to the system (Maxwell 2012). The case study design

of this study used the logic of replication, in which the inquirer replicates the procedures for multiple cases(Yin 2009). Thus, the inquirer can select representative cases for inclusion in the qualitative study. In this research, a triangulation of two locations within the case study allowed the researcher to study the lives of individuals within different temporal contexts by asking them to provide insights into the design of their dwellings. The two cases were selected to represent:

1. Jordanian vernacular architecture examples located in the old downtown area of the city of As-Salt; and
2. Contemporary residential dwellings design examples located in the newly developed housing project of King Abdullah Bin Abdul Aziz city

These comparative cases provide a general understanding of the built environment within the context of Jordan by acting as typical representative cases of that context (Yin 2009). Typical cases serve an exploratory role. Here, the cases are as representative as possible of both modern and vernacular residential dwellings found across Jordan according to a set of descriptive characteristics which can be probed for causal relationships. These cases are located within the researcher's home country, Jordan, where he can access information and personals to interview in either English or in his native language (Arabic). More objectively, these case study areas are pertinent for the following reasons:

- Their various components and typologies, which gives numerous forms and designs for analysis and study.
- The expected role, impact and importance of the newly developed king Abdalla city in the region and Jordan as a whole. The Pilot Phase is mostly built and inhabited, while others are under development. This allows following the current trends in regional design within Jordan.
- The opportunity to compare old vernacular parts of the town with the new ones. Also, to explore the efficacy of framework and tool in old and new contexts.
- As-salt played a significant role and history in Jordan for a long time, and its architecture represents a small version of the dominant architecture in all of Jordan, and as of the time the city was flourishing and changing, so did its architecture.
- Also, as presented in chapters 1 and 2, there is a need for this research type since Jordan is a developing country. Its vernacular architecture is facing the forces of modernism.
- Jordan also faces environmental and economic related challenges. Thus, it is also struggling to combine new sustainability ideas with a regional image (see Table 4.1).

Table 4.1 Overview of the two case study areas

Quality	King Abdulla City in Zarqa	Salt City Historic Centre
Size of population	3605 Inhabitants (during the time of the fieldwork)	No data about inhabited vernacular dwellings
Dwelling typology	Detached, semi-detached and row houses and apartments blokes	Detached, semi-detached and courtyard vernacular dwellings
Type of case	New urban development	Historic town centre
Data source	Mawared Company (the developer and operator)	Various online data format and from As-Salt city council
Building material	Concrete and stone cladding use of local building forms, with modern features	Mud and stone dwellings with concrete renovation or additions. Use of vernacular building forms. With historic features
Zone and Climate	Jordan Badia (Desert) region and climate	Jordan highland region and climate
Economy	Industry, commerce and military-based employment	Tourism, agriculture and services

Generally, qualitative researchers are reluctant to generalise from one case to another because the contexts of cases differ. However, focused research must represent a broader set of cases to provide insight into a broader socio-cultural context (Yin 2009). The study approach and design enabled the study to make a significant theoretical and practical contribution. It helped generate

and propose tangible metrics relating to intangible cultural factors so that this can be effectively incorporated into existing design assessment methods and tools. Moreover, although this work is situated with case study in Jordan, the outputs are scalable. Therefore, there is scope to apply and refine the findings and methods used here for other contexts. Furthermore, other researchers could investigate weightings and scales for the indicators to serve as a useful benchmarking measure in sustainability assessment tools and frameworks in other regions. Equally, it can help other researchers duplicate this approach and customise it based on their context and cultural settings.

4.2   Case study characteristics

King Abdullah bin Abdul Aziz City and the old centre of As-Salt city were chosen as the primary case areas for collecting information, investigating, and exploring this research output's efficacy. King Abdulla City is Jordan's largest mega real estate project. It consists of six phases and is planned to house 500,000 residents by 2025. The project occupies a 250 thousand square site in Az-Zarqa city, Jordan's second-biggest city, and a primary industrial centre, less than 25 km northeast of Amman. The site of the development borders the Amman-Zarqa motorway. As-salt city, on the other hand, lies about 30km to the northwest of Amman. It consists of 12 neighbourhoods and houses almost 110,000 people (JDOS, 2019). Salt is an old agricultural and trade outpost and is famous for its vernacular buildings, some dating back to the Ottoman period, where Salt was Jordan's administrative capital. These buildings were also mainly constructed using a local type of golden coloured limestone. They were structured using a specific type of foundation and load-bearing walls stressed by internal walls, vaulted arches and pitched roofs. Vernacular dwellings vary in typology and shape based on the period of construction. Figure 4.2 Illustrate the location of King Abdulla and Salt city within Jordan.
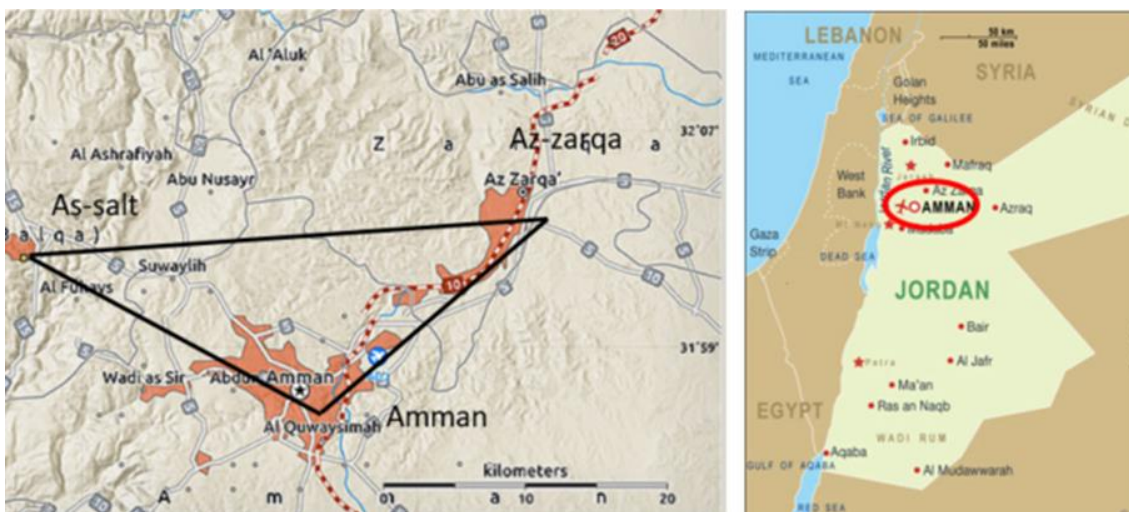
Figure 4.2 Relative location of King Abdulla in Zarqa, As-Salt and Amman, the capital of Jordan (JOBGB, 2012)

4.2.1   King Abdullah Bin Abdul Aziz city

In King Abdullah city, the project's pilot phase was the main area of investigation for this study. The pilot phase consists of 250 thousand square meters that represent the anchor point of the project. It also includes a variety of accommodation shapes and sizes. About 8% of the total phase area was intended to be a green area. The development intent is to regenerate and connect the old parts of the city with the new ones. The new city is intended to create a sustainable social connection between various urban amenities. This is done by providing land use for low-income inhabitants, creating more green areas, providing numerous cultural facilities and services. This change will enable people to relocate and expand beyond the" old city" of Zarqa, integrating green spaces into it. It will provide a better rapid transit system with pedestrian and bike-friendly routes. Sustainability will be acquired by providing jobs opportunities and business promotion involving

the old city (Mawared Co 2020). Figure 4.3 illustrates King Abdulla city's master plan and the first phase's location within the project boundary.

Figure 4.3 King Abdulla city's masterplan and location relative to Zarqa city (Mawared co)

King Abdullah city first phase is constructed alongside a commercial corridor and consist of few zones each with a different type of Housing that includes, apartments blocks, detach houses, semi-detach houses and row (terraced) houses. Among the objectives is the improvement of the social life of the city, and the provision of new development opportunities. The existing city centre of Zarqa City will expand 3.5 kilometres to the east along with a covered pedestrian market. The development plan for the city has defined six construction phases for the entire site (Mawared Co 2020). The pilot project has a 250-hectare area representing the first phase of implementation of the master plan (Fig. 4.4). The pilot project will consist of private spaces, which will be the dwellings, and the public space at the centre which will be the plaza, as well as commercial shops, entertainment facilities and other public use.
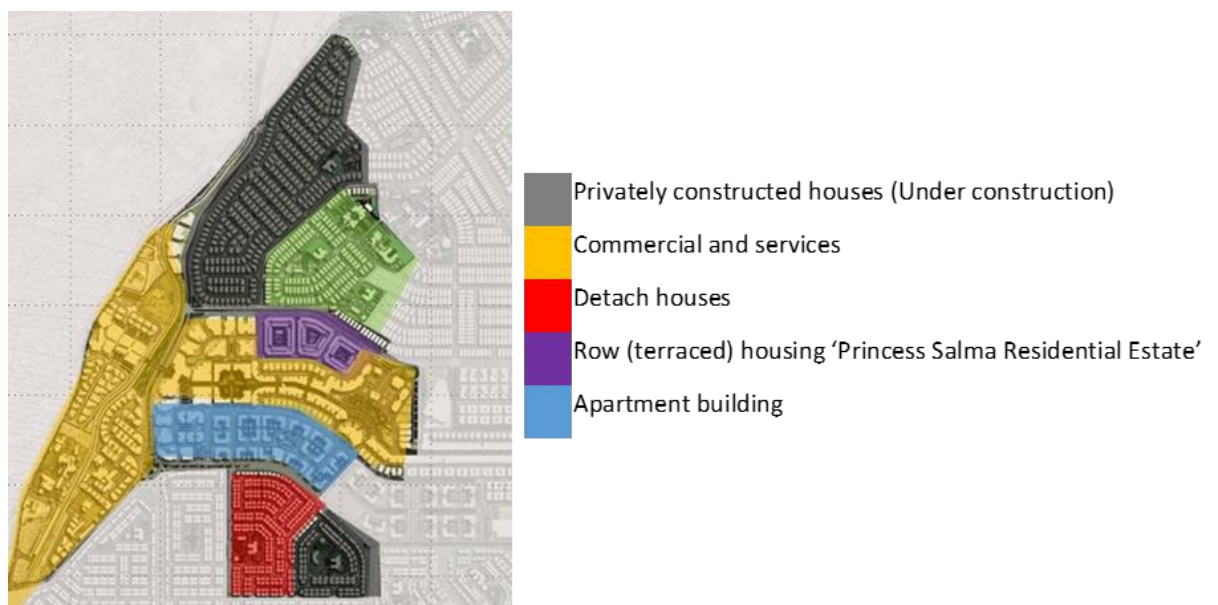
Figure 4.4: Zones of the pilot Phase in King Abdulla City (Personal communication with Mawared Company, 3rd May 2018)

The pilot project has different shapes and layouts of buildings. The row housing model, with alternative configurations, was aimed to offer privacy, freehold ownership and a private garden for each dwelling is adopted. The pilot project depends on the concept of neighbourhoods, which

is associated with the concept of the Garden City and New Towns. The pilot project has 27% of its total area for commercial use and public facilities, 36% for residential use, 29% for roads and 8% as a green area. All the buildings in the project are heavyweight structures built using concrete blocks and reinforced concrete. Some buildings were rendered using limestone while some were rendered using plaster and paint.

4.2.1.1 Row houses (terraced houses)

The project is divided into two phases A and B. Phase A of the project consists of 90 residential units with a total area of about (11,521) sqm distributed as follows:
- 29 residential units with an area of (90) sqm
- 42 residential units with an area of (120) sqm
- 13 residential units with an area of (150) sqm
- 6 residential units with an area of (180) sqm

The first phase was hard to market and sell and eventually was bought by the local police department to be resold for its members as a social/work type of housing. Figures 4.5- 4.7 illustrate some plans for the first phase of the terraced housing estate (Known as Princess Salma estate).

Figure 4.5 Master plan of phase A of Princes Salma estate (Mwared co)

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Figure 4.6 Floor plans of phase A units of Princes Salma estate (Mwared co)

Figure 4.7 Cross-sections of phase A units of Princes Salma estate (Mwared co)

4.2.1.2 Apartment dwellings

These are apartment buildings comprising four to six floors where family members live as neighbours within the defined area. It also contains public services and recreational places that are commonly used by residents. Nowadays, the vast amount of Jordan's urban society lives in similar apartments due to the high population density and the cost of land in cities. Figures 4.8 illustrate a typical apartment dwelling floor layout.

Figure 4.8 The ground floor plan for one of the apartments blocks from the first phase of King Abdulla city (Mawared co)

Figure 4.9 The apartments block as seen on the project site (By Author)

4.2.1.3   Semi-detached houses

In Jordan, this type of dwelling is not very popular yet compared to the detached typology. Two main areas contain this typology. One of which is constructed by a third-party contractor and are market as luxurious villas and these have been extremely difficult to market or sell due to their high price (Figures 4.10-4.11). The other type was sold as separate smaller lots where various small contractors can develop them separately as long as they meet certain architectural style standers such as height, shape. Mawared company have had fair success in promoting this typology due to its reduced price and its qualities that are similar to the detached house (Figures 4.10-4.13)

Figure 4.10 Floor plans of the "luxurious" built semi-detach houses in King Abdulla city (Mawared co)

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Figure 4.11 Pictures of the luxurious" built semi-detach houses in King Abdulla city (By Author)

Figure 4.12 Example of a privately built semi-detach house in King Abdulla city (By Author)
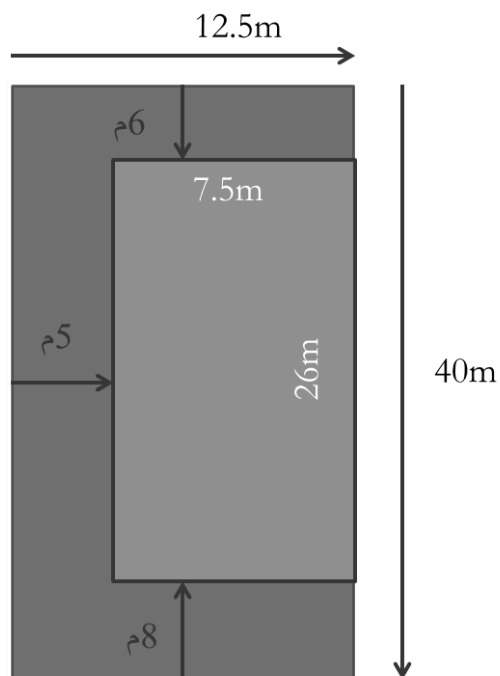
Figure 4.13 Typical lot layout for the privately built semi-detach houses in King Abdulla city (Personal communication with Mawared company)

4.2.1.4   Detach dwellings

Detached dwellings in the King Abdulla project contain an open area, a specific area with limited roofs and a villa where people live. These types of houses enjoy significant advantages such the

family's level of privacy and freedom is maintained, as single-unit (detached) properties are segregated from each other and each land parcel is given to a particular family. In Jordan, this is the most popular type of dwellings outside dense urban city centres. Most of the detached dwellings in King Abdulla city were sold as empty lots where private homeowners built them following some design and architectural style guidelines to ensure homogeneity in the project. According to Mawared company, this typology is the most successful in marketing and is the bestselling.
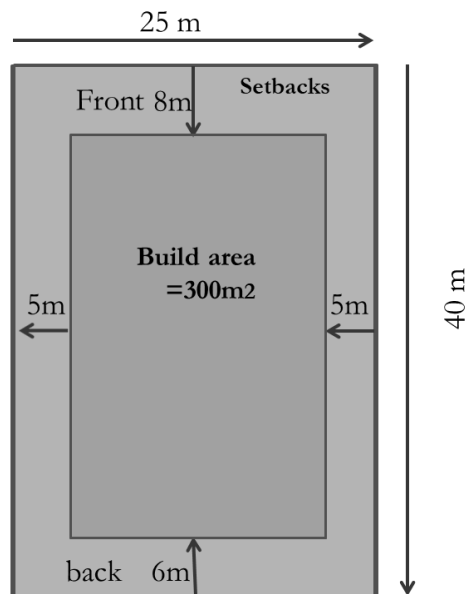
Figure 4.14 Typical lot layout for a detached dwelling (Personal communication with Mawared company)

Figure 4.15 Examples of privately constructed detached houses in the King Abdulla city project (By Author)

4.2.2   As-Salt old city centre

 As-salt city is an old trade post and a governor seat in northwest Jordan. It is on the old route connecting Amman with Jerusalem. Situated within Gila'ad hights, about 1200 meters above sea level, the old part of town was built in-between three hills; Citadel, Al-Jada'a and As-Salalem, separated by the floodplains of Wadi-Akrad and Wadi-As-Salt seen in Figure 4.16 (As-Salt Greater Municipality, 2010). Salt city possesses some of the best-preserved examples of vernacular buildings in Jordan (Abusafieh 2019). The fact that it was the central trading hub, political, administrative and political centre to Jordan up until the early 20th century made it the destination of local migration from other villages and cities from Jordan and Palestine. This led to a diverse building typology, materials and construction methods that represented what is seen in all these villages and cities. The dense urban fabric of As-Salt makes the city unique from any other city with its yellow limestone buildings that go along the contours line, the buildings mainly go back to the late 18th century to the early 19th century (Al-Zubi and Koura 2010).
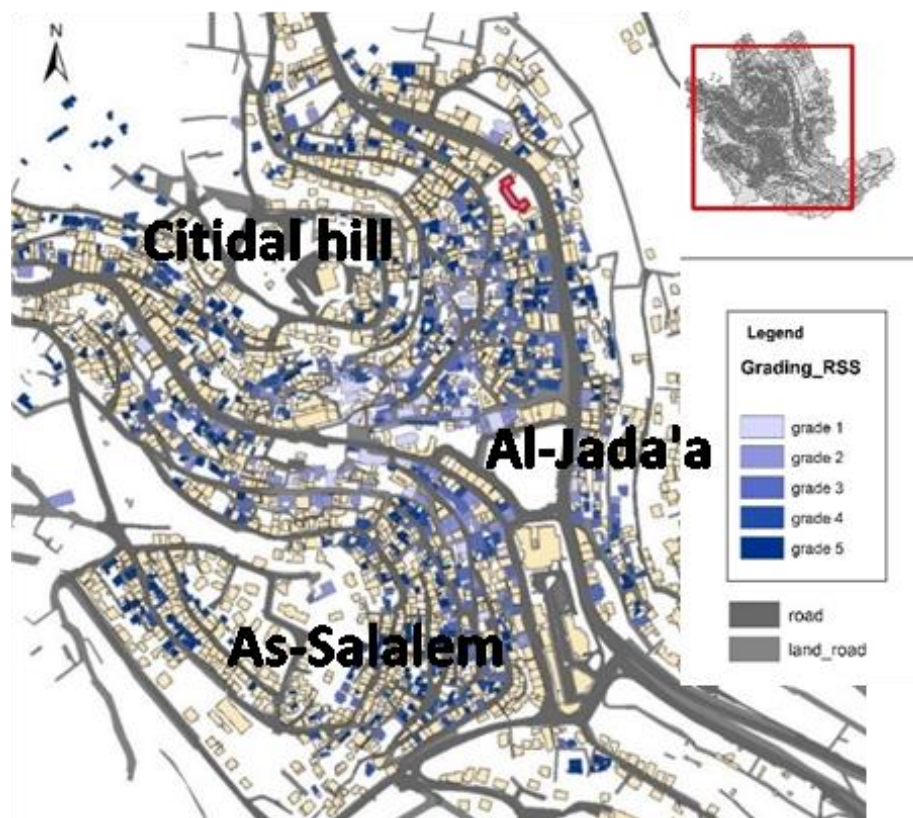
Figure 4.16: Census of the most notable remaining vernacular buildings in As-Salt city centre assigned into grades based on their condition, aesthetics and value as tourist attractions. (Darker blue shade indicates more important buildings, yellow are newer or not assessed buildings) (Personal communication with Salt City Department of Planning 15th May 2018)

Most of the old buildings of As-Salt were built using Yellow limestone which was extracted from the local quarries of As-Salt There are two main building styles in the city of As-Salt. The first is the typical vernacular-style buildings that occupy most of the city. These are, primarily, the households constructed with rural characteristics identical to the highlander villages of Jordan. These usually consisted of a single storey with courtyards or were consisted of a single cell building built around a central stone arch. The material usually consisted of rubble walls, had small openings with roof wooden beams spanning between arches, and with little to no ornament. Other distinctive features include the use of arched windows, balconies, detailed embellished facades and soft earthy colour tones. Buildings also tend to be low-rise (comprising only of one or two stories) (Khraisat 2017).
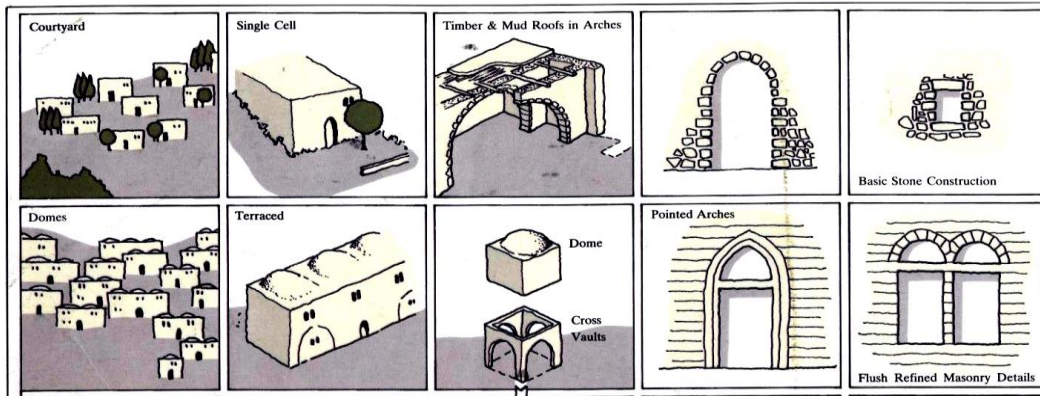
Figure 4.17 Characteristics of the first most common typology of vernacular dwellings found in As-Salt old downtown (Almatarneh 2013)

Figure 4.18 Examples of the first most common vernacular dwelling typology (By Author)

The second type of dwellings in Salt consisted of more elaborate details and urban character that included:

- Two or more storeys.
- Separate rooms / spaces.
- Coursed yellow local stone, vaults, domes.
- Pointed / round arches, flat detail.
- Sculptural design – corbels. Up to four storeys.
- Sophisticated decorative architecture.
- In later years these were constructed using Imported tile roofs, and steel I-beam balconies.
- Rich detailed carving/ornament.
- Highly decorative doorways
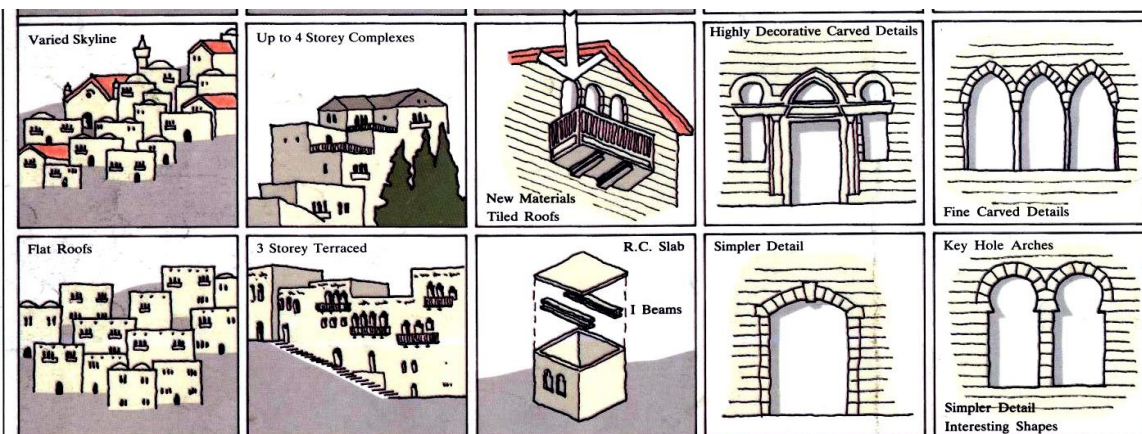
Figure 4.19 Characteristics of the second most common typology of vernacular dwellings found in As-Salt old downtown (Almatarneh 2013)

Figure 4.20 Examples of the second most common vernacular dwelling typology (By Author)

In general, As-Salt vernacular buildings are characterised by compactness and their layout around the contour lines of the hills they were built on. It is observed that some owners of these dwellings rent them to immigrants and some of them are abandoned. The former result in the easy alteration on the walls to meet their lifestyle with the lack of consideration to historic value. And the latter results in an increase in vacancy rates. Some older vernacular dwellings in Salt city are also characterised by compactness and arrangement of several large vaulted rooms around several courtyards (locally called *Housh*) that were added through the years to house the increasing number of family members (Khraisat 2017). These rooms and halls are connected to each other's with a series of interior stairs and the structure was strengthen with additional vaults that support the walls opening to the courtyard (See Figure 4.21). Windows were directed to the interior courtyards where possible and twin types of windows were used to increase ventilation and light entering the rooms (Fakhouri and Haddad 2017). When windows had to be poisoned to the outdoor windows were taller and thinner to increase the privacy of these rooms (Al-ZUBI and KOURA 2010).

Figure 4.21 Plan's layout for one of the vernacular dwellings found in As-Salt city old downtown (Personal communication with As-Salt Municipality)

In As-Salt's vernacular architecture, domes and vaults have been widely used to cover buildings' roofs. The barrel vault is a relatively simple example of a vaulted ceiling. It consists of a series of arches arranged in parallel to create a form similar to a half-cylinder. The barrel vault is evident in most vernacular As-Salt architecture and is a relatively simple form to build, structurally, using the same principles as an archway spread over a broader area. A barrel vault usually adds character to a space. It works especially well for long, narrow spaces (See Figure 4.22). Vaults have been proved as useful elements in natural lighting, ventilation and passive cooling. Under the vaulted roof, the warm air flow occurs through the openings positioned on the far sides of the vault (Khraisat 2017).

Figure 4.22 Examples of the vaulted roof system found in many of As-Salt vernacular dwellings (By Author)

According to previous survey records, in most of the vernacular dwellings in As-Salt city, walls were built in a typical way. Thick walls used to have a thickness that varies from 80-120cm, not only to support the weight of the roof, but also to support the thrust of the vault, and the lateral loads (Fakhouri and Haddad 2017). Vernacular dwellings owing to their very thick walls remained cooler in the summer and warmer in the winter. Utilizing massive walls with high thermal capacity was a suitable solution to reduce the energy demand and improve thermal comfort in buildings especially in hot-arid climates due to the wide range of temperature variations during days and nights (Almatarneh 2013).

The core of the wall, the gap between the outer and the inner courses, is made of small rubble stones, and mortars. Lime, mud and gypsum were the traditional binders used by masons, for centuries in As-Salt, to insulate buildings. Until the second half of the 20th century, buildings in As-Salt were constructed of numerous natural materials available aplenty in its geographical terrain. Mud, straw, adobe and stone walls have served as thermal masses by limiting the penetration of heat from the sun during the daytime and returning this heat to the outside during the night.

4.3   Research phases and methods

As stated, this study adopted a social constructivist philosophical worldview that used a qualitative approach as the principal methodology for investigation. As a qualitative research methodology that adopts a case study design, there are many ways to conduct research that employ a variety of environmental and social factors. The study design consisted of a case study as the primary strategy for inquiry that applied interviews and observations as methods for studying the objectivity and subjectivity of the socio-cultural issues of this study. In a case study approach, data collection is typically extensive, drawing on multiple sources of information, with data analysis reporting case descriptions and case-based themes (Maxwell 2012). The following sections illustrate the different methods that were adopted in each phase of this study Literature review

It is essential to highlight the relationship between the study's conceptual framework presented through the literature review and the methodology. The qualitative research design first utilised a literature review phase to define, classify, and investigate the relationships between existing sustainability housing indicators. The literature review phase was crucial for exploring collective knowledge and evidence in the field of sustainability assessment tools and design quality schemes. It was also used to set the research agendas, identify research gaps, and establish the basis for building the study's conceptual framework (Ravitch and Riggan 2017).

The field and literature regarding building sustainable development and assessment are broad and distributed on many sub-topics and issues. The review of every single article that could be relevant to the topic was simply not possible. Therefore, a semi-structured integrative approach for searching, reviewing and analysing literature was required for conducting this phase. A semi-systematic review allowed the study to looks at how research within the sustainable building assessment field has progressed over time (Snyder 2019). The review was integrative as it had the

aim to assess, critique, and synthesise articles on a research topic to conceptualise and expand on the conceptual framework of eco-cultural architecture and design (Torraco, 2005; Wong *et al.*, 2013). The purpose of the review was not to cover all articles ever published on the topic but rather to combine perspectives and insights from different research points of view.

Semi structure and integrative review were also selected as they have many similarities with qualitative research (Creswell 2019). For example, a thematic or content analysis is a commonly used technique and can be broadly defined as a method for identifying, analysing, and discussing the various literature sources (Braun & Clarke, 2006). This type of analysis was also useful for detecting themes, sustainability indicators and theoretical perspectives, or joint issues within a specific research discipline or methodology or identifying components of a theoretical concept (Ward, House, & Hamer, 2009). For conducting the literature review, three main steps were required: (1) designing the review, (2) conducting the review, (3) then analysis and writing, as suggested by Snyder (2019) and Winchester and Salji (2016).

Step 1: Designing the review

This step included identifying the research questions and considering the review approach and goal. The step also included designing the search strategy for identifying relevant literature sources. This step was carried out by selecting appropriate search terms and databases and deciding on the inclusion and exclusion of database criteria. In general terms, the study looked into all journal and articles year and searched terms while conducting the second step of this phase.

Step 2: Conducting the review

The actual selection of the articles and other literature sources was made by reading their abstracts and making initial selections. After the initial selection, full-text were read thoroughly to determine if the text was relevant and useful or not. In the initially selected articles, references were also scanned to identify other potentially relevant articles as the semi-structured and systematic review method allowed for such flexibility (Snyder 2019). The process of including and excluding articles and literature was repeated until the sources list had covered all the primary research aims and questions satisfactorily to allow the move to the next step of the research design.

Step 3: Analysis and writing

The analysis and writing of literature sources fell within qualitative design analysis as the purpose was to develop a conceptual framework and to criticise the body of work looking for research gaps. As suggested by Winchester and Salji (2016), a narrative and thematic analysis technique were used.

4.3.1   Data collection

The data collection phase applied semi-structured methods such as open-ended interviews with residents in the case study. The findings were combined with ethnographic methods such as observations, field notes, and photographs. The aim and goal of the study relied on the participant's view of the situation. Therefore data collection phase applied semi-structured methods such as open-ended interviews with residents in the two case studies. (Creswell 2018). The findings were combined with other data sources such as observations, field notes, documents, and photographs.

4.3.1.1   Documentary Data

Documentary data was used in combination with other qualitative research methods as a means of triangulation (Groat and Wang 2013). The qualitative researcher is expected to draw upon multiple sources of evidence, that is, to seek to converge and corroboration through the use of different data sources (Yin 2009). By triangulating data, the researcher attempts to provide a

confluence of evidence that breeds credibility (Maxwell and Miller 2008). By examining information collected from documentary data, the study corroborates findings across other data sources and collection methods sets and thus reduces the impact of potential biases that can exist in a single study. Sources of documentary data in this research included records, photographs, maps, demographic and typology data. Access to this data was facilitated by Mawared Company and As-Salt City Council, who acted as gatekeepers of the cases studies.

4.3.1.2 Semi-Structured Interviews

Semi-structured interviews were used to allow for flexibility of wording and questions to go deeper into the phenomenon. Questions were asked using the same words and in the same order for each participant to ensure reliability and consistency in the interview protocol. No names were collected, and participants' transcripts and recordings were assigned title codes using alphabets and numbers (e.g. A1 for King Abdulla City; B1 for As-Salt City). Interviews were conducted in the Arabic language. While interviewing, participants were prompted with follow-up questions and explanations. Follow-up questions were asked to gather more detail about how the design factors facilitate or hinder their experience and perception of the local built environment. Suggestions for improvement were also discussed. Data collection was performed by the principal researcher and with the aid of two trained assistants (NQ, MY). Interviews were recorded by the researchers using a digital recorder and were later interpreted and transcribed from Arabic to English. Different types of questions were asked (Table 4.2). The full interview guide and questions are included in Appendix A.

Table 4.2 Variables explored in the study and structure of the interview guide

Type of indicator	Description and illustration	Question
1.Background/demographics	Standard background information such as Gender, Age, Education, Marital Status, Employment Family Size	Consent to interview. Check the data copied from the participation form
2. Cultural Indicators	To elicit a description of the user's experience, behaviours, what a person has done or is doing within a built environment. In which ways would culture be reflected in buildings and advantages/disadvantages of the building towards cultural identity	What do you like …? To what extent …? Where do you ….?
3. Dwelling's organisation and space arrangement	To understand the spatial arrangement of elements in dwellings in relation to lifestyle, social relation, family structure	What do you believe/know about…? Have you made any changes in …?
4. Vernacular architecture-related metrics	Figure out indicators of vernacular architecture that made it sustainable and culturally appropriate. To elicit the reactions to a certain quality or metrics of space, What the participants feel besides what he thinks	In which ways would culture be in aid of sustainable design? Advantages/disadvantages of the vernacular buildings towards cultural identity?
5. Sustainability Indicators	Level of user satisfaction based on the building sustainable features Attitude towards satisfaction & accessibility within green buildings indicators	Do you feel about …? What do you know about…?
6. Social Interaction, relationships and planning	Sharing ideas/strategies for sustainable building practices on the neighbourhood level to improve sustainable building practices.	Reflect your own experience about neighbourhood social interaction
7. Economic indicators	The relationship of socio-economic factors with sustainable elements of buildings (their cost and preference)	Which qualities would you choose? To what extent would factors e.g. cost determine these choices?
Others	To determine facts and information about the indicator.	Rank the following…? Survey rating questions

It is worth mentioning that results and feedback from the pilot interviews phase showed that the participants did not engage in an in-depth discussion, nor did they elaborate most of their answers. Therefore, it was necessary to increase the total number of unstructured questions in the interview guide to increases the amount of in-depth information gained about the subject matter. The increased number of total questions was also justified by the complexity of the subject that involved many dimensions and potential indicators. It was also justified by the need to reach saturation which would not have been possible with the number of questions recommended by some qualitative researchers (Creswell 2011). Table 4.3 illustrate some of the staring interview questions list, feedback on them and the final list of questions used in the interview guide.

Table 4.3 Starting and final list of interview questions

Starting list question	Feedback	Final list questions
What do you like or dislike about your home?	Pilot study participants from King Abdulla city pointed out that they recently just moved to their current dwelling as the Project was new.	What did you like about your current house? a) What did you dislike? b) What do you like about your previous house? c) What did you dislike? d) Why did you move?
What would you change in your home?	One pilot study participant pointed out that some residents they knew, have already carried out some changes to their dwelling. Furthermore, the participants did not elaborate on reasons associated with changes. Therefore, it was essential to expand this question to include more sub-questions that explain possible recuring changes.	Have you made or plan to make any changes in your house? a) What are these changes e.g. redecorating, change in elements (e.g. windows, or doors), and changing materials? b) Are these changes internal or external of your home? c) Does this involve additional rooms or spaces, vertical or horizontal spaces? d) Why would you make these changes?
How much do you think your house can adapt to your future needs? Why? Do you think your dwelling' internal design is ideal? Why?	Feedback from the pilot study showed again that participants did not engage or elaborated their answers and it was essential to expand the list of questions with further clarification.	How much do you think your house can adapt to your future needs? a) What are the opportunities and constraints associated with living in your house? b) What are the constraints to making changes to suit your needs? Are your internal spaces (e.g. bedroom, bathrooms) located in the right places to suit your needs and preferences? a) Do you think that spaces in your house are ideally distributed? b) Explain why, why not
What are the similarities between your dwelling and traditional vernacular ones? What are the differences? What makes a sustainable house in your opinion? how?	Feedback pointed out that some participants might not have enough background knowledge on sustainable or vernacular architecture. More comprehensive questions where required to initiate brainstorming with case study participants.	-Which of the following buildings would you consider to be sustainable? a) In what way? Please explain Which example best compare with your own home? a) What are the similarities? b) What are the differences?

Starting list question	Feedback	Final list questions
What sustainability traits does your dwelling have? Which does it need?		-Which of the following buildings would you like to live in? a) Why b) What do you like about each one? c) What do you dislike? d) Which of the buildings best represent Jordanian architecture in your view? Why? e) In what way? Please explain -Have you seen any building like in picture number b? a) What does it represent to you? -Does your house relate to the architectural heritage in Jordan? a) How? b) Aesthetically and form? c) Material? -Have you ever lived or are living in vernacular building? a. What do you like about it? b. What do you hate? c. (why did you move)? - What material you think suits Jordan best? What colours? - How comfortable is your house in? a) winter? b) summer? Is there a season where utility bill increase? Why?

4.3.1.3 Observations

The social world and the behaviour of people could be objectively observed and recorded, classified, and measured (Bryman 2016). This method enables the researcher to focus on the context, relationships, symbolic meanings embedded in the cultural life, patterns of interpretations and how participants reacted to their circumstances (Groat and Wang 2013). There are two types of observation methods: participant and non-participant observations. In the former, a researcher participates as a member in the activities of the group being observed. In contrast, a researcher in non-participant observation remains a passive observer to capture conclusions and do not get involved in the activities of the sample. For this study, unstructured non-participant observations were conducted that aimed to achieve three main objectives:

- Observations of how the daily lifestyle and routine activities of the family are affected by the spatial layout design of the dwelling (how they are carried out, how they are associated with other activities).
- Understanding the hierarchy of spaces, patterns of movement inside the dwelling, size of rooms, and availability of outdoor spaces.
- Searching for any specific treatments or alterations to the original design of the dwelling and its relation to social purposes and its impact on dwelling function and sustainability (such as privacy, social interaction and thermal performance, to name a few).

Observations were recorded using written notes and photographic pictures. Data collected from observations were transcribed and analysed in similar manners of interviews texts. That is, observations were analysed for connections to the studied tangible and intangible indicators. However, observations could have some problems, especially when there is a possibility of observer bias, incomplete recording of observations, or variations in interpretations (Kumar 2014). Therefore, observations were used for completing the picture and for supporting data collected from interviews.

4.3.1.4   Protocol and Participants Sampling

Sampling in interview-based qualitative research studies is based on the purpose of the study and its intended outcomes rather than the statistical rules of confidence intervals and margins of error. Robinson (2014) details four approaches for sampling:
1. Defining a sample universe by way of specifying inclusion and exclusion criteria for potential participation
2. Deciding upon sample size, through the conjoint consideration of epistemological and practical concerns
3. Selecting a sampling strategy, such as random sampling, convenience sampling, stratified sampling, cell sampling, quota sampling or a single-case selection strategy; and
4. Sample sourcing includes advertising, incentivising, avoidance of bias, and ethical concerns pertaining to informed consent.

In this study, the participant sampling focused more on ensuring that the epistemological and practical concerns of the study can be achieved robustly and justifiably, rather than achieving a statistical representation of the entire population.

Participants were recruited using an exponential non-discriminative snowball sampling technique to ensure homogeneity and focused interviewing while permitting logical generalisation and maximum application of information to other cases (Creswell 2018). The recruitment process included knocking on doors, recruiting people through local mosques and through friends and family networks. This technique allowed for the collection of data in a cost and time-effective manner as well as reaching the hidden population (Jamshed 2014; Creswell 2011), especially in the case of As-Salt city where the number of inhabitants and vernacular buildings was unknown. Participants had to be current residents within the case study areas (stakeholders), over 18 and of any gender, employment, or economic background. Participants filled out a recruiting questionnaire to gather their socio-demographic characteristics (age, gender, education, work), provide information and characteristics of their current dwellings and give ethical consent.

Size-wise, in qualitative research, Dukes (1984) recommends studying 3 to 10 subjects, Riemen (1986) studied ten individuals, while Creswell recommends including 20 to 30 individuals to develop well-saturated data, but this number may be much larger (Charmaz, 2006). Eighty-one participants were interviewed from the two case study areas (50 from the pilot phase of King Abdulla city and 31 from As-Salt City historic centre) from 29-04-2018 to 27-05-2018. Table 4.4 summarises the demographic characteristics of the participants.

Table 4.4 Dwelling characteristics and participants demographics

Total	King Abdulla City					As-Salt City Centre				
	Apartment's complex	Terraced house	Semi-Detached house	Detached house	Grand Total	multi-levels	Detached house	Courtyard house	Single semi-detach	Grand Total
	20	5	15	10	50	5	4	10	12	31
Gender										
Male	9	3	6	6	24	2	2	3	7	14
Female	11	2	9	4	26	3	2	7	5	17
Age range										
24 or younger	2	1		2	5	1	1	1	1	4
25-34	6	2	4	2	14	1		1	1	3
35-44	7	2	5	1	15	1		2	1	4

Total	King Abdulla City					As-Salt City Centre				
	Apartment's complex	Terraced house	Semi-Detached house	Detached house	Grand Total	multi-levels	Detached house	Courtyard house	Single semi-detach	Grand Total
45-54	4		2	3	9		2	2		4
55-64	1		2	1	4	1	1	2	3	7
55-65			1		1	1		2	3	6
65-74			1		1				2	2
75 and older				1	1				1	1
Education level										
Doctorate	1				1					0
Master's degree	2			1	3					0
Bachelor's degree	5	4	5	4	18	2		1	2	3
Secondary education	3		3	2	8	1	2	3	4	10
Collage/technical training	5	1	4		10		2	2	2	6
Primary education	4		3	3	10	2		3	3	8
No schooling (illiterate)					0			1	1	2
Employment Status										
Employed for wages	9		2	3	14	2			4	6
Military	1	3	1		5			1		1
Unemployed	2				2			1	1	2
Retired	3		3	2	8		2	3	2	7
Self-employed	1		4	3	8	1	1		2	4
Stay in house parent	4	2	5		11	2		4	3	9
Student				2	2		1	1		2
Ownership										
Borrow it (work housing)		4			4					
Own it	15		14	9	38	4		7	10	21
Rent it	5	1	1	1	8	1	4	3	2	10
Number of Bedrooms										
1						2		1	1	4
2	8	2	3		13	2	4	7	5	18
3	11	3	11	6	31	1		2	6	9
4			1	4	5					
Number of Living rooms										
1	13	2	2		17	2	4	8	9	23
2	7	3	12	7	29	3		2	3	8
3			1	3	4					
Number of Bathrooms										
1	5				5	4	4	10	8	26
2	15	5	9	4	22	1			4	5
3			6	6	13					
Built-up area (m²)										
<100	3		2		5					
100-120	13	5	1		19	2			1	3
120-150	4		4	1	9	1	4	2	2	9
150-180			1	4	5			1	2	3
180-200			2	2	4			1	1	2
>200			3	1	4	1				1
Unknown			2	2	4	1		6	6	13
Family size (Total)										
2		2			2		4			4
3	1	3	6		10			3	4	7
4	4		1	2	7	4		1	3	8
5	5		5	3	13			3	3	6
6	6		3	2	11	1		1	1	3
7	3			1	4			1		1
8	1			2	3			1	1	2
Family size (Children)										
0	4	3			7	3	4	4	7	18
1	4	2	8	3	17			1	2	3
2	5		1	4	10	1		2	3	6
3	4		3	1	8	1		2		3

Total	King Abdulla City					As-Salt City Centre				
	Apartment's complex	Terraced house	Semi-Detached house	Detached house	Grand Total	multi-levels	Detached house	Courtyard house	Single semi-detach	Grand Total
4	3		3	1	7			1		1
5				1	1					
Family size (Adults)										
2	9	3	10	3	25	1	4	6	2	13
3	3	1	3	1	8	1		3	4	8
4	3	1	2	3	9	3			5	8
5	2			2	4			1	1	2
6	2				2					
7	1			1	2					
External Building materials*1										
Painted plaster	15	2			17	1	2		2	5
White Limestone	5	3	15	10	33					0
Yellow Limestone					0	4	2	10	10	26
Structural system*2										
Single or double arc							4		2	6
Vaulting system						1		6	6	13
Iron beams on bearing walls						2		4	4	10
Continuous concrete slabs	20	5	15	10	50	2				2
Building age /date*3										
1-3	6	2	10	2	20					
4-6	10	2	3	4	19					
7-9	4	1		2	7					
10 and more			2	2	4					
~1870							1	2	3	5
1870-1920						1	3	7	9	21
1920						4		1		5

*1: Some of the surveyed buildings had changes in the material when changes or addition were installed. *2: Some buildings in As-Salt had also had changes in construction material from vaulted or flat roof to steel beams carrying concrete slab when another floor was added. *3: The age of vernacular buildings was approximated based on building characteristics and a previous survey conducted by Al-Zubi and Koura (2010).

Whilst the participants were randomly sampled, their age, gender, and types of dwellings were monitored to avoid significant bias toward specific groups. For example, when there were significant numbers of participants living in apartment blocks, efforts were made to recruit participants in other dwelling typologies whilst maintaining the overall sample size and demographics. The following points outline the process, preparation, protocol while conducting the data collection phase (Flinders 1997; Gray 2013; Jamshed 2014):

1. Choosing a relaxed atmosphere with few distractions. However, because the questions were related to how participants live, interviews needed to be held at their residential dwellings. This allowed for better understanding and observation of what the participants might try to explain about their dwellings and changes in them.
2. The interviewer prepared for the interview by introducing themselves, the principal researcher, outline the purpose of the study and the interview process.
3. The interviewer explained the terms of confidentiality and privacy and participants right to withdraw from the study at any stage. Various contact details were also provided for the participants.
4. The researcher then prepared the digital recorder, and any necessary written forms were filled.
5. Then, the interview started by turning on the recording machine, reciting the interview code, and asking the participants to consent to record their interview.
6. Demographic and dwelling characteristic questions were asked first.
7. Participants were given the option to skip any questions they did not want to answer.
8. During the interview process, the researcher asked one question at a time to allow transition between main topics while also trying to maintain as much neutrality as

possible. When the participants start by giving short, ended answers, the data gatherer asked follow-up questions.

9. The researcher was aware of the many ways that the interviews can unintentionally create bias in the outcome.
10. The researchers also conducted covert observations of how the participants hosted them, which part of the dwelling the host seated them in, whom they were seated with, and any modifications the participants pointed to inside the dwelling.
11. Notes were written down on the participant's interview guide and form.
12. Researchers asked for permission to take photos of modifications, and the participants occasionally welcomed them to step inside other rooms to see any modifications or issues when applicable.
13. Observations were also conducted on the case study site while walking around the case areas writing impressions and events occurring while looking for participants in the interviews.
14. The study was piloted with four friends and family members to ensure that questions were fully understood and predetermine any issues before starting the fieldwork.
15. Mawared Co and As-Salt City Council facilitated access to other data.

The protocol utilised open-ended and semi-structured questions during home visits. Before beginning the interview, the researcher read an introduction and asked for consent to record both the voice and the participants' demographic data. No names were collected, and participants' transcripts and recordings were coded using alphabets and numbers (e.g. A1 for King Abdulla City; B1 for As-Salt City). All interviews were conducted in the Arabic language. They were recorded using digital recorders and then interpreted and transcribed to English.

While interviewing, participants were prompted with follow-up questions and explanations. Follow-up questions were asked to gather more details about how the factors facilitate or hinder their experience and perception of the local built environment. Suggestions for improvement were also inquired. Data collection was performed by the principal researcher and with the aid of two trained assistants (NQ, MY). The study protocol and questions were pre-approved by the University's ethics committee.

4.3.2   Data analysis

The findings were analysed and discussed qualitatively, and interpretations were specific to the research questions and context. Where numbers are presented, they are simply used as an indication of the level of consensus among the respondents rather than as a means for generalisation.

The data analysis phase first included coding and reviewing responses, transcripts, documents, observation notes and textual information gained from the data collection phase to explore the different spatial, social, and sustainable qualities and then construct meanings and interpretations. An example of a coded interview transcript page is included in Appendix B. The emphasis was on the words in more than one level; first, their meaning from the participant's perspective, and second through their frequency in the number of times a participant identified a word or concept.

4.3.2.1   Coding Data

Data gathered from interviews observations and demographics/dwelling characteristics were coded into social parameters and spatial constraints to achieve the following:
- To develop a holistic picture of residential buildings in the study area,
- To interpret the different meanings for using specific elements,
- To better understand how residents make sense of their circumstances.

The transcripts coding and analysis process were carried out using the Nvivo software. This process was useful for making comparisons and organising data into categories or occurrences (Bryman

2016). It aimed to reduce the massive data into smaller and manageable themes and concepts that seem to be of significant potential. Coding was carried out in cycles. Before constructing categories, first and second cycle coding methods were applied as instructed by Saldaña (2015). There is a multitude of coding methods available, and while not all methods can be applied, those better suited for data format and nature were used. The first and second cycle coding methods were conducted in the following stages:

- Open (initial or prior) coding: In open coding, transcripts were read several times then tentatively labelled as chunks of data that summarise what was seen based on the meaning that emerges from the data itself with the help of the literature review and the conceptual framework of the study.
- Axial coding: Axial coding was constructed by identifying relationships among the initial open codes. Finding connections among codes made it easier to understand interrelations among different codes. Axial coding usually means working actively in one category but putting data back together in new ways by making connections between a category and its sub-categories.
- Selective (theoretical) coding: Selective coding was done after having the preliminary interrelated codes. During selective coding, previously identified concepts and categories are further defined, developed, and refined and then brought together to tell a larger story by explaining relationships between main and sub-categories. These relationships were developed and refined towards describing the phenomenon, casual conditions, context, intervening conditions, consequences, actions, and strategies.

4.3.2.2   Thematic and Content Analysis

The study followed the work of Braun and Clarke (2006), Gale *et al.* (2013), and Ritchie and Spencer (2002) by employing the thematic and content data analysis method. Content and thematic analysis is a form of text-based examination (Silverman 2006). It allows various sizes of data to be simplified and grouped (Flick 2018). These themes and categories evolved and were refined in an iterative process through the researcher's familiarisation and cross-cycling coding of data (Saldaña 2016). The analysis process followed Braun and Clarke (2006) reflexive approach to thematic analysis. Their six phases of the cyclical process involve going back and forth between phases of data analysis until they are satisfied with the final themes. Therefore, the steps followed in this study are as follows:

1. Familiarisation with the data: this phase involved re-reading the data to become immersed and intimately familiar with its content.
2. Coding: This phase involved generating succinct labels (codes) that identify the critical features of the data relevant to answering the research question. It involved coding the entire dataset, collating all the codes and all relevant data extracts, and later stages of analysis.
3. Generating initial themes: this phase involved examining the codes and collated data to identify significant broader patterns of meaning (potential themes). It then involved collating data relevant to each candidate theme so that the researchers can work with the data and review the viability of each candidate theme.
4. Reviewing themes: this phase involved checking the candidate themes against the dataset to determine that they tell a convincing story of the data and one that answers the research question. In this phase, themes were refined and sometimes were split, combined, or discarded. In the thematic analysis approach, themes are defined as a shared meaning pattern underpinned by a central concept or idea.
5. Defining and naming themes: this phase involved developing a detailed analysis of each theme, working out the scope and focus of each theme, determining the 'story' of each. It also involved deciding on an informative name for each theme.
6. Writing up: this final phase involved weaving together the analytic narrative and data extracts and contextualising the analysis concerning existing literature.

Data were analysed for facts describing links or disconnects between cultural, social life, and possible sustainable practice during the coding and analysis process. Data analysis was concerned with all the information about what participants repeated, felt missing, lacking, present, and unique to their dwelling, any construction or management issues, strengths, and means for improvement. Further meaning and potential linkages among themes were explored by considering the participants' context and background. Finally, findings were triangulated based on data from the different respondents, the case study and, the context variable and characteristics (Patton 2002; Maxwell 2012).

The study also employed tables for arranging, comparing and contrasting information and data (Ritchie and Spencer 2002). Furthermore, as Krueger and Casey (2000) advocated, the study also used context, frequency and intensity of comments and how specific participants were in their words as a means for interpreting coded data to conduct a thematic analysis. This approach was suggested and used by Sandelowski (2001) and Ferrer *et al.* (2015) and involved utilising qualitative findings supported by the frequency of the participants discussing the studied indicators to gauge consensus.

4.3.2.3 Saturation and Theoretical Sufficiency

One of the goals during qualitative data gathering, coding and analysis were to achieve saturation. That is, when no new properties, dimensions, conditions, actions/interactions, or consequences are seen in the data (Strauss 1987). In the saturation point, incoming data will no longer contribute but only confirm past-shaped understanding (Fusch and Ness 2015). Unlike quantitative research aiming to quantify or count the number of opinions, the focus is generally not on sample size but preferably on sample adequacy because generalisability is not the only aim. Hence, the adequacy of sampling is usually justified by reaching saturation, and is used by researchers to indicate the quality and theoretical sufficiency (Bowen 2008; Fusch and Ness 2015). However, one limitation is apparent with qualitative saturation, in that there is always new data to be discovered, and data can never be genuinely saturated (Ando et al. 2014). Therefore, some argue that imposing data saturation as a quality indicator is not always relevant (Lowe et al. 2018).

The saturation rationale for this study came from (Bernard and Bernard 2013), who argued that in-depth interviews are one method by which one's study results reach data saturation by default. Bernard and Bernard (2013) stated that the number of interviews needed for a qualitative study to reach data saturation was a number he could not quantify, but that the researcher takes what he can get. However, researchers agree on some general principles and concepts for qualitative theoretical saturation: no new data, no new coding, no new themes, and the ability to replicate the study (Fusch and Ness 2015; Guest *et al*. 2006). When and how one reaches those levels of saturation will vary from study design to study design. The idea of data saturation in studies is helpful; however, it does not provide any practical guidelines for when data saturation has been reached (Guest *et al.* 2006). Data saturation may be attained by as little as six interviews, depending on the sample size of the population. However, it may be best to think of data in terms of rich (quality) and thick (quantity) rather than the size of the sample (Fusch and Ness 2015).

In the case of this study, the data collection phase was a continuous process where the researcher kept interviewing participants as long as new information kept appearing. The data collection phase ended when conducting more interviews added no new knowledge and data to the issues under investigation. Similarly, the data analysis phase was carried out until there were few new discovered patterns and themes emerging from the data.

4.3.3 Framework and tool construction and evaluation

The study's final phase included constructing and validating an eco-cultural design framework and tool for residential buildings in Jordan. The analysis phase results were used to specify socio-cultural constraints and translate the findings into design guidelines for eco-cultural housing in Jordan. This process had a bottom-up approach, which started with generating initial design rules and qualities which could be outlined as follow:

- Defining important intangible Indicators of promoting socio-cultural sustainability from results.
- Determining the most critical categories and indicators to produce an eco-cultural design missing from the Jordan codes and green building guide.
- Synthesising the selected indicators into a working set of design rules and spatial relationships by combining socio-cultural spatial and design quality requirements with environmental and passive design principles that are adequate, repeatable, and customizable both in and beyond Jordan's context.

The tool was constructed for practitioner architects to evaluate and rate their design early and identify obstacles to sustainable design. The design of the eco-cultural tool required a final process of testing and evaluating the ability of the constructed tool in achieving its intended goals. This process was also useful to test results from the data collection and analysis stages. The stage aimed to evaluate (Schroeter 2008; Stufflebsseam 2001) :
1. Effectiveness and accuracy of the tool content and
2. Efficiency and usability of the tool.

The study used Schröter (2010); Stufflebeam, (2000; 2001) suggestions to (1) incorporating an expert panel, (2) testing the tool with intended targeted users, and (3) synthesising the information from both the initial research findings and from the fieldwork. Therefore, another round of in-depth interviews was conducted with practising architects from Jordan. After a testing session, interviews were held where architects were introduced to the research and invited to test the tool. The testing and valuation stage was held during a second fieldwork trip to Jordan between the 1st and the 23rd of November 2019. Feedback collected from architects was analysed for themes and content, and results were integrated into an updated version of the tool.

4.3.3.1 Participants' sampling

Participants were recruited using purposeful convenient sampling techniques, as proposed by Patton (2002) and Schroeter (2008). The sampling was purposeful in that the potential eco-cultural tool users were targeted by inviting participants with relevant professional experience. The sample was convenient because the emphasis was on recruiting participants who have undertaken at least five years of professional architectural practice in Jordan, especially with regional design, housing projects, and sustainable design. The researcher started by contacting well-known architects in these fields. These architects promoted the study to other architects who could contribute to the research, adding a snowball sampling technique to the whole recruiting process.

The recruiting process started with sending a personalised e-mail to the initial list of pre-identified experts starting from October 10th, 2019. Within the e-mail, the nature and purpose of the project were explained. Experts were asked if they had the time and interest to contribute to the study. Participants were given the option to choose the time and location for the interview to reduce time conflict with possible participants' timetables and minimise rejection to participate in the study. After a positive response, each expert was contacted individually to draft the tool's final draft in the Arabic language.

No specific number of participants was initially proposed. Nevertheless, Nielsen (1994) and Robinson (2014) agreed that a study forming at least 25 participants were quite likely to produce statistically significant findings. Faulkner (2003) also suggested having a minimum of 10-12 participants. Nonetheless, the resulting study sample was 38 participants representing architects with different years and sub-fields of experienced. Table 4.5 summarises the demographic characteristics of the participants.

Table 4.5 Summary of research validation participants

Number sampled	38		
Gender			
Male	16		
Female	22		
Age			
25-34	8		
35-44	12		
45-54	12		
55 and more	6		
Years of experience			
5-9	4		
10-14	8		
15-19	6		
20-24	10		
25 and more	10		
Education level			
Bachelor's degree	21		
Master's degree	13		
PhD.	4		
Field of expertise			
Dwellings and housing design	17		
Regional and vernacular architecture	10		
Sustainable architecture	7		
Other	4		

4.3.3.2   Data Collection

After the interested parties responded positively to participation requests, a personal e-mail invitation was sent, including a copy of the draft eco-cultural tool. In the pre-selected experts' case, the e-mail also asked about the preferred place, date, and time of the participation session. The purpose of these sessions was to collect feedback and enable the study to implement any necessary changes and add missing elements to the tool. An unstructured data collection method that included semi-structured interviews and testing sessions was used to allow for flexibility of wording and for questions to go deeper into the phenomenon. Each session was conducted individually using the same interview questions and guide and took approximately 60-120 minutes to complete. The session was started with a short introduction to the research and its objectives. After that, the tool was presented, and the participants were invited to evaluate and try the tool by themselves.

For an acceptable tool and interface, Teasdale (2019), Paryudi and Fenz (2013) proposed using two main criteria; (a) effectiveness and accuracy of the tool content and (b) efficiency and usability of the tool. Table 4.6 displays the items used to measure each criterion. Participants assessed the previous statements using a five-point Likert scale, where (1) indicates 'strongly agree' and (5) indicates 'strongly disagree'. The Likert scale is a standard method used in software methodology evaluation (Favi *et al*. 2018). Participants that completed the questionnaire provided concise positive or negative feedback about the different features of the tool. An in-depth discussion was carried out during the session, and participants were encouraged to discuss any thoughts they had while using the tool.

While conducting the test session, participants were prompted with follow-up questions and explanations. Follow-up questions were asked to gather more details about how the factors facilitate or hinder their experience and perception of the local built environment. Suggestions for improvement were also inquired. Written and voice notes were taken during this process to analyse and summarise them later. At the end of the test session, users completed an evaluation form, followed by a brief interview. The interview protocol consisted of six open-ended questions.

These questions are intended to yield in-depth information about the tool and its improvement (Favi *et al.* 2018; Schröter 2010). Full interview questions and guide with the expert panel is included in Appendix B. Reactions and comments raised by participants were also noted and documented in the manner of field notes. The six overreaching questions are:

1. What is missing from the tool?
2. What components of the tool are not necessary?
3. Are there any other errors or problems that need to be addressed?
4. What, if anything, did you like about the tool, and what did you dislike?
5. Do you have any suggestions for how to improve the tool?
6. Do you have anything else to say or add?

Table 4.6 Accuracy and efficiency measurements statements.

Accuracy and effectiveness of the tool	Efficiency and utility of the tool
1. The tool can be used effectively alongside professional practice and architectural design of dwellings.	1. Users need additional support to use this tool for the first time.
2. Most of the criteria and metrics are compatible with the local context, environment, and culture.	2. The tool is easy to learn and use in general
3. Criteria and metrics can be implemented easily in most projects	3. The tool requires a reasonable amount of time to use
4. The tool is suitable to use at the early stages of the project design	4. The tool design and structure make it pleasant to navigate and use
5. The tool has all the expected criteria to achieve eco-culturally sensitive design	5. You can be more productive using this tool
6. Using the tool can help achieve eco-culturally sensitive design	6. Information provided with each stage was clear and effective

4.3.3.3   Data analysis

This study used descriptive and content analysis, which is backed with results from the Likert scale questionnaire to relate it to the questions of interest and develop rationales for improving the checklist (Patton 2002; Maxwell 2012). Data from the questionnaire and the interviews were examined for facts describing the tool's strengths and issues. Quotes from participants answers were used to highlight and illustrate findings and improve the tool. Data analysis was concerned with all information on (1) missing and (2) unnecessary components, (3) errors and problems, (4) strengths, and (5) means for improvement (Favi *et al.* 2018; Schroeter 2008). Participants' responses also functioned as a checklist to illuminate the cultural validity of the tool. These questions were first coded for each participant. Then, responses were considered against their participants' experience and background. After that, responses were analysed by their related question group (i.e., weaknesses, errors, suggestions). Results from the questionnaire were then used to corroborate findings from participants' analysis.

4.4   Rational and justification for the research design

A qualitative approach was utilised as the extent of critical indicators to be examined were not known. Researchers who engage in qualitative studies rely on their skills to receive information and uncover its meaning, through using an inductive style with descriptive, exploratory, or explanatory procedures (Suter 2012). The outcomes thus have a flexible structure as it includes an interpretation of the meaning of data (Creswell 2014).

According to Suter (2012), narrative research captures the voice of the participant and offers a collection of themes to understand the phenomenon being investigated. For instance, when we are interested in investigating human behaviour and attitudes, and discovering the underlying motives, such as why people think, do or like certain things and how they feel, qualitative research using in-depth interviews is the suitable technique. Data produced from quantitative methods such as a questionnaire could be limited in giving a more complete view on intangible indicators such as the social life of people inside houses. The qualitative approach allowed the researcher to

study phenomenological topics such as the one presented in this thesis and allowed the researcher to interact in-depth with participants, leading to more rich and detailed answers which was essential to fulfil one of the main gaps of knowledge.

Two types of generalisations could be generated based on the process of reasoning. Firstly, when a case is created or reconstructed from historical data, generalisations occur within an evidential paradigm (Cor 2016). Secondly, operative or naturalistic generalisations, which are made from known cases, and applied to an actual problem situation by making appropriate comparisons (Nilsson et al. 2014).

The case study approach was important as it allowed this research to study, in-depth, multi-the faceted explorations of socio-cultural sustainable design requirements in their real-life settings. Case studies allowed the researcher to investigate and compare both old and new residential situations from a new perspective and explain links between tangible and intangible indicators. This facilitated analytical comparisons rather than statistical generalisations (Suter 2012). However, determining theoretical ideas at earlier stages in a case study design is essential since these ideas guide types of data to be collected. Moreover, studying multiple cases would be more informative, as they give a potential to replicate findings and test if there is a matching in explanations (Cor 2016; Suter 2012). The case study approach also helped to understand the complication of the various indicators affecting the eco-cultural design approach. The following summarises other justification for following a qualitative approach (Fross and Sempruch, 2015; Persaud, 2010):

1. The thesis could not rely on previous knowledge alone, as it does not fully fit the framework or context because:
   a. There is an absence and shortage of data regarding cultural sustainability indicators for the built environment.
   b. This topic is regarded as new and there is not much previous research to apply from Jordan or the MENA region.
   c. Most previous research overlooks intangible indicators of sustainability in favour of tangible ecological one.
2. Interviews afforded opportunities to better engage with respondents, clarify and refine questions, and promote a two-way learning process due to:
   a. Better involvement and response rates compared to surveys and questionnaires. Therefore, more responses were achieved by conducting face to face interviews rather than over the internet or phone.
   b. Interviewing triggered brainstorming between participants which helped to observe common reactions and reveal ideas and opinions that some participants could have otherwise missed or not articulated.
   c. Some interviewees may not know how to answer a question and the interviewer usually gets the 'do not know' answer, so having the interviewer on the telephone or in front of you will help get a more specific answer.
   d. The interviewer has the advantage to get further insight into a specific question and obtain more in-depth answers.
3. The interviews also helped to directly investigate and refine the indicators defined from the conceptual framework by evaluating and testing the final framework and tool of this study.

4.5   Challenges and ethical considerations

The main issue with this research was that it involved interaction with stakeholders or members of the general community, who serve as participants in the research. In this type of research, there is the chance that being in contact with contributors might unintentionally harm them in some way (Fernandez-Feijoo et al. 2014). Unintended harm could include psychological, financial, social harms such as being fired from work over the disclosure of sensitive or confidential information. Any research should ensure that no harm is inflicted upon participants. Therefore, before initiating

the study, an EIRA1 (Ethical Implications of Research Activity) Form was prepared and approved by the University of Bath Departmental Research Ethics Committee (DREO).

Confidentiality is another issue when it comes to interviews and observations. It concerns the use of data where no one should be given access to them, with the attention that these data should not be disclosed without proper permission (Linstone and Turoff 1975). Thus, participants were assured their identity would be kept anonymous and that they can withdraw from the study at any point or stage with their data being destroyed securely in that case.

Before initiating the study, an EIRA1 (Ethical Implications of Research Activity) Form was requested and approved by the University of Bath Departmental Research Ethics Officer (DREO). Participants were assured their identity would be kept anonymous and that they can withdraw from the study at any point or stage. Notes and self-filled questionnaires were the only forms of data collected at this stage. All data were stored in password-protected files on the researcher's personal computer with an additional copy on the university's cloud storage directory. Data obtained via e-mail were copied into Microsoft Word for purposes of data analysis.

The costs to participants in the study were limited to; (a) the time involved in reading the provided script; (b) carrying out the evaluation process of the tool; (c) and participating in the interview and filling in the survey. Efforts were made to keep the response time and effort as minimal as possible by providing flexible time and location options to meet and the opportunity to withdraw at any time. Moreover, all participants were informed about the study purpose, how they were expected to take part in it, how much time the experiment is expected to take, and the right of any participant not to answer any specific question or withdraw from the study at any time. Participation in the study was entirely voluntary.

Furthermore, the costs and burden on participants in the study were limited to the time involved in participating in the interview session or carrying out the tool's evaluation and testing process in the expert panel case. Efforts were made to keep the response time and effort as minimal as possible by providing flexible time and location options to meet. Participants were informed about; the purpose of the study, how they are participating, how long sessions would last, and the right for each participant not to answer questions they do not feel comfortable answering. Participation in the study was also entirely voluntary.

Another issue encountered in this study was related to data and time management. The time needed for collecting the data and fieldwork can be lengthy. So is the time needed to transcript the data and analyses them (Creswell 2011). This was particularly challenging in the As-Salt city case as information about the current numbers of inhabited vernacular dwellings and their residents was not available. On the other hand, data management is a topic that can be forgotten in the early stages of the research (Creswell 2018). The researcher needed to keep track of the data converted to text from taped interviews (Plummer, 1983). The data management plan included a way to backup collected data on a secure database. Other followed principles regarding qualitative data management included (Creswell 2007; Creswell 2011):
1. Frequently backing up the data.
2. Using adequate quality of recording instruments and digital format while conducting interviews.
3. Making sure that the device has enough space for the data collected (voice recording file).
4. Maintaining a master list of types of information gathered.
5. Developing a data collection matrix as an aid for locating and identifying information for a study.

4.6   Qualitative research validation

(Maxwell 2012) considers the 'validation' process in qualitative research to be an attempt to assess the "accuracy" and "trustworthiness "of the findings, as best described by the researcher and the participants. The term "validation" in qualitative based research is used to emphasize a

process rather than "verification" which has quantitative overtones (Creswell and Poth 2018). FitzPatrick (2019) also viewed validation as a distinct strength of qualitative research in that the account made through extensive time spent in the field, the detailed thick description, and the closeness of the researcher to participants in the study all add to the value or accuracy of a study. (Flick 2018) emphasised that in qualitative research, validity is underpinned by the credibility and authenticity of the data. The researcher achieved this by using appropriate research methods, clearly outlined criteria, accepted procedures, systematic analysis, adequate discussion, and a clear distinction between data and interpretation. In this study, the qualitative framework and result were validated by focusing on the following strategies (Creswell and Poth 2018; Flick 2018; FitzPatrick 2019) :

- Prolonged engagement and persistent observation in the field include building trust with participants, learning the culture, and checking for misinformation that stems from distortions introduced by the researcher. In this study, the researcher is a native of Jordan, facilitated participant involvement in the research. This offered valuable insights and provided the convenience and opportunity to overcome accessibility constraints, access to information and political nuances. This also enabled the researcher to become closely involved with the data collection, which created human conditions that generated enough trust for the participants to disclose their views on the subject under investigation.

- Triangulation of data sources. In triangulation, researchers make use of multiple and different sources, methods, investigators, and theories to provide corroborating evidence. This research involves corroborating evidence from the case study and two rounds of interviews with various stakeholders to shed light on the themes being investigated.

- The research also solicits participants' views of the credibility of the findings and interpretations. This was carried out using the second set of interviews sought to provide more in-depth explanations for evaluating the results of the survey constituting the proposed framework. These interviews were conducted with professionals and academics in architecture and urban planning. This increased the validity of this framework.

4.7 Methodological limitations

The qualitative research design allowed the study to explore multiple socio-cultural indicators and was very useful in understanding participants' perceptions and attitudes towards vernacular architecture and its role in the contemporary residential design context. However, they also brought some limitations. One was that qualitative research methods are time and resources consuming as well as labour intensive (Bryman 2016). Qualitative methods also generate rich and detailed data from participants, which is subjective. This can make it challenging to compare interviews directly or generalise more broadly about the data set (Ochieng 2009). It is also difficult to predict the outcomes and findings of the qualitative research, which may be an issue if evidence of a particular issue or organisational priority is required (Chetty 2016). The interviews are also challenging to replicate as the interviewer is the main instrument of data collection, making the data more susceptible to researcher bias. Research bias occurs when a researcher interprets the data to support their hypothesis or views.

However, Maxwell (2012) argued that the researcher is a unique individual and that all research, qualitative or quantitative, is essentially biased by each researcher's perceptions. Maxwell also argued that it is impossible to deal with these issues by eliminating the researcher's theories, beliefs, and perceptual lens. Instead, qualitative research is primarily concerned with understanding how a particular researcher's values and expectations may have influenced the process and conclusions of the study. The influence may be either positive or negative, and in that case, the researcher should avoid the negative consequences. Creswell (2019) argued that the role of the researcher as the primary data collection instrument necessitates the identification of personal values, assumptions and biases at the beginning of the study.

In this study, the researcher' perception of contemporary architectural practices in Jordan has been shaped by their own cultural and architectural backgrounds and the fact that he is a native of Jordan. This experience helped to enhance the understanding of the challenges and dynamics

involved in the local cultural and architectural practice context. The study also subjectively considered all the data obtained and analyse it with a clear and unbiased mind (Chetty 2016). Continually evaluating participants' responses and ensure that pre-existing assumptions are kept at bay. Additionally, during the research design and interviews' construction phases, any potential bias in the questions was considered. The interview guide and questions were piloted with three colleagues to ensure that questions were simple and that there were no wording or phrasing that could introduce bias to the research (Shah 2019).

One last possible limitation includes the accuracy of translating meaning and intent from Arabic to English (and vice versa) especially during the first round of interviews with residents. To avoid any in-accuracies the study followed suggestions by Regmi et al. (2010) that during the transcribing and translation stages:
- Determination of the relevance or context,
- Backward-translation,
- Examination of the translated meaning in both source and target languages, and then finally
- Revisiting the whole process to get similar interpretations.

4.8 Chapter conclusion

This chapter outlined the research methodology to achieve the main research objectives by using the main research methods. The outline explained why a qualitative approach was employed for this study. It also described the methods involved. The chapter also highlighted how exploratory, case-study, and semi-structured interview methods and observations were required to understand participants' perceptions, attitudes, and desire to build an adequate understanding and integration of socio-cultural needs in sustainable modern housing design. Table 4.7 summarises the connection between objectives, goals, and methods used for each step of the research. The following chapters will present the results and discuss the findings of the research in more detail.

Table 4.7 Matrix of research methods

Research objective	Research method	Chapter topic
Define and interpret the most relevant tangible and intangible indicators that affect contemporary and vernacular architectures within regional contexts.	Comprehensive literature review	Chapters one to three
Refine and evaluate the efficacy, appropriation, and measurement methods/tools for applying these indicators within a modern urban and vernacular housing example.	In-depth interviews with stakeholders and a case study approach.	Chapter five
Propose a multi-factorial, multi-stakeholder framework and tool to integrate these indicators within sustainable eco-cultural housing design. *Revise the final Eco-cultural framework and tool and evaluate it based on the investigation outcome and consultant panel interviews.*	Using thematic and content analysis approaches. Through synthesising the findings from the case study and interviews fieldwork. Using another round of interviews with a panel of experts to evaluate and refine the study framework.	Chapter Six

5   Chapter Five: Case Study Findings

5.1 Introduction

This chapter aims to investigate the current situation of residential buildings in the study area of Jordan. It also aims to define and interpret the most relevant tangible and intangible indicators that affect contemporary and vernacular architecture within regional contexts. These indicators, which represent the input data for the design of new developments, are extracted from a qualitative study, which investigated the everyday life of residents in two case studies in Jordan, in addition to their needs and concerns.

The qualitative study data include observations, pictures, and interviews with 81 stakeholders, from a contemporary residential development and vernacular dwellings within the study area. As illustrated in Chapter Four, responses have been coded and analysed to understand factors that affect the living residential environment, quantify any differences or similarities in interviews' responses, allow comparisons across the different variables, and construct meanings and interpretations.

This approach helped to bridge the gap between the tangible and intangible relationship of the sustainable built environment. By bringing attention to the unspoken indicators of physical space, embodied sustainable elements of the home and what people said about their homes, all of which are central to an eco-cultural approach. This approach can also help other researchers duplicate this method and customise it based on their context and cultural settings.

5.2 Case study observations

Case study observations in the form of photographs and written notes were taken during the fieldwork period to achieve the following objectives:
- Observing the daily lifestyle and routine activities of families inside their homes (where these activities are carried out, and how they are associated with other activities),
- Documenting spatial arrangement of spaces, and movement patterns for guests and family members inside the dwelling,
- Documenting spatial arrangement of apartments on each floor, and they are connected with common areas,
- Searching for any specific treatment in the apartment or the building, and its relation to social or environmental purposes,
- Observing any problems that affect the social life of residents inside apartments or buildings.

To analyse the observation notes, first, they were transcribed and linked with the dwelling and other characteristics of their respective participant. After that, they were coded and analysed alongside interviews data in that they were examined for any concepts, relationships and ideas to identify any major possible themes. Looking over fieldnotes from observations, interview data and images, helped to reflect on the larger thoughts presented in the data and helped formed initial eco-cultural framework categories. Table 5.1 quantify some of the observations made during the interviews process.

From Table 5.1 we can notice that vernacular dwellings were most likely to have qualities related to the availability of an outdoor private space and a dedicated private entrance to the dwelling. The contemporary dwellings on the other hand were more likely to have a dedicated guest-hosting space. Vernacular dwellings were also more likely to have made changes to the house due to the need for them to meet many modern life requirements. This was also reflected in the interview discussions. For example, contemporary housing residents were more likely to discuss issues related to the absence or availability of detached housing qualities in their dwellings. Vernacular dwellings residents were more likely to discuss the absence or availability of modern dwellings qualities and facilities. Interviews were more likely to be held in the court or outdoor private area

in the vernacular dwelling case while in contemporary housing it was more likely to be held inside the dwelling. This reflects the role that a private open space played and still playing in vernacular dwellings. Further discussion on the hierarchy of spaces, availability and absence of certain spaces and changes made to the dwelling is in the following sections.

Table 5.1 Observations results

Total	King Abdulla City					As-Salt City Centre				
	Apartment's complex	Terraced house	Semi-Detached house	Detached house	Grand Total	multi-levels	Detached house	Courtyard house	Single semi-detach	Grand Total
	20	5	15	10	50	5	4	10	12	31
The dwelling had a garden										
No	15	2	0	1	18	5	0	3	2	10
Yes	5	3	15	9	32		4	7	10	21
The dwelling had a separate entrance										
No	15	2			17	3		1		4
Yes	5	3	15	10	33	2	4	9	12	27
Changes have been made to the dwelling										
No	3	5	11	6	25	1		1		2
Yes	17	0	4	4	25	4	4	9	12	29
Available private outdoor areas										
Garden only		0	10	2	20	0	4	8	9	21
Patio/balcony only	10	2	3	4	19	5	0	0	1	6
Both	4	3		2	7	0	0	0	2	2
None	0	0	0	0	0	0	0	2	0	2
Availability of a dedicated guest-hosting area										
Yes	4	3	10	10	27	0	1	3	3	7
No	16	2	5	0	23	5	3	7	9	24
The interview Hosting room										
Guestroom	4	2	8	8	22	0	1	0	4	5
Living room	14	1	4	0	19	3	5	2	6	16
Garden/Patio/Terrace/Court	2	2	3	2	9	0	3	5	2	10
Other	0	0	0	0		0	0	0	0	

5.2.2 Lifestyle and spatial design of the dwelling

As indicated in Table 5.1, it was observed that the dwelling's spatial design and availability or absence of certain rooms and elements can impact resident's behaviour and their comfort. This was especially the case when the dwelling did not have a dedicated guest-hosting room. The following summarises observations that are related to lifestyle and spatial design:

- living spaces functioned as a guest-hosting area due to the lack of a suitable area. This created some discomfort for family members especially young girls and they had to retreat to their bedrooms for the duration of the interview as female family members do not engage with strange men (from outside their family or social contact/ friends circle).
- Other areas of the dwelling that were used when there was no dedicated guest-hosting area instead of the Livingroom and when the weather allowed for that include, privately-owned outdoor spaces such as the dwelling's garden, and terraces.
- Participants used decorations and furniture items to enhance privacy inside their homes especially Infront of bedrooms zones.
- Bedrooms are highly private zones, and they are not accessible for non-family or friends
- Spaces in front of entrances in apartments buildings are limited to circulation paths. Therefore, social interaction among neighbours decreased accordingly.
- In a lot of traditional dwellings, rooms were built around a central open to the sky courtyard. This courtyard in many of these cases has been covered with a light construction roof (steel and glass) or a heavyweight construction (concrete slab).
- The guest room is almost always located near the entrance of the dwelling, sometimes have a separate entrance from the outside.
- Flat rooftops are used as terraces.

- The main bedroom in traditional dwellings is located on upper floors or on a different level from the rest of the dwelling, to preserve the privacy of the family.
- From an economic point of view, old dwellings requires more plot areas, and they are not suitable for the current building regulations, especially the courtyard model as it needs to be built on the edges of the plot with no setbacks.
- Most vernacular buildings had a similar number of stories and height and had small openings and windows when they were overlooking neighbouring dwellings to prevents direct access to the neighbours.
- The expansion of dwellings both modern and new in Jordan have a vertical scheme, where each family builds a room on the roof as needed.

5.2.3 Hierarchy of spaces

During the time of the interviews, the researcher tries to have a general idea about not the exact plan of the dwelling but most importantly the hierarchy of space and movement from one space to another and how it affected the residents and participants activities. Figure 5.1 illustrates the three main hierarchies found in the case study from Jordan:
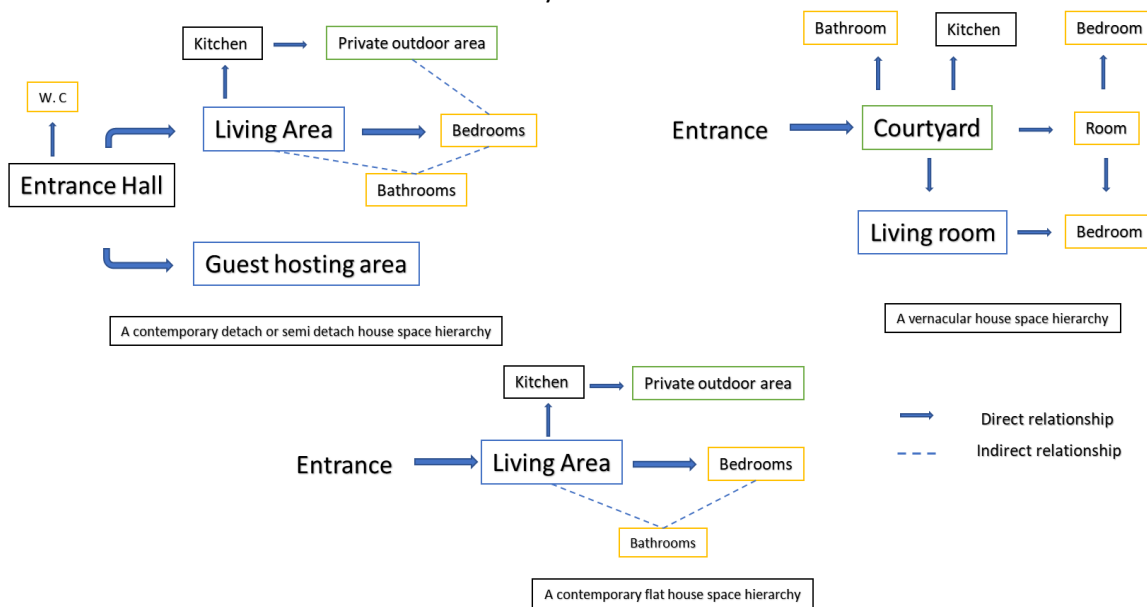
Figure 5.1 The main space hierarchies found in the case study participants' dwellings

Other observations related to the hierarchy of spaces in participants dwellings include:
- Entrances of most apartment type dwellings are opened directly on the inside, with a sudden transition from the entrance (a public space) to the living room and kitchen (private zone) due to the lack of an entry hall.
- The main characteristic of modern dwellings is the open layout, which means that public, semi-public and most living spaces (e.g. kitchen and living room) are connected with guest/dining rooms with visual separation (such as transitional spaces, partitions or doors).
- There is a hierarchical movement (from public to semi-public to private), which reflects the local culture.
- Many of the vernacular dwellings had a central courtyard or room that acted as a transitional space and as an entrance hall from which access to other rooms in the dwelling can be reached.

5.2.4 Specific changes or alterations to the original design of the dwelling

Other converted observations were geared toward noticing any changes to the dwelling layout, or any interior or exterior modifications, renovations. As seen from Table 5.1, vernacular dwellings were more likely to have gone extensive changes on their original design. Tables 5.2 and 5.3

highlights the most frequent physical changes made or planned by residents and the reasons for undergoing these changes (some participants made two or more changes).

Table 5.2 Types and reasons for changes to the original interior layout In King Abdulla city

Recurring changes in vernacular dwelling	Reason	Related indicators	Type of indicator
Closing the balcony or terrace with walls	To create an additional room or increase indoor space	Circulation and organisation	Tangible
Add a divider between the living room and the corridor leading to the bedrooms	Segregation of family members and guests To create an additional room or increase indoor space	Privacy	Intangible
Adding thermal insulation	To help repel heat or cold	Environmental measures/ thermal comfort	Tangible
Increase the area of the balcony by building a slap near it	Have a terrace	Private open	Tangible
Adding a screen on the balcony or windows	To provide more visual privacy	Privacy	Intangible
Adding solar power panels	reduce unwanted sun rays	Environment/ thermal comfort	Tangible

Table 5.3 Types and reasons for changes to the original interior layout in As-Salt city

Recurring changes in vernacular dwelling	Reason	Related indicators	Type of indicator
General renovations	The poor condition of the dwelling	Physical parameter	Tangible
Covering the internal stonework with plaster	For renovation purposes	Materials	Tangible
Covering the internal courtyard roof with a new slap	To create an additional room or increase indoor space	Circulation and organisation	Tangible
Closing the balcony or terrace with walls		Private open spaces	Tangible
Add a new partition between big rooms	Privacy and segregation of family members and guests	Privacy and segregation	Intangible
Build a new room	To create an additional room or increase indoor space	Circulation and organisation	Tangible
Adding an extra bathroom	Needed bathroom		Tangible/intangible
Changing the use of one of the rooms	To provide more privacy and noise control	Privacy/ noise	Intangible

5.2.5 Pictures

During the interviews and fieldwork process in both case studies, pictures were taken inside and outside the participants' dwellings and around the neighbourhoods where the interviews were being held. Also presented in relevant sections of this chapter, they helped gain more insight into what the participants discussed and talked about during the interview process. It was also used to highlight points and remarks that participants made to make it easier to explain. Results from the interviews were combined with observations notes and pictures and were coded and analysed qualitatively for recurring themes and concepts to draw a bigger picture as discussed in the following sections.

5.3 Case study interviews Results

Results from the case study interviews are structured along with the four dimensions of the eco-cultural sustainability framework. Each category is followed by a series of more practice-related indicators detailing components of eco-cultural buildings. The results steps through what tangible and intangible indicators buildings react to and how they affect and inform each other. Each eco-cultural category was discussed with participants dwelling characteristics and demographics to obtain the degree of their importance. The framework concludes with a discussion of overall strategies linking tangible and intangible indicators of the sustainable build environment. Attention was given to users' expectations and perceptions of a positive, sustainable environment. Participants were also asked to present examples or alternatives, or solutions to the issues raised. Findings are supported by comments made during the interviews. Table 5.4 summarises the findings.

Data analysis followed the work of Braun and Clarke (2006), Gale *et al*. (2013) and Ritchie and Spencer (2002). To analyse the interviews, first, all data were investigated for facts and connections to the primary list of eco-cultural indicators as established from the literature review stage. Second, the data were rechecked for new facts describing links or disconnects between cultural, social life, and possible sustainable practice. That is, data analysis was concerned with all information pertaining to what participants repeated, felt missing, lacking, present, and unique to their dwelling, any construction or management issues, strengths, and means for improvement. Third, different meanings and potential linkages among themes were explored by considering the participants' context and background. Lastly, findings were triangulated based on data from the different respondents and the two case study locations and context variation and characteristics (Patton 2002; Maxwell 2012).

The approach suggested and used by Sandelowski (2001), and Ferrer, Ruiz, & Mars (2015) were utilised to analyse and define the eco-cultural categories. The steps involved utilising qualitative findings supported with the interviewees' frequency discussing eco-cultural factors, the means to gauge consensus. When an indicator was mentioned by less than 25% of the participants, it was referred to as "few", when 25% to 50% discussed it, the word "some" was used, when between 50% and 75%, "many" and finally "most" was used when more than 75% of the participants discussed that indicator. Moreover, background information about the participants and their dwellings were used to determine whether their feedback warranted and illuminated the cultural validity of the research. Quotes from the interview with participants were used to illustrate their point of view and aid in explaining the discussed indicator and categories. The full transcripts of the quoted interviews are included in Appendix C.

The framework is not meant to be comprehensive by using many examples. The aim is not to list all possible interpretation methods but to list those which explain the indicators. The same interpretation method can appear within multiple categories for this reason. The emphasis is on illustrating the interviews' point and view and allowing the reader to understand eco-cultural design dimensions. It was found that the scope of eco-cultural sustainability indicators differs from the existing sustainability assessment frameworks and tools, primarily because of the differences in the user's perception of an ideal sustainable built environment. Moreover, context-specific issues in Jordan have resulted in unique challenges that have contributed to the final composition of the indicators list. This means that the assessment weights and credit allocation for eco-cultural indicators should and will diverge from other assessment frameworks. The participants' responses also illustrate additional criteria to the ones identified in literature which would be necessary for integration into the Jordanian Green Guide for sustainable residential buildings. The most notable and essential findings are discussed thoroughly in the following sections.

Table 5.4 The main indicators that are influencing eco-cultural sustainability in residential buildings.
* (+) or (-) positive or negative effect of the indicator on the quality of architecture based on participant perception

Main eco-cultural dimension	Eco-cultural category	For almost all (75–100%)	For a lot of (50–75%)	For some (25–50%)	For a few (0–25%)
Cultural Dimension	Aesthetic and perceptual	The feeling of density and crowdedness (-) Green areas and trees (+)	Building design and construction quality (+) The use of modern materials (such as glass and concrete) (+) Exterior views from windows and balconies	Continuity between buildings style (massing, typology, details materials) (+)	-
	Relevance to vernacular architecture	The use of stone as a material (+) Energy efficiency and thermal comfort (+)	The use of vernacular material such as mud (-) Living in a detached house type (+)	Vernacular design element and details (+)	Vernacular dwelling layout and space distribution (-)
	Role of privacy	Not enough visual privacy in principal areas of the dwelling. (-) access to private open space (+) Access to private open space (+)	The efficiency of circulation and movement in the dwelling (+) Having a dedicated room to host guests (+)	The living area is part of circulation (-) Bedrooms are close to guest-hosting rooms or the entrance (-)	The efficiency of the vertical transportation system and spatial efficiency (+)
Social Dimension	Design for social interaction	Interactive or overlooking dwelling entrances (+) Outdoor spaces and parks (+) Frequency of service of local public transportation (+)	Walkable sidewalks with no obstacles (+) Lack of services and amenities (-)	Higher boundary walls around the property (+) Communal spaces and social centres (+)	outdoor spaces overlook children's playing area (+) Street and traffic safety (-)
	Neighbours' rights	Limited access to daylight or ventilation from adjacent buildings (-)	Privacy in internal and semi-outdoor areas (+) Balconies overlooking each other's or adjacent windows (-)	-	Impact of the construction process on residents and commercial facility users (-)
Economic Dimension	Affordability and adaptability of dwelling.	The ability to add or modify space without much cost and effort The use of renewable energy systems (+)	Low operating and maintenance cost (+) Ability to perform maintenance over a long-term period (+)	The durability of the building envelope (+) quality construction (-)	Distinctions between affordable housing and low cost and low- The durability of key materials (+)

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Main eco-cultural dimension	Eco-cultural category	For almost all (75–100%)	For a lot of (50–75%)	For some (25–50%)	For a few (0–25%)
	Adaptability and flexibility.	The ability to make an addition to the exterior (+) Adaptability to future changes in the type of energy consumed (+)	Potential for horizontal or vertical extensions (+) Constraints imposed by structure, floor-to-floor heights and local authority (-) Economic burden/cost of changes (-)	-	Adaptability to future changes in the type of energy consumed (+)
Environmental Dimension	Indoor healthy environment	Appropriate daylighting in primary occupancy areas (+) Low thermal comfort and energy performance (-) Noise conditions (-) Hierarchy of zones and segregation between guests and family space (+)	Control of glare from daylighting (+) Poor noise transmission through the exterior envelope (-) Effectiveness of natural ventilation during various seasons (+)	Importance of mechanical heating and cooling systems (+)	Passive measures and energy saving (+)
	Outdoor and site t quality	Green spaces and vegetation (+) Impact of site orientation and topography of the site on the solar potential of buildings (+)	Flood risk (-)	Lack of shade on streets on hot summer days (-)	Air quality conditions (pollution) (-)
	Energy and resources	Insulation and heat transfer through envelop (+) Low thermal comfort and energy performance (-) Importance of mechanical heating and cooling systems (+) Vernacular architecture elements and techniques	Water management and rainwater harvesting (+)	Recycled and locally sourced materials (+)	-

5.4 Case study findings

5.4.1 Cultural dimensions

5.4.1.1 Building aesthetic and perceptual

For *a lot* of the participants in both King Abdulla and Salt city, the quality of building materials and the visual impact were important socio-cultural determinants for whether the building was deemed "suitable" for today's standards" "durable" and sustainable. Participants from King Abdulla City were more likely to associate good building quality with the use of modern materials such as concrete and glazed façade details. Participants from the case study thought that the use of stone in façade design was a sign of good design quality since local vernacular buildings were built using stone. In total, 34 out of 50 participants in King Abdulla and 24 out of 31 in Salt city considered vernacular architectural eliminates as an example of high aesthetics and cultural value. Furthermore, some participants associated better quality with a healthy, sustainable built environment for a lot. Participant A07, who is 25 years or younger male, and lives with his parents and one sibling in a multi flats building, said:

"…I like where I live now because of its good design, looks modern and newer with modern materials and large windows… it is comfortable clean and has all the privacy that modern lifestyle needs…"

5.4.1.2 Relevance to vernacular architecture

A lot of participants from the case study were aware of the many social, cultural and environmental benefits and advantages that vernacular architecture provided for their inhabitants. Furthermore, 34 out of 50 participants in King Abdulla and 24 out of 31 in Salt city considered vernacular architectural design and elements to be of high aesthetics and cultural value. For instance, long, narrow windows for more indirect sunlight, the use of plants around the building, the presence of a courtyard to create self-shaded areas and over-hangs on top of balconies and windows. B05, who is a 45-54 year's old female, married and living with her family of 5 in a detached vernacular dwelling, explained:

> *"Vernacular houses like this one have more greenery around them and look closer to the environment than other non-vernacular houses. They were built using natural materials, have nicer, bigger windows and courtyards with trees and water fountains that helps to make the house cooler in summer and thick walls that kept it warmer in winter…"*

Despite this apparent admiration, *a lot* of participants did not wish to be living in a dwelling built with the same vernacular and traditional materials and techniques, citing issues of life inconvenient and clash with modernity. *Many* also pointed to the social stigma associated with living in a dwelling built exclusively with earthen materials such as mud and timber, mainly when structural or building stone is not used for cladding and facades (Figure 5.2). Participants B03, who is 65-75 years old woman and have lived in a vernacular detach house for five years before moving out:

> *"The traditional house I lived in was a bad experience that I do not want to repeat. Rooms were open to each other with little privacy. The exterior walls were still made of mud. It was not even covered with limestone or poured cement like other houses that required much effort to maintain and clean. Some techniques and material are certainly not suitable today."*

Figure 5.2 Examples of a modern social housing apartment block in King Abdulla city (Left) and a vernacular building from Salt city (Right). Residents living in a modern social housing apartment block in King Abdulla city criticised the absence of natural stone on the facades as a determinant for "good for today's standards and "durable". While residents in As-Salt city vernacular buildings consider the use of natural stone as a reason for the building's durability

A few participants also pointed out the different economic and contextual factors for the production of vernacular architecture that are obsolete today. A few also pointed out the fact that vernacular building techniques are lost today. Participants B06, who is a 35-44 year's old male and lives in a semi-detach vernacular house with his family of five, said:

> *I think the first factor is the economic situation; no one can afford to build vernacular buildings anymore, land prices have increased and lived inside the city cost so much that apartments block started appearing everywhere, as they are more economically viable for both investors and cheaper for buyers.*

5.4.1.3 Role of privacy and dwelling type

Privacy was one of the most recurring and discussed themes during the interviews. *Almost all* participants considered privacy to be connected to the dwelling form, layout and cultural norms. Participants discussed privacy in interweaved relationships to segregation between genders, guests and hospitality. Participants also connected privacy to other tangible indicators such as dwelling typology, private outdoor spaces and internal circulation. *Many* participants interpreted privacy as being "concealed", "hidden", and being "sheltered "in their dwelling. Privacy meant that dwellings provided them with the comfort and freedom to perform their daily life away from the eyes of neighbours or street dwellers. This freedom includes family members' ability to move around the dwelling while guests are there, especially if the guests are males from outside of the family; otherwise, women need to stay in dignified clothing the entire time if they had to share spaces. So, it is essential for the guest-hosting area and the entrance to provide this privacy and freedom of movement. Participant A36 who is a 25-35 female, employed and lives in an apartment building, said:

> *"In our old house, the bedrooms were adjoining the living room. You would open the door of the bedroom and then you are in the living room. No hall or corridor separated them, and it was rather uncomfortable. it was noisy, and you never feel like have a private room...."*

For many participants, indoor comfort was also related to their dwelling plan layout and internal circulation, where inadequate plan design can create a significant amount of discomfort for the family. Most participants agree that an ideal dwelling should have the following qualities: (1) Three bedrooms (one separate from the other rooms and away from the entrance). (2) Two separate living areas where one of them would be used to host guests. (3) And a dining area connected to the kitchen. Participants living in apartments in King Abdulla city reported having fewer bedrooms than expected, and they were missing spaces like guests hosting area and an entrance hall.

Participant A16 who is a 44-54 year's old female and live in a detached house with her family of five, said:

> "… we still have this culture of houses to be closed into itself and not be so exposed for people in the outside, to have much control for privacy which is a shared point with traditional houses. Covered windows, balconies are not so exposed and so are the other floor. It is a shared point with most houses here in Jordan. In some houses, the kitchen would be open to the living space, which I do not like…"

Participants from King Abdullah city listed; narrow setback distances between adjacent buildings, windows and balconies overlooking each other, poor sound insulation, and not having a dedicated guest-hosting room as the main issues that affected privacy inside dwellings. For participants in Salt city, the main recurring issues that hindered privacy in dwellings were noise transmitting between neighbours and not having enough bedrooms for family members numbers. Participants B26 who is 45-54 years old male, lives in a courtyard dwelling with his family of five sad:

> "Yes, my house does provide enough privacy, and I feel so comfortable and safe here. However, vernacular houses usually did not provide individual. They would only have few big communal rooms that served all life purposes from sleeping to living, cooking, working and even hosting guests. Sound transmission is also an issue as materials and stone do not conceal sound well, and houses are very close to each other…"

5.4.1.4 Access to private open space

For almost all participants, having access to private open space was of the utmost importance, especially for those living in multi-apartment buildings and who do not have access to a garden. Additionally, participants were very concerned about not just the access. Participants also discussed the need for a satisfactorily designed balcony or a terrace to achieve its intended purpose. Most participants who live in apartments discussed the size and location of the balcony within the dwelling. They also discussed the balcony and terrace relationship with other balconies of neighbouring buildings. Participant A15 who is 25-34 of age and lives with his wife and child in a third-floor apartment, said:

> "None of us can relax on the balcony…. It is located on the building's side, where adjusted balconies and windows from the next buildings are also stationed. It is not comfortable at all, even the window of the balcony is too big, and we have to hide behind curtains all the time…

According to some participants, an excellent example of a balcony should be big enough for multiple people to use simultaneously. The balcony should also be positioned on the building's side or edge and far from other balconies of nearby buildings and preferably facing the street. What is also needed is for the outdoor places to have more than privacy is for it to be easily accessible and seen from inside the dwelling, especially the kitchen and the living room. Participant A27 who is a housewife aged 35-44 and lives in a detached house with her family of five, said:

> "I would like to change the location of the kitchen, so I can see my children playing either in the garden or in the living room while I am doing my daily chores so I can have control over what they are doing and also spend time with them."

Furthermore, almost all participants owning a garden outvalue having a terrace or a balcony. Many participants living in apartments stated their wishes to move into a detached or semi-detach house due to a lack of adequate private open space. Participants often modified and repurposed a balcony or a terrace that was small or had little privacy.

5.4.1.5 Critical reflection

Before starting the case study fieldwork and interviews it was expected that participants discussion of cultural dimensions of architecture would mostly revolve around vernacular architecture. It was also expected that participants would have favoured views toward vernacular

buildings. However, participants discussion of cultural dimensions and indicators was focused on privacy and architectural elements, many of which were not related to vernacular architecture. Furthermore, participants were expected to value vernacular and traditional methods of architecture. While most said they do and would prefer a traditional dwelling over a modern one but they also criticised many of their qualities such as the bigger multi-use rooms over dedicated smaller ones and the use of earthen materials in construction. The interviews also revealed that participants held rather a nostalgic view towards vernacular buildings. Most participants would not want to live in one unless it was heavily modified to suit modern life needs. Results of the survey indicated that the availability of private outdoor spaces (such as terraces and gardens) was an important factor in the satisfaction of families with their dwellings. Furthermore, although the importance of privacy in dwellings design was expected to be this critical for residents from Jordan it was revealed that its importance to participants was even higher. Privacy requirements to many participants included their privacy and ability to perform daily lives while also hosting guests.

Access to an outdoor space like a garden, balcony or terrace was not only important but its quality or area, and level of privacy was especially critical and it also highlighted how much emphasis it was given in vernacular architecture that is missing from contemporary Jordanian dwellings. A lot of vernacular buildings in salt were built to host a courtyard which provided an outdoor private space for the family that is adequate in size, shape, location and degree of privacy that modern dwelling terraces and balconies do not have. These issues are indeed essential points that Jordan's green building guide does not include and should be transferred into the eco-cultural framework.

The dwelling typology also was demonstrated to have a strong influence on the satisfaction of residents where those living in apartment block seems the least happy about their dwelling and most expressed their wishes or plans to move out or change their dwellings when their economic situation improves. Spatially related reasons were the main driver for implementing changes in the dwelling along with privacy reasons. A significant other feature that affected the satisfaction of residents with the spatial design of their dwellings, is the hierarchal arrangement of spaces (from the public, to semi-public/private, to private (such as living zones), to intimate spaces (such as bedrooms)). The interviews showed that respondents preferred this hierarchy between intimate zones (bedrooms) and living spaces.

5.4.2 Social dimensions

5.4.2.1 Design for social interaction and accessibility
For most participants, social interaction relied on the availability and quality of exterior spaces or walking facilities.
Participant A50, who is a male age 25-35 and lives with his wife and child in a terrace house, said:

"I think the developer did a bad job planning the lots here. They could have made it better organised where each dwelling entrance should be far from main roads to provide security, interaction and privacy for each adjacent lot…."

Participants' comments highlighted the need to reflect on the indoor-outdoor relationship in association with local social practices and lifestyle to avoid a socio-cultural and technical clash that is eventually unsustainable. For example, In King Abdulla city, the layout of rowhouses and terraced apartments on top of them created social inconveniences for residents instead of increasing social intimacy (Figure 5.3).

Figure 5.3 A cross-section in a terraced house from King Abdulla city. The upper deck (yellow square) forms a separate apartment from the lower deck house overlooking private gardens of these houses. The passage that links the upper deck apartments is a shared semi-public access, and residents cannot use it as an open private space

For some participants, the availability and accessibility to services played a central role in the community's social provision. A11, who is a male age 25-34 and lives in a semi-detached house, describe:

> *".... this development is still relatively new with not many services and empty land lots and construction sites that make the air rather dusty from building material particles. Distance from services and markets can be challenging and does not encourage you to go and walk as you will always have to use the car for shopping for groceries."*

Salt city residents did not face these issues as the site contained many old established squares and wide stairs. B02, who is a 55-64 female, said:

> *The location is good being central and has many advantages where you do not have to own a car or pay for transport to work, school or the market".*

Figure 5.4 Examples of vernacular buildings in Salt city. Vernacular dwellings has their biggest windows positioned toward the street away from direct contact with neighbour's windows and courtyards (By Author)

5.4.2.2 Neighbourhood and streets walkability

For many participants, the perception of streets and paths walkability was an essential indicator in determining the degree of social interaction and social sustainability. For almost all female participants in King Abdulla city, and for many of them in As-salt city, streets safety at night in relation to fear of crimes, lack of traffic control and stray animals were a deterrent to walking, preferring the use of alternative travel modes. For example, some parts of King Abdulla city were

still underdeveloped, with few people living there. The absence of people and walking along an area with poor lighting at night are the main reasons for using alternative transportation methods such as cars. Participants B22 from As-Salt city said:

> "For example, at a certain time of the night, poor street lighting makes me avoid walking in that time also there are some stray dogs and fewer people, so I fear for my safety and my children's."

For almost all participants from both genders, the low quality of sidewalks and physical obstacles in a narrow sidewalk was the main deteriorate for walking (Figure 5.5). Participant A12 from King Abdulla city Said:

> "if sidewalks are not wide enough and comfortable to walk, I will stop walking. The sidewalk curb is also too high in places of crossing that you feel like falling, some people even turned parts of sidewalks into a seating area for them when the weather is nice as they lack open public spaces or big gardens, which is not acceptable…"

Figure 5.5 An example of a poorly kept sidewalk in King Abdulla City

Apart from the sidewalk quality, few participants identified the lack of trees, vegetation, or shading elements as a deterrent to walking, especially on hot summer days. Participant A12 said:

> "The sidewalks, if they are wide enough, it is also boiling in the summertime and there almost no trees, shades to walk and it is very far from my house to the shops, so I use the car."

Participants from Salt city did not have as many walking-related issues as King Abdulla city as the city centre is well developed with various pedestrian-only paths, stairs, and public squares that encourage residents to walk and socialise outdoor (Figures 5.6 and 5.7).

Figure 5.6 One of the steps connecting dwellings near al-Khader street in Salt city (By Author)

Figure 5.7 Al-Ain square downtown near Al-Khader street where older men meet to play a traditional dice game called (Manqalla) (By Author)

5.4.2.3 Density and feeling of crowdedness

For *some* participants from Salt city and for *a lot of* participants from King Abdulla city, the feeling and perception of high density are associated with ugliness, congestion, and crowding. Participants also linked the perception of high density to a reduced sense of privacy. Participant A11 who is 35-44 years old male and lives in an apartment with his four children and wife, puts it when commenting on the photographs of buildings in the area:

> *"in this apartment building, the number of dwellings seems high. Having so many people living in the same building is a new thing for our society. People used to live in single-family houses. Having a building with few apartments is all right but just not too many families …"*

Participants stated that visual overcrowding increases noise levels while reducing the ventilation and sunshine rates that their dwellings receive, especially when living in a multi-apartment block where "too many" families live. According to interviewees, proximity and setbacks from other buildings and adequate green spaces were repeatedly associated with sustainable practice and could affect their health and comfort. Participants A47, a 25-34 year old female, married and living in an apartment with her husband and two children, said:

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> *"sustainable buildings would have a fewer number of apartments than non-sustainable ones... it would also have a good space between it and the other buildings in the neighbourhood to have optimal ventilation and sunlight, and so you can plant trees between them."*

Furthermore, for many participants, the perception of density is related to qualitative design issues such as housing typology, heights and setbacks between buildings, rather than quantitative indicators of actual population density. Results also suggest that the size of a community (social group size) also greatly influences the perception of density and crowdedness. Large community size can lead to sensitivities between residents living in one apartment building over issues such as communal areas cleanliness and maintenance.

Participants A47, who is a male, 25-34 of age and lives with her family husband and child, said:

> *"…apartments building around here look dense and too close to each other and how dense places like that does not suit local culture and mentality…"*

5.4.2.4 Neighbours' rights and impact on the context

Many participants who live on the ground floor levels complained about how tall multi apartments buildings reduce the amount of sunshine and ventilation they get, especially on winter days where the sun path is low in the sky. Many participants discussed the relationships between adjacent properties and how they affect private open spaces and indoor comfort and privacy. This raises issues of mutual responsibilities between neighbours toward each other. Participants A37 who is a married woman age between 45-54 and lives in an apartment with her family of four said:

> *"Although my neighbour is abiding with local regulation towards buildings height and floor ratio, his windows still expose my back-garden area. I am thinking about making a vine ladder so I can grow some vines to cover my back garden from my neighbour whose house is on a higher-level ground its inconvenient for us to use that space sometimes."*

On the other hand, Salt city participants did not have any complaints regarding the proximity between buildings in their neighbourhoods as most vernacular buildings were one or two levels high, with very few of them that exceeds that. Many traditional dwellings in Salt city are also inward-looking, with living spaces organised around a central open space. Thus, the surrounding low-rise buildings provided the needed privacy and access to natural daylight and ventilation equally for all the neighbourhood residents. Participant A33 who is living in a semi-detach house with his wife and two children said:

> *"I dislike the arrangement of the houses around here. They laid out a houses scheme on unlevelled terrain. This made the house behind me on a much higher level which turned the two-story building into something like a tower exposing all the surrounding neighbours."*

5.4.2.5 Critical reflection

Before the interviews, it was expected that participants are going to highlight the lack of social infrastructure such as meeting houses and social clubs as the main issue related to social sustainability. Interviews and observations did indeed reveal that participants from the case study relied on their dwelling to socialise and meet other people partially to the absence of these social facilities. Due to that one of the main qualities of dwellings that participants discussed was the availability of a guest room. This was also the case even in smaller size dwellings such as apartments where participants expressed their desire to have a room for guest hosting instead of essential purposes (such as TV/living room and bedrooms).

Moreover, the separation between male and female guests is associated with the area of the dwelling, although it is an essential issue for preserving privacy. Therefore, people prefer to have one guest room, as the area of the dwelling is relatively small and cannot accommodate more

than one guest room. To deal with this issue, they use the living room for female guests and the reception room for male visitors.

Furthermore, residents frequently discussed that the maximum number of apartments on each floor should be no more than one to three residential units. When this number exceeds four apartments, residents feel uncomfortable due to crowding and it also affected social relationships between residents negatively due to increased chances of arguments between neighbours of the same building over issues like noise. Moreover, the small size of plot areas might compel designers to divide each floor into two to three apartments based on the preferred areas for each unit as requested by the developer.

At the scale of the building, the interviews showed that several problems are affecting the social life of residents. These include lower levels of social support, lower sense of community and familiarity with neighbours, and impacts on children as parents keep them inside apartments due to safety concerns and difficulties of supervision at a distance as playing grounds are far from these apartments or due to street walkability issues.

5.4.3 Economic dimensions

5.4.3.1 Affordability and affordable housing

Non-conventional or rarely studied economic indicators assert the difference between housing affordability and affordable housing (Pocock *et al*., 2016). Most apartment blocks in King Abdulla city were built as part of a government scheme to provide more affordable homes. The scheme was not successful, and many participants had unfavoured views and attitudes toward such schemes. Participant A26 who is a below 25 years old male living in a detached house, said:

> "This project was supposed to be for lower-income citizens, but land prices and apartments are too high for them."

For *most* Salt city participants, their main concern was the durability and maintenance cost for their old traditional houses. B24, who is 25-34 years old female living in a semi-detached house with her family, explained:

> "Maintenance work: fixing the ceiling, adding tiles to prevent water from coming in, paintwork and so on. Even if we have the money now, we do not feel encouraged to do it as it will not last long. It was less than a year since we did the ceiling and look, paint is falling off already."

More than a few interviewees mentioned the negative impact of the new developments on their dwellings' value (including rental). In Salt city, the recent renovation and public works encouraged landlords to increase rent prices which affected many families and threatened them to leave and for many vernacular dwellings to sit empty and degrade due to the cycle of negligence. In King Abdulla city, prices went up sharply in recent years, which affected the moving-in rate, and thus social relations worsened. It also encouraged anti-social behaviours that endangered the project. The government also lowered the prices for the remaining units, which led to the value for all the units that were sold previously going down, creating a long list of people waiting for compensation.

5.4.3.2 Adaptability and flexibility

Adaptability and flexibility are the capacity of a building or design to effectively accommodate its context's evolving demands. This maximises a building's value and lifespan for its owners (Sharifi and Murayama 2013; Estaji 2017). The significant factors influencing flexibility and adaptability in the architectural circumstance are the users of buildings, their needs, and their requirements which change rapidly over time, thereby necessitating the cause for buildings towards a flexible physical, spatial, and cultural structure to respond to the changes (Anih et al. 2019).

In modern sustainable housing design, researchers and architects use the term flexible to discuss the ability to modify and implement physical changes to a building and use the term adaptable to discuss the varieties of way to use a space or a building without much modification to its physical form (Estaji 2017; Ujam and Stevenson 1996). According to Schmidt (2009), anything adaptable and flexible should have the following characteristics: (1) Capacity to change, (2) Ability to remain fit for purpose, (3) Maximising value and, (4) Time (speed of change and through life changes).

Adaptability and flexibility are two qualities that are also often associated with vernacular architecture. Vernacular structures and forms were also modular. Modular vernacular dwellings enabled their residents to modify and develop the physical space and add more rooms to the structure in a flexible way over extended periods and in response to any sudden social, economic or natural changes (Al-Jokhadar and Jabi, 2017).

A lot of participants in King Abdulla city and most of As-Salt city participants stated that they had made changes to their dwellings. These modifications were related to enhancing the dwelling's privacy, making it more suitable for their lifestyle and increasing their economic value. Participants also discussed adaptability and dwelling changes in terms of the financial burden and viability to their residents. Many participants said that the high financial costs of changes are what is holding them back from making alterations to their dwellings to suit their changing needs.

Frequent changes in dwellings include enclosing the balcony completely or covering it with plants, metal or wooden arabesque, adding a divider or a separator to increase the privacy and segregation between bedrooms and guest reception area of the dwelling like the living room or dining area or dividing living areas into two – one for family, the other for guests (Figure 5.8). It was also found that most of the residents living in apartments considered it inadequate for meeting their expectations. This included dissatisfaction with the number of functional rooms. The interviewees needed more bedrooms and additional living areas as well as spaces for studying and hosting guests rather than the more contemporary one big hall or an L-shaped living area.

Some changes, such as that switch from stone and mud material to concrete in some of Salt city vernacular buildings, had a negative impact on the dwelling's thermal comfort and acoustics. Participants B8 and B28, whom both live in a courtyard house in Salt city, admitted that the house became hotter after covering the open court (Figure 5.9). The architects and engineers gave little attention to the possibility of future adaptation of the dwellings, how much financial burden it would impose on their residents and whether changes could be implemented quickly.

Figure 5.8 Examples of modifications to dwellings in King Abdulla city. In the modern development of Zarqa City, changes were more related to enhancing privacy, such as increasing the heights of the boundary walls (top right) and enclosing parts of the balcony and terrace (bottom right and left) with glass panels.

Figure 5.9 Examples of modifications to dwellings in Salt city. Changes were more common in Salt old dwellings as residents were trying to implement changes to make these old dwellings adapt to modern daily life. The most common changes include covering the central courtyard (top right), removing the masonry vaults and arcs, and replacing it with concrete slabs to add a second floor (bottom right). Changing the interior décor was also very common (centre). Less frequently were changes made to increase privacy (left).

5.4.3.3 Critical reflection

Participants were expected to discuss Economic dimensions concerning the financial values of their homes relative to their qualities such as lot and dwelling area and the number of rooms. Participants did that but they also linked the economic values of dwellings to their ability to adapt and change over time to meet their future needs. Participants also linked this to vernacular architecture and how it enabled its owners to keep expanding and changing the structure efficiently and economically. However, from an economic point of view, vernacular dwellings requires more plot areas, and they are not favourable as a typology by most housing developers, especially the courtyard model. Courtyard houses also need to be built on the edges of the plot with no setbacks and thus not suitable for modern building regulations in Jordan. Vernacular architecture however provides an economic advantage in that it mostly relied on passive design qualities and elements to achieve holistic environmental and socio-cultural requirements for residents. Therefore, an eco-cultural design framework should also include more passive design measures.

Flexibility and adaptability also reduce the capital required for alteration and renovations. Moreover, changes in the arrangement of common spaces could have impacts on integration and connectivity values for these areas. Differences in the area of main public spaces and semi-private areas could affect the economic value of the building.

Vernacular dwellings provides many financial rewards for occupants. For instance, it allows for a dense development of the plot area. It could be linked to adjacent dwellings with shared walls from three sides, as there are no surrounding back or side yards. Based on this compact structure, the cost of construction and infrastructure is significantly reduced, as well as the annual operating costs for energy and water (Tabesh and Begum 2015; Pfeifer and Brauneck 2007). Yet, such a large ground area could affect the area of green and communal spaces at the urban scale (Tabesh and Begum 2015; Al-Jokhadar 2018). Moreover, some vernacular dwellings were expanded horizontally by adding rooms on the sides of the courtyard, or vertically by adding floors or using the roof to create additional living or sleeping spaces. However, this vertical expansion was limited by the structural system and the construction materials.

One issue that is important for developers is the economic revenue of the building. Their target is to increase the area of residential units. Thus, offering public areas inside the building is not a concern. In contrast, residents and designers wish to include such spaces to enhance social interaction between neighbours, and to provide secure areas for children. Dealing with this contradiction, there should be predefined minimum requirements for an eco-cultural design framework for the allowable area of common spaces and adaptability.

Economic dimensions in residential dwellings design especially social housing ones are always connected to the criteria related to price, return on investment and rarely looked through long periods related to energy and maintenances bills which could greatly impact the affordability of these dwellings on residents and therefore an eco-cultural framework should include both affordability and affordable housing.

5.4.4 Environmental dimensions

5.4.4.1 Indoor healthy environment

Participants from both cases mainly discussed environmental dimensions concerning interior living qualities, external landscaping, or the use of high technology products and materials. Regarding the healthy and comfortable indoor environment, most of the participants discussed the need for good natural ventilation and sunlight in the dwelling's main rooms. Participant B013, who is a female, 35-44 of age and lives with her husband and child in a multi-apartment building, said:

> *"I think building B is more sustainable because it has big windows for sun the air to*
> *come inside, gardens and trees, maybe by having so many windows that provide fresh*
> *air and sunlight to the house, also by having trees and area around it for plants.*

Many Participants also associated access to adequate sunshine levels and ventilation with the absence of tall structures such as apartments blocks. This was an issue particularly for those living in ground levels where they said that nearly other apartment buildings denied them enough sunshine and natural light.

This issue arose from local municipality building regulation that requires apartment blocks to fulfil predetermined minimum requirements of setback distances and maximum floor area ratio allowance without any contextual factors.

5.4.4.2 Energy efficiency and thermal comfort

Participants in King Abdulla city linked poor thermal comfort to insulation methods and the absence of central mechanical heating and cooling systems. Participants from Salt city praised how convenient their dwellings are in providing thermal comfort and energy saving (Figure 5.10). Participants from both cases talked about the thermal comfort and energy-saving qualities of vernacular architecture. They highlighted how vernacular architectural elements could help with passive and sustainable measures in architecture. They linked it to the use of suitable earth materials and passive measures such as orientation, thermal walls, shading devices, and the use of plants around the building. Participant B3, who is a 65-74 year old male and lives in a single-detached house with his wife, said:

> *"Materials and methods of construction played a major role in regulating temperature.*
> *This house has very thick walls; this made it suitable for both hot summer and cold*
> *winter. The courtyard used to help in cooling too."*

Participants were divided in the matter of using recycled or more expensive sustainable materials and gave their approval subject to the quality or price of these high-performance materials. However, most of the participants from both case study areas agreed to the importance and economic opportunities that solar energy collection methods provide. However, they pointed out issues related to the availability of suitable non-shaded areas required for installing such

equipment on the roof of the building, especially if the roof is shared with other dwellings. Participant A05, who is a male living in a semi-detached house with his family of three said:

"I looked into buying photovoltaic solar panels to reduce my utility bills, but I cannot put it on the roof as it's not just mine alone and my neighbours would object that."

Figure 5.10 Example of a vernacular courthouse. Multiple tall-arched and narrow windows; and interior courtyards in vernacular houses provide excellent natural ventilation and cooling while also providing enhanced privacy for the family. (By Author)

Many participants who live on the top levels of apartment buildings complained that their dwellings get cold in wintertime and overheat quickly in summer. This indicates that apartments upper the fourth floor need unique treatments (such as louvres, screens, pergolas, or specialised glass) to ensure that inner spaces have a comfortable condition.

5.4.4.3 Outdoor and site sustainability

Most participants discussed the presence of vegetation and the availability of green and open spaces as leading indicators for a sustainable outdoor environment. Participant B05 Said:

"I think a sustainable place should have many trees and enough space to have a garden of your own where you can relax and enjoy some fresh, clean air on summer days. houses like this one have more greenery around them and look closer to environmentalists than the others."

Participants also discussed building orientation as a sustainable site indicator. However, participants were more concerned about the function of the room that receive the most and least benefits from the building orientation. Participant A34 commented:

"… the guests hosting room, kitchen and entrance hall are always the coolest in summer as they are not affected by much direct sunshine and receive lovely cool southern brees. Sadly, our living and bedrooms are always hot in the summer and cold in winter, which makes it inconvenient as we use these rooms the most…"

Similarly, participants discussed that the kitchen should be located in the east or south direction (not on the west) to prevent cooking smells from penetrating the dwelling. Some also said that living rooms should be oriented towards views, and at the same time to the south, to benefit from natural lighting all day and good winter sunshine. Building facades need to be protected from the direct sun, using screens and louvres.

5.4.4.4 Critical reflection

It was expected that participants are going to mention issues related to climatic conditions, heating and cooling demand when discussing environmental dimensions of architecture. However, participants from both case study areas discussed building materials and quality the most and link them to sustainability. Participants discussed the indicators that they felt the most impactful and although that does not prove that the dwellings of the participants were well-built and were climatically sensitives to the context. This highlight the situation that issues related to daily life and comfort are always going to be felt more than climatic factors of heating and cooling which can partially be addressed by using mechanical systems such as gas air-conditioning.

The changes that many participants did in their dwellings were made to better suit their socio-cultural daily and life needs but those made especially in the case of As-Salt city might have had a negative impact on the climatic and environmental qualities of dwellings due to these changes. Additionally, participants discussed issues related to building and rooms orientation. An excellent location and an appropriate orientation for the kitchen and other sanitary facilities could prevent smells from entering other spaces in the dwelling. These issues have direct impacts on the level of satisfaction with the spatial layout of the dwelling.

The interviews revealed that participants from King Abdulla city were dissatisfied with the quality of public open spaces such as parks and squares. This is due to an economic reason, as developers are not interested in providing common gathering spaces that facilitate social relations between residents or inserting them as an environmental modifier. In contrast, they depend on using mechanical equipment for cooling and paid little to no attention to passive potentials in site design. This gives more confirmation to the importance of studying intangible indicators and their relationship to tangible sustainable design indicators and confirm the use of an eco-cultural approach to investigate and build upon these findings.

5.5 Discussion

From the results, it can be observed that socio-cultural indicators dominated participant's perspectives and image of sustainability. Cultural indicators in the built environment were frequently discussed in relation to planning, internal environment and heritage relevance. For example, participants discussed the image of sustainability and its relationship with the quality of materials, design and even aesthetics. Bennetts *et al*. (2003), and Nocca (2017), made the same remark about how the image of cultural sustainability in architecture is "highly contextual" and influenced by most shapes and materials. However, studies such as Satterfield *et al.* (2013), Plieninger *et al.* (2013) and Wu *et al.* (2016) limit cultural sustainability to the presence of cultural and spiritual facilities and the need to preserve current heritage buildings. The research findings align with conclusions made by Ashley *et al.* (2014; 2015) and Olakitan Atanda (2019) in that stakeholders' perspectives represent a different point of view of context that should be addressed within policy frameworks to achieve its intended objectives. The lack of conversation between policymakers and various stakeholders can jeopardise the success of heritage building conversation and contemporary urban housing schemes alike, as noted in As-salt and King Abdulla cities.

Most of the participants reported that vernacular architectural elements were more aesthetically appealing and performed better, stating that they are suitable for both local culture and climate. This aligns with previous research that asserts the bioclimatic potential of vernacular architecture (e.g., Memmott and Keys 2015; Daoudi *et al*. 2019; Al-Sallal 2017; Weber 2013; Semahi *et al*. 2019). Chiesa and Grosso (2017) also found visual-related indicators to enhance satisfaction and the socio-cultural experiences of people in housing. Al-Sallal (2017) and Weber (2013) explained that vernacular elements possess both a socio-cultural and environmental function that some participants in this study also discussed. Many participants also made little distinction between vernacular and sustainable architecture. For example, the architectural design of the building

envelope in vernacular architecture reflected not only aesthetic concerns but also performance (e.g. thermal performance).

Many participants also discussed the visual impact of multi-apartment blocks and described feelings of density and crowdedness. Most built environment sustainability frameworks such as BREEAM and LEED encourage high density mixed developments as a cornerstone for sustainable development (Ameen *et al*. 2015; Al-Kodmany 2018). However, few studies discussed occupant perception of density. Bradecki *et al.* (2017); and Dave (2011) concluded that the perception of high density is related to housing typology rather than being an issue of how many people are living within one square km or unit space. This aligns with what this study found; that perception of density is related to buildings form, typology, location of windows and setbacks. Nearly all the participants discussed how ventilation and natural sunlight in the dwelling could be affected by nearby buildings, especially those who are living in multi-level apartments. This, in part, gears towards the association between tangible factors like window sizing with socio-cultural indicators and satisfaction levels.

For almost all the participants, privacy was the most critical cultural trait that a dwelling must have. This transcends the inner part of the dwelling to semi-open and semi-private outdoor zones like the garden, balconies, and terraces. Participants also pointed out various vernacular elements that serve a dual function of environmental controller and privacy enhancer. The city of Salt has introverted planforms comprising of a series of rooms built around a central courtyard that is usually open to the sky. This type of plan satisfies cultural conditions while being a flexible space that can be adapted to the changing requirements of a large family. It also suits climatic conditions for passive cooling and enhanced ventilation. Balbo (2013), Bayoumi (2018), and Ghosh (2019) found similar dual properties at the vernacular urban design level, and this study confirms this at the typology-social level for modern occupants. Many participants also affirmed that functionality and circulation are also necessary. So far, consideration of these two factors is limited to distribution, communications and quality of the design rather than environmental requirements (Chiesa and Grosso 2017; Nocca 2018). Not considering functional and environmental components together during the preliminary design phases may result in significant user changes and adjustments to the building post-construction at delayed, higher costs, time and disruption to the occupants. Many dwellings in Salt city were abandoned and left to decay. Although vernacular Architecture is often praised and studied for its context and climatic sensitivity, clashes imposed by modernisation and changes in their context's socio-cultural life forced their owners to abandon them and their underlying principles (Figure 5.11).

Figure 5.11 Examples of abandoned vernacular dwellings from Salt city.

In the sphere of social wellbeing, many participants discussed the layout of dwellings for social interaction. While some of the participants connected wellbeing to the walkability of streets and the presence of public spaces, the latter is the only indicator considered in assessment tools and literature alike (Al-Jamea 2014; Awadh 2017; Olakitan Atanda 2019).

Few participants mentioned the walkability of streets and sideways as a vital factor for enhancing the social relationship and reducing cars' use. This was combined with their need for services and amenities to encourage inhabitants to meet and socialise. In sustainability assessment tools and research, the focus is geared towards urban and neighbourhood design that prioritises safety, security, inclusivity and cultural facilities (Ewing and Handy 2009; Åhman 2013). On the other hand, participants' responses showed that outdoor design qualities and walkability come first in participants' perceptions of their social realm.

For many participants, community centres and facilities are not as important as a good quality outdoor space with a design that respects all residents' privacy, access to ventilation, solar rights and services. They regarded sidewalks' condition, presence of trees, landscaping, shading elements, and connection to services as main encouragements to choose to walk rather than drive. This shows the need to reflect on the relationship between the indoor and form/exterior in association with people's social practices and lifestyle =to avoid a socio-cultural and technical clash that promotes unsustainability.

Few participants connected sustainability and housing quality to economics. Nearly all live in the apartment blocks that were built as part of an affordable housing scheme. The affordable housing scheme failed to sell all the units due to its low quality, limited marketing, and developers' reports being involved in corruption. Many also discussed economic indicators with their dwellings adaptability and flexibility to change and maintenance. Non-conventional sustainable economic studies assert that affordable housing affordability is not the same thing (Anacker 2019). Moreover, sustainable building assessment methods usually fail to differentiate the importance of flexibility and adaptability indicators of housing and its role for holistic, sustainable design.

Although participants living in the multi-apartment affordable apartments praised their thermal performance, their discussion was more focused on build quality, lack of privacy, typology and high-density feel. Many explicitly expressed their plans to move out once they could afford something better. In conventional architectural practice, sustainability and affordable housing have rarely been considered alongside each other. Sustainability and affordability are often negatively correlated with each other because "more sustainable" often means "less affordable" (Friedman, 2012). Neighbourhood amenities such as access to services, pedestrian safety, access to complete streets and quality housing standards have essential roles in determining the affordability of living in sustainable neighbourhoods (Friedman 2012; Anacker 2019). Participants who can spend money on their dwellings are more likely to have more favourable attitudes. Therefore, there should be access to a diverse range of affordable housing typologies (e.g., high-rise and low-rise, detached or semi-detached, mixed-use or multi-functional buildings, etc.) rather than just one apartment type such as is the case in King Abdulla city.

Shirazi and Keivani (2017) Aksamija *et al.* (2015) and Atanda (2020), highlighted the main features for social sustainability that also includes indicators like energy efficiency, thermal comfort, a healthy internal environment, presence of trees and attention to the overall quality of life. Interestingly, participants interpreted eco-cultural indicators in two ways: (a) sustainable site and form and (b) indoor spatial and environmental quality. The indoor environmental quality links local culture and values, mainly with the indoor spatial layout. Responses also focused on thermal comfort-related factors such as daylight and ventilation and how they affect the occupant's comfort and wellbeing. The sustainable site is concerned with how appropriate the public realm is for socialising and how much privacy is achieved in semi-private and private zones. These indicators are currently considered in a limited way in assessment tools. They are often considered in isolation and ignore the direct relationship between the tangible and intangible indicators.

These links also exercise culture's influence as a medium that gives both the social and tangible environment – natural and built their characteristics. The physical environment can be seen in heritage buildings, nature, landscapes and fauna and flora. The social environment is the lifestyle, and local traditions passed down generations, and religion and beliefs.

For this reason, this understanding of sustainability also involves recognising how socio-cultural indicators have and should still shape the physical built and natural environments. Figure 5.12 summarises the findings on the qualities and issues that accompany each dwelling type relative to the scale. Moving away from each side indicates the increase or decrease in the presence of these qualities. For example, a detached house type provides more privacy for a family but is less affordable than an apartment or other types of dwelling.

- Affordability.
- Social interactions.
- Safety and security.
- Better thermally and energy. Performance.
- Balcony and viewing.
- More density.

Apartments   Semi-detached houses

Row houses   Detached houses

- Privacy
- More culturally preferable
- Semi-outer zones like garden or patio
- More adaptability
- More expansive
- Can relate more to vernacular housing
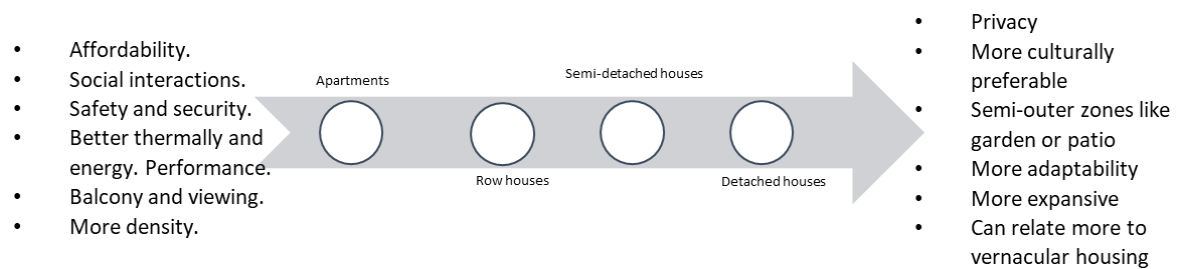
Figure 5.12 Strength of metrics relative to the dwelling typology according to participants.

5.6 Chapter conclusion

The fieldwork and interviews with case study participants revealed a few important points. One is that socio-cultural indicators dominated participant's perspectives and image of sustainability. Furthermore, most of the participants reported that vernacular architectural elements were more aesthetically appealing and performed better, stating that they are suitable for the local climate. However, many participants stated that they do not wish to replicate some vernacular architecture materials due to practicality and convenience issues. For almost all the participants, privacy was the most critical cultural trait that a dwelling must have. This transcends the inner part of the dwelling to semi-open and semi-private outdoor zones.

Findings from the interviews highlight the connections participants made between intangible socio-cultural factors and how they can be translated into tangible architectural elements such as space, form and resource use and thermal performance. Interviews with participants also lead to the belief that building regulation in Jordan falls short of integrating cultural indicators and needs for the design of residential units. Tangible and intangible design metrics are essential for fulfilling these needs. For instance: privacy can be achieved by the size, position and orientation of openings and space, whilst thermal comfort can be achieved with traditional building materials and thermal mass. Therefore, the findings confirm that there is a need for better integration of the cultural indicators of architecture to the three dimensions of sustainability during the design, planning and implementation of housing schemes. Cultural metrics should be integrated holistically, bearing in mind that this would differ per location and context.

This chapter helps bridge this gap by proposing tangible metrics relating to intangible cultural factors for incorporation into existing design assessment tools, guides and standards. User input could thus be incorporated with better satisfaction impact in existing assessment methods. It will help improve the sustainability of housing schemes if the user needs and requirements are considered. Finally, results extracted from the analysis are transformed into spatial parameters and design guidelines, as presented in the next chapter, which is then used to construct an eco-cultural design tool for residential buildings in Jordan.

Chapter Six. Eco-cultural design framework and tool for residential buildings

6.1 Introduction

An eco-cultural design approach was useful for exploring and highlighting missing sustainability indicators from current residential buildings sustainability frameworks. However, these indicators do not show the social, environmental and semantic levels of the composition on their own, nor do they show the relationships between what is tangible and intangible regarding sustainable design. Therefore, it was crucial to translate the eco-cultural indicators into a working set of design rules and guidelines within the proposed eco-cultural framework and tool. This process is also aimed at drawing relationships between tangible and intangible indicators of indicators that reflect users' socio-cultural needs.

Chapter Six builds on the previous research results from the literature review and fieldwork stages. The chapter illustrates the construction of the conceptual framework and spatial design rules for an eco-cultural design tool that is specific to Jordan. It also addresses the different indicators of socio-cultural sustainability. The conceptual framework represents the theoretical results of this thesis. It also represents the theoretical base on which the tool was built. The tool applies the categories and indicators defined within the framework. The extraction and translation process were carried out by reviewing recently published books, journals, technical manuals, and assessment methods to achieve cross social, cultural, and environmental sustainability dimensions. Information sources were investigated to obtain conceptual and practical insights into the eco-cultural indicators and framework. The reviewed sources were identified using keyword-based database searches relevant to the holistic sustainability of the built environment and buildings. The following illustrates this process in more detail.

This chapter also investigates the validity of the research results and framework and the usability of the produced eco-cultural tool. The usability of any tool lies in the clarity of the application (Kitchley and Srivathsan 2014). The tool was tested with real users to inspect its usability and satisfaction with content (Nielsen 1994; Seo and Kim 2016). Users can measure the usability of the eco-cultural tool by three issues: (a) effectiveness: which measure to what extent the tool accurately presents solutions that are useful in achieving its objectives; (b) efficiency: which deals with the utility aspects of time and effort expended to achieve the objectives; and (c) satisfaction: the acceptability of the tool's content by users (Park and Lim 1999; Scriven 2007; Teasdale 2019).

The evaluation and testing process was therefore carried out by (1) incorporating an expert panel, (2) testing the tool with intended users, and (3) synthesising the information from both the initial research findings and from the fieldwork. The purpose of the evaluation is to explore the extent to which the tool had content validity and was perceived as useful in its draft stage.

The fieldwork was conducted during a trip to Jordan between the 1st and the 23rd of November 2019. The study recruited professional architects and allowed them to try and use the tool. The aim was to assess and provide feedback on the tool's content's usability and effectiveness to deliver better eco-cultural sustainable housing practices in Jordan. Feedback from this investigation enabled the study to implement any necessary changes and add missing indicators. The following section illustrates the process in more detail.

6.2 Defining the eco-cultural design framework for residential buildings

The eco-cultural framework aimed to fill the critical gaps between research and sustainable architectural practice, particularly in Jordan. It aims to support architects and urban designers to assess the environmental performance and socio-cultural suitability of proposed residential

schemes according to the resident's needs. Table 6.1 presents the main categories and indicators deployed in the tool's framework. These indicators and categories are also highlighted to represent which of these findings are the results from the fieldwork and which are the results from the literature review stage of this thesis, as presented in Chapters Two, Three and Five. For the tool to be concise and able to achieve its intended purpose. Table 6.1 also highlights which indicators were missing from Jordan's Green Building Guide (JGBG) or those that were present but were revised or adapted to reflect this study's findings.

Table 6.1 The extracted eco-cultural framework categories and indicators

Main and sub-categories	Literature findings	Fieldwork findings	Missing From JGBG	Modified from JGBG	New eco-cultural indicator
1. Site and context					
Flood risk	✓		✓		✓
Use of vegetation and the presence of greenery		✓	✓		✓
Urban heat island effect	✓			✓	
2. Social Relationships					
Social interaction		✓		✓	✓
Walkable streets and pathways		✓	✓		✓
Proximity to services		✓	✓		
Provision of public open space(s)		✓		✓	
3. Cultural and perceptual					
Access to exterior views		✓	✓		
Visual privacy in principal areas of dwelling units.		✓	✓		✓
Relevance to vernacular architecture		✓	✓		✓
Access to a private open space		✓	✓		✓
4. Flexibility and adaptability					
Potential for horizontal or vertical space modification.		✓	✓		✓
Maintenance of building components		✓	✓		✓
Adaptability to add renewable energy sources		✓		✓	✓
Potential for internal space modification.		✓	✓		✓
5. Indoor comfortable environment					
Effectiveness of functionality and Internal circulation		✓	✓		✓
Appropriate daylighting in primary occupancy areas.		✓		✓	✓
Noise and Acoustics control		✓		✓	
6. Energy and resources efficiency					
Building orientation	✓			✓	

Main and sub-categories	Literature findings	Fieldwork findings	Missing From JGBG	Modified from JGBG	New eco-cultural indicator
Building envelop	✓			✓	
Shading device	✓			✓	
Use of local materials and techniques	✓	✓	✓		✓
7. Neighbours right and impact of context					
Solar access right	✓			✓	✓
Density and crowdedness	✓	✓		✓	✓
Typology and massing		✓	✓		

The indicators in Table 6.1 can be aligned into two groups. The first includes indicators of flash floods risk and typology and massing were both identified as essential for sustainable design for Jordan that was also missing from Jordan's green building guide. Although flash flood risk is not an indicator related to vernacular architecture its dangers are increasing in Jordan due to high urbanisation rates and climate change effect. Typology and massing are an indicator evident in vernacular architecture design in Jordan that can affect the energy efficacy and thermal comfort of a building. The other group of indicators includes ones of generic nature such as appropriate daylighting in primary occupancy areas, building orientation, building envelop, shading devices. All expect noise and acoustics control were already included in Jordan's green building guide. However, their criteria were lacking some vital requirements that were revealed from the case study analysis. Table 6.1 illustrate the socio-cultural indicators included in the framework of similar bodies of research. As seen from Table 6.1 and Table 6.2, most of the identified tangible and intangible indicators have not been covered in sustainable building assessment methods and literature sources.

Table 6.2 Socio-cultural sustainability indicators available in similar research work

	(Al-Jokhadar and Jabi 2017)	(Surf and Saied 2014)	(Al-Haroun 2015)	(Al-Zubaidi 2007)	(Atanda and Öztürk 2020)
Title	Towards a contemporary vernacular high-rise residential development in the Middle East and North-Africa	Challenges facing the application of sustainability to housing in Saudi Arabia	Contemporary attitudes to vernacular elements in Kuwait's domestic architecture	The sustainability potential of traditional architecture in the Arab world	Social criteria of sustainable development in relation to green building assessment tools
Available socio-cultural indicators	Hierarchy of Spaces, Social Interaction, Accessibility, Privacy, Hygiene, Spirituality	Privacy, Affordable Housing, Local Culture	local materials, Affordable to the consumer, Mental Health, Privacy	Neighbourhood relationships, Privacy, neighbours' rights, Cultural Identity, Hospitality	Equity, Education, Participation, Social cohesion, Health and safety, Accessibility, Cultural values

For example, urban heat island requirements in Jordan's green building guide included only using materials with high albedo values. The guide did not mention the importance of green spaces and plants for reducing this effect. This was also coupled with the high importance of participants assigned for the availability of green spaces and trees. For daylighting, Jordan's green building

guide uses the windows glazing factor as the primary measurement indicator for adequate daylight indoor areas. On the other hand, participants discussion and requirement for daylight was heavily linked to feelings of openness to the surroundings and absence of obstacles between windows and the direction of sunlight. Furthermore, building orientation requirements in Jordan's green building guide was only concerned with sun movement. Building orientation criteria should be expanded with more points allocation and additional design criteria for dwellings rooms' arrangement based on the orientation. Although shading devices are covered sufficiently in Jordan's green building guide this study felt the need to extend its requirements and function to cover social and cultural requirements such as privacy. This dual function for shading elements is evident from vernacular architecture in Jordan and the MENA region and from discussions with case study participants.

These indicator's importance is also evident from discussions with interviews participants where the fact that they discussed them point out that they felt they were missing or not available optimally. Therefore, it was essential to include these indicators in the initial research framework and proceed to evaluate and test their suitability for the context of Jordan. This is due to the pressing nature of these indicators for sustainable design which is currently lacking from Jordanian practice and green building guide. It was also essential to assess these indicators as their importance and integration requirements change from one region to another. The emphasis here is on the degree of importance these indicators are and how much are they are considered a regional priority which is one of the main targets for this research. The following sections illustrate the rationale for including these indicators as well as illustrating the main design rules deployed in the content of the framework.

6.2.1 Eco-cultural category: Site sustainability

6.2.1.1 Eco-cultural indicator: Flood risk

Jordan's natural disasters outline includes earthquakes and flash floods, and drought (WFP 2019). Among these, Floods are increasing in intensity and frequency due to urban sprawl, lack of drainage systems and climate change (Farhan and Ayed 2017). Flash floods are mainly a severe issue for households that are located within natural drainage areas and below natural ground levels (Al Qudah *et al.* 2016). This risk is not addressed in Jordan Jordan's Green Building Guide but was frequently discussed with case study participants. To address this gap, the following practices, recommended in the proposed eco-cultural tool, should be considered (Liao *et al.* 2016; Barsley 2020; Watson and Adams 2010; Bowker 2007):

- **Elevate Above the Flood Level:** The floor of the lowest inhabited floor of the building should be elevated 1.60 cm above street level or where water would be coming from
- **Build with Flood Resistant Material:** Flood resistant materials are those which can last in contact with floodwaters for at least 72 hours without significant damage.
- **Apply Coatings, Sealants, and Waterproof Veneer**. Dry floodproofing such as Coatings, sealants, and waterproof veneer prevents the entry of floodwaters. A waterproof veneer can consist of a layer of brick backed up by a waterproof membrane, sealing the exterior walls against water penetration.
- **Raise or Floodproof HVAC Equipment and Mechanical, Plumbing, and Electrical System Components**: Locating service equipment above the flood protection level is generally the best way to protect it. Such equipment includes heating, ventilating, air conditioning, plumbing appliances, plumbing fixtures, duct systems, and electrical equipment, including service panels, meters, switches, and outlets.
- **Construct Permanent Barriers:** Placing a permanent barrier around the structure in question can prevent floodwaters from reaching it.
- **Install Sewer Backflow Valves:** Sewer backflow valves prevent flooded sewage systems from backing up into a home. In certain flood-prone areas, this issue is common and can cause damage that is both difficult to repair and hazardous to occupants' health. Generally, gate valves are preferred over flap valves because they provide a better seal against flood pressure.

- **Grade the property garden and setbacks Away from the dwelling:** One final method that architects can use to mitigate flooding damage is to grade the lawn away from the dwelling.

6.2.1.2 Eco-cultural indicator: Use of vegetation and the presence of greenery

There are several benefits to incorporating plants into a project's design. The shade provided by the plants reduces the cooling load of the building, provide ambient and pleasant feelings for pedestrians and increase the quality of air in the area (Kotzen 2018). Participants in the interviews knew a lot of these points and heavily linked sustainability in the built environment with the presence and degree of greenery. On the other hand, the capacity of planted spaces in buildings to support these tangible and intangible benefits is not well established in Jordan's Green Building Guide. Jordan's Green Building Guide mentions both greenery and urban heat island effect together. However, due to the great importance users have assigned to greenery, it was vital for greenery and urban heat island effect criteria to be separated into two different categories.

Moreover, there is a clear need for a greenery metric to link this qualitative aspect with a measurable assessment indicator. Green plot ratio (GPR) represent a suitable metric for the ratio of total vegetated surface area (on the ground and roofs, and including trees), divided by total site area (Breda 2003). Green plot ratio (GPR) is a relatively recently developed architectural and planning metric for assessing and facilitating greenery in master planning, as well as an architectural design tool for individual buildings. It can reflect the desired degree of greenery from the viewpoint of the planners and users (Ong 2003). In addition to GPR calculation, the achievement of vegetation and greenery can be ensured using native deciduous plants species and trees.

6.2.1.3 Eco-cultural indicator: Urban heat island effect

Participants indirectly discussed the cooling effect that plants have on outdoor temperatures. Participant also discussed how dark coloured surfaces and the absence of shading plants increases heat emitting from pavements and exposed surfaces at summertime for long periods of time that last until nighttime. Indeed, high summer temperatures and urban heat island effect are an increasing issue in Jordan's urban areas that increase energy use for cooling (Al-Kurdi and Awadallah 2015; Al Jadaa *et al*. 2019). The heat island effect is mainly due to the lack of greenery and the high level of solar radiation absorbed by the urban surface (Ross *et al*. 2015; Kotzen 2018). Jordan's Green Building Guide only favours the use of building materials with high albedo values as the primary strategy to counter the heat island effect. Using plants and trees in buildings projects is suggested to shade pedestrian sidewalks and awards two points in total. Furthermore, the two points are only awarded for achieving 100% coverage of pedestrians' routes with high solar reflective materials or shading trees. Therefore, it is necessary to introduce more shading plants and greenspace related criteria and points allocation to counter the urban heat island in the eco-cultural design tool. The following design and planning methods are suggested to mitigate the effects of urban heat island for the context of Jordan (Andric *et al.* 2020; Karimi *et al.* 2020; Gago *et al.* 2013; Besir and Cuce 2018):

1. Increase the percentage of green coverage and trees and vegetation to more than 50 % of open spaces and exposed surfaces.
2. The use of an open-grid pavement system in open spaces where trees are not suitable for use.
3. Shading structures using energy generation systems, such as solar thermal collectors, photovoltaics, and wind turbines, can be included in calculating the coverage percentage.
4. The use of green roofs and façade can also be counted into the calculation of shaded surfaces and spaces. A green roof is simply a roof that includes plants and vegetation. Green roofs harness the same evaporative cooling effect that cities lose when they hack away vegetation.

6.2.2 Eco-cultural category: Social relationships

6.2.2.1 Eco-cultural indicator: Social interaction

Social relationships from the perspective of urban design are enhanced in a community when residents have opportunities for contact, live close to others and have appropriate space for interaction (Williams 2005). Providing chances for quality interaction through design increases repeated passive contacts between residents, forming social relations (Mangut *et al*. 2020). Jordan's Green Building Guide interpreted social relationships minimally with the availability of services within a walkable distance. Therefore, it was necessary to introduce additional design indicators for enhancing social interaction on the level of the dwelling. The following design and best practice measures are suggested for implementation in the eco-cultural design tool (Williams 2005; Manzo and Perkins 2006; Mousavinia *et al*. 2019; Mangut *et al*. 2020):

- Increasing proximity between dwellings entrances positively influences patterns of socialising. Immediate neighbours tend to communicate more with each other than residents living further apart. Residents living in the middle of a row of dwellings communicate with the other residents more than those who live at the community's edge.
- The use of semi-private space between private, public or communal spaces can increase the threshold of forming good social relations between neighbours. They provide a gentle transition between public and private spaces. They can create a protective barrier providing a degree of privacy and territorial control with active contact options into adjacent public space.
- The creation of opportunities for surveillance within the community. Residents' ability to see and hear others using public spaces outside their home greatly influences their sense of community and enables them to observe others with whom they would like to interact. Thus, enabling surveillance through views from dwellings windows, balconies and terraces to the street and nearby playing ground or gardens maximises social interaction and increases the feeling of safety and security.
- Providing shared pathways to activity sites such as parking spaces and shared local facilities. Shared activities spaces such as gardening lots in a community also increase the potential for social interaction.

6.2.2.2 Eco-cultural Indicator: Walkability of streets and pathways

Interviews results showed that walkability indicators were more prioritised by participants when discussing the walkability of streets. Furthermore, the degree of street walkability also influenced the perception of fear of crime for participants in the study, particularly for women at night. The absence of people walking along inadequate quality sidewalks with low lighting at night was the main deterrent to walking for many residents.

Jordan's Green Building Guide indicates the importance of walkable and shaded pathways. However, it does not entitle any criteria or set credit points for walkability indicators. The following criteria are suggested to fill this gap in Jordan's Green Building Guide and enhance user's walkability experience in new residential development. These design options tend to increase pedestrians' perception of safety while also providing shading and other amenities to them (Nasution *et al.* 2018; Van Cauwenberg *et al.* 2012; Ewing and Handy 2009):

- Pedestrian routes and sidewalks should be continuous, with even surfaces and no significant or sudden change in level or texture for the whole path.
- Pedestrian sidewalks and paths should be at least 2 meters in width to accommodate two people to walk side by side.
- Reduce the number of obstacles such as poles, signs, chairs along sidewalks. Stairs are considered an obstruction if no alternative is available for people with mobility disabilities
- Reduce the number of potential vehicle conflict points, including intersections.
- The availability of a green buffer zone further increases the zone between pedestrians and vehicular traffic. This buffer zone should be planted with trees to provide shade for pedestrians and include street furniture.

Pedestrian routes should be well lit, with 4 meters between each light pole as the minimum value that brings comfort to social contact.

6.2.2.3 Eco-cultural indicator: Proximity to services

The fieldwork study revealed that there is still a lack of nearby services, transportation and schools in the newly developed king Abdulla city, where residents extensively relied on their cars to reach these services. Jordan's Green Building Guide only includes one optional criterion that awards one credit score for the availability of services within a 2 Km distance from the project without stating what type of services are needed. Adequate provision of social services, including health and education, should be available within a distances radius as follow (Awadh 2017; BRE 2016; Mattoni *et al.* 2018; Nguyen and Altan 2011):

1. Amenities and support services, such as health, houses of worship and community centres or meeting houses, should be available within a 2km radius.
2. Local food retail and a major commercial centre or street should be available within a 2km radius.
3. Schools: a pre-school should be available within 500m, primary schools within 1km and a high school within a 2km radius.
4. The availability of bus routes and a bus stop within 500m to 1 km from the project.
5. Play and leisure: a toddler play park within 500 m and a public park within a 2 km radius.

6.2.2.4 Eco-cultural indicator: Provision of public open space

Public open spaces in the form of parks or recreation areas were essential factors for the study participants to determine a residential neighbourhood's sustainability and liveability. Jordan Green Building Guide agree with the importance and role of open spaces in the built environment. It provides one optional criterion for the provision of open space by reducing the building's footprint on the site, which awards one score only.

A building footprint is a metric used to determine the quality and availability of open space in urban and building projects (Mangut *et al.* 2020). It represents the ratio of a building's total floor area (gross floor area) to the size of the piece of land upon which it is built. It is often used as one of the city planning regulations, along with the building-to-land ratio (Caves 2005). Reducing the building footprint alone is not enough to promote biodiversity and provide adequate open space standers (Kotzen 2018). Furthermore, the green building guide does not address when local codes have no open spaces requirements or whether the local code provides adequate minimum area requirements for open spaces (Malik 2017). For implementation in the eco-cultural toolkit, the following scenarios should be considered when designing for low building footprint on-site (Cohen *et al.* 2019; Nasution *et al.* 2018; Aswad and Damayanti 2020).In the first scenario, there is a legal requirement for an open space:

- The area of the public space should surpass that required by 25% (minimum practice)
- The area of the public space should surpass that required by 50% (good practice)
- The area of the public space should surpass that required by 75% (best practice)

In the second scenario, there is NO code for open space availability or no open space area is required by code:

- Open space, an open green space equal to 35% of the site area should be available (minimum practice)
- Open space, an open green space equal to 50% of the site area should be available (good practice)
- Open space, an open green space equal to 65% of the building footprint area, should be available (best practice).

The following criteria should also be applied for credit compliance of open space:

- Vegetated roof areas can be considered for the achievement of this requirement.
- Pedestrian oriented hardscape areas are permitted toward credit compliance
- 25% of the open public space should be planted with suitable local species of plants.

- The designated green open space area should exclude car parking and car driving paths within the project.
- The open space should be overlooked by building frontages.
- The open space should be of high biodiversity value, with at least 50% of the total open space be vegetated.
- It should be designed to be secure, safe and acceptable for all users.
- The open space should be provisioned with seating, resting spots and with shelter and shade.

6.2.3 Eco-cultural category: Cultural and perceptual

6.2.3.1 Visual privacy in principal areas of the dwelling

Protecting the dwelling from direct outdoor views was an essential issue for the study participants to achieve visual privacy for the family and was one of the most regarded and discussed indicators. Despite this importance, privacy is unaccounted for in Jordan's Green Building Guide as it has no criteria or points allocated for its improvement. Proper distribution of spaces and openings and offering unique treatments, such as screens, partitions or greenery in front of private spaces, are potential solutions for maintaining the family's privacy (Atanda 2019). Based on interviews and study results, the following design criteria are proposed to be integrated into Jordan's Green Building Guide to help achieve the privacy of the family inside their dwellings (Tomah *et al.* 2016; Kennedy *et al.* 2015; Mandhan *et al.* 2016; Al-Kodmany 2018):

1. There should be at least nine meters of separation between principal rooms windows of adjacent dwellings.
2. The distance between windows, porches and balconies of adjacent dwellings should not be less than twelve meters. In the case this requirement can be achieved, the designer should avoid direct views between the main living areas and private open spaces of adjoining units.
3. Direct views should also be obscured using design elements such as high boundary walls, screens, or plants.
4. Provide semi-open and semi-private areas of the dwelling with enough visual privacy. Terraces, balconies should not be directly positioned toward openings and balconies from nearby buildings.
5. Back gardens should have a high boundary or vegetation wall to preserve their privacy. Jordan's Green Building Guide should also set maximum grading allowance so that the position of ground floor gardens level above ground does not exceed the original level of the site before development to decrease exposure to neighbours' semi-private zones and gardens.

6.2.3.2 Eco-cultural indicator: Relevance to vernacular architecture

Many interview participants were even aware of the many sustainable advantages that vernacular architecture once provided for their inhabitants. Eco-cultural architecture needs to be culturally relevant to the vernacular architecture, emphasises its sustainability lessons while preserving modern housing requirements. Based on study results and literature review, the following vernacular architecture design elements are suggested for integration within Jordan's Green Building Guide (Loo and Mahdavinejad 2017; Sayigh 2019; Balbo 2013; Adwan and Abu Muhsen 2016; Semahi *et al.* 2019; Amro and Ammar 2020):

- **Compactness:** Compact urban form, shading building, shaded walkways. Protection from direct solar radiation and hot wind.
- **Orientation:** It has been noticed that most vernacular buildings were oriented towards the south and extended along the east-west direction to benefit from passive heating supplied by solar radiation.
- **Solid walls & minimum openings on the western and** southern façades to delay and reduce solar

- **Small, recessed windows to** control indirect natural light; thus, less heat gain. The area of openings on the south façade should be the largest in relation to the exterior walls' total area. At the same time, it should be minimised on the northern facades to reduce heating energy demand in the building.
- **Local Building materials and construction methods**: Achieving energy-efficient, bioclimatic design requires the use of local materials for buildings.
- **Building typology.** Spatial organisation and plan design affect the production of a bioclimatic building. For example, the arrangement of building components around courtyards is a standard plan layout of vernacular buildings in the Middle Eastern region that have passive cooling purposes.
- **A flexible adaptable structure towards its users changing needs and socio-economic situations.**
- **The availability of a privately owned open space**. To allow for family gathering and growing of plants.

6.2.3.3   Eco-cultural indicator: Access to a private open space

Interview results revealed that a dwelling must meet its occupant's personal and collective social and cultural preferences to be considered liveable and sustainable. For nearly all residents, the availability of a privately owned open space such as gardens, balconies or terraces was of the utmost importance, especially when living in multi-apartment buildings. Participants remarked on how external private space contributed to a sense of spaciousness and offered them an alternative place of occupation without necessitating social contact. Notably, a private balcony allowed the resident to move to an outdoor space without leaving the residence.

Furthermore, for many participants, small balconies and narrow gardens were not appropriate for them, and many changed their design or purpose of use. Jordan's Green Building Guide should include criteria for the availability of private open space and determine what qualities that space possess for it to achieve its intended purpose. The following design indicators should be considered when designing an open private space in Jordan's Green Building Guide (Mangut *et al*. 2020; Kennedy and Buys 2015; Lewis *et al*. 2018; Swapan *et al*. 2019):
- Private open space should preferably be directed towards the south or southwest while providing adequate protection for the envelope from excessive solar exposure.
- Private open space should have an adequate size and proportions that enable the realisation of various housing needs, such as a living room's function during warm days and evenings.
- Private outdoor space should have a minimum area of 6 m2 and a minimum dimension of 2m, and for ground-level units as having a minimum area of 16 m2 and a minimum dimension of 4m.
- An adequate level of acoustic isolation from street noise
- An adequate level of visual privacy from the street and neighbours
- Protection against adverse weather conditions (wind, rain, sun)

6.2.3.4   Eco-cultural indicator: Access to exterior views

The availability of terraces and balconies offers with the outside context and environment. Participants in the interviews wished to access the outside environment to enjoy the views, especially those living on upper floors, where they do not own a private garden and connect with the social life on the street. Moreover, the absence of quality views from dwellings was one of the critical housing problems linked to the increased prevalence of mental health symptoms (other indicators that participants felt were missing included daylight, noise, and inadequate privacy perception. Another issue that had great importance for participants who lived in dense developments, windows overlooking other homes, can intrude on peoples' sense of privacy.

For a metric to assess access to views from dwellings, Bonnefoy (2007), Kaplan (2001), and Prochorskaite (2016) suggested using the area of open spaces, terraces, balconies, and glazed

facades that are connected directly with the outside context. Additionally, for integration within Jordan's green building guide, the study suggests conducting a subjective third-party expert assessment of exterior views in projects. Assessors could be asked to define the quality of views to fall one of the four following outcomes:

- External objects seen from upper-level windows are less than 10 m away (views are not significant even from roof level).
- External objects that are seen from upper levels windows are no closer than 15 m. or views are visually acceptable from top floors
- External objects that are seen are no closer than 20 m, and views include features of interest or natural features that can be seen starting from mid to top levels
- External objects that high levels windows are more than 20 m and views include features of considerable interest or natural features that are visually attractive.

6.2.4 Eco-cultural category: Indoor comfortable environment

The Jordan Green building guide discussed indoor environment issues such as air quality, lighting, and ventilation in concern with energy-saving and thermal comfort indicators only with little regard to occupant well-being and comfort. This study revealed that issues related to perception for openness, quality of design, and interior space planning dominated participants' views of the indoor environment. The following illustrate missing indicators to be included with the eco-cultural tool.

6.2.4.1 Eco-cultural indicator: Appropriate daylight in primary occupancy areas.

While some daylighting strategies are included in Jordan's Green Building Guide, it uses the windows glazing factor as the primary measurement indicator for adequate daylight indoor areas. Other used criteria include the use of energy-saving light sources. However, the study results showed that participants associated appropriate daylighting in the dwelling's principal rooms with openness to the surroundings and absence of obstacles (mainly tall structures) between windows and the direction of sunlight during various seasons. To address this limitation, the study suggests using the daylight factor as an additional metric for measuring appropriate daylight in primary occupancy areas. Daylight factor (DF) characterises the amount of daylight space receives compared to what is available from the sky. Daylight factor (DF) can be calculated using the following equation where $DF = \left(\frac{Ei}{Eo}\right) \times 100\%$ where Ei represent illuminance due to daylight at a point on the indoor working plane. E_o represent simultaneous outdoor illuminance on a horizontal plane from an unobstructed sky. In addition, the following criteria should be considered (Al Horr *et al.* 2016; Zarghami *et al.* 2017; Fatourehchi and Zarghami 2020):

- Maximise access to natural daylight in interior shared spaces with at least two hours a day of sunlight. This can be done by creating a skylight or shared inner courtyard and using clerestory windows and fanlights to supplement daylight access.
- Consider using two-story and mezzanine arrangements to increase daylight access to the living rooms and private open spaces of apartments with limited daylight (e.g. ground floor apartments)
- The design of the dwellings plan should utilise the use of dual aspect apartments with the long elevation of the building facing east and west. The design should avoid the use of single aspect apartments with a northerner aspect and limit the depth of single aspect apartments when forced to use it.
- A dual aspect apartment (or double aspect apartment) is an apartment that has been designed with openable windows on two or more walls, allowing for views in more than just one direction. The windows may be opposite one another or adjacent around a corner.
- The number of entirely single aspect apartments with a northerner aspect (North-west to north-east), should not exceed 10 per cent of the total number of units proposed.

- Living areas and gardens should be located to the south and service areas to the north of the dwelling.
- At least 70 per cent of living rooms and private open spaces in the proposed development should receive a minimum of three hours of direct sunlight between 9 AM and 3 PM in mid-winter (against 50% stated by the Jordan's Green Building Guide)
- The following things should be considered when planning rooms' arrangement: (1) The kitchen should be given the direction between the northeast and south-east (2). Living areas should be in the extreme of south-east direction because much light is available there (3). The bedrooms should be given the direction between south-east and north-west (4). The suitable place for store and staircase is between north-east and north-west because less time is spent there, and they need less light (5). Open private spaces should be constructed in the southern direction (6).

6.2.4.2 Eco-cultural indicator: Effectiveness of functionality and Internal circulation

Adequate design of floor plans and hierarchical transition from public to private zones and formal to fewer formal spaces are essential considerations to attain an acceptable level of privacy and comfort for residents. Following interviews results and examples used by Al-Jokhadar (2018); and Abousaeidi and Hakimian (2020), the hierarchical system of spaces in residential units for this study can be classified into six types:

1. **Public spaces** which are linked directly with the outside world with no restrictions on interaction (outdoor areas beyond the dwelling's boundary such as streets and parks)
2. **Semi-public spaces represent shared and communal spaces of one building or group of dwelling units** linked with outdoor spaces via a controlled entry point (entrance hall and other communal areas of an apartment building).
3. **Private open spaces** represent a transitional area between semi-public or public open spaces and private zones and are only accessed by one household. (e.g. gardens, courtyards, balconies and terraces).
4. **Semi-private indoor spaces** that are dominantly used by visitors to enhance the social interaction with the family (e.g. guest-hosting rooms).
5. **Private spaces:** this type relates to activities, such as living rooms, kitchen, toilets, and storage areas, that maintain the household's privacy.
6. **Intimate spaces** that are controlled directly by the family (e.g. bathrooms and bedrooms).

The study revealed that participants from both case study areas in Jordan valued a clear hierarchy of spaces from public to semi-public, then private and intimate domains. Such an arrangement could offer privacy for the family, which is one of the most critical social requirements for residential dwellings. The tool does not suggest following one design alternative for the dwellings plan. Instead, it supports designers to arrange these spaces in a hierarchical order based on the following user preferences related to orientation, position, and cluster of spaces with the sun and ventilation. These design guidelines aim to make residents able to manage their desired rate of social contact, increases degrees of privacy and security, and at the same time maintain general comfort and well-being conditions:

- The building layout should promote a hierarchy of spaces from most private (bedrooms) to less private living areas and kitchens to guest-hosting spaces and main entrances.
- The allocation of rooms based on function and type to create a thermally controlled zone that enhances indoor environment quality for the family. Thermal zoning is the positioning of the building spaces regarding the sun's path, prevailing winds, opening's locations, and landscape design, leading to improved thermal comfort in relation to the functions and climatic requirements. In hot, dry climates, the concept of thermal zoning or heat buffering entails creating intermediate semi-controlled zones that serve as an active double skin or even triple skin. These zones block the heat in the mass of spaces and

include courtyards, deep veranda, porches and landscaping bioclimatic strategies (Semahi et al. 2019; Attia 2014).

- The following should be attained when designing the floor plan of dwelling units. Direct access between the dining room, secondary bathroom and guest rooms (1). Direct access between the living area, kitchen and pantry (2). Bedrooms and their bathrooms should be clustered together (3). There should be direct access or via lobby from the kitchen, guest-hosting area and private open space (4).

6.2.4.3   Eco-cultural indicator: Noise and acoustics control

Jordan's Green Building Guide advised using sound-insulated materials and appropriate thickness for the building envelope to avoid noise penetration from the outside streets and their neighbours. However, the study results revealed that residents were more concerned about the noise's direction and which rooms inside the dwelling were more affected the most by the noise. For example, residents were more concerned about street noises in bedrooms than the same living rooms and kitchen noises. This indicates the importance of the dwelling's layout as a tool to control noise and acoustics in dwellings. Park and Lee (2019) argued that there is a need for a post-occupant survey to understand occupants' responses to the existing sound levels in each project separately. An analysis of the recorded and recommended sound levels and the occupants' responses would also help determine the comfort range of the noise factor for residents. Thus, the study argues that envelop thickness and modifications alone could not predict the subjective responses toward the degree of noise. Other issues such as dwelling typology and ownership seem to have significant associations with the degree of responses to the degree of discomfort reported from the perceived noise level.

The Jordan's Green Building Guide and rating systems should consider the debate on plan layout, especially the impact of open plans on acoustic performance inside dwellings. Additional architectural elements and details in the building design can help reduce noise transmitted inside dwellings. For example, Moroke (2019) recorded that balconies give nine dBA noise reduction, and windows with staggered openings give 20 dBA reduction. Both treatments are well-known elements used in traditional vernacular dwellings in the Middle East (Balbo 2013). Moreover, treatments for walls and floors using dense materials (stone or mudbrick) and thick solid walls are essential to avoid unwanted voices or sound reflections to the outside streets and their neighbours (Sözen and Gedík 2007; Mortada 2016). Additional vernacular architecture inspired strategies which could be used for achieving acoustical privacy include (Al-Sallal 2017; Daoudi *et al*. 2019; Nguyen *et al*. 2019):

- The vertical separation between living rooms, which are active spaces, and intimate spaces, which are the quiet zone in the dwelling, through allocating bedrooms on upper floors.
- The horizontal separation between living rooms and bedrooms through transitional space reduces noise transmission.
- Thick exterior walls, however, such treatments could affect the size of spaces, penetration of natural light and ventilation and must be attained to issues if used.
- The use of landscaping features, such as trees and shrubs around dwellings.
- Use of transitional places between indoor-outdoor such as balconies and corridors.
- Staggered and recessed openings' size and quantity in direction or orientation of anticipated heavy noise.

6.2.5   Eco-cultural category: Adaptability and flexibility

The previous fieldwork and study revealed that there is still an ever-changing socio-economic situation that accompanied the lives of many residents from the case study, which could impose changes on people's lifestyles and eventually the design of their dwelling. Many residents have made changes to their dwellings, and some of these changes had a negative impact on the thermal comfort, durability, and energy performance of the dwelling. Furthermore, many of these changes were made against local municipal and building regulations in Jordan.

Flexibility and adaptability are, therefore, essential indicators for an eco-cultural architecture. Flexibility and adaptability in buildings offer several environmental, social and practical benefits. Less waste is one of the most important benefits due to more precise purchasing, planning, cutting of materials, and appropriate recycling opportunities (Estaji 2017). Jordan's Green Building Guide should evaluate residential buildings to be able to cope with new lifestyle requirements.

The changing demand in Jordan's case includes but is not limited to an increase in the size of families, increase in income and changes in the surrounding urban built environment such as the erecting of a new building and changes of street width and function. The ability to achieve adaptability and flexibility in design is a conscious effort to create dwellings that meet the occupants' present needs and their future needs at an affordable rate. Therefore, they are among the most critical strategies for affordable, sustainable housing (Anih *et al.,* 2019). Table 6.3 below illustrates the synthesised Indicators for eco-cultural flexibility and adaptability in residential buildings and their achievement objectives to be included in the eco-cultural tool.

Table 6.3 Indicators of flexibility and adaptability in residential buildings

Flexibility and adaptability sub-category	Objective	Assessment indicators
Potential for horizontal or vertical space expansion.	To assess the potential of the structure for future vertical or horizontal space expansion of the dwelling.	- Site and space availability for future extensions. - Configuration of existing nearby buildings. - Bearing capacity of the structure - Effect on neighbours and laws and regulations. - Degree of technical, design difficulty and capital cost requirements linked to expansion possibilities.
Maintenance of building components	The selection of design material, elements and structural systems allow for easy and long-term maintenance of the dwelling.	The building envelope, HVAC, water and electrical systems offer a degree of flexibility that will allow residents to change and maintain them with a reasonable level of renovation work and cost. The dwelling design offers the ability to alter the building envelope or technical systems to suit residents' needs. This includes light fixtures, electrical wiring, water and drainage pipes, and acceptability to roof equipment.
Adaptability to change in or add renewable energy sources	To ensure that the building can, in the future, be adapted to run on a different energy source than initially anticipated, or to install photovoltaic systems.	The ease or difficulty in installing heating or cooling equipment that requires a different fuel, or installing photovoltaic systems. Characteristics of roofs, walls as well as the orientation and degree of shading on the building may support or hinder the installation, operation of photovoltaic or solar thermal systems.
Potential for Internal space modification.	To assess the potential of changes in the use and layout of spaces within the building in a minimum cost and time requirements	Design housing with flexible spaces such as dividable rooms, secondary suites and the possibility to make customisation to doors and semi-private spaces like the option of adding shading panel and changing door colour.

6.2.6   Eco-cultural category: Energy and resources efficiency

Many participants in the interviews were aware of how vernacular architecture offered enhanced thermal comfort and energy-saving conditions to their residents. Jordan's Green Building Guide emphasises energy efficiency in its assessment criteria, with more than one-third of the total weight of points allocated to it. However, the main focus of energy and resources criteria was on the conservation of energy in active systems. There is negligence towards consideration of passive design measures in Jordan's green building guide, some of which were used in local vernacular

architecture. Passive building design applies climatic and other context considerations that contribute to saving limited resources, reducing energy consumption and improving environmental quality (Mahmoud Bayoumi 2018). The following illustrates passive energy issues and indicators that were not addressed within Jordan's Green Building Guide.

6.2.6.1   Eco-cultural Indicator; Building Orientation.

Jordan's Green Building Guide concluded that the southern direction is the best orientation for buildings facades in Jordan highland regions to minimise the heating load. On the other hand, the north orientation is best suited to minimise cooling loads in the Jordan desert and valley regions. Building orientation criteria in Jordan's green building guide awards one point only for achieving either of these conditions. Research results revealed that participants were more concerned about the rooms' type and function that receive the most and least benefits from building orientation. Building orientation criteria should be expanded with more points allocation and additional design criteria for dwelling rooms' arrangement based on the orientation.

The dwelling rooms and spaces with the most occupancy time should be given the south most direction. (1) The kitchen should be given the direction between the north-east and south-east (2). Living areas should be in the extreme of the south-east direction because much light is available (3). The bedrooms should be given the direction between south-east and north-west (4). The suitable place for store and staircase is between north-east and north-west because less time is spent there, and they need less light (5). The verandas are constructed in the southwest direction because the sunlight is severe in summer in this direction (6).

6.2.6.2   Eco-cultural Indicator: Shading devices

Shading devices are a significant climatic and passive design consideration. Shading devices have several advantages: reducing glare, preserving privacy, allowing outside view, improving the architectural design, and reducing cooling loads without affecting passive solar heating and increasing occupant thermal comfort (Mahmoud Bayoumi 2018). Jordan's Green Building Guide shading devices criteria only covers its role in reducing unwanted solar gains on windows only with no significant discussion on the importance of shading for other envelope components such as roof and façade. The shading devices section in Jordan's green building guide should therefore be expanded to cover shading devices for other envelop components as well as self-shading structures. The guide should also include criteria regarding the use of trees to shade the building during the hot season. Other criteria proposed for the eco-cultural tool include the following:

- Deciduous Native types of trees should be planted to cover facades and openings of the building envelop facing the equator. These trees should provide shading of about 40% of the total facade area during the warm season within five years.
- Use Shading devices on openings and walls exposed to the high solar heat where trees cannot be planted without compromising light and air access.
- Other passive design strategies for shading include Offset windows or balconies on elevations that face each other (1). using shaded films and screes, recessed balconies and or vertical fins between adjacent balconies (2). Solid or semi-solid balustrades on balconies (3). Louvres or screen panels on windows and or balconies (4). Planter boxes vegetation as a screen between spaces and on walls (5).
- The use of shading elements or self-shading structures for the roofs as they a significant source of thermal gain.
- In the case of an apartment block with an undesirable position, all the parts of a building that is exposed to excess solar gain should be covered through a veranda or a corridor and be isolated from other rooms to minimise the heating and cooling load required.
- Increase external sources of ventilation and sunlight by appropriately positioning openings and shading devices to allow for more indirect daylight and repelling of excessive solar heat gain.

6.2.6.3　Eco-cultural Indicator:　Building envelop and opening

The façade and envelop design should respond to any positive characteristics in the local area and street, directly informing the design response. Furthermore, envelop design should also reflect existing local patterns, rhythms or dimensions. Building envelopes in Jordan Green Building Guide are mainly concerned with technical indicators such as window shading coefficient, transmission, and U-values of enveloping components. More emphasise and point allocation should also be geared toward the following points (Ross et al. 2015; Nguyen et al. 2019; Engin et al. 2007):

- The design of the envelope should consider the orientation of the building and change the specification of the envelope to either maximise desired wind or sun position or avoid the undesirable position of windows and balconies in direct contact with other openings of neighbouring buildings.
- Solar control measures: This should be achieved by limiting or increasing the window to wall ratio (WWR) based on the direction of the façade (1). Light coloured external finishes can also reduce the absorptance of solar radiation (2). Landscape elements such as shade trees and ground cover can also help if properly placed to block the sun and reduce the reflectance (3).
- Openings and windows could be narrow from the inside and wide from the outside to narrow vision angles, provide more privacy and prevent undesirable direct sunlight from entering.
- Solar Collection Envelope (SCE): Through the generation of the self-shading envelope that assures the exposure of the elevations and sidewalks to the desired winter sun and creating the appropriate shading during the critical hours of the summer days.
- Self-shading can be assured using double-skin facades, verandas, balconies, porches, roof components and over-hangers. The façade subdivision and compactness should also reflect existing local patterns, rhythms or dimensions.
- Thermal and humidity control is essential for building skin in hot climates. The use of wall cavities, thermal mass, and external reflective materials on the roof and facade can help prevent heat gains and suppresses these exchanges.
- Design the façade to optimise its orientation to the street and key views (e.g. Façade elements may be angled towards a water body) where frontages should include windows to main habitable rooms.
- Natural ventilation systems: cooling systems in vernacular architecture in hot climate zones are based on natural ventilation. Among various schedules observed in traditional dwellings, there are three basic models distinguished by Sørensen (2008), that may be applied in contemporary architecture, such as (1) Cross ventilation based on the pressure difference across the building. (2) Chimney ventilation is based on the under-pressure effect caused by the rising hot air. (3) Wind catchers and wind towers based on air movement and pressure.

6.2.7　Eco-cultural category: Impact on context

6.2.7.1　Eco-cultural indicator: Density and feeling of crowdedness

Density is a term representing the relationship between a given physical area and the number of people who inhabit or use the area. It is expressed as a ratio of population or number of dwelling units to an area (Wahid *et al.* 2017). However, density itself cannot create a good or bad environment because density is only a measurement, not an independent factor that could create a good or bad urban built environment (Bradecki *et al.* 2017). The population density in development might not be a practical measurement because it will be lower with small households such as empty nesters than with large families with several children (Mousavinia *et al.,* 2019). Another area of confusion is crowding, a perception that there are too many people (Karakiewicz 2004). For many participants, the feeling and perception of high density are associated with ugliness, congestion, and crowding. The study revealed that occupant perception

of density is related to qualitative issues such as housing typology and the number of dwelling units in an area rather than quantitative indicators of how many people live within one square km or unit space. The study also revealed that the size of a community (social group size) also significantly influences density and crowdedness. There also appear to be fewer social interactions in apartment buildings with a larger number of dwellings. Therefore, it can be argued that a well-designed high-density development can reduce the feeling of crowding and can save the land, energy, infrastructure cost and the overall cost of the housing development. In Jordan's case, no more than 8-10 units should share the same communal area and entrance for the apartment block. Apartment buildings should not exceed the four floors' limits. The smaller a community, the greater its intensity and the more residents are prepared to participate in communal activities reduce the perception of density and crowdedness.

6.2.7.2   Eco-cultural indicator: Solar right

Mutual shading between buildings determines if a place will be pleasant or uncomfortable during the different times of the day or throughout the year. Jordan vernacular towns and buildings were to be built to one fixed height, usually of one or two storeys, which aided in respecting the rights to access proper sunshine and ventilation through the year between neighbours (Alhaddad and Alshboul 2010). Solar right access is defined as the right to have solar radiation accessibility without any obstacles from any adjacent objects (Gago *et al.* 2013). Solar Right implies that new structures must never shadow the roof of any existing building. Determining suitable vertical limits of sites under consideration is the right solution for this problem (Seong *et al.* 2006). Jordan building regulation and green building guide do not include any metrics for preserving the right to access solar radiation throughout the year. In general, laws protecting solar rights are rare worldwide; however, codes and regulations in some countries encourage respecting solar rights as one way to utilise passive solar design.

Respecting solar rights between neighbours is related to building shape, size, orientation, and height, as well as the latitude of the site and the amount of allowable shading on adjacent streets and buildings (Alzoubi and Alshboul 2010). It defines the space of all possible solutions for the determination of design that does not violate the solar rights of existing buildings and open spaces during the winter period of the year where the sun is at its lowest point. For the case of Jordan, the design of the building should preserve solar access at 32° N latitude to adjacent sites between 9 AM and 3 PM on all days in December when the sun is lowest in the sky, assuming that before 9 AM and after 3 PM shading adjacent sites is permitted (DeKay and Brown 2014; Alzoubi and Alshboul 2010). This relation among the envelope parameters could be determined using computer software like SustArc and HELIOS (Seong *et al.* 2006; Li *et al.* 2019). Alzoubi and Alshboul (2010) further illustrated additional methods of constructing a solar envelope to ensure solar accessibility and rights in Jordan's case.

6.3 The eco-cultural design framework for sustainable housing

This previous chapter aimed to discuss interview results with participants from the two case study areas to assess stakeholders' perspectives and identify holistic sustainability indicators. This approach was only used in a limited way with professional stakeholders in Olakitan study (2019) and within the research of heritage conservation like in the work of Ashley *et al*. (2014; 2015). It was found that those socio-cultural indicators dominated participant's perspectives and image of sustainability. Contrary to this, most frameworks for assessing sustainability in the built environment focus on environmental criteria. Sustainable building assessment frameworks rarely incorporate the cultural criteria categories and indicators. The lack of understanding regarding socio-cultural criteria was evident due to its intangibility and complexity.

The findings highlight the connections the participants made between intangible socio-cultural factors and how they can be translated into tangible architectural elements such as space, form and resource use and thermal performance. Tangible and intangible design metrics are essential for fulfilling these needs; for instance: privacy can be achieved by the size, position and orientation

of openings and space, whilst thermal comfort can be achieved with traditional building materials and thermal mass. Therefore, the findings confirm that there is a need for better integration of the cultural indicators of architecture to the three dimensions of sustainability during the design, planning and implementation of housing schemes. Cultural metrics should be integrated holistically, bearing in mind that this would differ per location and context.

Figure 6.1 consolidates the findings as a consolidated eco-cultural framework. The framework itself shows the three dimensions of sustainability alongside a fourth dimension: culture. The categories and indicators represent practice-related components of the eco-cultural architecture. Lines connect indicators that directly influence one another. Lines represent the relationships between themes and indicators in the contexts of space and the envelope of buildings. These categories and relationships were conceptualised based on the participants' viewpoints towards sustainability and quality issues concerned with new and vernacular residential dwellings. This framework integrates tangible and intangible indicators: placing value on the historical, contemporary or hybrid contemporary-historic built environment. It will be used to propose a new eco-cultural assessment system for Jordanian residential buildings but can also be applied to deliver improved regional and sustainable developments in similar contexts.

6.4 How the framework informed the tool

The comprehensive literature review and synthesising process highlighted in the previous chapter helped to focus the tool's categories, provided references and theoretical basis for its content and intended use. Moreover, besides improving the socio-cultural qualities of future developments, the review helped save time and effort to generate solutions and create the database of available best practices and solutions. The nature of the tool required a qualitative, descriptive approach to its development (Patton 2014; Schroeter 2008). The qualitative approach also revealed a variety of scientific and practical resources related to sustainable design and evaluation. Best practice and design rules of the eco-cultural design were chosen based on the following criteria (Abousaeidi and Hakimian 2020):

1. A rationale or evidential warrant was given for their importance in that source
2. They are related and relevant to the scope of the revealed eco-cultural indicators
3. Alternative practices were cross-checked between studies, as were different terminologies related to the same eco-cultural indicator.
4. The revealed best practices were refined based on Identified contextual variations given the unique regional characteristics and barriers for Jordan.
5. They were partially or fully not covered by Jordan's Green Building Guide and weighing system.

- Private outdoor zones
- Hierarchy of space
- segregation between guests and family space

Role of privacy and dwelling typology

Feeling of density and crowdedness
Continuity between buildings style
Relevance to vernacular architecture
Green areas and trees

Aesthetic and visual Impact

Controllability and adaptability

- The ability to customise dwelling
- Potential for extension of structure
- future changes in type of energy

Cultural aspects

Effectiveness of natural ventilation during various seasons
thermal comfort and energy performance
Impact of orientation and topography of the site on the solar potential of buildings
Appropriate daylighting in primary occupancy areas
Passive measures and energy saving
Insulation

Indoor environment quality

Environmental aspects

Outdoor environment quality

Eco-Cultural Sustainability

Economic aspects

Affordability, and affordable dwelling.

Durability of key materials

operating and maintenance cost

Social Aspects

Interactive or overlooking dwelling entrances
Outdoor spaces and parks
Frequency of service of local public transportation

Design for social interaction

Neighbours rights and regional loads

access to daylight or ventilation from adjacent units

Privacy in internal and semi-outdoor areas

Figure 0.1 Consolidated eco-cultural framework showing the relationships between the main indicators and categories of an eco-cultural design approach.

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The eco-cultural tool development was carried out in two steps; The first builds on the findings from the qualitative fieldwork results illustrated in Chapter Five. Findings were used to determine the most critical categories and indicators to produce an eco-cultural design. The second step synthesised the selected indicators into a working set of design rules and spatial relationships based on residents' preferences and requirements of sustainable residential buildings specific to Jordan. Figure 6.2 depicts the steps leading to the development of the eco-cultural tool.
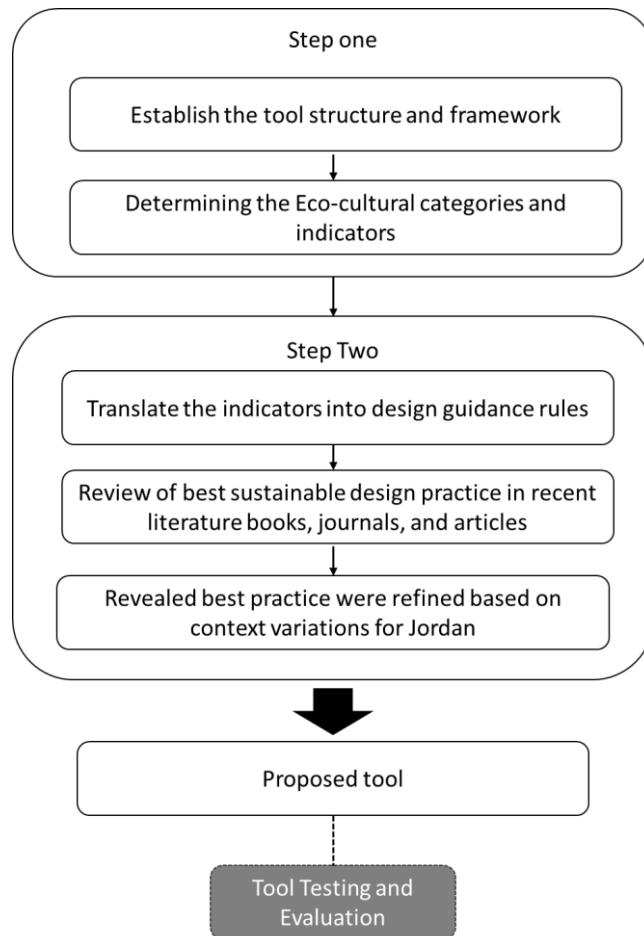
Figure 6.2 The approach applied to developing the eco-cultural tool.

The central aim of the proposed categories and indicators is to provide a panel of experts with an infrastructural category and indicator as a start-up point from which they would be able to evaluate, and deliberate. This step was necessary to create a list of appropriate categories and indicators set for the eco-cultural criteria in green building assessment tools. The proposed categories (illustrated in Table 6.1 and Figure 6.1) represent the consolidated outcomes of the theoretical review and fieldwork, which covers well known green building assessment tools and socio-cultural sustainability theories in sustainable development.

The information generated in this pre-test investigation informed the conversational guide and interview process. In addition, it informed the decision to determine the main factors that should be involved in the new assessment system for Jordan. The research's overall approach assumed conducting interviews semi-structured– with a panel of experts to refine and evaluate the categories, indicators, and parameters that should be involved in the final eco-cultural framework and tool. The eco-cultural design tools offer a means to demonstrate that a residential building has successfully met an expected performance level. Additionally, the developed tool should have the following characteristics (Lazar and Chithra 2020):
1. The developed tool should be comprehensive enough to define building performance from different dimensions – environmental, social, and economic; respecting different climatic, cultural and economic conditions.

2. The categories and indicators of the developed tool should acknowledge the local context within which the tool is developed.
3. The developed tool should be a phase-by-phase method according to the construction of the building, so it could be feasible and could tell different information to us.
4. The developed tool should address all stages of a long-term life cycle with regard to sustainable issues, including a building's design, construction, operation, repair, renovation, and demolition.

6.5 Eco-cultural tool design and description

The eco-cultural design tool design and structure were influenced by building sustainability rating tools (Chapter 3). The tool is structured following the same approach used in most green building assessment methods. It consists of chapters consisting of categories that are further broken down into indicators relating to the building performance considered during the assessment. The tool also utilises a scoring and a performance measurement system that cumulates the number of possible points or credits that can be earned by achieving a given level or number of indicators. The tool also displays output and the environmental and socio-cultural performance results obtained during the scoring phase.

These tools aim to establish an objective and comprehensive method for evaluating a broad range of sustainability performances throughout building design, construction, operation, maintenance, and sometimes disassembly or deconstruction (James 2015). They measure the performance of a building in a consistent and harmonised manner using pre-established standards, guidelines, factors, or criteria (Awadh 2017). Scoring methods are used to create rating systems to assess the environmental sustainability of buildings, which are based on four major components (Doan *et al*. 2017)

The prototype tool was delivered through Microsoft Excel to facilitate automatic scoring and point calculations based on the identified indicators and criteria. The eco-cultural prototype tool (V1) consists of seven major sections with multiple worksheets, including Introduction, Users Guide and instructions, and results. The main revealed categories are site Sustainability, social relationships, cultural and perceptual, flexibility and adaptability, indoor environment, energy and resources, and impact of context. Each of the main seven categories is further divided into sub-categories, including the revealed eco-cultural indicators for the achievement of this sub-category. Worksheets contain sections (cells) that explain the assessment and aims to pertain to it. They also cover the measures needed to achieve the objectives of the category. Other information provided includes relevant examples and external references to aid the users in their assessment.

Figure 6.3 illustrates the flow of the initial version of the eco-cultural tool architecture (pre-evaluation), while Figure 6.4 shows a screenshot of a sample page from the tool. Screenshots of the entire tool's pages and components are included in Appendix E. The assessment process allows users to pre-calculate and evaluates spatial and qualitative and quantitative qualities of their design relevant to each indicator set. As shown, the tool begins with an introduction that clarifies its purpose, intended users, key characteristics, and how to input data for design assessment.

Eco-cultural toolkit V.1.0
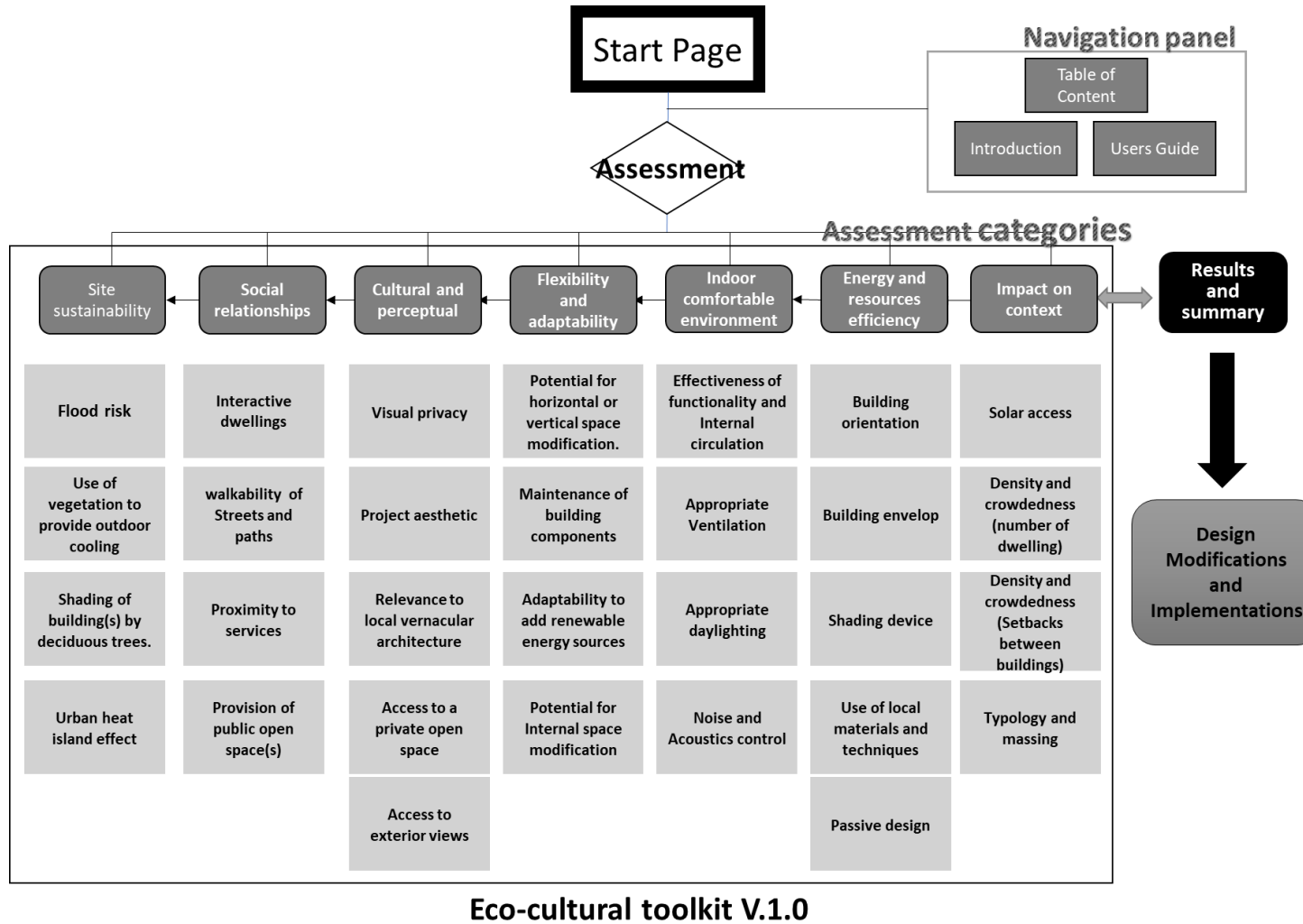
Figure 6.3 Eco-cultural tool V.1 architecture

R	Social Relationships

R 1.4	Provision of public open space(s)

Objective	Parks, open spaces, gardens, and ecological areas are particularly important for urban environments where green space and places of refuge can be in short supply. Proximity to parks is often associated with increased physical activity, more social interaction, and reduced stress.
Applicable for	Multi-dwelling planning and design
Indicator(s)	Availability and special treatments of design and vegetation in private and semi-private open spaces to accompany the micro-climate and demographics needs.
Analysis method	Availability of common use and gathering space in the building or between group of units in the neighbourhood.
Relevant information sources	Site plan, landscaping plans. Design documentation; building permit; planning department in local government
	https://www.psrc.org/sites/default/files/sustainable_parks_and_open_space.pdf http://www.greenexamacademy.com/ss5-2/
	1) there IS a local code for open space restriction, open space should exceed local code by 25%
	2) Case 2: there is NO code (campuses or military bases), open space is to be 50% of the size as building footprint
	3) there IS a local code, but ZERO open space requirement: open space should be 75% of site area
	For all cases the design of shared and semi-private spaces of the dwelling can be counted into the assessment criteria
	vegetated roof areas can count toward assessment criteria
	pedestrian oriented hardscape areas can count toward credit compliance (min. 25% open space must be vegetated)
	The design of shared and semi-private spaces should provide: a) variation of hard and soft landscape with trees and plants. b) local climate-appropriate shelter from harsh sun in common outdoor and semi-private spaces on site or on landscaping c) Use of small water features (e.g. fountain) incorporated into the site and appropriately protected' to cool ambient air. At least quarter of that open space must be vegetated or have overhead vegetation. Open spaces must be designed for one or more of the following uses: social gathering, gardening, physical activity, or natural habitat that includes elements for human interaction. Vegetated roofs can be counted in certain circumstances., there are both shaded and sunny areas, and the design makes it very attractive for users.

	Assessment		Score
Negative		<25%	-3
Minimum practice	The project must provide open space percentage in comparison to built up area equal :	25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

Scooring (choose the number of criteria)	<25%	-3

Total Score for social reltionships	-3

Figure 6.4 Screenshot from the proposed eco-cultural tool (V1). The screen shows the open space sub-category within the social relationship chapter of the eco-cultural tool.

Tool users carry out design assessment by answering questions related to the achievement of design criteria related to that indicator (see Figure 6.4). Areas for data entry and scoring by the user are highlighted and contain a drop-down menu of choices. The tool addresses the following objectives for the assessment process:

1. Provide designers with a checklist of the central eco-cultural design aspect.
2. Embed spatial and design rules, constraints, and relationships governing the creation of sustainable and socio-cultural sustainable buildings.
3. Allow designers to create better design alternatives by modifying their properties and location of design elements.
4. Search for better solutions according to predefined criteria.

The assessment process requires users to pre-calculate and evaluate spatial and other qualitative and quantitative qualities of their design based on each sub-category's required indicators. Users then choose the quantitative value or the qualitative statement most appropriate to their design and are given pre-determined points based on that choice. This falls within one of four possible outcomes, as follows:

- Negative practice, which subtracts (-3) points from the total score (lowest).
- Minimum practice, which awards no points (0) to the total score.
- Good practice, which awards 3 points to the total score.
- Best practice, which awards 5 points to the total score (highest).

The proposed scale was influenced by examples presented in the SBtool framework and guide, which can be found in Laustsen and Lorenzen (Laustsen and Lorenzen 2003) and Cole and Larsson (Cole and Larsson 2002). The indicators and sub-categories were scored using a linear scale from −3 to +5 to enable users to assess and reflect the different contextual priorities, technologies, building traditions, and cultural values during the assessment process and to encourage better effort in achieving good and best practice criteria. This is designed to enable users to reflect the different priorities, technologies, building traditions, and cultural values existing in the various regions and countries involved in the assessment process. Different modes of representations were used to quantify the translated indicators, such as numbers, area, size, building physics properties, diagrams, or textual descriptions.

After completing the assessment, the last tab entitled "Results and summary" gives a simple view of all the results, broken down by category, along with a chart. The summary aims to help address socio-cultural weaknesses in the current design proposal. Users could move back and forth between sections and categories to address issues that have low scores. The completed assessment tool helps architects plan a transparent and open pathway to discuss potential eco-cultural improvements to the design with clients and the local community. This process will promote sustainable development and green building and encourage developers to build according to eco-cultural design goals. The resource guide provides links to studies, research, documents, model codes/ordinances, and organisations, which offer additional tools and techniques for architects designing sustainable residential buildings.

6.6 User testing and evaluation results

As presented in the previous section, the questionnaire included two sets of items intended to assess the tool validity, measure its effectiveness and efficiency. Figure 6.5 summarises results from effectiveness and accuracy statements, while Figure 6.6 summarises results from the ease of use and utility. Table 6.4 breaks down participants responses to the ease of use and effectiveness statements. Based on their replies to the questions and the participants' comments during the evaluation process, the results showed that most participants had positive feedback about using the tool.
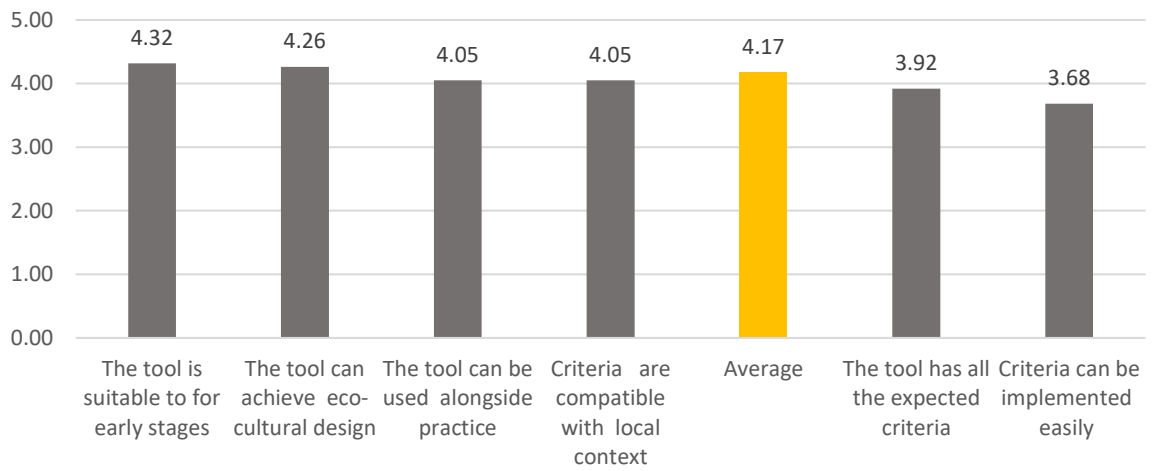
Figure 6.5 The average mean score of the effectiveness and accuracy statements.
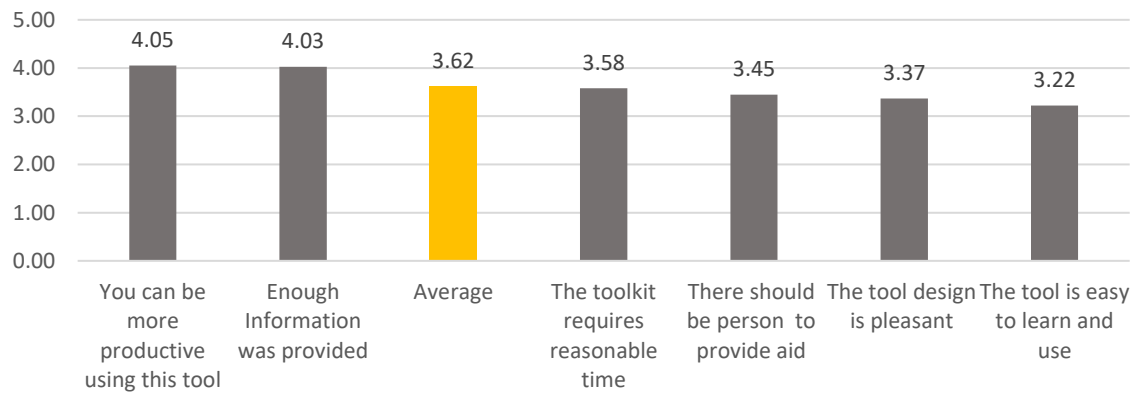
Figure 6.6 Average mean score of the efficiency and utility statements.

Table 0.4 Distribution of participants responses to the questionnaire regarding the usability of the tool

Statement	Effectiveness and accuracy						Efficiency and ease of use					
	The tool can be used alongside practice	The tool is suitable for the early stages	Criteria are compatible with the local context	Criteria can be implemented easily	The tool has all the expected criteria	The tool can achieve eco-cultural design	The tool is easy to learn and use	The tool requires a reasonable time	The tool design is pleasant	You can be more productive using this tool	Enough Information was provided	There should be a person to provide aid
Strongly agree	14	24	16	10	8	21	4	8	4	11	13	7
Somewhat agree	14	10	14	14	20	10	6	12	16	16	19	11
Neutral/ no opinion	8	2	4	8	8	10	15	14	9	8	6	10
Somewhat disagree	2	2	2	4	1	0	9	2	6	3	0	7
Strongly disagree	0	0	2	2	1	0	4	2	3	0	0	3
Total	38	38	38	38	38	38	38	38	38	38	38	38
Average mean	4.05	4.32	4.05	3.68	3.92	4.26	3.22	3.58	3.37	4.05	4.03	3.45

6.6.1   Effectiveness and accuracy

Effectiveness responses scored an average score of 4.17. The two highest-scoring statements are "the tool is suitable for early design stages" with 4.32, and "the tool can help to achieve an eco-cultural design "with 4.26. Both of these statements were related to effectiveness. Participant P06, who is a female partner at an architectural firm with 20-25 years of experience and hold a master's degree in sustainable architecture, commented:

"… I think the tool covered everything that involves green building and culture in Jordan, but its use can be dreadful, you should make it shorter and easier…"

On the tool's ability to achieve its objectives, only one participant disagreed with the statement that "the tool has all the expected criteria." Moreover, less than a quarter replied with "neutral or no opinion," which indicates that the tool did not overlook essential characteristics. Moreover, two-thirds of participants agreed (top two levels of the scale) to the statement "the tool can be used alongside the architectural design practice for dwellings in Jordan". Almost all of the participants (34 out of 38) were interested in using the tool in the early stages of the design, with a mean score of 4.32.

More than half of the participants said the tool offers architects a flexible rating system and checklist with parameters that give them various design options and modifications according to their ideas. Most participants were also satisfied with the tool as a design assessment aid. The tool fills a gap as architects need to increasingly consider and apply the essential design indicators presented in the tool. Almost two-thirds of the participants agreed that they can produce more sustainable and culturally sensitives designs using this tool. In general, results indicate no apparent issue with the tool's content, but rather a frustration was observed in issues related to using the tool and time required in carrying out evaluation tasks and their difficulties level.

6.6.2   Efficiency and ease of use

Results indicate that participants perceived the efficiency and ease of use statements less favourably than those in the effectiveness and accuracy set. Efficiency items scored an average score of 3.62. Furthermore, the two lowest-performing statements were the "Tool is easy to learn and use" with 3.22 and "the tool design makes it pleasant to use" with 3.37. Both of these statements belong to the ease-of-use items.

 Moreover, the data shows that participants had a wide range of opinions to "the tool is easy to use" and "the tool requires reasonable time" statements where almost half of the participants had no opinion, with the remainder of the response were relatively evenly spread evenly across the rest of the answers. Participants P04, who is a senior male partner at an architectural firm with more than 30 years of experience, commented:

"… I agree that it will take some long time to finish, but it is not a bad thing; on the contrary, it is a good thing because such thorough and deep, sustainable analysis needs that much time with or without the tool…"

One-third of the participant said that completing all of the tool's evaluation tasks would take a long time. Nevertheless, the general response was that this is not a bad thing as the tool can be consulted back and forth while working on the design of a housing project. Meaning that even if the assessment took a long time, it would still be considered very reasonable for the tasks and objectives at hand.

Only half of the participants felt the tool was easy enough to use for the first time without someone helping them. Participants who demonstrated frustration from using the tool cited issues of length, overwhelming and unnecessary information, and references. Most of them complained that the tool was made using Microsoft Excel and thought the tool was hard to use and navigate. Furthermore, more than half of the participants found that each stage's information was clear and sufficient to complete the task.

The results listed above show that the tool performed well with its content effectiveness and accuracy but less well in its design efficiency and ease. To further discuss this, the results from the questionnaire are discussed in the following section in relationship to; (a) characteristics of the tool, (b) potential issues of using, and (c) consequences of use /problems with implementing the tool criteria and tasks. Emergent themes and issues and recommendations are discussed in the following section.

6.7 Content evaluation: Results

After the participants concluded testing of the tool, they were asked a set of six overarching questions about the tool that are related to absent issues (What is missing?), unwanted parts (What components or checkpoints are not necessary?), confusions (What areas are confusing?), errors and problems (Are there any other errors or problems that need to be addressed?), strengths (What, if any, are the strengths of the checklist?), and suggestions (How can the checklist be improved?).

Those questions were first coded for each participant. Then, responses were considered against their participants' experience and background. After that, responses were analysed by their related question group (i.e., weaknesses, errors, suggestions). Results from the questionnaire are used to corroborate findings from participants' analysis.

The following sections present the findings from each analysis. Note that "Idea" is used to refer to the pattern of answers found within the overarching categories. "Theme" is used to refer to emerging patterns from responses.

Each of the 38 participants come from different backgrounds, so they had a unique experience with the tool and had different goals that they hoped the tool to achieve. However, the barriers that they encountered and the codes/themes that emerged were somehow similar and connected. Therefore, similar comments or comments that fell within the same sub-category were clustered together. These are discussed in the following sub-sections.

6.7.1 Absent elements

Figure 6.7 displays the ideas and themes that participants discussed what they thought was absent from the tool. As indicated in Figure 6.5, more than 70% of participants agreed to the statement that the tool presented all the expected criteria. Also, almost a quarter of the participants said nothing was missing or that they could not think specifically about anything else. On the other hand, one-third of the participants thought that tool was missing "specification" or characteristics rather than missing criteria or metrics. Some of these specifications were sometimes there in the tool, but participants explicitly requested them to be further developed or have more highlighted functions within the tool.
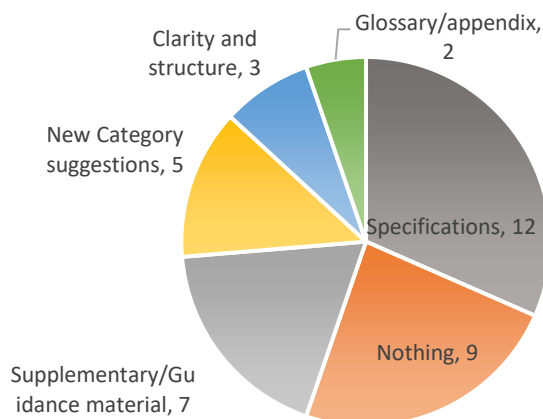
Figure 6.7 Absence: Frequency of Emergent Themes

For example, participant P02 who is a male senior partner architect with 20-25 years of experience and holds a master's degree in urban planning, illustrated the "specification" problem with the following comment:

"… I did not feel that anything was missing, but it would be better if the sequence of the evaluation tasks aligned better with that of the flow of design process in the sense that architects usually start designing their building from the site analysis and design and then solve issues as he progresses in the design process."

Other participants suggested that there should be room for customisation and modification. Expandability and customisation were indeed one of the objectives of the tool. Some even said adaptability should be in the users' hands as each project would have its unique issues and parameters. Participant P05, who is a female architect with 10-15 years of experience and have a master's degree in sustainable building design, commented:

"…I think the opposite, the tool is very much complete, perhaps maybe too complete for me. Will there be room for improvisation and implementation later? Is there room for a participatory process when someone needs to adjust a little bit to meet their needs? Not all sites and projects are the same, and each project has unique issues of its own…"

Few other participants thought that what is missing is specific sections or a different tool that is guided to various stakeholders of the project or at least the client as they thought some of the decisions are in the clients' hands and not their hands, not the architect. Participant P19, who is a male senior architect with 15-20 years of experience, commented:

"… what is missing is to specify the degree of the owner or developer involvement in the project and that most architects cannot or do not want to make conflict with the client…"

Participant P23, who is a female architect with 5-10 years of experience, also commented:

"… There should be different tools or guides/checklists for the client to read and solve before the architects do their part. Which involves some sections and criteria where the architect does not have any authority like choosing the site…."

A less discussed but crucial missing characteristic was as participant P05, who is a female architect with 10-15 years of experience and have a master's degree in sustainable building design, put it:

"… There is a lack of understanding of the site as a three dimensional, and I don't only mean the typography of the site but also the heights of nearby buildings and slopes and infill and cut required …"

Many participants also suggested that the tool's introduction section should allow input from various sites and building parameters. Data like; area, climatic region, and geographic location should inform what criteria the user should follow or not, even in a small country like Jordan, which has three central climatic regions.

Furthermore, the need for more supplementary guidance material and "add-on resources" was the second most discussed theme. Participants requested more examples, case studies, summary tables, and calculation tools to make using the eco-cultural tool faster and easier. For example, participants suggested this list of additional information that would be beneficial in the tool; checklist, templates, example matrices, indicators, footprint impact assessment, case study examples, bibliography/literature review of useful case studies methodologies.

Finally, there were a few items that occurred less frequently. For example, the need for a "glossary" section related to terminology found within the tool. Also, the need for " more clarification" was made evident by respondents' misunderstandings of the checklist statements. Similarly, participants expressed a lack of " clarification" in using terms like "too technical" or the need to "simplify the language and the tool" and is made evident by the need for "A visual-based user guide," which is further discussed in the Errors and Confusion section.

6.7.2   Unwanted elements
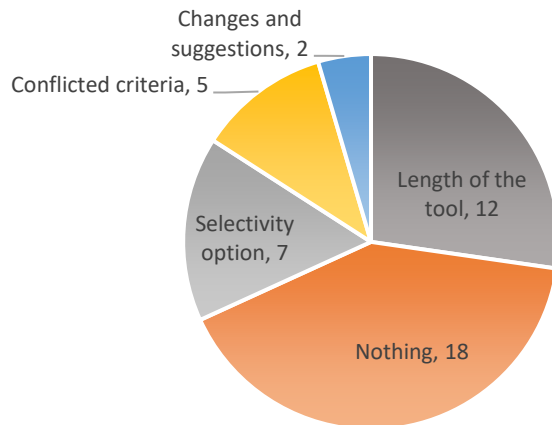
Figure 6.8 Unwanted; Frequency of Emergent Themes

Figure 6.8 illustrates the themes participants discussed in relation to the unnecessary components of the tool. Like the missing elements, more than 40% of participants said no parts of the tool felt irrelevant to the tool's objectives. The second most frequently occurring theme was: "length of the tool." More than 35% of the participants indeed disagreed with the statement that using the tool requires a reasonable amount of time. Participants mainly talked that performing evaluation tasks requires a rather "a lot" amount of input data and preparations.

Furthermore, participants' responses also highlighted that more attention is needed regarding data sources, collection, analysis, and other related concerns. Participant P21, who is a female architect with 10-15 years of experience and head of the architectural drawing auditing office at the Jordanian Engineering Association (JEA), commented on the solar set access right equation:

"… most architects would look for the easy way and would not want the tool to Take much of their time. They might even skip data analysis and stop using the tool so the tool should have all the analysis-bits ready and for them"

Moreover, although participants indeed complaint about the amount of time performing tasks of the tool would take. The general response was that it is not a bad thing as the tool can be consulted back and forth while working on designing a housing project. Meaning that even if the assessment took a long time, it would still be considered very reasonable for the tasks and objectives at hand. Participant 15, who is a 45 years old female, and has been an architect for more than 20 years, said that:

"The tool offers architects the ability to assess the design in a reasonable amount of time, which would not be different from the time taken in comparison to other applications. This is due to the structured process that they need to follow and the predefined parameters that control the generation process".

"Selectivity option" was also among the most frequently discussed ideas. Selectivity means that respondents indicated that, while not all of the analytical tasks might be of use in all cases. Instead, users should be able to input data and information about the project and its context. The tool would then automatically generate a list of what is required for evaluation based on these contextual pieces of information. Response exemplifying "selectivity" by participant P18, who is a male partner architect with 25-30 years of experience and hold a master's in architectural design, also said:

"I found all of the sections of interest and worth keeping. Also, given the complexity of sustainability in the architectural field, I would encourage adding even more options, depending on the user's exact role using it, and based on the type of project they are designing. "

Finally, themes such as "suggestions" and "conflict" were made less frequently. This section's main comments revolved around a possible conflict between some requirements and metrics in different tabs. For example, participants felt that privacy requirements could go against that increased social interaction. Moreover, suggestions like the need for a separate code for aesthetics and visual impact. Furthermore, the need to unify the typologies and "architectural language" used in one street or neighbourhood is further discussed in the revision section.

6.7.3 Errors and confusions
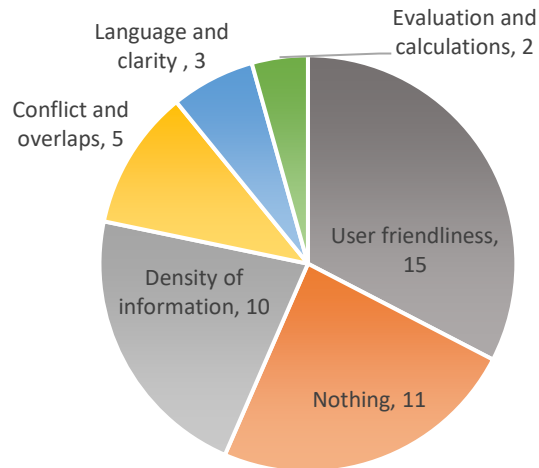
Figure 6.9 Errors and confusions; Frequency of Emergent Themes

Figure 6.9 illustrates the issues and errors participants encountered or expressed frustration during the trial process. Almost a quarter of the participant did not report any problems. The comments from P28, who is a female junior architect with five years or less experience illustrate their experience:

"In general, the tool is a bit lengthy, but it is clear, perhaps one would need to use it more often in practice before being sure what is or not confusing or facing any issues. However, based only on what I read and tried, I liked it very much."

User-friendliness was the main recurring issue. Participants associated user-friendliness with the design of the tool mainly. They also associated it with the use of Microsoft Excel as the interface for the tool and the primary method of data entry and calculations. Many participants demonstrated frustration from using Excel. Indeed, more than half of the patricians disagreed or had a "Neutral" response to the statement that the tool design makes it pleasant and easier to use. Comments stated that Excel had put them off from using the tool initially, although they agreed that the tool was straightforward after they got used to it. Participant P20 who is a male senior architect with 10-15 years of experience, stated:

"Architects think visually and react more to visual methods in portraying and visualising data."

Participants suggested making it web or mobile compatible. One said that he first tried to view it from his smartphone but could not and therefore described it as not user-friendly. Some were not comfortable or confident using Excel software, which created many difficulties and confusion. They even tried printing it out first, but the tool was not prepared for that either.

Another central theme was the "density of information," which refers to remarks that the tool is too complicated and' thick,' even for the distinguished and highly educated respondent group. Examples of responses within this theme included participants expressing the frustration of the tool's length and asking to make it shorter and removing the "overwhelming" amount of background information to a separate section. Comments from participant P10, who is a female senior architect with 20-25 years of experience, commented:

"This is an amazingly complete project, but I found it overwhelming. There is simply a large amount of detail. But excellent points, nonetheless."

"Language and terminology" appear to be another issue for potential users of the tool as well. Comments related to "language" were explicitly targeted at the academic and technical nature of the tool, and include, for example, the use of translated terminology for sustainability practice and components according to participant P01 who is a female architect with 10-15 years of experience in architectural design, commented:

"I imagine that one would need a background in sustainability to comprehend the terms and phrases and the stream of logic. Who is it expected that would be using the tool? If the persons have some exposure and background in green building rating systems, it should be fine."

Another less reoccurring issue was "overlaps," which relates to aspects that should be rethought when revising the tool. Participants P03, a female partner architect with more than 30 years of experience, though some criteria could go against others in a different tab and asked to re-evaluate them. For example, they thought that increased setbacks in the "Solar access right" section of the tool could go against the objective of increasing the social connection between them. Participant P19 saw that parameters for windows regarding daylighting and ventilation might go against criteria for visual privacy inside dwellings. Participant P3, on the other hand, commented that the codes for planting trees for shades might go against that of view corridors and daylighting.

6.7.4   Strengths

As shown in Figure 6.10, respondents referred to the tool strength in association with its Comprehensiveness and complexity, Context-based approach, and contribution. Participants also associated it less frequently with usability, raising awareness, content, and concepts.
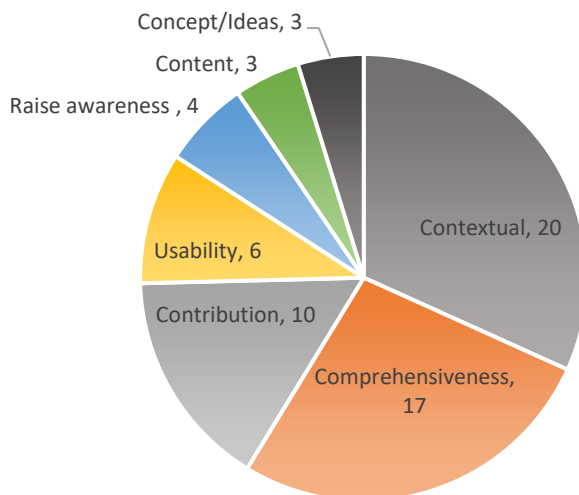
Figure 6.10 Strength; Frequency of Emergent Themes

"Comprehensiveness" was interpreted as the dimensions of sustainability in the built environment covered by the tool. Participants who had experience with green building rating systems said that the tool provided indicators for sustainability that other assessment methods usually overlooked. Comments explaining this includes that from participants P14, who is a female partner architect with more than 30 years of experience and holds a master's in architectural engineering, said:

"It is comprehensive. From my point of view, this is the main strength that a tool like this should possess. Indeed, any sustainability evaluation tool should be as complete as this tool."

More than 70% of participants agreed to the statement that the tool covers all the expected criteria. This statement achieved the second-best average mean score, supporting the findings

related to these criteria. Participants complemented the context-based approach of this tool. More than two-thirds agreed to the statement, "the tool is suitable to the context." This statement also achieved 4.05 averages mean score, which was one of the highest ratings among all statements. Participants P02, P15, and P35, who are all well-reputed architects in the sphere of regional design, complemented the tool's context-based approach and said that Jordan's architectural practices would benefit significantly from the tool. Also, there was general agreement among participants that the tool" successfully captured socio-cultural indicators necessary for sustainable architecture in Jordan, which other green building guides, certification, and rating systems overlook. Participant

P35, who is a male architect with 10-15 years of experience, said:

"It is very sensitive to the culture and context of Jordan, which includes the multiple dimensions of sustainability. It touches all areas that border on sustainability in Jordan I am pleased to see that"

Other less frequently discussed themes include its "usefulness" to the field and raising awareness for architects attaining sustainability and maintaining/improving sustainability. For example, participant P1 also said:

"The checklist would be beneficial for beginner architects and even experienced ones to make sure they do not miss or forget any of these issues. It generates discussion and controversy around what is meant by "sustainability, and what is important and necessary for the context" for helping to think globally about essential aspects of program evaluation and identifying all relevant criteria."

One notable theme that participants discussed a few times stated that the tool is unique for including passive solar measures within its criteria. Participants P14 P05 and P06, whom all had previous experience in green and sustainable architecture, said that other rating systems in Jordan focus only on the active systems and material properties without integrating any guidance for passive solar design criteria. Participants said this aspect of the tool should be emphasised and expanded in the tool's future revision.

The last theme, in addition to usability and usefulness, was flexibility. More than 50% said the tool offers architects a flexible rating system and checklist with parameters that give them various design options and modifications according to their ideas. However, only 55% of the participant felt the tool was easy enough to use on its own without someone helping them for the first time. Participants who demonstrated frustration from utilising the tool cited issues of length, overwhelming and unnecessary information, and references. Most of them mentioned the fact that the tool was made in Microsoft Excel as the main disadvantage for its ease of use.

6.8 Revisions and improvements to the tool

Results from the usability and validation phase characterised the tool as valid and useful for its intended objectives. Based on the findings presented in the previous section, several improvements to the tool are necessary. The final part of this chapter includes recommendations for improving the eco-cultural tool. Recommendations related to "utility" are evident in the suggestions to "simplify" or "clarify." Some of the responses are explicitly associated with improving the formatting and structure, adding supplementary materials (e.g., examples, cases, tables), and developing a user's guide. Figure 6.11 illustrate the modified eco-cultural tool architecture (V2). Screenshots of the entire modified tool's pages and components are included in Appendix F.

Summary from participant feedback is as follows:
   A. In general terms, the participants praised the effort to make a contextual green building assessment tool.
   B. They expressed that it should focus more on the local context.
   C. Some participants said the main barrier against implementing some of the criteria is the economic burden that the developer might face. The increase in construction and design costs would limit developers and investors from following some of the metrics.

D. Participants said that the tool should provide more economic-related factors related to both developers' and residents' needs.
E. Participants expressed that it would be better if the tool is more graphical, quoting that "architects are visual" or more interactive with live design and 3D interface.
F. Participants suggested adding an index page along the tool pages to help guide the users and show their progress.
G. issues addressed include (1) improving clarifications of the required assessment tasks, (2) improving the language both grammar and terminology, (3) simplification the assessment tasks by providing in-tool calculator or links to web-pages that can help users with solving complex equations; (4) the addition and merging of some criteria, (5) more supplementary material and descriptive introduction that addresses key concepts and principles for an eco-cultural design used within the tool. Specific analysis of some sections of the tool Improvements to the tool are described in the following sections.
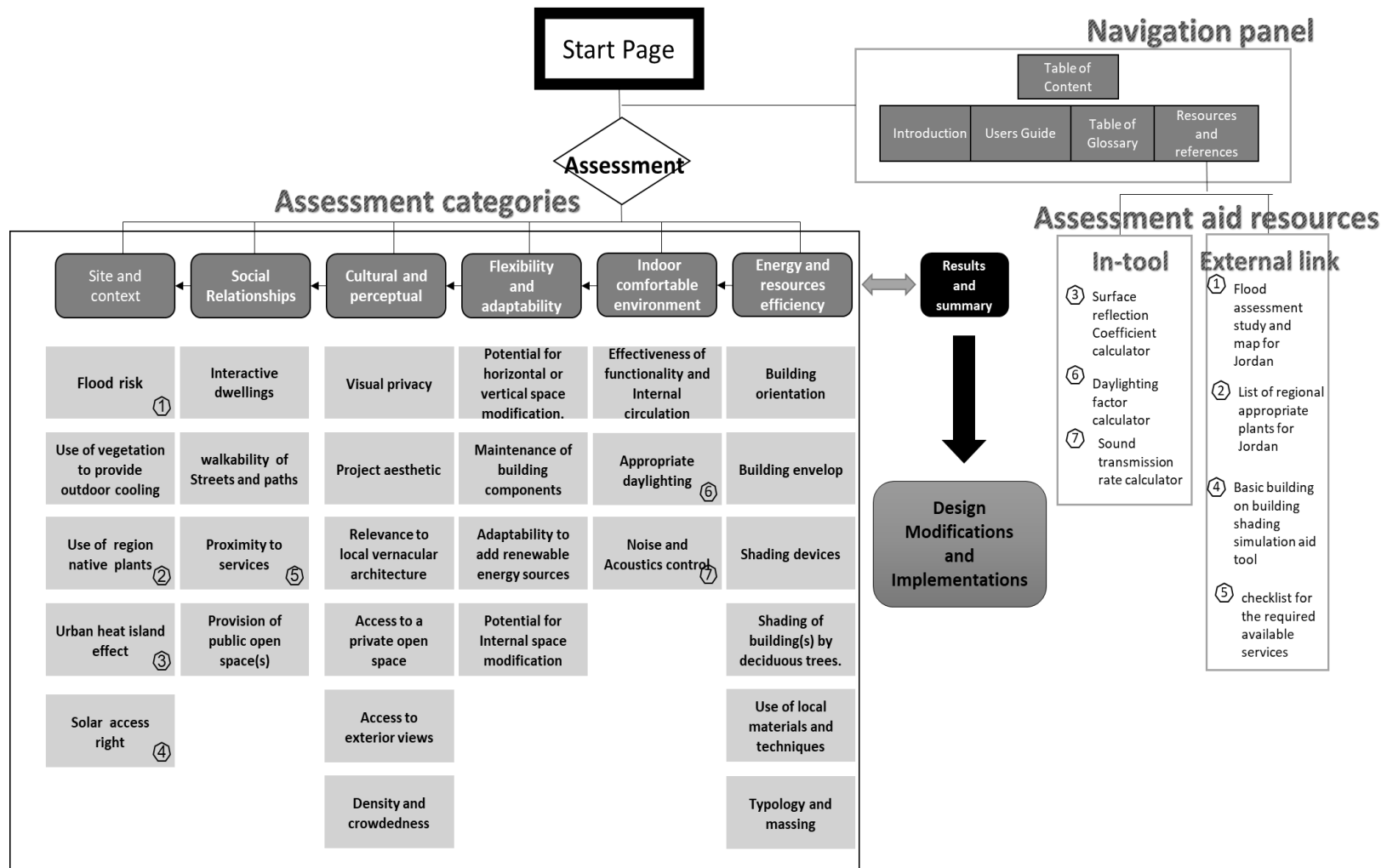
Figure 6.11 The modified eco-cultural tool (V2) architecture

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6.8.1   Tool structure and utility

Table 6.5 summarises the findings and most frequently discusses topics concerning tool structure. The most requested modification was the addition of a table of content that will also work as a checklist highlighting the section that the user has finished assessing by showing either a red or a green ball near that section (See Figure 6.12). A new progression bar shows the tool's percentage completion and added parts (Figure 6.13).

Table 6.5 Modifications made to the structure of the eco-cultural tool

Main findings and issue	Actioned Modifications
Need for more Clarifications	*Expanding the introduction and user guide sections. Pictures and examples have been added to the guide tab.* *Tabs on excel now have colours to differentiate them from each other (blue for introductory section, yellow for assessment sections, and red for summary sheet).*
Need for a "content table."	*The addition of a content table. This section also functions as a completion and progress checklist.*
Structure	*Criteria now are divided into either; Criteria for a multi or single dwelling. And criteria that are either assessed by the architect/designer or owner/developer of the project.*
Simplifications	*Simplifications and adjustments to language throughout the tool. Most criteria are turned into either calculated or estimated percentages to unify the metric throughout the tool and present quantifiable rigorous metrics for assessment.*
Terminology and glossary	*Attach an appendix of all the terms used in the tool in both English and Arabic definitions.*
Reduce the density of the tool.	*Background information and references are relocated to the end of the tool.*
Changes to assessment criteria	*Participants highlighted some needed alterations to assessment criteria to better suit the context of architectural practice in Jordan.*
Need for more supplementary material	*Adding a new section that defines and introduces various eco-cultural strategies, architectural elements, and metrics contained within the tool Present an appendix with case studies and precedents of these eco-cultural metrics.*
Some calculation was hard for some participants	*There is a link to an in- tool calculator where participants can fill variables and obtain the required calculated value for some sections.*
Overlapping	*Overlaps will not be fully addressed due to the overlapping nature of eco-cultural sustainability.* *Some participants felt that there is a conflict between criteria in context and neighbour tab and between other sections. They also thought that this section as a stand-alone section is not required. So, this section was removed and, its sub-categories merged with other sections.*
Fix issues of usability and ease of use	*The tool needs to be made interactive by developing a web-based format in which, categories, sub-categories, and indicators are interlinked to make it easier and simpler to use.*

		Eco-cultural design guide and toolkit Table of contents	Completion check

s.		Site Sustainability	
	S.1	Flood risk	🟢
	S.2	Use of vegetation to provide ambient outdoor cooling.	🟢
	S.3	Use of suitable local type of plants	🟢
	S.4	Urban heat island effect	🟢
	S.5	Solar access right	🟢

R.		Social Relationships	
	R.1	Interactive dwellings	🟢
	R.2	Walkable streets and pathways	🟢
	R.3	Proximity to services	🟢
	R.4	Provision of public open space(s)	

C.		Cultural and perceptual	
	C.1	Visual privacy in principal areas of dwelling units.	🟢
	C.2	Relevance to vernacular architecture	🟢
	C.3	Access to a private open space	🟢
	C.4	Access to exterior views	🟢
	C.5	Project aesthetic	🟢
	C.6	Density and crowdedness	🟢

F.		Flexibility and Adaptability	
	F.1	Potential for horizontal or vertical space modification.	🟢
	F.2	Maintenance of building components	🟢
	F.3	Adaptability to add renewable energy sources	🟢
	F.4	Potential for Internal or external space modification.	🟢

K.		Indoor environment	
	K.1	Effectiveness of functionality and Internal circulation	🔴
	K.2	Appropriate daylighting in primary occupancy areas.	🔴
	K.3	Noise and Acoustics control between primary occupancy rooms	🔴

E.		Energy resources efficiency	
	E.1	Building orientation	🔴
	E.2	Building envelop	🔴
	E.3	Shading devices	🔴
	E.4	Shading of building(s) by deciduous trees.	🔴
	E.5	Use of local materials and techniques	🔴
	E.6	Typology and massing	🔴

‹ Prev   ⬠ Next   ⬡ Finish

Introduction	User Guide	Table of Content	Site Sustainability	Social Relationship	Cultural and Perceptual	Flexibility and Adaptability	Indoor Environment	Energy and Resources	Summery	Resources

Figure 6.12 Section of the newly added content tab at the start of the tool

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S	Site Sustainability and Development
S 5	**Urban heat island effect**

Objective	Reduce the effect of the urban heat island effect by reducing the total built up and paved area of the project.
Applicable for	Multi and single type of dwellings
Indicator(s)	Ratio of dark and low albedo surfaces in urban structures and ground pavement and presence of plants or shading structures. Green roof specifications.
Responsible Assessor	Architect only
Assessment method	Site plan, landscaping plans.
Related Resources	The city and urban heat islands: A review of strategies to mitigate adverse effects Author links open overlay panelE.J.Gago 2013 — https://www.sciencedirect.com/science/article/pii/S1364032113003602
Assessment Criteria	1) Use plants that can provide shadows over paved areas and on low-reflectance coats on site 2) Providing shades by covering the surfaces with thermal or optical complexes, which produce energy to cover surfaces exposed to too much solar radiation. 3) Provide shades by covering surfaces with reflective shading tools of at least 50% 4) The use of ground paving and cover material with a minimum reflectivity of 50% 5) Use green roofs and green facades. A "green roof" is simply a vegetated roof. 6) Reducing the parking area of cars on the surface of the site and replacing them with specifications under the building structure or underground, or replacing asphalt with porous materials for water with a reflectivity of at least 50%

Assessment	Reflection Coefficient Calculator	**Metric**	**Score**
Negative	The plans indicate that the area of the open area with vegetation in addition to the built-up areas and surfaces with a reflection coefficient equal to 50% or greater, as a percentage of the total open area (includes the roof of the building) is:	<25%	-3
Minimum practice		25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

Choose the value that matches your calculations	25%-49%		0

Total Score	0
Section Progress	100%

Prev   Next   Finish

| Introduction | User Guide | Table of Content | Site Sustainability | Social Relationship | Cultural and Perceptual | Flexibility and Adaptability | Indoor Environment | Energy and Resources | Summery | Resources |

Figure 6.13 Screenshot from the modified eco-cultural tool (V2). The screenshot shows some of the modified components, such as the chapter progressing and navigation bar and a link to an in-tool calculator to help users perform various assessment calculations.

Moreover, the user guides were expanded with screenshots, and guiding graphs are added to the user guide section to make it easier to understand. Also, a short tutorial video is now provided. Supplementary materials and clarification are presented in the form of a glossary of terms section. Also, a new table of the content section is added at the beginning of the tool. This page provides an overview of the identified eco-cultural measures, metrics, and strategies within the tool. This section includes a case study and precedents for the use of these metrics and architectural elements to explain its dual cultural/environmental purposes and function. Participants also suggested relocating the references and additional background and reading material to its separate section to reduce confusion and the sense of density and overwhelming information within the tool.

Another issue was user-friendliness. The font size has been increased and changed to Arial from Times New Roman throughout the document. Finally, potential overlaps may exist due to the nature of the checklist. As users are not forced to engage with each step, some issues could appear redundant to those who utilise the complete tool.

6.8.2   Site Sustainability

The participants felt that the proposed flood treatment measures were inadequate and suggested giving architects more choice. Thus, more flood resilient measures have been added and expanded within the site sustainability section and in the newly added supplementary guide section. Some participants also pointed out that the proposed minimum height above the ground of the lowest inhabited level is less than that required in the current regulations. Therefore, the new minimum floor level was increased to prevailing standards in the case of a flood or flash flood zone. Table 6.6 summarises the main findings and revisions made to the site sustainability section.

Table 6.6 Modification made to the Site sustainability section of the tool

Section	Main Finding	Modification
Flood risk	Minimum heights of inhabited floor Are not enough.	Increase the floor level height or match it to that in local building regulation of 1.6 m above ground level
	Flash flood and flooding safety measures are not enough	Introduction of additional structural and architectural measures to combat flooding.
Use of vegetation	Determine the type of plants. Plants should be of local origin	The requested criteria have been added as a new sub-category: The Use of region native type of plants based on "Landscape plant for Jordan and the Middle East."
Solar access right	Many participants found it hard and complicated to do the calculations	Replace the solar setback equation with an interactive calculator that only requires architects to fill variables
Urban heat island effect	The Sun is also being reflected and absorbed by another component of the building.	Add facades of the buildings to the surface albedo factor calculator.
	The calculation was hard for some participants	Inside the tool, there is a link to where participants fill variables to get the "Reflection coefficient" value.
Solar access right	The calculation was hard for some participants	There is a weblink that can help users consider possible shadows from their projects to other neighbours.

6.8.3   Social relationship

New parameters are added to regulate the relationship between the outdoor-indoor zones. Participants cited increased security and visibility between the inside and outside of dwellings as essential metrics for improving social interaction. Many participants also felt the need for additional criteria aimed towards demographics with special requirements that include children and the elderly. Table 6.7 summarises the main findings and revisions made to the social relationship section.

Table 6.7 Modification made to the social relationship section of the tool

Section	Main Finding	Modification
New section added	Participants felt this is a missing criterion that the eco-cultural tool should address	outdoor-indoor relationship
Residents' interaction	Some participants felt confused about the criteria as it contained design requirements and a metric based on how many dwellings' doors are interactive with each other.	remove the confusion by keeping the percentage as an easily quantifiable metric
Proximity to services	Some participants asked to make it easier to follow and calculate	They were turned into more straightforward choices: either, Yes or no,

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Section	Main Finding	Modification
		to enable automatic calculations of the resulting score.
Walkable streets and pathways	Need for demographics metrics	Introduction of vulnerable or demographics with special needs like young children, disabled people and older citizens.

6.8.4 Cultural aspects

This section's main comments revolved around a possible conflict between some requirements and metrics in different tabs. For example, participants felt that privacy requirements could go against that of increased social interaction. Nevertheless, the intricate and broad nature of holistic eco-cultural sustainability requires overlapping between various sections. Therefore, similar and interconnected metrics are left without significant modification. Finally, the participants criticised the use of old vernacular elements only. They suggested adding a page or a reference where the tool identifies factors or traits in vernacular architecture that can serve a new purpose and thus fit within contemporary design. Examples include using double facades for increased privacy and better insulation.

Table 0.8 Modification made to the Perceptual and local culture section of the tool

Section	Main Finding	Modification
Visual privacy	Some participants felt that metrics here contradict other criteria. Such as enhanced privacy can go against enhanced daylighting social interaction	These criteria have been reviewed, and no issue was found. Due to the broad interlocking matters of sustainability in the general and eco-cultural design, there will always be topics that overlap with each other. And it was ensured that they are not contradicting each other.
	Privacy requirements are different between multi-dwelling projects and single dwelling one	This criterion has been split between multi-dwelling projects and single dwelling one
Relevance to vernacular architecture	Identify new modern vernacular elements rather than copying old ones.	A suggested list of contemporary eco-cultural and vernacular elements Is presented in the resources section.
Access to a private open space *The feeling of density and crowdedness*	Some participants thought there were some Overlaps with other sections of the tool	No measures are taken due to the broad nature of an eco-cultural integration, which requires some overlapping.
Newly added sections	Some participants felt that there is a conflict between criteria in context and neighbour tab and between other parts. They also thought that this section as a stand-alone one is not required.	Density and crowdedness were relocated from the now-deleted (context and neighbour tab)

6.8.5 Indoor comfort

Many participants suggested adding metrics for indoor-outdoor relationships (such as parking space, with direct access to the kitchen or entrance) based on their regional housing design experience. They also pointed out that there are more ways to achieve optimal circulation and privacy at the same time without following the hierarchy of spaces such as in using zigzag or interrupted entrance viewpoints from living areas for enhanced privacy.

Some participants also thought that ventilation, humidity, acoustic performance, and security are missing indicators that are necessary to achieve indoor comfort. Some participants drew a

connection between the objectives of this tab and environmental psychology. They suggested adding more sub-categories that handle that topic.

Table 6.9 Modification made to the Internal comfortable environment section of the tool

Section	Main Finding	Modification
Effectiveness of functionality and Internal circulation	Participants found it hard to follow the requirements of this metric	The metrics have been changed to choose from either a yes and no list, and the score will be calculated instantly.
	Participants pointed out that these criteria only work for single types of dwelling only	This section has been modified and expanded for standards for single dwellings and multi dwellings.
Appropriate Daylight	Some participants faced difficulties calculating daylight factor	a link to an in-tool daylight calculator is added where users are only required to add data like room and window dimensions.
Noise control	Participants suggest combining acoustics for the envelope and indoor into one metric	Add acoustic metrics and criteria as it can affect noise inside the building component
	They said that suppliers and even some architects would not know what the STI value is or how to measure it	An appendix for STI value and a simple calculator is added

6.8.6 Energy and materials

Participants criticised the lack of passive heating and cooling design measures in Jordan's green building guide. Most rating systems used in Jordan also focus on the active systems and material indicators without providing any guidance for passive solar design criteria. Sustainability experts mentioned that Jordan is one of the countries that will be profoundly affected by climate change. Thus, the tool should include some parameters dedicated to reducing the effects of climate change in architecture.

Table 6.10 Modification made to the adaptability and flexibility section of the tool

Section	Main Finding	Modification
Missing passive measures	There is a lot of criticised for most rating tools due to their care for active systems over passive systems.	Added more passive measures
Trees shading	Participants faced issues doing the measurements for these criteria	Metric is now turned to percentages to simplify and unify it with other metrics and measurements throughout the tool
Building envelops	building S/v section is added	Added new climate change adaptation metrics and credit

6.9 Critical reflection on the evaluation and testing process

The evaluation and testing phase provided a lot of insight and good feedback for the whole research in general and the framework and tool testing in particular. However, there has been issues and notions that affected the evaluation process which could have been done differently. First, the tool and framework were emailed to the participants before the interviews session for them to try to learn and use the tool in evaluating one of their projects. However, only a few of them attempted to use and evaluate the tool on their own mainly due to their busy schedules. To counter this limitation the researcher kickstarted the session by demonstrating the tool to the participants. This has proven useful as reactions and questions were being recorded as they happen. Nevertheless, the time left for an in-depth discussion with the participants was reduced significantly which could have limited the findings from this phase. The presence of the researcher

during the testing phase might have also influenced the participants' opinions on the tool and framework and they could have provided different responses to the interview's questions. The testing and evaluation session with participants could have been simplified and targeted more carefully on topics more relevant to the study by doing a focused group study with two sessions instead. However, a grouped study research design with experts would have required more time to organise due to the busy schedules of these experts. It might also have been better to pose more clearly defined questions that targeted specific sections of the tool and framework to participants. Nevertheless, the testing and evaluation phase yielded a lot of valuable in-depth feedback from participants on the produced tool. The phase also deemed the tool and its content valid and accurate for the context of Jordan.

6.10   Conclusions

The study previously found that the scope of eco-cultural sustainability indicators differs from the existing sustainability assessment frameworks and tools, primarily because of the differences in the user's perception of an ideal sustainable built environment. Furthermore, context-specific issues in Jordan have resulted in unique challenges that have contributed to the final composition of the list of indicators for the eco-cultural design framework.

The case study interviews with participants also illustrate additional criteria to the ones identified in the literature, which would be necessary for integration into the Jordanian Green Guide for sustainable residential buildings. Therefore, this chapter identified the main components of the eco-cultural framework represented in; (1) a set of the suitable indicators for the context of Jordan through evaluating the indicators identified by the literature review; (2) a spatial design requirement for intangible socio-cultural residential needs (3) a synthesise of relationships between social, cultural economic and environmental indicators. The framework sets the bases for creating the eco-cultural design tool for residential dwellings in Jordan, as addressed in detail in the next chapter. The following chapters also presented a wide range of conclusions that constitute a variety of recommendations and a re-evaluation relating to this framework to be used effectively in Jordan's context.

Developing the eco-cultural tool required a qualitative, descriptive approach that combined results and information gained from the fieldwork, literature review stages, and sustainability principles. This approach was useful in defining spatial relationships and design rules that affect life inside dwellings. For instance, studying each space's location and defining the hierarchy between rooms, are useful for informing the degree of social interaction that takes place, and the ability to provide thermal comfort to their occupants based on the geographic location of the dwelling.

The proposed eco-cultural tool model, embodied in MS Excel, offers an alternative method for evaluating and assessing the sustainability of residential housing design and spatial topologies and in the early stages of development. The tool will help designers save time and effort in generating solutions from scratch by providing a checklist to eco-cultural design guidelines appropriate to Jordan's context. The tool is considered a new contribution to the academic and practical field in Jordan. However, before considering the tool suitable and accurate for use, an evaluation and testing phase needs to occur. The following chapters emphasise tool evaluation, a discussion of the study's results, and future implications for the eco-cultural tool and framework. The target is to examine the tool's efficiency for the deployment of this eco-cultural design process in Jordan and the wider region.

The average overall score for the ease-of-use questions of the evaluation was 3.78, which is felt to be adequate for the prototype tool. Moreover, architects expressed that the tool allowed them to think dynamically with multidimensional constraints rather than traditional methods that focus on a single design solution. They also praised the context-based approach toward sustainability and agreed that the current assessment methods are not entirely suitable for Jordan in their current form. Participants also commended the use of socio-cultural factors as a design moderator

and as the right way to consider specific residents' needs within the sustainable built environment. Other main conclusions and raised comments include:

- In general terms, the participants praised the effort to make a contextual green building assessment tool for Jordan that is not based on international green building rating systems such as LEED.
- Participants advised making the tool more user-friendly. They expressed how Microsoft Excel can be challenging to use without prior expertise and that the tool contains a lot of background information that can be moved to a separate section.
- Participants expressed that it would be better if the tool were more graphical, quoting that "architects are visual thinkers" or more interactive with web-based design and more interactive interface.
- Participants enjoyed using the provided in-tool calculators that can help measure the degree of achievement of metrics. They suggested turning all the equations and calculations needed in the tool into similar tools.
- Participants suggested adding an index page along the tool pages to help guide the users and show their progress.
- There is a consensus among participants that there should be various versions of the tool that are targeted at other stakeholders like project developers and investors.
- There were concerns by some participants that the impact of the context section had repeated ideas or indicators that can overlap with other sections. This tab was removed from the updated version, and its sub-categories were relocated to other sections.
- Participants supported the pre-chosen indicators, and all of the pre-selected indicators were preserved within the category.

Findings show that the tool will help its users to incorporate necessary eco-cultural design criteria and make changes to allow for more sustainable design and green building. In doing so, local governments would find ways to encourage developers, contractors, and design professionals to plan for and use sustainable design tools and techniques. The tool should be continuously improved and supplemented with clear examples, cases, and—potentially—training materials in the longer term. Also, the systemic nature of the tool content should be better addressed. The tool needs to be made interactive by developing a Web-based format in which parts, sections, subsections, and dimensions are interlinked, and connectivity to key terminology and resources is provided.

More practical examples are needed to illuminate the feasibility and practicality of the tool. Although many cases and means are available in the literature, a collaborative effort within an organisation may have led to a more practical tool in the first place. One of the core criticisms in the study was that the checklist is too technical and somehow idealistic. The extensive feedback provided by experts and practitioners relieved this problem to some extent. Nevertheless, the tool will have to be tested and further revised according to practitioner feedback and future studies.

Chapter 7. Discussion

7.1 Introduction

This chapter discusses the main findings and results from this thesis and links them to the research questions and objectives. The purpose is to synthesise conclusions regarding the research gap and the findings. The chapter presents discussions of the main findings and results from this thesis and links them to the research gaps, questions, and objectives. The discussion develops understandings, compliments ideas, and triangulate concepts that have emerged consistently throughout the analysis of the methods. From this point, findings, and practical implications from chapters Five and Six, are referenced along with discussions in the literature from chapters Two and Three. The chapter most notably includes an explanation of the relationship between the research results and the vernacular of Jordan. It also explains the novelty of research in the context of the literature, provide a critical reflection on the project and discusses the limitations.

7.2 Bridging gaps in sustainable, vernacular and regional architectural research

Architecture in Jordan as much as in the Middle East and North Africa region (MENA) has witnessed drastic changes since the beginning of the last century. The socio-economic boom and cultural changes that accompanied the rapid industrialisation and modernisation created a different type of architecture unfamiliar with the vernacular architecture and climate of the country. These changes brought improved desires for living, and lifestyle changes. The improvements in the economic status for many in society was accompanied by a building boom to meet the new demands and requirements, and the expanded need for more dwellings to address the pressures of a growing population. Western styles, new technologies, and building materials dominated new buildings methods and typologies without much critical thinking into what suits the context. Climatic and thermal comfort issues emerged in these new buildings, especially in Jordan. These problems of design, in turn, needed to be mitigated by more imported solutions in the form of mechanical heating and cooling devices. Consequently, buildings nowadays account for more than 40% of energy consumption and carbon emissions worldwide (Nations 2018).

The emerging issues that accompanied many contemporary buildings drove sustainability-based research in the built environment. However, measuring and integrating holistic sustainability still represents a significant challenge and a field for debate about implementing sustainable solutions (Dessein et al. 2015). Moreover, sustainability-based research in the built environment mainly revolved around physical indicators and assessments of life-cycle, material-flow analysis, energy and carbon emissions which are not enough to measure such a broad topic as sustainability (Verma and Raghubanshi 2018). Chapter Three demonstrated that many assessment methods ignored critical human-related factors in the built environment that could hinder sustainability integration efforts.

To address these gaps, this study employed theoretical and case study investigations to examine the less studied sustainability indicators for the context of Jordan. Studying occupants' opinions from traditional and modern dwellings represented an appropriate base for investigating sustainability in architecture. *No previous studies have investigated socio-cultural sustainability traits alongside environmental ones in traditional and modern architecture in Jordan. There is also a gap in studies aimed at refining the Jordan green building guidelines and sustainable building assessment methods for dwellings.* In the MENA region, few theoretical investigations such as Al-Zubaidi (2007); Mortada (2016); Mahgoub (2007); Al-Haroun (2015) have been carried out to trace and demonstrate sustainability indicators for the built environment, and the results have not gone beyond theoretical discussions. Studies such as Widera (2021); Mahmoud Bayoumi (2018); Amro and Ammar (2020); Kırbaş and Hızlı (2016) discussed sustainability in vernacular architecture in

different approaches; mostly about bioclimatic solutions. *The main issue here is the absence of culture as a standout aspect of sustainable development and design.* Figure 7.1 illustrate some of the research contributions of related research work against the contribution made by this dissertation. The figure illustrates the gaps and limitations found in some of the key research and how this study addressed them. The figure also highlights some of the ways this research dealt with such limitations.

This study asserted the importance of building in harmony with the environment within society's needs. Danivska et al. (2019) concluded that there is a shift towards occupants and the increasing importance of well-being in the built environment. However, the literature review concluded that when it comes to human wellbeing and social sustainability, the focus of researchers such as Al-Jamea (2014); Atanda and Öztürk (2018); Ahmad and Thaheem (2017); Fatourehchi and Zarghami (2020) remains geared towards traditional indicators such as employment, education, safety and limit cultural sustainability to the availability of cultural centres, preservation of heritage monuments and imitating traditional vernacular design. A contemporary sustainable building should meet the environmental and climatic criteria of that region and aim to meet the socio-cultural needs of that context and its occupants. *On this, the study effectively demonstrated a method to research and synthesise these requirements for Jordan. This research also sets an applicable approach drawing upon theoretical and primary investigations to integrate socio-cultural design indicators alongside environmental sustainability ones.*

The research used results discussed by participants to synthesise an eco-cultural design indicator that informed the creation of context-based guidelines for the design of sustainable housing developments. Few studies such as Ashley et al. (2015 ;2014) asserts the importance of including end-users in qualitative research regarding residential buildings. Participation in most research regarding the sustainable built environment is limited to experts and professionals (Sala et al. 2015; Fatourehchi and Zarghami 2020; Olakitan Atanda 2019; Mahmoud 2016; Abousaeidi and Hakimian 2020). Also, few studies were concerned with socio-cultural indicators in addition to the environment in their assessment frameworks. Non-attempted to provide a working set of indicators that can be used in practice or for the context of Jordan.

Results from this study showed that occupants from the case study area prioritised different sustainability indicators from those prioritised by sustainability experts. Case study participants prioritized qualitative social and cultural indicators and linked them to wellbeing and sustainability in the built environment. These qualitative issues were more easily felt by them than thermal comfort and energy-saving issues. This reflects a deeper divide between how experts and building users perceive sustainability. The study also demonstrated that the absence of these critical design qualities forces residents to undergo changes in their dwellings that can inherently be unsustainable. The absence or availability of these qualities also affect a dwelling's prices greatly and thus are prioritised over environmental indicators and would affect the economic dimension of a building's sustainability. For example, flexibility and adaptability of housing design were some of the traits of Jordanian vernacular architecture that still hold a significant role for contemporary housing residents. However, adaptability and flexibility are still ignored in modern architectural practice in Jordan as well as Jordan's green building guide. Furthermore, *very few studies researched the economic and environmental implications of building adaptability and flexibility.* No architecture is fully sustainable without the implementation of these intangible indicators alongside tangible environmental ones.

Sustainability dimensions | **Lessons from vernacular architecture** | **Stakeholders involvements** | **Research methodology** | **Research approach**

Al-Jokhadar and Jabi 2017

Gaps
- Focus on social sustainability
- Focus on tangible elements and lessons
- Mainly quantitative research design

Cont
- Included few cultural-related indicters
- Surveyed users household and dwellings characteristics
- Synthesised design grammar and framework for social sustainability

Al Surf 2014

Gaps
- Direct use of vernacular elements into modern design
- Quantitative approach with In-depth input from experts only
- little practical implementations

Cont
- Focus on socio-cultural dimensions

Stender and Walter 2018

Gaps
- Traditional social sustainability indicators
- Not considering vernacular architecture
- No input from building users

Cont
- Focus on green building assessment methods

Wu et al.2016

Gaps
- No emphasize on the role of vernacular architecture
- No stakeholders were involved
- Theoretical desktop research

Cont
- Focus on cultural dimensions

Atanda and Öztürk 2018

Gaps
- Focus on traditional social sustainability indicators
- No reference to vernacular architecture
- In-depth input from experts only

Cont
- Specific region focus approach

AlZubaidi, Maha, 2008

Gaps
- Focus on social sustainability
- Assumes that vernacular elements are suitable for modern use
- In-depth input from experts only

Cont
- Included few cultural-related indicters
- Emphasise on vernacular architecture
- Implication for local sustainable building assessment method

This Research
- The new framework holistically demonstrates the integration of tangible and non-tangible indicators and factors
- Demonstrated that sustainable housing incorporates the eco-cultural values of its occupants
- Proposed an eco-cultural approach that incorporate In-depth input from case study and housing users
- A new eco-cultural design tool is proposed, which facilitates improved environmental responsibility and sensitivity for context

Figure 7.1 Research addressed gaps and limitations

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This research establishes an alternative approach directed toward studying vernacular architecture and its sustainable traits. Studying sustainability lessons from vernacular architecture is an approach carried out extensively by many researchers to find solutions for present sustainability problems. Vernacular architecture, as identified by Brian Edwards (2005), represents a resource that has considerable potential for helping us to understand the principles of sustainable design. Principles, on which vernacular architecture is built, are still valid in the present time. Several studies like (Guillaud et al. 2014; Songel 2020; Weber 2013; Mahmoud Bayoumi 2018; Widera 2021) concluded, that there is much to learn from vernacular architecture if studied in the light of sustainability concept. They identify that sustainability is evident in vernacular architecture in the MENA region in three dimensions:

1. Natural and Built Environmental Sustainability (climate, building materials, and construction methods)
2. Psychological, Social and Cultural Sustainability (desires, identity, religion, family, and community lifestyle), and
3. Economic Sustainability (consumption and resources).

However, research on vernacular architecture remains mostly concerned with its ecological benefits and overlooks other sustainability dimensions. (Halicioglu 2012; Zhai and Previtali 2010; Motealleh et al. 2016; Ozorhon and Ozorhon 2014) regarded the ecological impact of vernacular architecture, forgetting to capture its true essence of sustainability. Their discussion also treated vernacular buildings as cultural heritage monuments that need to be conserved. Furthermore, Ghosh et al. (2019); Adwan and Abu Muhsen (2016) among others concluded that vernacular architecture is more sustainable than contemporary and current practices. However, their discussion did not leave the theoretical domain, neither did they tried to implement contemporary practical methods to measure and integrate these principles within the modern practice. Case study and interviews findings revealed that participants easily recognised vernacular dwellings and hold great sentimental value toward them. Participants consistently mentioned the vernacular dwelling in their responses to many different types of questions. They valued and desired the traditional dwelling for many different reasons. Some appreciated the building's relationship to culture and tradition with a sense of nostalgia. Others recognized the many environmental attributes they possess. Participants also stated that they are a more culturally expressive type of building. They also represent socio-cultural and environmentally sustainable qualities rarely found in today's dwellings. Vernacular architecture seems to have a profound impact on people's perceptions; not only as it relates to the built and natural environments but also their cultural identity. *This study concludes that it is the synthesis of all these qualities that people feel missing from their current contemporary dwellings and admired about vernacular ones*.

Results from this study demonstrated that the essence of vernacular architecture lies not in its physical elements and environmental characteristics only. Its true essence comes from its ability to meet the socio-cultural needs of its inhabitants. *The findings of this research also concluded that although vernacular architecture might be environmentally sustainable, they have stopped being so on social and cultural levels.* Interview participants criticised their inability to meet many basic modern life requirements and were part of the reasons why people stopped building and avoided living in them. Issues related to practicality and social stigma linked to the use of earthen materials dominated participants attitudes towards vernacular buildings. Therefore, vernacular dwellings In As-Salt city required major renovations in order to meet the many contemporary needs of its inhabitants. On the other hand, many contemporary buildings in Jordan have also been found to be problematic due to the context-unsuitable design materials and methods being deployed in ways and manner that contravenes local codes, climate and culture.

Additionally, Studies that were directed to generate practical recommendations and solutions for sustainability such as Semahi et al. (2019); Daoudi et al. (2019); Adwan and Abu Muhsen (2016) paid little attention to issues associated with the use of vernacular design elements. *Indeed, rarely did researchers discuss issues of practicality and comfort associated with the modern use of vernacular architecture and its elements as this research did*. *The research findings demonstrated*

that the main lessons of sustainability of vernacular architecture come from its core design values, paradigm and approach. The builders of these dwellings had the sensitivity to address issues on various environmental, economic, social and cultural dimensions of sustainability without the need to compromise one for another. *This study was among the few focusing on intangible socio-cultural indicators of vernacular architectural design and to show how these issues can impact the sustainability of these buildings.*

The study's approach proved useful in revealing which aspects of lifestyle associated with vernacular architecture and its elements is carried over to modern lifestyle in Jordan and which was changed. Therefore, the eco-cultural approach helps in revealing which vernacular architecture's elements can be adopted into contemporary practice and which needs to be critically reviewed and updated. For example, in the context of Jordan, the notion and requirement of privacy got passed down from vernacular to modern architecture. In a matter of fact, the emphasis on privacy is now more prevalent than before. Another is the requirements for open privately-owned space and the importance of the availability of trees and plant growing spaces. The modular vernacular buildings in Jordan also enabled their owners to expand and adapt to socio-economic changes in their lives with minimum costs and impact on the whole sustainability of the structure. These requirements are currently missing from design practices and codes in Jordan. *The study's framework successfully integrates these vernacular architectural lessons and solutions into Jordan's green building guidelines.*

The eco-cultural approach demonstrated the need to critically review vernacular architecture design elements away from nostalgic and romantic views. Suitability for modern use and solving contemporary sustainability issues should be the main criteria for applying lessons from vernacular architecture. A modern housing design cannot call itself sustainable if it fails to meet the current and future needs of its inhabitants. The critical point here is that modern regional architecture cannot go without the critical side that aim to integrate socio-cultural and contextual indicators alongside sustainability lessons of vernacular architecture. this should also be done while embracing modern design and technology that addresses issues of comfort and practicality associated with the use of vernacular architectural elements. The sustainability of vernacular architecture also comes from its ability to manifest awareness and sustainable culture that is aimed towards living with the context. Something that is rarely being mentioned or researched upon.

Few studies tried to demonstrate practical recommendations related to sustainable architecture in the MENA region. For example (Widera 2021; Kırbaş and Hızlı 2016; Tarrad and Sqour 2020; Songel 2020) studied the environmental potentials for various vernacular architectural elements and construction methods but they did not demonstrate their suitability for modern practice nor they suggested ways to modernise their use. Amro and Ammar (2020) presented some vernacular elements as indicators for a sustainable interior environment for Jordan. However, their sole case study was an elaborated contemporary courtyard dwelling the was built using vernacular elements. Many of these elements such as "Mashrabiyyah", and the fountain are not native to Jordan. They also did not comment on the suitability of these elements for Jordan socio-cultural, economic, or building regulations context.

One of the other main findings of this research revolves around the importance of a critical regionalism approach and contextual indicators for eco-cultural design. Most discussion on regional architecture approach revolves on the role of climate, local materials and other tangible indicators such as in (Pan et al. 2013). Others emphasise the role that vernacular architecture plays but fail to highlight what contribution it could play and limit its role to an eclectic design approach (Poon 2019). *This research calls for an approach for a regional design that includes human social and cultural indicators as well as design lessons from past local vernacular architecture.* The eco-cultural design framework also extended the discussion of indicators toward a comprehensive understanding of design indicators including those of general sustainability nature. This was also important as these indicators' requirements are different between regions as culture and social requirements change as much as environmental ones.

The eco-cultural approach and indicators synthesised by this study follow a context-sensitive design paradigm. This approach reflects core vernacular architecture design values and methodology. *The study's conceptual framework holistically demonstrates how the local context, people, culture, and technological development interact to support the emergence of a new contemporary eco-cultural architecture. This approach was not fully explored in any recent publication in a way that presents practical contribution in addition to the theoretical one*. The eco-cultural approach illustrated in this thesis presents an effective way to study, synthesise and integrate these regional and context-based indicators for sustainable building assessment methods in Jordan and beyond.

7.3   A new integrated eco-cultural housing framework for Jordan

One of the main outcomes of this research revolved around using thematic analysis of the semi-structured interviews and observations provided an answer to the first research question and objective. "Define the most relevant tangible and intangible indicators that affect contemporary and vernacular architecture within regional contexts ". The study generated a list of indicators that were incorporated into an eco-cultural design assessment framework for residential buildings in Jordan. *This study demonstrates that sustainable housing incorporates the eco-cultural values of its occupants*. The analysis of participants responses showed how their notion of sustainability was heavily linked to socio-cultural indicators. *It also confirmed that the perceived value of sustainable housing is underpinned by its ability to meet these eco-cultural needs.*

The discussion in recent literature sources on sustainability in housing is slowly shifting toward intangible indicators and dimensions. However, the main focus of researchers such as Maleki et al. (2019); Olakitan Atanda (2019); Kefayati and Moztarzadeh (2015) is still directed towards traditional sustainability indicators such as employment, cultural heritage and education. They also still favour quantitative approaches directed toward re-evaluating the role and importance of existing sustainability indicators. Very few of them have attempted to examine qualitative indicators or indicators that are rarely discussed and researched upon. This research moves the discussion of sustainable housing from traditional sustainability dimensions toward eco-cultural indicators that are based on regional and local requirements. The eco-cultural design framework employed a qualitative approach that incorporated housing users to reveal new eco-cultural indicators. Original outcomes from the study include a list of critical eco-cultural indicators that were never discussed within sustainable building assessment frameworks and methods before that includes:
- Human wellbeing and comfort,
- Social relations with neighbours,
- Solar access and neighbours right
- Availability of open private spaces,
- Privacy; and
- Flexibility and adaptability.

The research indicated that the current situation of housing projects in Jordan do not yet include discussion on these indicators. As a result, residents changed the original layouts of their dwellings to accommodate their needs. Holistic sustainability cannot exist without social and cultural dimensions. Learning from previous experiences, and investigating the current needs of the society, were adopted as a strategy for generating an eco-cultural design that could enhance the socio-cultural sustainability and environmental one in housing design.

This eco-cultural approach also transcends issues in sustainable building frameworks by drawing relationships between intangible socio-cultural indicators and physical design guidelines and how these can be integrated into building sustainability assessment frameworks. The proposed indicators, translated into spatial design relationships and rules, better reflect society's culture and social values while maintaining its context's environmental integrity. Mortada (2016) called for rethinking the role of culture in sustainability. They identified several principles in traditional

architecture that is identical with sustainability principles such as preservation of the natural environment, preserving environmental balance, reduction in resources consumption such as water, and society wellbeing besides social issues. Referring to traditional architecture in the MENA region was of Mortada's study objectives while relating traditional architecture to sustainability was indirect. *This research discussed traditional architecture, as well as contemporary, through a systematic framework to identify sustainability eco-cultural indicators in architecture.* This was in reference to how vernacular traditional architecture was able to create a sustainable built environment while reflecting the social and cultural values of its context and people. This approach has not been attempted before in any similar research.

This thesis's framework is based on 1) understanding the concept of sustainability in vernacular architecture, 2) investigating indicators of cultural sustainability and locality, 3) social values derived from the society and 5) developing an eco-cultural assessment framework and layout for Jordan green building rating system. In addition, the proposed framework and tool were developed to be appropriate and applicable to traditional and contemporary dwellings and buildings in Jordan.

Similar recent research that examined similar premises includes Al-Jokhadar and Jabi (2016) and Al-Kodmany (2018) who both studied the implications of social sustainability indicators for tall residential buildings in the MENA Countries. However, the main difference between their work and our research, is that it is dedicated to domestic buildings (dwellings in Jordan) adapting a user-focused and participation from people living in traditional and contemporary dwellings in Jordan. Al-Jokhadra (2017), research was focused on generating a parametric logic of design using mainly a quantitative methodology to generate social sustainability solutions for high-rise buildings. By doing so they overlooked a lot of issues that were not quantifiable or transferable into computation design metrics. Their study also synthesised their main findings from studying vernacular examples from across the MENA region and from interviewing experts and architects neglecting critical in-depth input from buildings occupants. They also used case studies from few selected countries to make generalisations about the whole MENA region.

Other studies (Surf and Saied 2014; Al-Zubaidi 2007; Al-Haroun 2015) referred to sustainability crisis in the region due to several factors: 1) imposing Western building types without considering their impact on the local culture and environment, 2) lack of trust in the traditional methods, and 3) loss of self-respect and identity. Yet, these studies did not formulate any policies or set practical indicators to solve this crisis. Sustainability principles needed to be formulated through a group of criteria to enable designers and policymakers to implement sustainability principles in contemporary architecture in the MENA region. *This research identified sustainability environmental indicators and sustainability socio-cultural ones that were set within groups of criteria and formulated within eco-cultural framework and tool*. This enables other researchers and architects to assess sustainability indicators in contemporary dwellings and buildings to ensure the applicability and reliability of the framework for sustainable buildings in Jordan and the MENA region.

The eco-cultural approach also helped to address issues and limitations in many sustainability indicators. Some indicators, especially those of generic nature like orientation, and shading devices are especially more critical for the case of Jordan. They are also more critical for social and affordable housing schemes where the term is often associated with low style and the absence of many qualities. The study showed that the expectations of general specific qualities which should exist in any housing design are proven to fail. This is also linked to regional specific challenges and gaps in Jordanian architectural practice that should be accounted for in Jordan's sustainable building assessment methods. So far, mimicking international sustainable building rating system indicators and categories have led Jordan to adopt typical sustainability indicators without much critical thinking on how they should be adapted for Jordan. Therefore, the eco-cultural approach presented in this thesis is vital to research, review and integrate these indicators within such methods and practices. *The eco-cultural approach also helped clarify the gaps in existing sustainable building design indicators as well as revealing new original ones.* The emphasis should

be directed from general environmentally sustainable housing toward eco-cultural housing based on regional and context-specific requirements.

7.4   The theoretical and practical implications of the eco-cultural framework and tool

Another contribution of this thesis lies in the use of its methodology which is applicable and repeatable for another context. The methodology utilised here affirms the value of user input in the design and shows that housing residents considered socio-cultural design based on a coherent understanding of inter-related indicators that highlight the importance of a well-designed residential dwelling. Very rarely did researchers studying socio-cultural dimensions and indicators of sustainability applied similar methodology. Studies like (Surf and Saied 2014; Al-Jokhadar and Jabi 2016; Al-Zubaidi 2007) only focused on including experts and architects in their research methodology and none of them considered in-depth interviews with housing occupants. Interviewing and including modern and vernacular dwellings residents and occupants enabled the study to reveal the previously set of eco-cultural indicators that were not previously studied or included in any sustainability assessment frameworks

By including participants from the case study and vernacular and modern housing users and residents. The research also highlights the importance of user involvement and residents participatory and engagement approach during different building stages that involve incorporating buildings inhabitants' views as a stimulator for an eco-cultural approach. The study showed that users could be involved in the development of building sustainability assessment methods in three main ways:
1. Users and citizens can be involved at the time of defining the sustainability targets and identifying the core criteria and indicators that are going to be assessed.
2. Users can also be involved during the weighing of different criteria. Having a consensus-based weighting for different categories of indicators can improve the assessment process.
3. Citizens can participate by providing feedback that helps planners update the system.

By using user feedback, planners and developers can decide when development changes will be required to align economic development activity with ecological limits and social needs. Enabling the residents to be involved in identifying and designing measurements systems for where they live is beneficial because they will be more invested in the reliability and accuracy of data collected. Consensus-based measurement systems can serve to diffuse conflicts within a community and establish a basis for mutual understanding and improved decision-making.

This research has also identified issues relating to sustainable building assessment methods and aimed toward addressing these issues through the development of an eco-cultural design framework and tool. The developed framework and tool present a practical basis for setting building codes and legislation to implement sustainability as an essential approach for architecture in Jordan and other countries within the MENA region. As a complementary part of this discussion, the research focused on environmental and social sustainability to create a basis for examining sustainability potential in traditional and contemporary architecture in Jordan.

The research represents the first investigation carried out to examine the appropriateness of an eco-cultural framework to assess environmental and social sustainability potential in architecture in Jordan. Conclusions of the theoretical investigations were drawn at two levels. The first is the conceptual framework and indicators for design assessment and its appropriateness to deal with sustainability potential in architecture. The second is the eco-cultural tool needed to be tested and evaluated to fit the Jordan context. The way this research employed investigation of eco-cultural design framework at both theoretical and practical levels represents an appropriate base for an evaluative framework for examining sustainability in architecture.

In other similar research bodies, the testing and practical recommendations and attempting to provide practical solutions for theoretical research have been largely overlooked. For example, Mahgoub (2007) asserted the importance of vernacular buildings to update buildings codes and legislations as one of the strategies to adopt sustainability as a futuristic approach in architecture. Yet, his study did not formulate any practical recommendations for how to modify buildings codes towards sustainability.

Al-Jokhadar and Jabi (2017) built a parametric design tool for applying the vernacular model to high-rise buildings in the MENA region but since their research is aimed toward a large number of countries they did not include discussion on local building regulations and sustainability codes or whether their research can fit or be unfit for specific countries. Verma and Raghubanshi (2018); Pocock et al (2016), did not suggest or provide any practical way to measure the suitability of their research to their context. Alyami et al. (2015) and Zarghami et al. (2019) in their research developed practical green building assessment frameworks and weighing systems for Iran and Saudi Arabia. However, their research did not deal with the criticism directed toward sustainable building assessment. Rather, they followed the same expert' oriented approach for creating, building and developing such assessment methods.

Investigating socio-cultural sustainability in architecture constructed the base for developing the eco-cultural framework and tool. This framework is based on five assessment areas: Site and neighbourhood, social relationship, Cultural indicators, Indoor comfort, and Energy and materials. Each area of assessment consisted of sub-sections and indicators of eco-cultural design requirements that are used in assessing the sustainability performance of the dwelling. The eco-cultural framework and tool were refined according to the testing and evaluation phase with an expert panel from Jordan. Very few studies followed a bottom-up approach in their methodology to develop sustainable building assessment frameworks and methods. Anih et al. (2019); Ali and Al Nsairat (2009); Alyami and Rezgui (2012); Mahmoud et al. (2019) relied only on experts input to generate their list of assessment indicators and to quantify their weighting and rating systems with no input from buildings occupants or residents. This method is particularly not suitable for assessing qualitative socio-cultural dimensions of sustainable housing design. Many investigated green building assessment methods fell short in including many socio-cultural criteria because the aiming goals of these assessment methods were mostly about the social performance of society or community as a whole. Thus, this study depended on developing the eco-cultural framework on the main source of social and cultural values and identity in a society, its people. *This research acknowledges the limitation and gaps found in green building assessment methods. The research aimed towards addressing them by studying indicators and issues rarely discussed in sustainable building assessment methods and by following an occupant's involvement approach*.

The testing and evaluation phase with a panel of experts concluded that the framework and tool are suitable, accurate, and applicable to aid in the design of sustainable dwellings in Jordan. Yet, the testing process indicated that some assessment criteria needed modification, which was considered in setting the final version of the framework. The new framework holistically demonstrates the integration of tangible and non-tangible indicators and factors. It also demonstrates how the local context, people, culture and technological development interact to support the emergence of a new contemporary eco-cultural architecture. The proposed eco-cultural tool helps to incorporate necessary eco-cultural design criteria and make changes to allow for more sustainable design and green building. In doing so, local governments would find ways to encourage developers, contractors and design professionals to plan for and use sustainable design tools and techniques. Within the framework, tangible design roles for intangible socio-cultural factors are effectively and successfully incorporated into the Jordanian Green Building Design guides and standards. *No previous studies have attempted such an approach that is aimed to generate tangible solutions for intangible issues within the context of Jordan before.*

7.5 Critical reflection and project limitations

critical reflection in research is related to the production of knowledge, and on how our social and research identities affect the whole endeavour, from research design to data analysis. It enables more rigorous research, allows a researcher to distance themselves from their work, and last, but not least, perhaps enable a fresher perspective on what can appear a quite tedious project (Fink 2000; Alvesson and Sköldberg 2017).

During the research design process, it was expected that the in-depth interviews are going to be an ideal method to answer the research questions and achieve its objectives. However, the process of data collection and analysis proved to have a few limitations and difficulties. One was that the interview questions guide was quite lengthy and might not have promoted an equal long conversation to cover all the possible thoughts participants might have had regarding them due to time limitations. The interviews guide design should have gone through an additional cycle of review to reduce the number of questions. It could have alternatively facilitated for the most critical questions to be asked firsts instead of going through the guide sections thematically.

A second limitation was that participants were reluctant to participate when first approached because they were not sure what would they gain by contributing and were not sure of what was going to be asked of them. However, after a connection was made with the participants using the extended social network, the process and content were explained, and the interviews were conducted, and responses were collected successfully. Furthermore, there were very few previous research works regarding sustainability or vernacular architecture in Jordan that can be used as a reference point with substantial data for this thesis. Other limitations, aside from lack of previous research for the context of Jordan, included limited available data on the selected case study, and the extensive time required to obtain information from the case study gatekeepers.

Regarding sampling, the sample size was deemed sufficient given that this study aimed to generate a theoretical understanding rather than to generalize to the population. In a matter of fact, the sample size might have been "too" large for the sake of the research. Indeed, a focused groups approach might have been more ideal to stimulate the interview while helping to cross-check the accuracy of the data. However, it proved difficult to organize a focus group interview among primary interview participants, as some of them were elderly and are often unwilling to leave home. Participants also had different professions and availability times and it was considerably easier meeting them individually. The required time to organise such communal meetings would have increased the time required for data collection significantly which was not possible due to funding and technical difficulties. It was also very important to meet participants at their dwellings and using a focused group approach would not have made this possible. In the end, the in-depth interviews approach has been very useful in understanding people's perceptions of and attitudes towards sustainability and vernacular architecture and their role in a contemporary domestic context.

In retrospect, some things could have been done differently. Scientific terms like environmental sustainability and cultural identity have been used for the interviews with housing occupants. It might have been better to break these terms into topics more meaningful and easier to discuss with individuals who are not experts. Some participants having difficulty answering questions related to the technical nature of the housing which took time to explain these terms to them such as the notion of sustainability in housing. The interview guide, however, aimed to ask about many potential indicators related to socio-cultural and environmental sustainability and behaviours to reveal themes around environmental sustainability and cultural identity in their everyday lives which can then be linked thematically to sustainability. Indeed, most of the questions were open-ended and generated themes around these topics, therefore, the limitation that revolved around the length of the interviews might have helped the overall findings. Moreover, the researcher was present to check individual understandings of these concepts. This study is also limited by the fact that the data derived from interview accounts are self-reported. Consequently, the answers,

attitudes and behaviour reported may differ and not correspond to real life. Here the large sample size helped validate and cross-check participants answers when they were repeated frequently across both case study areas.

Although the study addressed major socio-cultural sustainability indicators in residential buildings missing from sustainable building assessment methods, there are some limitations. Other socio-cultural factors may have direct effects on wellbeing and sustainability that were not revealed or investigated. This is due to the complexity of these issues, which requires collaboration between different experts and stakeholders from various research and practical fields. It is also essential to investigate other stakeholders and potential tool users in the future, including planners, engineers, potential developers and governmental officials in Jordan. This was not included within this evaluation stage as it was outside the scope of this work and because of practical and time constraints.

Another limitation of this type of study also includes categorisations, where in many cases, there are potential for overlaps and examples could easily fit into multiple categories. Conceptual frameworks can also be influenced by the experience and knowledge of the individual, presenting initial bias. However, the qualitative approach was required to research such human-related indicators of the built environment. Furthermore, the study went to evaluate its results through another round of fieldwork to eliminate any possible bias in its framework.

Culturally related indicators such as the role of privacy should be investigated separately in other contexts and are important issues that need to be incorporated into sustainability assessment frameworks. Furthermore, the effect of applying different building codes and regulations between Jordan and other regions should also be investigated as well. However, results deducted from Jordan are expected to be applicable to countries in the Middle East and North Africa region (MENA) as they share a similar climate, history, cultural and social norms.

There were issues related to the tool construction and design using MS Excel due to issues of feasibility and time constraints. However, the aim was to make generalisations about the eco-cultural design model of residential buildings in the case area and produce a repeatable study rather than addressing specific computational tool design requirements. Thus, further investigation is required to test the latest version of the tool and eliminate any unresolved usability issues. Other limitations in the collection of responses in interviews rounds were predictable but manageable, and include:
- The sample not representing the total population of Jordan, so the study tried to choose a case study setting that is representing for Jordan
- This research focuses on the environmental and social sustainability of one type of buildings, domestic buildings, in Jordan. This means that the findings of this research might not be relevant to public buildings, rural and nomadic areas in the region, and non-residential buildings.
- Further studies are needed to reveal possible sets of indicators that were not discussed and be compared to the findings of this research.

7.6   Conclusions

Literature review and fieldwork carried out by this research demonstrated that architecture in Jordan and many other MENA region countries have witnessed drastic changes during the past century. These changes created a different type of architecture with the vernacular architecture of the country that was aimed to meet the ever-changing and socio-economic changes in the society. However, the interviews with housing residents from the case study demonstrated that while modern architecture has helped meeting many of modern life requirements it ignored deeper socio-cultural qualitative needs. Furthermore, Jordan green building guide still represents an outdated point of view toward sustainable housing that focuses only on technical environmental requirements.

This study provided a few original contributions to knowledge that aims to bridge and answer these limitations and gaps for the context of Jordan. The main outcome of this thesis is the formation of the eco-cultural framework that will help the successful development of sustainable housing in Jordan and the adaptation of the unique contextual design requirements. The model was constructed based on the findings from the primary and secondary data that categorised missing indicators from Jordan green building guide. Integrating research findings to examine sustainability lessons and models in vernacular and modern architecture represented an appropriate base for the conceptual framework for investigating sustainability in architecture.

For policymakers, this research provided the necessary framework to be followed when planning for the major housing projects and how to overcome limitations and issues with current practices for the housing sector. For research, no previous studies have investigated sustainability lessons in vernacular and modern architecture in Jordan in such a way that modifies sustainability assessment methods for the built environment, especially housing. The research methodology and methods can be repeated for other regions or can be further duplicated and built upon to further expand the list of socio-cultural design indicators. For practice, the research provided a list of practical design indicators and requirements that can be integrated successfully into their work to achieve sustainable housing design on environmental, economic and socio-cultural levels.

Chapter Eight: Conclusion and recommendations

8.1 Introduction

The Middle East and North Africa (MENA) region, including Jordan, had one of the world's highest urbanisation rates during the twentieth century (Al-Jokhadar and Jabi 2016). This was accompanied by demographic, social and cultural changes. The resulting impact on the built environment was the abandonment of vernacular architecture as a primary building method, favouring modernist and globalised building methods, style and materials. Furthermore, Jordan's high dependency on its limited resources to service its reliance on conventional globalised building design and construction methods has led to the building sector accounting for 40% of its energy use and 40 % of waste products.

To better utilise technology to create environmentally sustainable solutions, efforts are represented in Jordan's first green building assessment method. Nevertheless, this building assessment method ignores the potential to incorporate social needs, building traditions and cultural values. Therefore, a balance between socio-cultural sustainability and other economic and environmental dimensions is one requirement that designers need to achieve.

This research aimed to propose a regional and context-based framework and tool for eco-cultural housing schemes that build on vernacular architecture lessons as a model to integrate cultural, social, and ecological variables. The development of a context-based eco-cultural framework and design tool is challenging, demanding coordinated knowledge of the three interrelated sustainable development dimensions, environment, economy, and society plus the fourth less discussed aspect, culture.

The study adopted a qualitative research methodology that employed interviews and a case study approach to extract eco-cultural sustainability indicators. Outcomes from the interviews, which focused on sustainable design qualities of modern and vernacular dwellings in Jordan and their effects on the residents, showed that most participants prioritised socio-cultural dimensions of sustainability. Indicators such as human comfort, social relations with neighbours, availability of open spaces and living areas, and visual privacy were discussed the most and linked to sustainable design. These indicators were then translated into topological relationships and design guidelines that reflect society's culture and social life. The following sections summarise the research stages and results while highlighting practical and academic contributions and implications. Finally, recommendations and directions for future studies are discussed.

8.2 Summary of work

The study adopted an eco-cultural and critical regionalism design approach that calls to understanding traditional values and studying lessons from vernacular architecture without the direct use of traditional forms and materials. This approach also emphasises the importance of progress. It investigates society's current needs to help create sustainable residential buildings that can enhance the socio-cultural indicators of human living and wellbeing. Table 8.1 highlights the main research questions, objectives, and methods used in this approach to achieve this study's primary aim.

Table 8.1 The main research questions, objectives, and methods used in this research.

Research Question	Research Objective	Research stage and method	Chapters
What tangible and intangible indicators inform the eco-cultural sustainability of housing?	Define and interpret the most relevant tangible and intangible indicators that affect contemporary and vernacular architecture within regional contexts.	This was carried out using a comprehensive literature review.	Chapters Two and Three
How can these indicators be measured and connected to the physical attributes of the built environment?	Refine and evaluate the efficacy, appropriation, and measurement methods/tools for applying these indicators,	This stage employed interviews with stakeholders and a case study approach within modern urban and vernacular housing cases.	Chapters Four and Five
How can the measurable and quantified indicators inform the creation of context-based guidelines for the design of sustainable housing developments?	Propose a multi-factorial, multi-stakeholder framework and tool to integrate these indicators within sustainable eco-cultural housing design.	The eco-cultural framework and design tool for residential buildings in Jordan was developed and tested through another round of interviews with practising architects and professionals	Chapter Six

The strategy chosen to answer the first question (What are the tangible and intangible indicators that affect both the built environment and inform human-cultural context?) involved a comprehensive review of recent literature. This review included sources on vernacular architecture, the role of culture in the production of the built environment, and sustainable buildings, as illustrated in Chapters One to Three. This stage helped identify the leading indicators of the conceptual framework for eco-cultural architecture production in different contexts. Results from this stage also led to the recognition of the need to develop a method to implement these missing indicators within modern sustainable building assessment based upon a comparative review of well-known sustainable building assessment methods.

The literature review stage facilitated the choices and rationale behind adopting the research methodology and methods to answer the second research question (How can these indicators be measured and connected to the built environment's physical attributes?). The most adopted sustainable building assessment methods represented expertly oriented bird-eye viewpoints and do not sufficiently involve all stakeholders. Therefore, a fieldwork phase was necessary to study these indicators' effect on residents' socio-cultural lives and reveal any additional indicators the literature review phase might have missed.

The fieldwork phase utilised a case study and interviews with residents from two areas in Jordan, one modern and one with vernacular architecture examples, to establish and refine the theoretical

model and indicators into user-defined eco-cultural indicators. The interviews' goal was to obtain the most reliable consensus from participants using a series of in-depth, open-ended questions. This stage also helped to answer the third and fourth research questions (How can these indicators be measured and connected to the physical attributes of the built environment?) and (How can the measurable and quantified indicators inform the creation of context-based guidelines for the design of sustainable housing developments?).

Participants' views were coded, clustered, and analysed to determine the relationship and importance between these indicators. The analysis revealed the categories and criteria required to form an eco-cultural design integration for residential buildings within the case area of Jordan. This stage was instrumental in providing a factual basis upon which the resulting indicators are incorporated into a working framework and tool, which answered the final question (How can these findings be pragmatically applied to preserve and transform lessons from vernacular architecture into contemporary housing design and development?).

This stage utilised results from the previous fieldwork stage and sustainable design methods taken from the literature review to focus the tool's categories and provide references and theoretical basis for its content. Moreover, besides improving the socio-cultural qualities of future developments, the review helped save time and effort to generate solutions and create the database of available best practices and solutions. This qualitative approach revealed a variety of scientific and practical resources related to sustainable design and evaluation. This toolkit outlines the influential factors and indicators to aid modern, sustainable, yet contextual residential building design. This stage also illustrates the translation of intangible indicators, especially into tangible working architectural and spatial qualities.

Then, it was necessary to evaluate the developed eco-cultural tool based on feedback from architects who specialise in residential dwellings in Jordan. The toolkit was tested by assessing its efficiency and effectiveness. The chapter concludes with the updated framework and a modified version of the tool based on these findings.

8.3   Summary of findings

The first research objective (**Define the most relevant tangible and intangible eco-cultural indicators that affect contemporary and vernacular architecture within regional contexts**) was achieved by revealing a list of frequently discussed tangible indicators in building sustainability frameworks such as site, typography, climate, materials and available technologies. It also revealed a list of less discussed but equally intangible human-related indicators that were not further measured or investigated, such as local culture, custom, social norms, gender roles and family structure.

The sustainability of architecture is not determined by technological and climatic indicators only, but to a large extent also depends on other socio-cultural indicators. They determine what materials are used, which form and typology are chosen and how space is used. These factors are, therefore, crucial in determining whether a form of architecture is sustainable or not. Even within a region with similar geography and bio-climatic factors, a small variation in intangible factors could result in a vast diversity of architectural construction and form, which would be considered native and suitable to its context.

The literature review stage also revealed that vernacular architecture offered an example of a socio-culturally and environmentally sustainable built environment. Most of these dwellings consider the cultural, social, and local living patterns of residents, while many contemporary buildings ignore and lack. Vernacular architecture thus presented valuable knowledge for this study regarding the relationship between culture and environmental sustainability. Research resources do indeed imply them as a learning source of which current issues can be addressed. However, they are mostly revolved around technology and bioclimatic performance lessons (Hărmănescu and Enache 2016; Kırbaş and Hızlı 2016; Semahi *et al.* 2019; Daoudi *et al.* 2019).

Researchers also seldom try to modernise vernacular elements, nor do they pay attention to practicality issues or appropriated for modern daily use. Although the culture that produced vernacular architecture has changed over time, the influences and indicators that shape it still exist in a transformed way.

This stage concluded with a review of sustainability assessment frameworks and tools, such as BREEAM and LEED, focus on environmental, physical issues, ignoring contextual and socio-cultural indicators surrounding sustainable building design. These foremost international environmental assessment methods created variations to be used in countries worldwide, despite having been designed to suit specific contexts. The evidence indicated that they lack regional priorities or locality considerations and are therefore not universally applicable to all regions. Most of the assessment tools also represent expert-driven and bird-eye opinions and do not sufficiently involve all stakeholders, including building residents and users. The results also indicate that they do not pay enough attention to how the performance of assessed sustainable buildings and projects can affect or be affected by users and their behaviour.

Case study work and interviews with residents from the case study were utilised to achieve the second research objective **(Refine and evaluate the efficacy, appropriation, and measurement methods/tools for applying these indicators within a contemporary sustainable housing schemes in Jordan based on regional architectural principles)**. The study argued that a qualitative research approach was the most appropriate to investigate and refine the initial list of eco-cultural sustainability indicators. Results related to this objective and stage found that socio-cultural indicators dominated participant's perspectives and image of sustainability. Most participants prioritised indicators of wellbeing and satisfaction such as human comfort, social relations with neighbours, availability of open spaces, visual privacy, and natural light and ventilation. For almost all the participants, privacy was the most critical cultural trait that a dwelling must have. This transcends the house's inner part to semi-open and semi-private outdoor zones like the garden, balconies, and terraces. Participants also pointed out various vernacular elements that serve a dual function of environmental controller and privacy enhancer.

The findings highlight the connections participants made between intangible socio-cultural factors and how they can be translated into tangible architectural elements such as space, form, resource use and thermal performance. Tangible and intangible design metrics are essential for fulfilling these needs. These socio-cultural indicators were frequently discussed in relation to planning, internal circulation and heritage relevance. Residents were likely to make changes to their dwellings' layout and original design to accommodate their needs due to these qualitative issues. For instance: privacy can be achieved by the size, position and orientation of openings and space, which can also have an impact on thermal comfort. Therefore, the findings confirm that there is a need for better integration of the cultural indicators of architecture to the three dimensions of sustainability during the design, planning and implementation of housing schemes. Cultural metrics should be integrated holistically, bearing in mind that this would differ per location and context.

To achieve the third and fourth research objective **(Propose and evaluate an eco-cultural framework with relevant user-defined eco-cultural indicators for sustainable housing in Jordan)** and (**Propose and evaluate an eco-cultural framework with relevant user-defined eco-cultural indicators for sustainable housing in Jordan).** Results from the literature review and interviews stages were consolidated in a conceptual framework and used in the production of an eco-cultural design tool for residential buildings in Jordan. The study revealed a total of 16 eco-cultural indicators that were missing or needed further implementation within Jordan Green Building Guide distributed on six main categories that include: (1) Site and context (2) Social Relationships (3) Cultural and perceptual, (4) Flexibility and adaptability, (5) Indoor comfortable environment and, (6) Energy and resources efficiency.

An evaluation and testing phase with a panel of experts was conducted to achieve the final research objective (**Apply the multi-factorial, multi-stakeholder eco-cultural framework to propose and evaluate an eco-cultural design assessment tool for sustainable housing design in Jordan**). Findings from this stage showed that the participants considered the eco-cultural framework accurate and suitable for the context of Jordan. However, they had less favourable opinions regarding the design and ease of use of the produced eco-cultural tool. Non the less, participants deemed the tool content useful and practical for integrating eco-cultural design indicators within the architectural practice in Jordan. The participants praised the effort to make a contextual sustainable building assessment method for Jordan that is not based on international sustainable building assessment methods. Participants also supported the pre-chosen indicators, and all of the pre-selected indicators were preserved within the category. Highlighted modification for the tool includes simplifications to the tool and enhances the tool's components' useability and clarity. The tool helps its users incorporate necessary eco-cultural design criteria and make changes to allow for more sustainable building design.

8.4 Contributions to knowledge

The study revealed several gaps in research regarding sustainable housing development and assessment. Most notably, the perception of cultural sustainability in sustainable building assessment methods is still vague. The focus on critical environmental and social factors only and the differences in multicultural dimensions and different contexts have limited the amount of research in social and cultural sustainability and its effect on sustainable building assessment. Intangible indicators, such as psychological requirements and socio-cultural constraints, are also critical indicators. They offer a comprehensive understanding of the design problem and harmonise the output with its context and users' needs.

This research has added to the body of knowledge regarding housing sustainability by demonstrating that occupants from the case study area prioritised sustainability indicators different from those prioritised by sustainability experts. The study also demonstrated that most sustainability assessment indicators have different priorities and requirements in different regions. The research presents an in-depth insight into the indicators that informed the production of vernacular architecture. It also provided new insight into cultural and social sustainability indicators and how can they be reflected in a contemporary eco-cultural design. These results also address the lack of a compelling, unified, systematic framework for assessing and relating intangible human needs to design features that makes the socio-cultural sustainability indicators complex. The following are also important areas where the study provided new significant insights and contributions are as follows:
1. This study demonstrates that sustainable housing is one that incorporates the eco-cultural values of its occupants. It also confirms that the perceived value of sustainable housing is underpinned by its ability to meet these eco-cultural needs.
2. It affirms the value of user input in the design and shows that housing residents consider socio-cultural design based on a coherent understanding of inter-related indicators that highlight the importance of a well-designed residential dwelling.
3. The findings bridge the gaps in knowledge by drawing relationships between intangible socio-cultural indicators and physical design guidelines and how these can be integrated into sustainable building assessment frameworks. The proposed indicators, translated into spatial design relationships and rules, better reflect society's culture and social values while maintaining its context's environmental integrity
4. It validates a methodology to select, measure, and integrate human-related socio-cultural and environmental sustainability indicators within sustainable building assessment methods. This methodology will also help other researchers and architects duplicate research toward developing a system of analysis that allows architects to integrate socio-cultural parameters in residential buildings' design processes.
5. A new eco-cultural design approach is proposed, which facilitates improved environmental responsibility and sensitivity for context.

6. The new framework holistically demonstrates the integration of tangible and non-tangible indicators and factors, e.g. demonstrating how the local context, people, culture and technological development interact to support the emergence of a new contemporary eco-cultural architecture.
7. An eco-cultural tool is proposed to help to incorporate necessary eco-cultural design criteria and make changes to allow for more sustainable design and green building. In doing so, local governments would find ways to encourage developers, contractors and design professionals to plan for and use sustainable design tools and techniques.
8. Practically, tangible design roles for intangible socio-cultural factors are effectively and successfully incorporated into the Jordanian Green Building Design guides and standards.

The research also highlights the importance of user involvement and residents participatory and engagement approach during different building stages that involve incorporating buildings inhabitants' views as a stimulator for an eco-cultural approach. The study showed that users could be involved in the development of sustainable building assessment methods in three main ways:

4. Users and citizens can be involved at the time of defining the sustainability targets and identifying the core criteria and indicators that are going to be assessed.
5. Users can also be involved during the weighing of different criteria. Having a consensus-based weighting for different categories of indicators can improve the assessment process.
6. Citizens can participate by providing feedback that helps planners update the system.

By using user feedback, planners and developers can decide when development changes will be required to align economic development activity with ecological limits and social needs. Enabling the residents to identify and design measurements systems for where they live is beneficial because they will be more invested in the reliability and accuracy of data collected. Consensus-based measurement systems can serve to diffuse conflicts within a community and establish a basis for mutual understanding and improved decision-making.

Lastly, this research sets a new precedent in research for Jordan and beyond. It deals with issues and queries intended for both academic research and practical application. Academically, it aids in understanding the role of socio-cultural indicators in sustainable design. In practice, the toolkit was deemed useful and usable for the integration of socio-cultural indicators within architectural practices in Jordan. Additionally, the research paradigm and approach are repeatable for other contexts and regions.

8.5 Recommendations and future research

According to research findings, several recommendations are suggested. These recommendations can be classified into general recommendations to integrate eco-cultural design indicators and achieve sustainable architecture, recommendations for stakeholders in Jordan and the MENA regions and recommendations for the eco-cultural tool application.

8.6.1 General recommendations

To ensure successful implementation schemes, guidelines for sustainable building design should be developed to provide practical assistance to building designers. Recommendations for demonstrating sustainable architecture in Jordan can be listed as follows.
- Raising public awareness about the environment and sustainability through encouraging community participation in decision making and setting development policies.
- Developing planning strategies, qualities codes, and building regulations towards sustaining local environmental, social values and cultural needs.

- Integrating the concept of sustainable architecture into the design process of professional practice. A critical regional approach to architectural design should incorporate all indicators of sustainability from vernacular architecture.
- Encouraging researching and publishing on sustainability, sustainable architecture, and assessment methods with special reference to socio-cultural sustainability.
- Introducing the concept and issues of social and cultural sustainability in architectural education. The architectural curriculum should address various indicators of sustainability as an overriding concept that influences design decisions.
- Redefining the valid issues in traditional architecture for developing futuristic sustainability policies in Jordan and the region.

8.6.2. Recommendations for eco-cultural tool application

The study showed that the eco-cultural tool is an efficient and effective instrument to be adopted by architecture students and professional architects in the early stage of the design for constructing sustainable residential buildings. The following are recommendations regarding the use and application of the eco-cultural framework and tool:
- Real case studies are needed to reinforce the efficacy of the tangible and intangible sustainable design indicators as implemented within Jordan Green Building Guide.
- It is recommended that the eco-cultural framework be subjected to regular review, informing required development and updates.
- This research recommends using the eco-cultural design tool in evaluating buildings whether in the design stage or after building completion and occupancy.
- The study recommends that Jordan's green building guide content and framework be updated with the new categories and indicators presented in the study's framework.

8.6.3 Key Recommendations for stakeholders

At this stage, it becomes necessary to present the study's key recommendations and their implications for policy, practice, and research. The following recommendations have been derived from the study's key findings:
- The study recommends homeowners and potential homeowners to consider using vernacular architectural design principles in their dwellings and not just to imitate traditional elements like courtyards and arches only. The study provided few design principles with significant potential for a contemporary application that will help dwellings be more sustainable in the long term.
- The study recommends researchers further explore the tension between tradition and modernity in Jordan's domestic built environment. Specifically, how people's passive and active adaptation may be learned from to direct future sustainable living environments? And to what extent does government policy affect people's relationship with their built environment?
- The study recommends for lawmakers and government officials to seriously work towards finding fast solutions to meet people's demand for public housing welfare and ensure that Jordan's codes are being meet in new contracted buildings.
- The study recommends practising architects and policymakers pay more attention to the notion of adaptability and flexibility of housing design and how future renovation and extension work can be performed to dwellings without jeopardising its sustainable traits.
- The study recommends for lawmakers and government officials to provide successful frameworks to promote cultural and environmental sustainability. This has been stressed by many participants in the initial workshops and especially by homeowners. For example, new regulations may be introduced to provide incentives for individuals or the private sector to employ eco-cultural design indicators and requirements.

- The study recommends housing developers to minimally follow Jordan's building codes especially energy saving housing codes and consider wider social and cultural implementations for their projects.

8.6.2. Recommendations for future work and research

After the implementation and the evaluation process, the following are recommendations for future studies that require further investigations:

- Future work could be directed toward other countries in the MENA region or other contexts to highlight similarities and differences between them using the same methodology.
- Another area of research is to develop a more user-friendly and graphical design interface that include extra details of sustainable building assessment based on site configuration, such as topography, windows, typology, to be used effectively in the detailed process of the design.
- Future development that can increase the relationship between the context and the spatial design is to consider building regulations and residential buildings' codes, as these regulations change over time.
- Future fieldwork from more case studies in Jordan should be carried out to reveal more categories and indicators that this research might have missed due to different regional priorities in between Jordanian cities and towns.

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Appendix A: Case studies interview guide

Interviews Guide

دليل المقابلات

<table>
<tr>
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1. Consent Form

A. **introducing the researcher**
I am Yahya Qtaishat a Ph.D. architecture student from the university of Bath

B. **Title of Proposal:**
INTEGRATED ARCHITECTURE OF TRADITION, CULTURE, IDENTITY AND SUSTAINABILITY

C. **Purpose of the Research:**
Explore the integration of modern design and technological indicators in fusion with traditional architecture and local cultural elements.

D. **Description of the Research:**
Semi-structured interviews with stakeholders about case studies of new development projects and heritage buildings in Jordan.

E. **Outcome:**
To create and test a toolkit that can help to foster and support an eco-cultural design approach for Jordan.

F. **Voluntary Participation:**
Participation in this study is voluntary. You will not suffer any harassment if you decide not to participate.

G. **Alternative to Participation and Withdrawal (if applicable):**
You may choose not to participate or withdraw at any point you want, and all the files will be destroyed.

H. **Confidentiality:**
Your identity as a participant in this research study will remain confidential with respect to any publications of the results of this study.

I. **Reimbursements:**
There will be no reimbursement for the participation in the study.

J. **Contact Person(s):**
For any specific questions regarding this study or in the event of a research-related injury, please contact the principal   investigator /delegate, Yahya Qtaishat telephone 00447445322262

K.   I acknowledge that I have read (or it had been explained to me in a clear language) the attached Research Participant Information Form. The nature and purpose of this study has been explained to me. I have had the opportunity to ask any questions I have regarding this study and all those questions were answered to my satisfaction.

L. <u>**Signature of the participant:**</u>
participant: _____

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1. نموذج القبول باجراء المقابلة

A. **تعريف بالباحث**
أنا يحيى قطيشات طالب رسالة دكتوراه في هندسة العمارة من جامعة باث في المملكة المتحدة

B. **عنوان البحث:**
نحو عمارة متكاملة بين التقاليد, الثقافة, الهوية و الاستدامة

C. **الغرض من البحث:**
البحث عن وسيلة لدمج حلول الاستدامة المستمدة من العمارة التراثية مع عناصر الثقافة المحلية و التكنلوجيا و التصميم المعاصر

D. **وصف البحث:**
عبارة عن مقابلات مع افراد ذوي علاقة بالحالات الدراسية من مشروع اسكاني جديد و منطقة تراثية في الأردن

E. **النتائج:**
تصميم و اختبار اداة يمكنها دمج عناصر الثقافة و الاستدامة في عملية تصميم المباني المعاصرة في الاردن

F. **المشاركة الطوعية:**
المشاركة في هذه الدراسة طوعية وإذا قررت عدم المشاركة فإنك لن تتعرض لأية مضايقات أخرى

G. **البدائل عن المشاركة والانسحاب من المشاركة (إن وجد):**
يمكنك ان تختار الانسحاب في اي مرحلة من مراحل إجراء هذة الدراسة.وكل الملفات المتعلقة بك سيتم اتلافها.

H. **السرية:**
كمشارك في هذه الدراسة ستكون هويتك ومحتويات المقابلة سرية في جميع المنشورات المتعلقة بنتائج الدراسة.

I. **البدل المالي:**
لا يلزم بدفع أى بدل مالي مقابل المشاركة فى البحث

J. **الأشخاص الذين يمكن الاتصال بهم:**
في حالة وجود أسئلة محدّدة تتعلّق بهذا البحث ، نرجو أو في حالة حدوث أي إصابات تتصل بالدراسة ، الاتصال على الباحث الرئيسي/نائبه يحيى قطيشات هاتف رقم 00447445322262

K. أقر بأنني قد قرأت (أو قد 'شرحت لي بلغة واضحة) جميع المعلومات الموجودة في نموذج الإقرار بالموافقة على المشاركة بالأبحاث . و قد أوضح لي ماهية الدراسة في هذا النموذج, والغرض منها, والفوائد المرجوة منها, أو لانزعاجات المتوقع حدوثها, كما أنه قد أتيحت لي الفرصة الكافية لطرح أي سؤال يتعلّق بالدراسة وتلقيت الإجابات الكافية.

L. <u>**توقيع المشارك/أو من ينوب عنه :**</u>
المشارك /مندوبه:_____

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M. Signature of Principal Investigator/Delegate:

و. **توقيع الباحث الرئيسي/نائبه: M.**

Print Name: Yahya Qtaishat
Title: PhD student at University of Bath, United Kingdom
IMC Badge No.:
Date:

الاسم:يحيى قطيشات
الوظيفة: طالب دكتوراه في جامعة باث بالمملكة المتحدة
رقم البطاقة:
التاريخ:

2. Questions for case study residents
Case and interview reference number:
Date:
Time:
2.1 General demographic questions
Gender: Male / Female

2. الأسئلة
رمز الحالة و المقابلة الدراسية
التاريخ:
الوقت:
2.أسئلة عامة للسكان في الحالات الدراسية
الجنس: ذكر / أنثى

English	Arabic
1) How old are you?	1) الفئة العمرية ؟
• 25 or younger	• أقل من 25 سنة
• 25-34 years old	• ما بين 25-34 سنة
• 35-44 years old	• ما بين 35-44 سنة
• 45-54 years old	• ما بين 45-54 سنة
• 55-64 years old	• ما بين 55-64 سنة
• 65-74 years old	• ما بين 65-74 سنة
• 75 years or older	• ما بين 35-44 سنة

2) • Education: What is the highest degree or level of school you have completed? If currently enrolled, highest degree received.

2) التعليم و التحصيل العلمي:
ما هو اعلى تحصيل علمي او دراسي حصلت عليه او تدرس للحصول عليه حاليا؟

English	Arabic
• No schooling completed	• أميّ (لا يقرأ ولا يكتب)
• Nursery school to 8th grade	• تعليم إبتدائي حتى الصف الثامن
• Until high school	• تعليم أعدادي حتى الصف العاشر
• High school	• تعليم ثانوي
• college	• كلية مجتمع
• Trade/technical/vocational training	• تدريب مهني
• Bachelor's degree	• شهادة بكالوريوس
• Master's degree	• شهادة ماجستير
• Doctorate degree	• شهادة دكتوراه
• Other _____	• أخرى _____

2) Marital Status:	3) الحالة الاجتماعية:
• Single, never married	• أعزب/عزباء
• Married	• متزوج/متزوجة
• Widowed	• مطلق/مطلقة
• Divorced	• أرمل/أرملة
• Separated	• منفصلون

3) Employment Status: Are you currently…?

4) حالة العمل, هل انت حاليا…..؟

English	Arabic
• Employed for wages	• موظف بأجر
• Self-employed	• توظيف ذاتي/ صاحب مصلحة
• Out of work and looking for work	• لا أعمل لكن أبحث عن عمل
• Out of work but not currently looking for work	• لا أعمل و لا ابحث حاليا عن عمل
• A homemaker	• رب/ربة بيت
• A student	• طالب/طالبة علم
• Military	• موظف بالجهاز العسكري أو الأمني
• Retired	• متقاعد/متقاعدة
• Unable to work	• لأأقدر على العمل

4) What is your occupation?	5) ما هي وظيفتك الحالية؟
5) What is the average annual income for the house in JD?	6) بشكل تقريبي, ما هو الدخل الشهري للبيت بالدينار؟

English	Arabic
• 1800 less than	أقل من 200
• 3000 - 1800	350 - 200
• 4200 - 3000	450 - 350
• 6000 -4200	550 - 450
• 8000 - 6000	650 - 550
	800 - 650
	1000 - 800

- 10000 - 8000
- 12000 - 10000
- 14000 - 12000
- More than 14000

1400 - 1000
أكثر من 1400

6) Family size:

7) حجم العائلة:
- كم فرد بالغ يعيش في المنزل (أكبر من 18 عاما)؟

- How many adults lives in the house (above 18)?

- كم فرد قاصر يعيش في المنزل (أقل من 18 عاما)؟

- How many children lives in the house? (below 18)?

- أي أجداد؟

- Any Grandparents?

7) What type of dwelling do you live in?
  - Multi store apartment complex
  - Single house
  - Attached house
  - Row house
  - Villa
  - Other _____

8) ما نوع المنزل اللذي تعيش/تعيشين فيه؟
- عمارة متعددة الطوابق و الشقق
- بيت مستقل
- بيت متصل من احد الجهات
- بيت مصفوف
- فيلا
- اخرى ____

8) House size:
  - What is the house size?
  - How many bedrooms is there?
  - How many living room/guest receptions?
  - How many bathrooms?

9) حجم البيت:
- هل تعرف كم مساحة بيتك؟
- كم عدد غرف النوم؟
- كم عدد الصالونات؟
- كم عدد الحمامات؟

9) How many floors are in the building?

10) كم عدد الطوابق في العمارة؟

10) Do you own the house that you live in?

  - Yes
  - Rented
  - Borrowed
  - living with family
  - other

11) هل تملك البيت اللذي تعيش فيه؟

- نعم أملكه
- مستأجر
- اسنعيرة
- اعيش مع عائلتي
- اخرى

11) Which level/store is your apartment on?

12) في اي طابق يقع بيتك؟

12) What is the orientation of the house/ flat?
- South facing
- North facing
- East facing
- West facing

13) في اي جهة تقع شقتك؟
- شمالية
- شرقية
- غربية
- جنوبية

13) How long have you been living in this house?

14) منذ متى و أنت مقيم فب منزلك أو مسكنك؟

2.2 Semi –structured questions

الاسئلة الغير ممنهجة

2.2.1 cultural Indicators
1) What did you like about your current house?
   a) What did you dislike?
3) What do you like about your previous house?
   a) What did you dislike?
   b) Why did you move?

المؤشرات الثقافية
2) أخبرني/أخبريني ماذا أحببت في بيتك الحالي؟
   a) ما لا تحب؟
3) أخبرني/أخبريني ماذا تحب في بيتك القديم؟
   a) ما لم تحبب؟
   b) لماذا انتقلت؟

2.2.2 House organization and space arrangement
4) Would you like to change anything in your house?
   a) If so, what and why?
5) Have you made or plan to make any changes in your house??
   a) What are these changes e.g. redecorating, change in elements (e.g. windows, or doors), and changing materials?
   b) Are these changes internal or external of your home?
   c) Does this involve additional rooms or spaces, vertical or horizontal spaces?
   d) Why would you make these changes?

دالات على توزيع البيت وتنظيم الفراغات
4) أترغب في تغيير شيء في البيت؟
   a) إذا كانت الاجابة نعم فما هو؟ لماذا؟
5) هل قمت بالتخطيط لإجراء أي تغييرات في منزلك؟
   a) ما هي تلك التغييرات (مثال دهان, ديكورات, عناصر بيت من ابواب و شبابيك, مواد بناء).
   b) هل هي تغييرات خارجية أم داخلية.
   c) هل تشمل إضافة غرفة او افساح مجال لوظيفة او نشاط محددة, أو مساحات إضافية عمودية أو افقية؟
   d) ما هي أسباب هذة التغييرات؟

6) Are your internal spaces (e.g. bedroom, bathrooms) located in the right places to suit your needs and preferences?	6) هل توزيع الغرف الداخلية (النوم و الحمامات) يناسب احتياجاتك و تفضيلاتك؟
a. Explain why, why not	a. لماذا؟ هل لك ان تشرح؟
b) Do you think that spaces in your house are ideally distributed?	b. إذا كان التوزيع غير مناسب , ماذا قد تفعل لحل المشكلة؟
	c. هل تظن ان توزيع الفراغات في منزلك مناسب؟ هل المسافات و توزيع الغرف بين بعضها مناسب؟

7) How much do you think your house can adapt to your future needs?
   a) What are the opportunities and constraints associated with living in your house?
   b) What are the constraints to making changes to suit your needs?

7) كم تظن/ين ان منزلك قابل للتغيير و التطور في ضوء حاجاتك المستقبلية؟
   a) ما هي الفرص او العوائق المرتبطة بالعيش في منزلك؟
   b) ما هي المعوقات التي قد تمنع تحقيق التطور و التغيير في منزلك؟

2.2.3 vernacular architecture related metrics

2.2.3 العمارة التقليدية

8) Which of the following buildings would you consider to be sustainable?
   a) In what way? Please explain

8) أي من المباني التالية تميل/ي الى إعتبارها مستدامة (صديقة للبيئة)؟
   a) باي طريقة, هل لك ان تشرح لماذا؟

9) Which example best compare with your own home?
   a) What are the similarities?
   b) What are the differences?

9) أي من هذة الامثلة اقرب لبيتك؟
   a) ما هي أوجه التقارب؟
   b) ما هي اوجه الاختلاف

10) Which of the following buildings would you like to live in?
   a) Why
   b) What do you like about each one?
   c) What do you dislike?
   d) Which of the buildings best represent Jordanian architecture in your view? Why?
   e) In what way? Please explain

10) أي من المباني التالية ترغب/ي أن تعيش فيها؟
   a) لماذا؟
   b) ماذا تحب بكل واحد منهم؟
   c) ماذا لم تحب؟
   d) اي منهم يمثل العمارة الاردنية بنظرك؟ لماذا؟
   e) اي منها يمثل قيم المجتمع اكثر؟
   f) باي طريقة؟ هل لك أن تشرح؟

(1

(2

3)

11) Have you seen any building like in picture number b?
- a) What does it represent to you?

12) Does your house relate to the architectural heritage in Jordan?
- a) How?
- b) Aesthetically and form?
- c) Material?

13) Have you ever lived or are living in vernacular building?
- a. What do you like about it?
- b. What do you hate?
- c. (why did you move)?

2.2.4 Sustainability Indicators

14) What makes a sustainable house in your opinion?
- a)

15) What material you think suits Jordan best? What colours?

16) How comfortable is your house in?
- a) winter?
- b) summer?

17) Is there a season where utility bill increase?
- a) Is there a room where you think its hotter or colder? Why?
- b) What type of activities do you do in this room?

18) Do you prefer natural ventilation for cooling or AC? Why?

19) Would you want
- a) Bigger windows or
- b) Smaller windows?
- c) Why?

20) Do you think that vernacular traditional buildings were easier or harder to regulate their temperature?
- a) Why?
- b) Do you have any idea how people used to do to insulate or regulate house temperature?

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11) هل سبق لك و أن رأيت مبنى مشابه للذي بالصورة (ب)؟
- a ماذا يمثل لك هذا النوع من المباني؟

12) من وجهة نظرك, هل هناك ارتباط بين بيتك الحالي و التراث المعماري في الاردن؟
- a إذا كانت الإجابة نعم, كيف؟
- b هل الارتباط متعلق بناحية جمالية و شكلية؟
- c هل الإرتباط متعلق بناحية مواد؟

13) لماذا لم يعد الناس يبنون منازل مثل البيوت التراثي؟
14) هل تعتقد انها مناسبة لمعيشة اليوم؟ كيف؟ لماذا؟
15) هل تعتقد ان مواد البناء التراثية مثل الحجر و الطين غير مناسبة لليوم او تعتبرها رجعية (متخلفة)؟

16) هل سبق لك/ي ان سكنت في مبنى تراثي او تقليدي؟
- a. إذا كانت الإجابة نعم, ماذا احببت فيه؟
- b. ماذا لم تحب؟
- c. لماذا رحلت؟

2.2.4 معايير الاستدامة

17) هل لديك اي معرفة عن المباني المستدامة أو الصديقة للبيئة ؟
- a إذا كانت الإجابة نعم, ماذا تعرف عنهم؟ ماذا برأيك يجعل البيت مستداما او صديقاً للبيئة؟ هل لديك أي رأي عنهم؟

18) أي مواد تظن/ي انها تناسب الاردن طبيعتاً أو ثقافةً أكثر؟
- a أي الوان أو أية مواد؟
- b لماذا؟

19) كم هو مريح منزلك في ...
- a الصيف؟
- b الشتاء؟
- c هل لديك اي فكرة لماذا؟ ماذا تفعل لتحسين ذلك؟

20) هل هناك اي فصل او فترة معينة تزداد فيها فاتورة المنزل؟ (كهرباء, غاز, اخرى)؟
- a هل هناك غرف تظن ان درجة الحرارة في امثر او اقل من بقية الغرف؟ لماذا تظن هذة؟
- b ما طبيعة النشاطات التي تقوم فيها في ذلك الفراغ؟

21) هل تفضل/ي التهوية الطبيعية لتبريد المنزل ام تشغيل(أو امتلاك تكييف)؟ لماذا؟

22) هل ترغب/ي لو كانت شبابيك المنزل ...
- a أصغر؟
- b أكبر؟
- c لماذا؟

23) بإعتقادك او حسب معرفتك, هل تعتقد ان المباني التراثية في الاردن كانت اسهل ام اصعب لضبط الحرارة؟
- a لماذا؟
- b حسب معرفتك, كيف كان الناس في الاردن قديما يفعلون لعزل او ضبط الحرارة في المنزل؟

21) Would you mind if your windows were partially covered to protect it from sunrays? Why?

    a) Would you add shading devices on your windows and walls if you knew it would decrease temperature in summer?

22) Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

    a) smaller house area
    b) smaller windows area
    c) pay more for insulation
    d) View from house windows

23) Do you think your house suits Jordan environment and climate? Why?

24) Would you pay more money for a more sustainable house?

25) Would you use traditional methods or materials in order to have a sustainable house? Why?

26) Do you know if your house was thermally insulated?

a. Would you like if it was insulated?
b. Why you didn't care about insulating it?
c. Would you mind if it the walls were thicker, and your room size were smaller? Why?

27) Would you agree to use traditional methods and materials in your house? why?

28) Would you agree to use recycled or reused materials for your house? Why?

29) Would you prefer high-tech methods and materials like solar panels? Why?

2.2.5 Zoning and regulation

30) Does the layout of your building, apartment and neighbourhood allow for social interaction?

31) Do you value your neighbours and neighbourhood? Why?

32) Is it important to have appropriate communal places where you and your neighbours meet?

    a) Do you have this? Where?
    b) If not, what, and where would you like it? Show on the map?

33) How much do you know about Jordan building codes and regulations?

    a) How much do you know about Jordan green building guide?
    b) Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
    c) Would you consider them?

35) Any issues regarding laws or regulation you are aware of?

    a) Any issues regarding how the neighbourhood have been designed?

2.2.6 social relations and privacy indicators

36) Do you think your house provide enough visual privacy in principal rooms?

37) Where do you host your guests?

    a) Are there places in the house they can't go to normally?
    b) What are they? Why?

38) Do you have a balcony, garden, or patio in your house?

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24) هل كنت لتمانع لو كانت نوافذ المنزل محجوبة جزئيا لغرض حجب جزء من اشعة الشمس؟ لماذا؟

a) هل سترغب باضافة ادوات تظليل على واجهة بيتك ان علمت انها ستقلل من درجات الحرارة؟

25) اي من هذة الوسائل قد تضحي في بيتك سبيل بيت مستدام(يشمل تقليل استهلاك الطاقة و توفير جو افضل داخل البيت)؟

a مساحة بيت اصغر
b شبابيك اصغر
c تكلفة اضافية
d منظر من شبابيك البيت

26) هل تعتقد ان بيتك ملائم للبيئة, و المناخ الأردني؟ لماذا؟

27) هل انت مستعد لبذل المزيد من المال من اجل بيت مستدام أو صديق للبيئة؟ لماذا؟

28) هل تقبل باستخدام اساليب او مواد بناء قديمة (كتلك في المباني التقليدية) في سبيل بناء مستدام؟ لماذا؟

29) هل تعلم اذا كان بيتك معزول حراريا؟
a. هل ترغب لو كان معزولا؟
b. لماذا لم تهتم بعزله ؟
c. ل كنت لتمانع لو كانت جدران بيتك اثخن و مساحة الغرف أصغر؟

30) هل تقبل ان تستخدم مواد محلية الصنع فقط في بيتك في سبيل بيت مستدام؟ لماذا؟

31) هل تفضل وسائل استدامة و توفير طاقة حديثة مثل الالواح الشمسية

32) هل تقبل ان تستخدم مواد بناء معاد تدريرها او استخدامها في بيتك؟ لماذا؟

2.2.5 التنظيم و قوانين البناء

33) هل تظن/ي ان توزيع عمارتك أو المباني في حيك يتيح فرصة للتواصل الاجتماعي ؟

34) هل تقدر/ي جيرانك و الحي اللذي تعيش فيه؟

35) هل من المهم وجود مكان ملائم و مشترك يسمح لك و لجيرانك بالاتقاء ؟
a. هل هناك واحد مثل ذلك هنا؟اين؟
b. ان لم يوجد اين ترغب لو كان موجودا؟على الخريطة

34) هل لديك أي معرفة عن نظام و قوانين البناء الاردني؟
a إذا أجاب بنعم ماذا تعرف؟
b هل سمعت عن دليل البناء الاخضر لأردني؟
c إذا أجاب بنعم ماذا تعرف؟
d ماذا تظن عنهما؟
e هل سألت او أخبرك أحد (ممكن المعماري او المهندس) عن حصائص و اضافات تجعل بيتك موفرا للطاقة أو صديق؟
f إذا كانت الإجابة نعم ماذا أخبرك؟
g هل كنت لتهتم بهكذا اضافات؟
h لماذا؟

35) هل هناك اي مشاكل ناجمة عن طريقة توزيع و تخطيط الحي؟
a هل هناك مشاكل مع القوانين التنظيمية للمباني للمنطقة؟

2.2.6 العلاقات الاجتماعية و الخصوصية

36) هل تظن ان بيتك يوفر لك الخصوصية الكافية في جميع الغرف الاساسية؟ لماذا؟ كيف؟

37) أين تستقبل ضيوفك؟
a) هل هناك غرف لا يسمح لهم بدخولها عادة؟
b) ما هي ؟ لماذا؟

38) هل هناك مكان تجلس فيه للاسترخاء في بيتك؟
a) ما هو؟ حديقة؟ شرفة مدخل؟ بلكونة؟

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(b)	هل وجودهم مهم؟
(c)	ايها تظنهم اهم؟ لماذا؟
(39)	هل تعتقد ان بيتك يعبر عن قيمك و ثقافتك أو ثقافة و أصالة مجتمعك ؟
(40)	كيف؟
(41)	هناك اي عناصر او غرفة في بيتك خارجية او داخلية تعبر عن معتقدات او قيم حاصة فيك او المجتمع؟

2.2.7 الملكية و نمط المعيشة

(42)	هل قمت بناء بيتك بنفسك ام اشتريته حاهزا؟
(a)	هل قمت (قد تقوم) باستخدام عناصر تظنها تراثية في منزلك؟
(b)	ما هي هذا العناصر؟ ما اللذي يجعل البيت تراثيا؟
(43)	هل تظن ان بيتك ملائم لوضعك الاقتصادي؟
(a)	كم كان سعر المنزل او الارض سببا في اختياره لك؟ هل كنت اشتريته لو كان اغلى؟
(44)	هل تظن ان اسعار المنازل هنا تلائم قيمتها؟
(a)	لماذا؟ ما الاسباب؟
(b)	هل تظن ان معايير بناء المنازل و الاسكانات التجارية تأخذ بعين الاعتبار الظروف المادية للمواطنين؟
(c)	هل كنت لو تفضل بيت اعلى لكن مع ديمومة اكثر و فاتورة اقل ام بيت ارخص مقابل ان تدفع اكثر على ادامته و فواتيره؟
(45)	هل تفضل السكن مع؟
(b)	عائلتك النووية فقط؟
(c)	عائلتك النووية و عائلات اولادكم؟
(d)	مع عائلاتكم الممتدة, (بيت الاجداد, الاقارب المباشرون)؟
(46)	ماذا تقدر أكثر؟
(e)	نمط حياة تقليدي ام حديث؟
(f)	نمط بناء تقليدي ام حديث؟
(g)	نمط حياه ريفي ام مدني؟
(h)	نمط حياه شخصي أو احتماعي؟
(i)	بيت ذو منظر غير مألوف او بيت متجانس مع الانماط المتشرة محليا؟
(47)	هل ترغب في اضافة اي شيء اخر اية افكار او مقترحات

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c) What do you use it for?
d) How important do you think it is?
e) Which is more important? Why?

39) Do you think you house reflect your values?
40) How?
41) Any external or internal elements or spaces that reflect that?

2.2.7 Ownership and lifestyle indicators

42) Did you build your house or bought it?
   a) Did you use/ would you use traditional elements in your house?
   b) What are these elements? What makes a house traditional?

43) How much do you think your house suits your financial statue?
   a) How much was the land price or house price a reason in choosing it?

44) Do you think house prices here equal its value?
   a) Why?
   b) Do you think commercial building slandered takes financial conditions for people?
   c) Would you prefer more expansive house

45) Would you prefer to:
   a) Live only with your children as they grow?
   b) Live with your children's family or parents in the same building?
   c) House other relatives in the same building?

46) Which do you value more?
   a) Traditional life or modern one?
   b) Rural life or urban lifestyle
   c) Individual life and personal space
   d) Collection and community life
   e) Special looking house or similar and big/expensive/modern looking houses?

47) Any additional comments/observations?

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Appendix B: Expert panel Interview guide

At first the researcher interduces the research and its purpose. Explain how the interview will work and what will happen with the data. After that, the researcher starts by the following warm up questions:

- What is your gender?
- What is your age?
- How many years of experience do you have in the field of architecture?
- What is your educational and professional backgrounds?
- What is your current position?
- How long have you been in it?
- What do you consider your main area of expertise?
- Can you describe your design strategy and steps of work while designing a building and until construction phase? How local environment and culture fit into this strategy?

After the researcher and the expert participant finish the primary questions the researcher will explain the design guide and decision tool to the participant and set to try using it. After finishing this process, the expert will be asked to fill the following questioner. This will be followed by another round of follow up questions Suggested questions will cover the following:

1) What is your opinion on the design guide and tool? Do you think eco-cultural indicators are comprehensive enough? What is missing?
2) What improvements would you make?
3) What negative aspects you found about the tools? Can you name/ list them?
4) What parts of the guide you found not useful? Why?
5) Which parts you found most useful? Why?
6) what do you think the toolkit lack/missing regarding cultural influences on the built environment? Can you explain?
7) Do you think the tool is compatible with local building and development regulations? Why not?
8) Do you think the tool can fit into normal teaching/professional process of architecture? how? Why not?
9) How would you change the tool and design guide? What would you remover/add?
10) how would you make it easier/more pleasant to use?
11) have you ever used a similar tool or guide? Can you name it? what did you like/dislike about it?
12) Have you designed or participated in designing a building in Jordan that is sensitive to vernacular and eco-cultural factors?
13) Can you provide information about this project so that I can use as a case study?
14) Any additional comment? Any observation or thoughts?

Finally, the researcher asks the participant to fill the following Likert scale questionnaire:

Criteria	Strongly Disagree	Slightly Disagree	Neutral	Fairly Agree	Strongly Agree
1. The tool can be used effectively in professional practice					
2. Suitable in early stages of design					

3. Final result matched your initial expectations					
4. Performing tasks was easy to learn					
5. Needs the support of a person to use this tool					
6. You were able to complete the task in a reasonable amount of time					
7. You can become productive using the tool					
8. Information provided with each stage was clear and effective to complete the task					
9.The organisation of the interface was clear					
10. The tool has all functions and capabilities, you expect it to have					

Appendix C: Transcript of the quoted case study interviews

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion

The house really supports my family's current lifestyle there is nothing that can hold that back, on the other hand I think it won't suite a traditional family lifestyle as building requirement and housing specification are very different now from how it used to be, but still this house still represent the local culture I think although not many people still like living in apartments buildings and prefer their own independent home.

Q 2.2 What did you liked about your current house?
What did you dislike?

I like the balcony (laughs) it's nice to just nice to relax there when the weather is nice. And I dislike how noisy the building can be, I don't mean that the neighbours are noisy but because I used to live in a separate one level house I still haven't adjusted well to this type of buildings and I feel its crowded and discomfort sometimes. I just don't think there is a good noise insulation system in the building.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?

I felt more independent living there with my mother but had to move after she died and now living with my brother in his flat. I liked that place more as it was a separate quite house.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

There are a lot of things actually like turning my room into a master bedroom (laughing) it's quite tight to put everything I want

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?

There was another balcony that was added to the kitchen to increase its size, and we added an arabesque (wooden decorated panel) as a separator between the living room and the hallway that leads to the bedrooms. Although I liked that balcony as well. The separators were necessary as guest are being hosted in the living room and give more privacy to the bedrooms.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?

By adding the separator, it became better now and very adequate, the flat is cosy and the hallway between rooms is wide and good for circulating around the rooms.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?

The house is too small to make any changes, I would like to have a garden like I had in my old house. I would see its much safer here than the other place and that's why I came here people here are close to each other's and help one another.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain

Second picture, it's an old-style building (vernacular) and although it's an old it still looks cleaner and am sure it doesn't house too many families like here.

Q 4.2 Which example best compare with your own home?

First one, it's a low-cost apartment block with only concrete finishing and it's probably as small as here with no noticeable differences it almost looks the same.

Q 4.3 Which of the following buildings would you like to live in?
Why?
Second one I really like This type of building although the third one looks newer and nicer, maybe I feel nostalgic and traditional but this the type of building I relate to the most or feel attracted to and where I really would like to live.

Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.
I didn't like a lot about the first one but perhaps that it has a nice balcony it seems too small. The third one that it's so new and seems well organised and designed.

The second one can be bit noisy as it's in a downtown, the third one is just too modern and sleek for my taste (laughs) I don't like these types of modern buildings and I don't think I'll enjoy living in one. Maybe I just feel too nostalgic for these periods of time and what architecture was popular then. The second one for sure represent the history and culture of Jordan and would definitely suite todays life even all these years. These types of buildings are eternal.

Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?
All parts of Amman's downtown and other cities like Zarqa, Irbid and Madaba. they represent the cultural heritage of Jordan say that time.

Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
No, not at all nothing in this apartment relates to these kinds of building expect maybe they are all cubic (laughs).

Q 4.7 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?
Yes, it was bit old but not as old as that building, that building changed a lot, but you can still see some of the mud brick walls in some of the rooms there. I liked how big and independent it was, and how it had a large garden I can grow plants in it. And because it was too big, and some walls are made of mud it needed a lot of effort to keep clean and to renovate it. New buildings require less effort to maintain.

The only reason I left was because of family circumstances and I would not have left if that didn't occur. Also, I am come from a Bedouin bloodline and I still would prefer an open system house where it looks winder and spacious over closed one with a lot of walls and separations (laughing).

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
What makes a sustainable house in your opinion?

What construction material you think suits Jordan best? What colours?
You do hear that term consonantly, but I don't really know anything about how these buildings function. For a building materials stone I think relate more and ground and white colours as I think they represent nature and relate to old buildings more.

Q 5.2 How comfortable is your house in:
Winter?
Summer*?*
Why?
It is very comfortable I think in summertime specially that I have the balcony which is shaded and can spend a lot of time there. In winter it is very cool and very discomforting. I don't know why that is.

Q 5.3 Is there a season where utility bill increases?
In winter it increases drastically as we use electric heaters to heat the spaces in the apartment.

Q 5.4 Is there a room where you think it's hotter or colder? Why?
What type of activities do you do in this room?
The living room is warmer in winter as sunrays enter it in winter.

Q 5.5 Do you prefer natural ventilation for cooling or AC? Why?

Natural ventilation, I hate Air-conditions I can't stand them, and I always get sick when I set in a place that has an AC.

Q 5.6 Would you want bigger windows or smaller windows? And why?

I would say if they were bit bigger it would be better to make lighter and air flow inside. They are already covered by meshes for bugs and safety bars for the children as it's an apartments multi f

floors block, which limits light and air from coming inside, it feels like its closed fixed walls.

Q 5.7 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

Traditional building was definitely Easier to control temperature, I have no idea why, but I sensed it and everyone also who experienced living there says the exact same thing.

Q 5.8 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

If it will certainly help making better condition at the apartment certainly why not? I would use any expect making the house smaller it's already small. And I don't want to lose the view from my balcony

Q 5.9 Do you think your house suits Jordan environment and climate? Why?

As I said it's not suitable in winter and we suffer a lot.

Q 5.10 would you use shading devices on your walls and windows for better thermal comfort?

Probably I would if it's going to help us, yes.

Q 5.11 Would you pay more money for a more sustainable house?

Yes, I would, definitely I would use no issue.

Q 5.12 Would you use traditional methods or materials in order to have a sustainable house? Why?

Yes, I would, I would not mind at all.

Q 5.13 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

I think it is not insulated and would wish if it was insulated as it will help control temperature in harsh weather conditions. Even if that was on the expense of losing some area or paying more money.

Q 5.14 Would you agree to use traditional methods and materials in your house? why?

No one knows how to build with traditional materials anymore, it is lost because people thought it is outdated and went with better alternatives.

Q 5.15 Would you agree to use recycled or reused materials for your house? Why?

I don't mind doing that either. As long as it gives a better or good performance.

Q 5.16 Would you prefer high-tech methods and materials like solar panels? Why?

I would really like to do that; I love that idea and was thinking about that for a while now.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

I think apartments buildings are more communal and allow for much more social interaction than other type of houses where neighbours meet easily and it's so close to each other's and cosier.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yes, I do very much. People are friendly and it's easy to bond with them when you all live this close and door to door from each other's.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

Yes, it would be something very great. We don't have any at this point, a small gathering square or space in front of the building would be vital for people to interact and knew each other's. When I first moved here it was hard for me to know people living here and really wished for an easier way to see them and say hi to them.

Q 6.3 How much do you know about Jordan building codes and regulations?

Nothing at all sadly.

How much do you know about Jordan green building guide?

Nothing at all too

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

No, I don't know I never been told, but I would certainly be interested. It would help make the home comfortable and save us money

Would you have interested in them? Why

I would but we didn't build it.

Q 6.4 Any issues regarding laws or regulation you are aware of?

Nothing too important, its well organized here, I remember back in my old house there would be some disputes from between neighbours who built an extra floor and how it conflicts with solar rights and ventilation and so on but nothing in this neighbourhood.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Not in kings Abdulla city I didn't face any issues and never heard about such things, I just wish they finish all the services area and amenities already.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yea I think it does, everyone has his room and as we are elevated, we don't have to worry about setting in front of windows or on the balcony.

Q 7.2 Where do you host your guests?

Yes, the living room, and that's why we added the arabesque separate, to help create privacy for the bedrooms which strange or very formal guests don't go to without prober invitation.

Are there places in the house they can't go to normally?

Yes, private bedroom

What are they? Why?

They are too private to be gone there without a prober Couse or invitation

Q 7.3 Do you have a balcony, garden, or patio in your house?

What do you use it for?

How important do you think it is?

Which is more important? Why?

Yes, they are very important, the balcony is my favourite spot in the house.

The balcony for apartments and garden for ground levels houses I would still; my garden because I love gardening.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

Yes, I would say a Jordanian house is a spacious house with an area top host guests and as this apartment is small with no such space, I would say it does not reflect these values and with nothing related to that expect some decoration (like adding stone tiles indoor of the room) in our living area.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

Yes, I would like that

What are these elements? What makes a house traditional?

Q 8.2 How much do you think your house suits your financial statue? Do you think investors take that in consideration?

How much was the land price or house price a reason in choosing it?

It's very suitable, it was very cheap when we bought the apartment. Although Its way more expensive now and overpriced now even renting a not so good apartment would still cost around 180-200 JD which you would never rent before for 80 JD, and I don't think they actually care now, this project was supposed to be for lower income people, but land prices and apartments are too expensive for them.

I would not mind a bit expensive house if it was going to be more durable and sustainable.

Q 8.5 Would you prefer to:

Live only with your children as they grow?

Live with your children's family or parents in the same building?

House other relatives in the same building?

I prefer each with his family, it's not a think to live with your extended family. Even with a big traditional house.

Q 8.6 Which do you value more?

Traditional life or modern one?

Traditional life

Rural life or urban lifestyle

Urban life

Individual life and personal space or Collection and community life

personal

Special looking house or similar looking houses?

Looking similar is nicer even if it wasn't better.

Q 8.7 Any additional comments/observations?

No thanks

Case and interview reference number: A05

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion

Answer I feel it comfortable and suits the modern daily life of my family. And I think it maybe can suit a traditional family lifestyle, it suits our culture and current lifestyle, it suits our culture and current lifestyle. And there is nothing in the house that prevent me practicing or goes against my faith

Q 2.2 What did you liked about your current house?
What did you dislike?

It is easy going around here and close to services and I have my own car park

There are still many landfill and open spaces where many people come to as a park and it makes it crowded

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?

It was a countryside separate type of house, nothing in it I really did not like I just had to move for work and as my kids are going to university.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what, and why?

Nothing now I think all spaces are well planned. Just would like to have more bedrooms to be in consistence with the family member number and more luxury like having another bathroom or having a master bedroom with its attached bathroom

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?

No not at these stages

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?

They are good and adequate I think the house space is well managed and there are no lost spaces, rooms are clustered based on their function together which is ideal.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?

Very hard after as it already built, it gives me Good location the is service to work and university and to the capital, no constrains, your simple cannot change much in an apartment that I do not own and with no ground floor space.

vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

Third picture, large windows to allow sunlight compared to other examples

In what way? Please explain

Q 4.2 Which example best compare with your own home?

First one, same design of low-cost apartments state, with small rooms and windows, other services like car parking and so on

What are the similarities?
What are the differences?

No significant differences

Q 4.3 Which of the following buildings would you like to live in?

Third picture

Why?
It looks more modern and newer
Q 4.4 What do you like about each one?
Nothing about the first, the second it represents traditional type of architecture, and the third because it looks modern and new, bigger windows, the traditional one does not fir peoples mind nowadays
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.
Second one, The second for old and the first for new. It has arches and arches vault, some prefer it because it Islamic or traditional, having an elevator is important if you have more than 3 stories buildings.
Q 4.5 Have you seen any building like in picture number b?
yes, a lot in old town centres like Amman, Irbid, and As-Salt
What does it represent to you?
The Arabic/ Jordanian traditional house style
Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
No, no significant attachment or relation No Aesthetically the old buildings g was more appealing and beautiful, and might have connection relating to using stone as a material
Q 4.7 Have you ever lived or are living in vernacular building?
Yes, I have
What do you like about it?
I liked how thick the walls are that mad the house cools in summer and warm in winter
What do you hate?
Nothing really, everyone like them
(Why did you move)?
For work, so I moved to another region

5.0 Sustainability Indicators
Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
Yes, I have some limited knowledge about them
Q 5.2 What makes a sustainable house in your opinion?
A building that may use renewable energy sources like solar power, or which its bell is low compared to other type of buildings. Allows enough sunlight, have a lot of green areas, recycling grey water.
Q 5.3 What construction material you think suits Jordan best? What colours?
Stone I think suits Jordan and light colours like white, that it protects from harsh sun
Q 5.4 How comfortable is your house in:
Winter?
Its ok
Summer?
Not good I have to use a lot of AC
Why?
I do not know
Q 5.5 Is there a season where utility bill increases?
No, its high in both seasons (laughing)
Q 5.6 Is there a room where you think it's hotter or colder? Why?
Norther rooms are cooler because they do not have a lot of sun going there
What type of activities do you do in this room?
They are bedrooms
Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
Natural ventilation, it is cheaper and healthier
Q 5.8 Would you want bigger windows or smaller windows? And why?
They are in a good size, in king Abdulla city there are a design guide which does not let you do them too big or any shape rather than the rectangular
Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Traditional buildings were Easier to control temperature, I think the walls were thick and insulated better then modern buildings in Jordan.
Do you have any idea how people used to do to insulate or regulate house temperature?
I think they would have a layer of stone followed by a layer of hay infused mud and rubble which did not allow temperature to escape

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area
smaller windows area
pay more for insulation
View from house windows
I do not prefer any except maybe making the windows smaller
Q 5.11 Do you think your house suits Jordan environment and climate? Why?
Its suits it with the size of windows and size of the house
Q 5.12 Would you pay more money for a more sustainable house?
Yes, I would, because it will save me money in the future. If I own it of course I don't mind paying more money in order to make it more sustainable.
Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?
I would definitely. I would have preferred the design of the house include some traditional elements such as thick insulated walls, long arched windows and vaults.
Do you know if your house was thermally insulated?
I think it was insulated and I would insulate it if it weren't
Would you like if it were insulated? -----
Why didn't you care about insulating it? ------------
Would you mind if it the walls were thicker, and your room size were smaller? Why?
I am not sure about that. and I do mind make the wall thicker even if that could help in isolate the building thermally because I prefer the bigger space for my rooms.
Q 5.14 Would you agree to use traditional methods and materials in your house? why?
If these materials were good quality, then why not
Q 5.15Would you agree to use recycled or reused materials for your house? Why?
If they were good also why not, if it was recycled and safe
Q 5.16 Would you prefer high-tech methods and materials like solar panels? Why?
Yes, I would really like to. I looked into buying photovoltaic solar panels to reduce my utility bills, but I cannot put it on the roof as it's not just mine alone and my neighbours would object that. It also requires a lot of paperwork to get a permit for that.

6.0 Zoning and regulation
Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?
I think it does, doors are close to each other's and we see each other's often in the hallways
Q 6.2 Do you value your neighbours and neighbourhood? Why?
Yes, I do a lot
Q 6.3 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
Yes, only in the mosque sadly now
If not, what, and where would you like it? Show on the map?
the nearby gardens have not finished yet, if there were more green areas that would be good enough
Q 6.3 How much do you know about Jordan building codes and regulations?
A little enough about setback laws and building ratio/ cars parking and so on
Q 6.4 How much do you know about Jordan green building guide?
Nothing really
Q 6.5 Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
No never, and not interested now
Would you consider them? Why
I would but I bought my apartment and did not built it
Q 6.6 Any issues regarding laws or regulation you are aware of?
Nothing too important
Q 6.7 Any issues regarding how the neighbourhood have been designed?
The company responsible for the city (Mawared Co) is strict and fair in applying its regulation which is good, but I think not too many people like that

7.0 social relations and privacy indicators
Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Yea I think all room are isolated from each other's and public rooms, even the guest room has its own entrance which is good
Q 7.2 Where do you host your guests?
Yes, the guest room Yes, private bedroom
Q 7.3 Do you have a balcony, garden, or patio in your house?
What do you use it for?
How important do you think it is?

| Which | is | more | important? | Why? |

Yes, they are very important. The balcony for apartments and garden for ground levels houses

Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
Yes, the peasant traditional house is not feasible, and people learned how to accept apartments.

8.0 Ownership and lifestyle indicators
Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
What are these elements? What makes a house traditional?
Rented it. Yes, like the arches and vaults and so
Q 8.2 How much do you think your house suits your financial statue?
How much was the land price or house price a reason in choosing it?
Do you think house prices here equal its value?
Why?
Its ok for the time being I am planning on buying my own house once I can afford that.
Q 8.3 Do you think commercial building slandered takes financial conditions for people?
Not really, they don't.
Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
Yes, I would it would be better.
Q 8.5Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I prefer each with his family
Q 8.6 Which do you value more?
Traditional life or modern one?
Individual life and personal space or Collection and community life
Special looking house or similar looking houses?
looking similar is better
Q 8.7 Any additional comments/observations?
No answer

Case and interview reference number: A06

2.0 cultural Indicators
Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion
yes, I do think that my current house supports my household. Also, we can consider it as a traditional and modern lifestyle house. It supports Jordanian culture as well.
Q 2.2 What did you like about your current house?
What did you dislike?
I like my house' balconies the most, and I don't like how small in size is the house in general.
Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?
I liked how big the house was, and I didn't like the neighbourhood which was the reason why I moved out.

3.0 House organization and space arrangement
Q 3.1 Would you like to change anything in your house? If so, what and why?
Yes, actually I would like to add more spaces outside the house.

Q3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?
Yes, I have planned to make some changes, but the building regulations stopped me. One of these changes is adding more spaces outside the house, however if I got the approval to do that I will with no doubt.
Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?
yes, they are. The bedrooms and the guestroom are located where the privacy is achieved for both of the guests and my family.
Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?
well, the building regulations and the financial statue are the biggest two obstacles that face the changes that I could do to my house to adapt my future needs.

4.0 vernacular architecture related metrics
Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain
I think building C is, because as you can see it has good free spaces and contains trees and plants.
Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?
I believe it is building A, everything looks the same, the design, the floors, the balconies, everything. I don't see any differences
Q 4.3 Which of the following buildings would you like to live in?
Why?
Building C because it has good free spaces.
Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.
I don't like building A because it's small in size usually, while I loved building C because it has good free spaces. I like how traditional building B looks. I see building B is the best representative for the *Jordanian architecture*
Q 4.5Have you seen any building like in picture number b?
What does it represent to you?
yes, I did in Salt and Zarqa Governorate, it represents the Jordanian *heritage* because as you see it's so old.
Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
No, it doesn't relate to the architectural heritage in Jordan at all.
Q 4.7 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?
Yes, I have. I liked how wide and big in size everything in it, the bedrooms, the balconies, the living room, everything I didn't like about it that it was full of insects and rats because houses were near each other. believe me I used to live in such houses long time ago and it is hard to get rid of these creators.
Q 4.8why have people stopped making vernacular buildings?
Do you think it's good for today's living?
Do you think traditional materials is good for today or is it backward?
I think because these materials are not available as before. But of course, it is really good for today's houses and I wish to use it.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

Not really, I know nothing about it.

Q 5.2 What makes a sustainable house in your opinion?

I think if it has good natural ventilation and sunlight the house would be environmentally friendly house

Q 5.3 What construction material you think suits Jordan best? What colours?

I think glasses panels and mud, because mud is really good in thermal insulation and good in regulating the internal temperature, but on the other side it needs to be frequently maintained and cleaning. I think glasses panels is good because it makes it easy to the sunlight to get in the house.

Q 5.4 How comfortable is your house in: Winter? Summer? Why?

It is really comfortable in the summer because it is a west facing house, so it has a good natural ventilation and sunshine doesn't hit it directly.

Q5.5 Is there a season where utility bill increases?

In winter, because of the heating system.

Q5.6 Is there a room where you think it's hotter or colder? Why?

What type of activities do you do in this room?

I like the guest room because it is warm in winter and cold during summer

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

Of course, natural ventilation, I don't even have AC in my house.

Q 5.8 Would you want bigger windows or smaller windows? And why?

Bigger for sure because it let more sunlight and wind to enter inside the house.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

it was easier as I mentioned before because it's made from mud.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

I would choose D; the other choices can't be done because already I own a small house with small windows, and I can't afford the insulation cost.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

I think so, because we don't have high-temperatures in summer such as the gulf countries.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

Yes, I would, actually doing that is better for the house' people.

Q 5.12 Would you pay more money for a more sustainable house?

Yes of course! Because the one I own is on the third floor, so when I get older, I won't be able to take the stairs, thus; I wouldn't mind paying more money for new technology could help me out.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

Actually, I wish! But it's not available in the market these days. Even structural stone nowadays the majority of it is not natural stone.

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

I'm not sure but I think it's not, I wish if it is thermally insulated though.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

Actually, I wish! But it's not available in the market these days. Even structural stone nowadays the majority of it is not natural stone.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

Not really, because it doesn't have the same quality and durability of new materials.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Of course, but the problem is that it doesn't suit everyone, for instance if you want to put solar panels in your house you need to do a lot of paper work, also there are many regulations and limits from the government regarding it

Q 5.18 Would you prefer using local sourced material or imported one? Why?

It's better if it is imported.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Yes of course.

Q 6.2 Do you value your neighbours and neighbourhood? Why?
In scale of 1 to 5 I give it 4.
Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what and where would you like it? Show on the map?
Yes, it is important. And yes, we have such a place, my neighbour has a garden where all the neighbour's meat at.
Q 6.3 How much do you know about Jordan building codes and regulations?
How much do you know about Jordan green building guide?
Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
Would you have interested in them? Why?
Not really, I have no idea about it. I know nothing Jordan green book. I never asked him/them, and I'm not really interested in them because usually they are expensive to implement, and I have some financial problems.
Q 6.4 Any issues regarding laws or regulation you are aware of?
No there are no issues.
Q 6.5 Any issues regarding how the neighbourhood have been designed?
No there are no issues.

7.0 social relations and privacy indicators
Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Not at all rooms, because some of them are really small and located in a way where privacy can't be provided.
Q 7.2 Where do you host your guests?
In the living room.
Q 7.3 Do you have a balcony, garden, or patio in your house?
What do you use it for?
How important do you think it is?
Which is more important? Why?
yes, I have a balcony, it's really important for providing natural ventilation for the house.
it's the only one I have among what mentioned in the question.
Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
Not really.
8.0 Ownership and lifestyle indicators
Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
What are these elements? What makes a house traditional?
I have bought it, and yes, I will use traditional elements in my house if I have money for them, such as antiques.
Q 8.2 How much do you think your house suits your financial statue?
How much was the land price or house price a reason in choosing it?
Do you think house prices here equal its value?
Why?
no way it suits the financial statue or even equal to its value.
Q 8.3 Do you think commercial building slandered takes financial conditions for people?
Of course, I don't think they do that,
Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
Yes, I would if I can afford the house price.
Q 8.5Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I prefer only to live with my children as they grow. But if my parents still alive I wouldn't mind living with me because it's my responsibility.
Q 8.6 Which do you value more?
Traditional life or modern one?
Individual life and personal space or Collection and community life
Special looking house or similar looking houses?
I prefer a modern life with community life.
I think everyone likes a special looking house, but it needs more money in parallel
Q 8.7 Any additional comments/observations?

No

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion

My current house supports my household these days. However, it doesn't support traditional lifestyle because it's not independent house. and yes, it supports a modern lifestyle as well as religion, but it doesn't support the country's culture. people in the old time had their own detached houses, nowadays the norms say to share your apartment buildings with other apartments so its suites the modern-day life

Q 2.2 What did you like about your current house?
What did you dislike?

I like where I live now because of its good design, looks modern and newer with modern materials and large windows. it is comfortable clean and has all the privacy that modern lifestyle needs.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?

I didn't like about it that I was renting not owning it, and I liked about it that it was a bit bigger than my current one. I moved because the previous one wasn't mine; I just was renting it.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?
Yes, make it bigger because it small in size.

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?

Yes, I had planned to add 3.5-meter slab connected with the balcony's so I can use it as a guest room, but I am still waiting for the approval from the government. Why I want to do that is because I want to make the house bigger and to host men and women separately.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?

Yes, they are, because the two bedrooms have a bathroom between them, and the kitchen and the guest room have a bathroom as well.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?

I think it can because I have an opportunity to add more space within it. However, building regulations is the only obstacle faces changes.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain

I think it's building C, because it is more modern than the others and it has a good design so it has a good natural ventilation and sunshine can enter freely to the house.

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?

I think it's building A, because buildings are so close to each other such as building in my neighbourhood. actually, I see no differences.

Q 4.3 Which of the following buildings would you like to live in?
Why?

It's building C, because it is more modern than the others and it has a good design so it has a good natural ventilation and sunshine can enter freely to the house.

Q 4.4 What do you like about each one?
What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

There is nothing special about building A. I like how building B represents our culture. While building C I like how it has a good design so it has a good natural ventilation and sunshine can enter freely to the house. I think building be is the best representative of Jordanian architecture.

Q 4.5 Have you seen any building like in picture number b?

What does it represent to you?

Yes, sure, in Salt. It represents a traditional lifestyle architectural heritage in our country, also it represents Islamic Turkish culture and architecture.

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

Not related in any way.

Q 4.7 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

Nit really, I never lived in such buildings.

Q 4.8 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

Because they are looking for improvements and modern lifestyle

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

I think they are buildings with solar panels and thermal insulation systems and have zero emission.

Q 5.2 What makes a sustainable house in your opinion?

I think solar panels and thermal insulation systems and zero emission.

Q 5.3 What construction material you think suits Jordan best? What colours?

I think concrete and structural stone are the materials that suits Jordan the most. Also, I think desert color suits the country because of the environment and the climate.

Q 5.4 How comfortable is your house in:

Winter?

Summer?

Why?

It is comfortable at both seasons because my house is thermally insulated.

Q 5.5 Is there a season where utility bill increases?

Yes, the hottest two months of summer and the coldest two months of winter.

Q 5.6 Is there a room where you think it's hotter or colder? Why?

What type of activities do you do in this room?

Not really, all of them are the same.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

Natural ventilation for sure because it is natural not like AC ventilation.

Q 5.8 Would you want bigger windows or smaller windows? And why?

Bigger of course because they provide better ventilation and sunlight.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

I think it was harder because they didn't have thermal insulation systems. I think they used to use structural stone to do that.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

I think I would choose smaller windows, also maybe I would choose a view from house windows

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

Yes, I think so

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

Yes, I would, I don't mind doing that in order to get better comfort.

Q 5.12 Would you pay more money for a more sustainable house?

Yes, I would, because this money is only a direct cost, but after that you will get better life with low-cost bills.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

If it's better, then why not! It only needs to be better.

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

It is thermally insulated. But if it wasn't, I will mind do that if the walls will get thicker.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

If these methods materials make the house more sustainable then of course I would agree.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

If these materials make the house more sustainable then of course I would agree.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes sure.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

I don't mind using local or international sourced material as long as it makes my house sustainable.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Yes, it does.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

In scale from 1 to 5 I will give it 5

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

Yes, it is important, we have an empty area beside my house the neighbours meet frequently in. I think it is the best place in the neighbourhood to meet in.

Q 6.3 How much do you know about Jordan building codes and regulations?

How much do you know about Jordan green building guide?

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why?

Not that much, but I know buildings categories (zone A, zone B, zone C) and what are the differences between them. And no, I never heard about Jordan Green guide. Also, no, no one asked me about *energy saving or sustainability elements* could be used in my house. of course, I am interested in them.

Q 6.4 Any issues regarding laws or regulation you are aware of?

Yes, because it's against the regulations to add any spaces or rooms.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Yes, buildings are so close to each other and this provides no privacy.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yes, I think so.

Q 7.2 Where do you host your guests?

In the guest room

Q 7.3 Do you have a balcony, garden, or patio in your house?

What do you use it for?

How important do you think it is?

Which is more important? Why?

I have a balcony and usually set there to relax. But I think the most important one to have is a garden.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

Yes, I do think that.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

What are these elements? What makes a house traditional?

I bought it, yes, I would use traditional elements such as arched windows decorated with stones.

Q 8.2 How much do you think your house suits your financial statue?

How much was the land price or house price a reason in choosing it?

Do you think house prices here equal its value?

Why?

I think it suits my financial statue well. and I think house prices here don't equal its value, it's higher than what it normally cost.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

I don't think so, they make it less quality and they sell as if it a high-quality building.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

Yes, I would prefer that.

Q 8.5 Would you prefer to:

Live only with your children as they grow?

Live with your children's family or parents in the same building?

House other relatives in the same building?

I would prefer to live by my own and my children.

Q 8.6 Which do you value more?

Traditional life or modern one? Individual life and personal space or Collection and community life Special looking house or similar looking houses?

I would value more a traditional lifestyle with a community life, also with a special looking house

Case and interview reference number: A08

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:

Household

traditional Lifestyle

Modern lifestyle

Culture

Religion

It's a Modern lifestyle house but at the same time it supports the country's culture within.

Q 2.2 What did you liked about your current house?

I do like the most that it's an independent house and it's not within a commercial building. Also, it's bigger in size than the previous house I owned, and it's located in a better neighbourhood.

What did you dislike?

it's not about the house itself but the neighbourhood in general, I hate not being all houses in one same level which will lead to have buildings taller than the others while they have the same floors numbers.

Q 2.3 What do you like about your previous house?

That the beginning of my life where there and I grew up in

What did you dislike?

that it was really crowded with people and it has no garden.

Why did you move?

Only in purpose to improve my lifestyle

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

Not really, nothing I would like to change in the main time.

Q 3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

yes of course! I added and modified a lot of things such as: added a brick rooftop, modified the boundary wall and the garden. These additional things and improvements came lately because when you buy a house you will be paying a big amount of money, so you do it after a while of buying the house.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

yes it suits my needs because I spent so much time and efforts to design it as I want and as it could fulfil my needs

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

Of course, I may demolish or add some partitions in order to change the distribution of the rooms in the house if my needs changed during the time. However, the biggest obstacle that could make the changes limited is the size of the house because there is no way to increase it.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

I think it's building C, because it's a modern style house and it has wide windows, so the sunshine enters easily and in good amount inside the building.

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?

I believe building C is the best compare to my current house, both of them have wide windows and there is good distance between them both and the houses around. The deference is building C is a money floors building while mine is only one floor.

Q 4.3 Which of the following buildings would you like to live in?
Why?

Building C

Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.

The second pictures represent old and the first picture represent new. Building B has arches and arches vault. Some prefer it because it Islamic or traditional, hey look heritage buildings and traditional forms like how people used to build in our region, the stone is in the old shape. Sadly, there is no connection; they used to be built manually and by the people sharing them to be built by themselves. Now it is a profession on its own, which can be more convenient and better. Also, there are more shapes and design that people can choose from

Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?

yes, it looks the same of the governmental buildings we have it in Amman

Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?

Everyone represents different society, like building B with all this traffic jam and noise around it looks the same of the governmental buildings we have it in Amman. While building C is pretty good place to live in, and building B is a crowded commercial building.

Q 4.7 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?

not really.

Q 4.8 why have people stopped making vernacular buildings?
Do you think it's good for today's living?
Do you think traditional materials is good for today or is it backward?

Because people's needs increased with time and this type of buildings don't fulfil these needs any more. Also, modern buildings are more convenient to live than *vernacular buildings*.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

Maybe it means that it's a place where the sunshine and the air could enter inside it easily?

Q 5.2 What makes a sustainable house in your opinion?
The one could last for longer time.

Q 5.3 What construction material you think suits Jordan best? What colours?
I think cement, sand, aggregates. I think it's reinforced concrete in general.

Q 5.4 How comfortable is your house in:
Winter?
Summer*?*
Why?

It's convenient at the summertime but it's ultimately cold at the wintertime because I made a mistake of not putting heating system.

Q 5.5 Is there a season where utility bill increases?
The utility bill is high in both summer and winter seasons. But the 3 summer months have the highest bill.

Q 5.6 Is there a room where you think it's hotter or colder? Why?
What type of activities do you do in this room?

My bedroom is the hotter at summer and colder at winter because it's located in the edge of the building, so it's facing all different weather conditions.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

natural ventilation of course

Q 5.8 Would you want bigger windows or smaller windows? And why?

In my previous house the windows were small, but I made them bigger in my current one because it's better with entering air and sunshine

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

I heard it is easier in a traditional building to regulate its temperature because I think it's made of mud and contains thicker walls, so it keeps the warm inside during winter and vice versa during summer.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

I could use any options to make my life easier.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

I think it is 70%-80% suits Jordan environment and climate

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

I could use any options to make my life easier.

Q 5.12 Would you pay more money for a more sustainable house?

I could use any options to make my life easier.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

Why not! While it's fulfilling the need in a good way then why not!

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

It's actually not, but I wish if so. I didn't do it because the contractor cheated me and didn't do it

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

Why not! While it's fulfilling the need in a good way then why not!

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

If these materials are excellent and have the same characteristics of ordinary materials, then why not!

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Ive tried solar panels before but I found it is not worth it do it.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

If the local materials have good characteristics, I don't mind use it.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

3 meters between my neighbour's house and mine is not a big distance to not interact socially with each other.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

I do value my neighbours and neighbourhood 4 out of 5 scale.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

I believe every neighbour has to have such a place to meet within in case of happy or sad occasions happen in the neighbourhood, though we don't have one, but it is really important to have one.

Q 6.3 How much do you know about Jordan building codes and regulations?

How much do you know about Jordan green building guide?

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why

I think you need to do a soil test and know the ground level, the sewage system, vehicle garage and things like that I guess.

Q 6.4 Any issues regarding laws or regulation you are aware of?

Of course there is, and actually I see a serious problem here in my neighbour which is the buildings with no distance between them at all and having shared boundary walls with each other.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

I hate not being all houses in one same level which will lead to have buildings taller than the others while they have the same floors numbers.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Q 7.2 Where do you host your guests?
I have a guest room
Q 7.3 Do you have a balcony, garden, or patio in your house?
What do you use it for?
How important do you think it is?
Which is more important? Why?
I don't like balconies that much, but I love having wide garden in my house because I have a small one and I don't like setting in it because of that
Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?

8.0 Ownership and lifestyle indicators
Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
What are these elements? What makes a house traditional?
I built it by my own, and yes, I have top arch shaped windows which reflecting some of the roman architecture that used to be here in this country, also I don't mind using more traditional elements in the future.
Q 8.2 How much do you think your house suits your financial statue?
How much was the land price or house price a reason in choosing it?
Do you think house prices here equal its value?
Why?
my house suits my financial statue really well, and for the location I got here the price was good for me in 2014 when I bought the land, but nowadays the prices have raised significantly.
Q 8.3 Do you think commercial building slandered takes financial conditions for people?
I think build commercial buildings in such area (his area) is not suitable and could affect the general look of the neighbourhood because all the buildings here one or 2 floor building.
Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I'm thinking of letting my children to live with me because I have only 2.
my parents have their own building so there is no need for them to live with me.
Q 8.6 Which do you value more?
Traditional life or modern one?
Individual life and personal space or Collection and community life
Special looking house or similar looking houses?
I prefer a community life more than individual one.
Q 8.7 Any additional comments/observations?

Case and interview reference number: A10

2.0 cultural Indicators
Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion
I think it's 100% support it and my family lifestyle (being comfortable was highly related to the type of house people lives in), the house I think is somehow intermediate location between how an old or modern one, I don't know how a would a house reflect the culture here to be honest nor how it can reflect architectural image of Jordan, but am certain an old fashioned family won't be able to live their life fully here as they used to. There is no barns and no courtyard for women to meet at, and its way smaller with less communal areas for large families to live in. at the same extended I think it suites my religion and there is no conflict between them (house and religion).
Q 2.2 What did you liked about your current house?
What did you dislike?
I like the areas surrounding my house (outside) which are the small garden surrounding the house setback from other houses and land lots. Nothing I dislike about my house it's just the fact that this development is still rather new with not much services and empty land lots and construction sites that makes the air rather dusty from building materials partials.
Q 2.3 What do you like about your previous house?

What did you dislike?

Why did you move?

I didn't like anything about my old house (laughs), I was still living with my family on an old-fashioned house where extended families are sharing the same apartment blocks (a house that grow to house the growing families and their married children) the house itself was tiny and the location of neighbourhood wasn't the pleasant either. These were the main reasons why I moved: the area, the location, and just to get away from the extended family.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

I would certainly like to, not saying that the house is bad, but if I got the chance to add another level to the house, I would like to change the lay pout of the plan as I think it would be better with my interference. Just little pieces, when my kids move outside of the house and get marry, I want to remove the partitions between their rooms and turn it into one big living area with only two bedrooms.

Q 3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

No nothing, we have not done anything so far, but we are planning to paint the house by next holidays.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

Yea as I said, thankfully the house is well arranged and constructed and there is nothing bothering me, the current house with its size and the number of my family member are adequate, if my family was bigger the house would not have suited us then. A room for the girl and a room for the boys and our master bedroom, we also are not that sociable to have that many guests, in summertime guest would even use the front porch so another hall is not that critically required now.

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

I think the house have possibilities to change and adapt with my future needs as I said earlier. I think for others the distance from services and markets can be challenging but for me it's alright. As you can see many of the houses here are still being built and thus there is not so much of social interaction or relation which I am fine with now. There are not issues to prevent me from changing and upgrading my house.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

Although the second one looks like it's in a cramped area that is too central to commercial area with a lot of cars and pollution, I think it's more sustainable than the others, I like this type of old buildings, it has something that pulls you to the past. It's simply beautiful.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

Third one, I think it's new like my house, picture one and two doesn't have anything to do with it. It has a garage, separate entrances, big windows with (roll down shutters), new clean stone, the only difference is that my house is a detached one, and this is an apartment block, same for the first one.

Q 4.3 Which of the following buildings would you like to live in?

Why?

Second, I like buildings with history, even when we were building this house, I tried asking for the old type of windows shutters that was used long time ago but could not find someone who still do them sadly.

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

Nothing really about the first one it looks so dens there, there is nothing I didn't like about the second one (laughs), and it sure represent Jordan old architecture, no doubt in that.

Q 4.5 Have you seen any building like in picture number b?

What does it represent to you?

All parts of Amman's downtown like rainbow street and Khurfan street I like going there and walk around and just be fascinated by the windows the buildings have. Same to As-Salt houses too.

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

No, sadly, I tried to add some things like high ceilings and long narrow arched windows with their shutters, but my husband didn't agree.

Q 4.7 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

No, I have not lived in any of them. My grandpa's house was there in Khurfan street and that's why I am still connected to these types of buildings. And there was nothing I didn't dislike about it. I wish I could live there in it.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

Do you mean the building that are comfortable and away from polluting, if not then I don't know about it much?

Q 5.2 What makes a sustainable house in your opinion?

I don't know, it's a hard question.

Q 5.3 What construction material you think suits Jordan best? What colours?

I don't know much, but I think the thing that distinction traditional architecture is stone and how its ages and changes colour as it grows old. That what gives the feeling of heritage.

Q 5.4 How comfortable is your house in:

Winter?

Summer*?*

Why?

Well, we still use fans and AC sometimes, but as we have a nice seating area outside, we spend most of our time there in summertime. I don't think it's that unbearable. It's also cold in winter, we just use heating devices and put carpet on the ground to make it feel warmer.

Q 5.5 Is there a season where utility bill increases?

Its stable in both seasons.

Q 5.6 Is there a room where you think it's hotter or colder? Why?

Just the girl's bedroom, its bit hotter in summer and warmer in winter.

What type of activities do you do in this room?

It is a bedroom

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

Natural ventilation for sure it's healthier

Q 5.8 Would you want bigger windows or smaller windows? And why?

I would want them to stay the same they are big and nice and allow excellent ventilation and sunlight.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

They were warmer I think because many of them were more than one story and clustered around each other's which made them warmer in winter and cooler in summer. Also, I remember my grandma telling me their house used to have a wooden frame with bamboo like strings and she said it never felt hot inside it in summer.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

I don't want anything to obstacle the sunshine to come inside, so I would say no to them. Even nit meant the house would be cooler or warmer. I like natural light to come in unless it didn't obstacle it all. I did though cover the glass door of the kitchen but not because of the excessive heat gains but for privacy as new people moved to the house behind ours. We certainly now wish if we have paid more to help insulate the house, but besides adding extra costs I don't like any of the other measures.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

I think it's just fine; Jordan climate is mild; it can get bit hot or cold, but I don't think my house is different than any other houses here.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

I Would I don't mind that.

Q 5.12 Would you pay more money for a more sustainable house?

I Would do it too.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

I would really like that, I told you I tried to but could not.

Q 5.14 Do you know if your house was thermally insulated?

Yes, it is insulated.

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

I do mind it making the wall to wide to some extent.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

I would really like that, I told you I tried to but could not.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

No, I don't think I'll like it.

Q 5.17 Would you prefer to use local soursed material or imported one? Why?

I would prefer imported one I know they usually have better quality.

Q 5.18 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, for sure and we are thinking about that.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

No, as I said it's a new area with few inhabitants, so not much goes for social interaction, entrances are far from each other's and it's hard to catch neighbours yet, although we are waiting for out attached neighbour to come and join us.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

No, not much goes for social interaction. This neighbourhood is relatively new and many of the land lot are still empty so I don't know much I will like it once it's all been built up. Entrances are far from each other, and it is hard to catch neighbours, we are waiting for our attached neighbour to come and join us. Our buildings are without sidewalk while other buildings in the same area have wide ones

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

Am not so sociable to be honest and am at work most of the time and so is my husband so I don't think we would have time to do these social events even if we wanted. So, it's not important to me. And there is none so far and don't know where a good location would be.

Q 6.3 How much do you know about Jordan building codes and regulations?

I don't know anything.

How much do you know about Jordan green building guide?

No, never.

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why

He did not at all, I would certainly be interested to know about them then. For the environment and to save bills later. Even if he guided us to plant more trees we would have. I do care about the environment; I would love to help sustaining it.

Q 6.4 Any issues regarding laws or regulation you are aware of?

Nothing I know about. I know some people made some extensions against the building law and they had to correct it. (Mawared) Company require you to remove what you have made, weather it was plants pots, skylights, how many façades with stone, can't remember what else my husband knows more.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Just the things I mentioned earlier. They (Mawared) are quite strict in enforcing the regulations.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yea I think it's very good, everyone has its own room, and the neighbours can't look inside the house, also I mentioned we now covered the kitchen so yea I think the hose provide good privacy for us.

Q 7.2 Where do you host your guests?

Mostly here in the living or dining room and in summertime we set outside.

Q 7.3 Do you have a balcony, garden, or patio in your house?

Nothing really maybe the bedrooms, it's just private, I invite people to pray in my room as its quiet, I don't have anything am ashamed of and don't want people to see really, so am easy going with that.

What do you use it for?

How important do you think it is?

Which is more important? Why?

I like setting in the porch or the area behind the garage, there is a sling I like to nap in when the weather is nice. It's not a big garden it's just the setback but from the kitchen side we have like 5 meters one we can set there and it's nice and wide.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

I do yea, we were involved a lot in the designing stage with the architect tell it came on its current image that we like. It's like we planned it.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

Built it myself, and no we didn't use any direct element of these.

What are these elements? What makes a house traditional?

Hmm, windows shape, arches, windows cover and shading devices, stone like the big thick ones. As I said, also the vegetation part is really important, old houses had courtyard where they can plant and grow even their own vegetables. The connection with vegetation is very Jordanian like I think and few of the things that have not been lost, I think even modern houses are more Jordanian and still little influenced by foreign examples. We added (شحف) tiling to the area outside the kitchen which I think resembles how people used to do their tiles traditionally.

Q 8.2 How much do you think your house suits your financial statue?

Its ok for the time being

How much was the land price or house price a reason in choosing it?

Yes, it was

Do you think house prices here equal its value?

Why?

People were buying and reselling lands which made it more expensive and way overpriced for what its worth's.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

No, they don't at all.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

Yea I certainly would want that.

Q 8.5 Would you prefer to:

Live only with your children as they grow?

Live with your children's family or parents in the same building?

House other relatives in the same building?

I prefer live with my family only

Q 8.6 Which do you value more?

Traditional life or modern one?

Modern life

Traditional building or modern?

Traditional one

Rural life or urban lifestyle

Urban life

Individual life and personal space or Collection and community life

Individual one

Special looking house or similar looking houses?

looking similar is better

Case and interview reference number: A11

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:

Household

traditional Lifestyle

Modern lifestyle

Culture

Religion

For a family that has kids who are growing in age and in numbers and want to find a space to play indoor it's not, this is a closed apartment, also it is the same for an old traditional conservative family, they won't feel comfortable sharing the stairs with other people especially young men who keep coming up and down it won't be easy for them.

Q 2.2 What did you liked about your current house?

What did you dislike?

The house itself has a nice layout; its size Is very suitable for a small family. What I dislike is the that it's an apartment building, am not used to that, we used to live in a single detached house where we had a lot of space for the kids to play.

Q 2.3 What do you like about your previous house?

What did you dislike?

Why did you move?

I like it's an independent house, you can go to your porch, park your car alone, there is not much noise coming from people living around you, you have a choice of who to socialise with from the neighbours and not being forced to socialize with them all or whoever. Something I didn't like? Nothing really, I moved as I got married and had to move to new place.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

I would not like to do anything with the house myself. I prefer having the house ready as it is and not have the need to change it. I want to change the whole apartment soon and move to a detached house. We have not thought about making any changes so far. When we moved, we painted the rooms, added the kitchen, lights etc. as the apartment was empty when we moved.

Q 3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

Just the things I mentioned about area, space and independence. We can't even make that significant changes as it's an apartment within a block, even people living on the ground floor would find it challenging to do any changes really. The regulation and the fact it's a housing project won't just allow it.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

The lay out is good but the rooms are small, as a family with a small baby it was challenging finding a space to put in the furniture with the sizes you find in the market, if it was a bigger family with more kids or young adults it would be very hard to live and fined storage spaces. The living area is bit big, I would have preferred if the length of the living room was shorter and the extra length be given to the bedrooms inside. They should have the priority.

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

I Think it is very hard, you can't just demolish and rebuild it's just hard. The fact it's an apartments block, the stairs, it does not have an elevator, there are too many people, this block has 20 apartments in it, it's always noise. It's hard living with 20 family and keeping touch with them all and just make agreements with them all about cleaning and children playing in the halls and so on.

4.0 vernacular architecture related metric

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

I would guess the second ones, they have maybe a smaller number of apartments, they have space to grow trees and have green spaces more than the modern type of apartments in picture A or C even for garages and cleaning as they have fewer people living there.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

The First one, looks like an apartment building that is not too cramped and have similar finishing materials No trees, no green spaces, nothing environmentally friendly, it's very close to it.

Q 4.3 Which of the following buildings would you like to live in?

Why?

Second one. It seems it has a smaller number of levels and apartments it looks nice and seems to have more space around it and far less quitter than mine.

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

In the first and third one it seems there are a lot of people living there, the number of apartments seems high there. Although it has a balcony and seems to have a garage for the car the third one looks much nicer than the first one but still an apartment block but with better finishing materials. I think you can find all of these types in Jordan specially the one in third one, most of the high-end housing projects looks like that now. B is the traditional form of lower rise and less floor levels which I think might suit people's nature and culture more. Having so many people living in the same building is a new thing to our society people used to live in a single-family house. Having a building with few apartments is alright but just not

too many families. It's a very commercial oriented market force that led to projects like the one I live in and the one in the first picture to start appearing all over the place.

Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?
Yea I think so many villas and independent houses looks like that although not as many levers or old as it is. It represents the big family extended house; it must be too expensive as it's old and big.

Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
No not mine nothing at all between them.

Q 4.7 why have people stopped making vernacular buildings?
Do you think it's good for today's living?
Do you think traditional materials is good for today or is it backward?
I think the first factor is the economic situation, no one can afford building them anymore, land prices have increased and living inside the city cost so much that apartments block started appearing everywhere, as they are more economically viable for both investors and cheaper for buyers. They simply have to live there. Am sure traditional building being prettier and better but as I said costs are too much, they need bigger land lots, and most importantly no one want to live as an extended family, I know these places used to house the core family, their sons and daughters and their wives and kids. It would be hard also as I think these materials might not exist anymore, or the tool used then are not available.

Q 4.8 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?
No. never. It was an old house, but I won't call it traditional, it was built as the form of a traditional building, it had the old type of shutter windows the layout of the traditional house of halls and big rooms to house many children and extended family, it had a high ceiling and so on. It was very old house and we used to rent it and then my family bought a new house and I moved after I got married.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
I think it is related to being able to sustain for a long period of time. With not much maintenance and with material or properties that does not harm nature

Q 5.2 What makes a sustainable house in your opinion?
I think it is related to being able to sustain for a long period of time. With not much maintenance and with material or properties that does not harm nature

Q 5.3 What construction material you think suits Jordan best? What colours?
I think the current material is suitable, stone blocks and so, not timber or wood (laughs)

Q 5.4 How comfortable is your house in:
Winter?
Summer?
Why?
There is another apartment above us so I think it mad things so much easier here as it's not so cold or hot as it would be if we were on the last floor, it's warm in winter and bit hot in summer. It's a closed apartment where we can't open so many windows or doors due to privacy issues and noises.

Q 5.5 Is there a season where utility bill increases?
Summer bills are higher with the fans and AC sometimes. As its hot and a closed apartment with no place to breath and we keep windows close for privacy issues and noise control.

Q 5.6 Is there a room where you think it's hotter or colder? Why?
I think they are all the same, all windows come with one window for each.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
Natural of course but as I said not much space to breath or have privacy to set near a window or a balcony as the building are quite new to each other's sadly.

Q 5.8 Would you want bigger windows or smaller windows? And why?
Its bit small in my opinion, bigger windows give you better ventilation and sunlight, we have to use curtains so it reduced the light we have, if it was bigger it would allow lighter to come in even if it was still covered, the apartments next to us are close so we can't keep them uncovered for long time.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?
Traditional building was better and cooler, especially with its layout and ventilation, they could grow

vegetation even in the courtyard and have a small fountain to cool the inside air, even the walls had better properties and was better insulated. They didn't need air condition or fans. I also think techniques like self-shading with plants helped a lot too.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area
smaller windows area
pay more for insulation
View from house windows

I would mostly prefer adding extra costs including insulation with less preferences to other choices although I would sacrifice view or windows size. If the windows were smaller but there would be more, I would agree to that it all just depends. I would not want the house to be smaller as its already very small.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

I think it's a normal house that is insulated Its not more or less suitable than other houses, its good in winter but built hot in summer as I said.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

Windows are bit small and I would not necessary like covering them more, we already use a lot of certain but if it could help protect from heat, I might just use them, our neighbour is covering his balcony and it help create better place and better conditions.

Q 5.12 Would you pay more money for a more sustainable house?

I would certainly as it would make things easier and healthier for me. We all like the environment too

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

Maybe depends on muds and stones worked for a good while as people didn't have anything beside them, but as traders start importing and then manufacturing new materials people started looking for what is modern and new, they don't want the old anymore, I don't think personally that mud is a back warded material or that houses built by mud are a sign of that I would just prefer more efficient modern materials.

Q 5.14 Do you know if your house was thermally insulated?
Would you like if it was insulated?
Why didn't you care about insulating it?
Would you mind if it the walls were thicker, and your room size were smaller? Why?

Yes, it is, if would have been much worse if it wasn't, one of the few good things about this building is its well-built and well insulated.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

Maybe, they need a lot of maintenance or how good will it look so it depends on that. I would love to help the environment though of course.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

If it will help saving the environment I would.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, we are thinking about that. But how much the cost would be

Q 5.18 Would you prefer using local sourced material or imported one? Why?

If it will help environment and has good quality, why not.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

There are too many people with 4 doors opening into each other's so social interaction is a must here (laugh). you can't just keep in contact with them all not mentioning the surrounding buildings.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yea I do, this development is still relatively new with not many services and empty land lots and construction sites that make the air rather dusty from building material particles. Distance from services and markets can be challenging and does not encourage you to go and walk as you will always have to use the car for shopping for grocery."

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what and where would you like it? Show on the map?

Yea it would be better to have a place near the neighbourhood that allows for such interaction but there is nothing so far. One of the planned gardens or a using the school hall would be a good idea. I wish they also fix the sidewalks here and finish set up the streetlights too as they are in a bad condition and discourage you from walking. Even in pedestrian zones, that should encourage walking, as there are few people, you don't see cars, they are less crowded, then you don't feel like walking, because you feel unsafe

Q 6.3 How much do you know about Jordan building codes and regulations?

Not much honestly. Can't recall anything.

How much do you know about Jordan green building guide?

This is the first time I hear about it.

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why

No but insulation really and it wasn't from any engineer or architect. And I would be interested, it would be better and would help my house sustain for long time.

Q 6.4 Any issues regarding laws or regulation you are aware of?

No nothing. It's just bit streets. They don't aloe people to have direct entrance from the street level to the ground levels apartments or sub level.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

The entrance is designed to be on the side of the apartment and you have to go near the garden of the lower floor which done not give them a lot of privacy and noise cancelation to rooms in that side, also the garage space is behind the building with no direct footbath to the entrance of the building, I think it was an architectural or engineering grave error, you would have to walk all the way around the building to get to the entrance, also with 4 levels building there are no lifts here.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Not quite sadly, as I said balconies and windows are close to each other's that doesn't allow you to set too near an exposed window. Also, the proximity issue is severing, we share the walls with some neighbours and sometimes I can hear their morning alarm clock.

Q 7.2 Where do you host your guests?

In this living room.

Q 7.3 Do you have a balcony, garden, or patio in your house?

Yea the balcony.

What do you use it for?

Don't use it often we use mostly for laundry we rarely use it its very exposed to other buildings. And it's just too small

How important do you think it is?

Which is more important? Why?

The garden its more specious and breathable space.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

No. but the house isn't different from other people's houses too. I would prefer a house that embrace independent and where I don't have to share entrance, stairs with so many people. Even going in and out you would find boys setting there, if I had a daughter and she would want to go out then she will find them and it is just not comfortable to do so, this is against our values I guess.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

Nothing so far but I would like that.

What are these elements? What makes a house traditional?

Materials like mud and stone, its form, lay out, and how the rooms are arranged around an inner hall or space, it had the old type of shutter windows the layout of the traditional house of halls and big rooms to house many children and extended family, it had a high ceiling and so on.

Q 8.2 How much do you think your house suits your financial statue?

It suits us now as it's hard for us to build our own independent traditional house now.

How much was the land price or house price a reason in choosing it?

It was a big part of it on the start of building our family.

Do you think house prices here equal its value?

It's yes very reasonable. If it was more expensive, I would not buy it

Why?

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

Yea at some pint it is, it's reasonable priced house in a place not so far from work and city centre.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

Not too expensive I hope, not much extra costs.

Q 8.5 Would you prefer to:

Live only with your children as they grow?

Live with your children's family or parents in the same building?

House other relatives in the same building?

I prefer live with my family only, core one only. If it was a big house, I would not share an apartment building with few relative families together not so many stranger people like here.

Q 8.6 Which do you value more?

Traditional life or modern one?

traditional life and traditional type buildings.

Rural life or urban lifestyle
Rural places.
Individual life and personal space or Collection and community life
Individual is more convenient as work would not allow us to socials a lot.
Special looking house or similar looking houses?
special looking is nice.
Q 8.7 Any additional comments/observations?
A traditional building is very nice.

Case and interview reference number: A12

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion
I think it's very suitable to everyday life modern life I have all the type of rooms I want and the spaces in the house are well organized with no lost spaces. it cannot suit a traditional family lifestyle, the way we build our houses today is vastly different from how people used to build or even expect in their houses, even in how doors and windows look like. I don't think there is anything in it that goes against culture and religion, but I don't think it goes against another religion.

Q 2.2 What did you liked about your current house?
What did you dislike?
Although it's a semi attached house, I still have enough outdoor area and good ventilation access to the house. And because it's also a semi attached one, my house is protected from the bad sun. (meaning the southern side). I like everything about it, there is no specific thing I think of I hate about it.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?
I didn't enjoy living in my previous house as it was small, and the area was bit crowded and before that I lived with my family which I also didn't like for long. I wanted my independence and that's why I moved. The house was also very old and I most old things don't suit nowadays.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?
Nothing I want to change or thinking about changing.

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?
No nothing

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?
As I said I worked a lot with the architect to make the plan and room distribution suitable. All the rooms except for one open on the same corridor which is the best he could do with such limited space, but I still think it's very suitable that room is near the living room and it might be bit noisy from TV and so on.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?
Size wise I can't except that I still have a portion of a floor level I can still build. Which is bound to the regulation and laws. I think my family have completed so I don't think I will need anything else in the house in future time. I mean I just built it and made sure I take everything I could think of into consideration.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain
Second picture, large windows and old-style building (means vernacular) these buildings were very durable (sustainable) and very environmentally friendly.

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?
third one, same design windows and modern looking more it also used stone I guess too.
No significant differences beside its apartments and many floor buildings while mine is one story.
Q 4.3 Which of the following buildings would you like to live in?
Why?
Second one I really like these types of houses and tried to do imitate things like stone and windows but could not do much. They are bit nostology and I've heard they are way better to live in than new buildings.
Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.
Nothing about the first one it looks so crumbed and cheap like a match's box, the third one is bit better, nothing in it I specifically don't like except its apartment block too but looks newer and better. And uses stone.
Second one, The second for old and the first for new. It has arches and arches vault, some prefer it because it Islamic or traditional, having an elevator is important if you have more than 3 stories buildings.
Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?
All parts of Amman's downtown and other cities. It represents the old heritage architecture
Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
No, as I said I would like if it did, but I couldn't achieve anything related to that in my house except maybe using stone as a shell to my house.
Q 4.7 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?
No, I have not lived in any of them.

5.0 Sustainability Indicators
Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
No nothing at all to be honest.
Q 5.2 What makes a sustainable house in your opinion?
I really don't know
Q 5.3 What construction material you think suits Jordan best? What colours?
Maybe stone is good for this environment and caring about walls and windows insulation. Climate here can be harsh in this area. (laughing)
Q 5.4 How comfortable is your house in:
Winter?
Summer*?*
Why?
It is very comfortable in all seasons as I said I cared about insulating even my windows and doors and the house is protected from the southern side where most of the harsh sun comes.
Q 5.5 Is there a season where utility bill increases?
I think its stable in both seasons where in hot days I'll use fans and in cold days we use heating
Q 5.6 Is there a room where you think it's hotter or colder? Why?
The boy's bedrooms as it lays on east-northern side and has two windows on the side of a house
What type of activities do you do in this room?
They are bedrooms
Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
Natural ventilation, it's better and healthier
Q 5.8 Would you want bigger windows or smaller windows? And why?
This is a very good size I would say and no need to change them, vertical long shaped windows can help dispose of hot air better than horizontal
Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?
Traditional building was Easier to control temperature, walls were made with a mixture of mud and hay which works as a natural insulator.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area
smaller windows area
pay more for insulation
View from house windows
I don't prefer any really and my house is already in good orientation and insulated to have to use any, but I would choose a smaller window maybe.
Q 5.11 Do you think your house suits Jordan environment and climate? Why?
I think it's adequate enough as I explained earlier. (means windows, orientation, insulation)
Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?
Maybe, am not sure it would do much as my house is already shaded by the semi attached house, also I don't think it allowed by the laws or regulation, they don't allow people build canopy here.
Q 5.12 Would you pay more money for a more sustainable house?
Not at this point I think the house is comfortable enough and can get some good ventilation which can help reduce the heat.
Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?
I wouldn't really like that, its old and even people who knows these techniques are dead now, no point in reviving it as there are good contemporary alternatives
Q 5.14 Do you know if your house was thermally insulated?
Yes, it is insulated.
Would you like if it was insulated?
Why didn't you care about insulating it?
Would you mind if it the walls were thicker, and your room size were smaller? Why?
The house is already small, and insulation is not that thick so why not.
Q 5.15 Would you agree to use traditional methods and materials in your house? why?
I wouldn't really like that, its old and even people who knows these techniques are dead now, no point in reviving it as there are good contemporary alternatives
Q 5.16 Would you agree to use recycled or reused materials for your house? Why?
No, I don't think I'll like it, new things are always better.
Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?
Yes, I might use it depends on the cost.

6.0 Zoning and regulation
Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?
I think that this is up for people and not zoning, but regarding that point I think it won't at this state where none of the public parks are done yet and there seems to be no public place to meet.
Q 6.2 Do you value your neighbours and neighbourhood? Why?
Yes, I do but this neighbourhood is new and many of the land lot are still empty so I don't know much I will like it once it's all been built up (laughs).
Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what and where would you like it? Show on the map?
I think the planned gardens would be good if there were any. Not thinking of a more suitable place
Q 6.3 How much do you know about Jordan building codes and regulations?
A little enough about regulation only related to King Abdulla's city, where there quite difference between it and other council's regulations. Things like windows ratio, clustering in the front faced where the staircase house should go inside 20 cm from the main façade and so on.
How much do you know about Jordan green building guide?
Nothing really, I never heard about it
Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
Would you have interested in them? Why
Yea he did tell me about insulation but that's it really. Not sure if I would be interested in knowing or doing more than that. Regulation won't let me do much anyway, even adding a canopy or shading shelf is not allowed here by law.
Q 6.4 Any issues regarding laws or regulation you are aware of?
Not really.
Q 6.5 Any issues regarding how the neighbourhood have been designed?
The main issue I find here is how bad sidewalks are here. Most of them are not finished yet although we pay a lot of fees and taxis for Mawared Co. The sidewalks are not wide enough and comfortable to walk, I will stop walking. The sidewalk curb is also too high in places of crossing that you feel like falling, some people even turned parts of sidewalks into a seating area for them when weather is nice as they lack

open public spaces or big gardens which is not acceptable. it's also boiling in the summertime and there almost no trees, shades to walk and it is very far from my house to the shops, so I use the car

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Yea I think it's very good here and the back yard is quite isolated as its below my neighbour eyesight.

Q 7.2 Where do you host your guests?
Depends on how close they are, the quite strangers I host in the guest room but the closer ones I host in the living room.

Q 7.3 Do you have a balcony, garden, or patio in your house?
Yes, they are very important although I rest mainly in the living room.
What do you use it for?
How important do you think it is?
Which is more important? Why?
The balcony for apartments and garden for ground levels houses

Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
No but I think the house reflect how people build here, it's as progressive as technology here. Old houses won't have this many bathrooms or laundry room for example.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
Built it myself, and no I didn't use any direct element of these.
What are these elements? What makes a house traditional?
Hmm, windows shape, arches, windows cover and shading devices, stone like the big thick ones.

Q 8.2 How much do you think your house suits your financial statue?
Its ok for the time being
How much was the land price or house price a reason in choosing it?
Yes, it was
Do you think house prices here equal its value?
Yes, its bit higher but even if the land was more expensive, I would have bought it.

Why?
This was a military camp and when the development started the prices were skyrocketed and everyone wants to live here because its good organized and not cramped like older parts of the city.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?
No don't think so, this was supposed to be the middle- and lower-class development but the prices don't really reflect this vision.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
I already did that, like this wall, (southern-Easter) one I made it double blocked with heavy insulation and when If I did the roof floor, I would make it even thicker no matter the cost. Yes, I would it would be better

Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I prefer live with my family

Q 8.6 Which do you value more?
Traditional life or modern one?
traditional life
Rural life or urban lifestyle
Rural life
Individual life and personal space or Collection and community life
collective
Special looking house or similar looking houses?
looking similar is better

Q 8.7 Any additional comments/observations?

Case and interview reference number: A15

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture

Religion

I think my house supports around 70% of my household, and it averagely supports traditional and modern lifestyles. However, it totally supports religion and culture. It's very good on its current condition, it's very far from how traditional families used to live and don't think it will suites them, I don't know how a house would reflect culture, but there is no conflict between my lifestyle and my house or how people live here and certainly it doesn't go against religion, it provides safety, privacy, and just a place to house and dignify us. Everyone has his room which I think it's important in modern Jordanian society.

Q 2.2 What did you like about your current house?

What did you dislike?

I like how close it is from different services such as: easy to get clean water, electricity, there is good sewage system, and availability of parking lot...I don't like how noisy it becomes at night because there are a lot of people come to our neighbourhood and stay late at night with so much noise.

Q 2.3 What do you like about your previous house?

What did you dislike?

Why did you move?

I like my previous house because it was independent house and located in countryside. The reason why I moved out is because of my job and my kids' schools.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

Yea it's very suitable and has good layout. The rooms are separated based on their function, bedrooms are together on one side, and living room and kitchen are on the other, I think it's nice this way. Gives privacy especially away from the guests' room.

Q3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

I haven't made any changes nor plan to make. It would be very hard to change here especially with the laws and regulation also don't have enough space to do much upgrading or addition. it doesn't give me special opportunities. It's an apartment so you can't do much here, you are limited by the space you have.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

Sort of, but bedrooms are kind of smaller in compare of family members. Also, I prefer if there was a third bathroom in the master bedroom. As I mentioned before, it has an excellent design and absolutely the spaces are ideally distributed.

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

I guess it is hard to do any changes after it has been built. The biggest opportunity is being the house near the capital, Amman, while constraints are limited. I think the only constraint to make changes in future is being the house in a multi-floor building, which make it impossible to add any spaces or rooms.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

I think it is building C, because it has wide windows which will provide good amount of sunlight to the house and good natural ventilation.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

It's building A, it appears that it has small rooms, has the same windows size and same neighbourhood. I think there are no differences, maybe the only one is that mine has a parking lot but I can't see one in photo A.

Q 4.3 Which of the following buildings would you like to live in?

Why?

Building C for sure, simply because it's modern house.

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

The first one looks like it's in a very quiet area, the second one looks it's like close to shops and other services, the third one looks modern and clean. The second building looks like it's in a very dens area with people and buildings the building looks so old. It represents the architecture of Jordan its very heritage like. And represent the architecture that is connected to the people's culture. And just the traditional lifestyle that is based on community and social connection, not like modern life. I like the small windows that building A has, also I like building C and I see that it's similar to building A but with wider windows. Building B becomes an old model and I think it doesn't suit people taste any more, and I think it represents traditional Jordanian architecture while building A represents the modern one.

Q 4.5Have you seen any building like in picture number b?

What does it represent to you?

Yes, I have, it represents the Islamic and eastern architecture.

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

No, not really. It is not related neither internally nor externally to the architectural heritage in Jordan. Let's take structural stone for instance, my house doesn't have it but in traditional Jordanian building it is a must.

Q 4.7 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

Yes, I have, I like the most the look of old structural stone it has, and how it is cold at summer and warm at winter. I moved because of my job. usually they are in more popular (شعبي) areas where people look after each other's, now and here people just don't care at all. And that's what I like about them. Also, too many people crammed into small places makes it uncomfortable.

Q 4.8why have people stopped making vernacular buildings?

Do you think it's good for today's living?

5.0Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

Yes, I know a bit about it.

Q 5.2 What makes a sustainable house in your opinion?

It is the building where we use solar panels, there is a lot of green areas included within it, has the ability and facilities for collecting rainwater and use it for growing plants for instants.

Q 5.3 What construction material you think suits Jordan best? What colours?

I think it is structural stone and white colour suit Jordan the best, because they remain for long time as if they were new.

Q 5.4 How comfortable is your house in:

Winter?

Summer*?*

Why?

It is not that comfortable in summer to be honest; I keep using AC's and I put some plants and small trees in front of it to make the temperature cooler, but in winter it's comfortable.

Q5.5 Is there a season where utility bill increases?

It increased frequently no matter in what season we were, but in simmer it is a bit higher.

Q5.6 Is there a room where you think it's hotter or colder? Why?

What type of activities do you do in this room?

Yes, the one that located to north usually cooler than the others because the sunlight has no way to enter inside it.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

Natural ventilation for sure. Because it costs nothing and simply healthier.

Q 5.8 Would you want bigger windows or smaller windows? And why?

Recording to Jordanian building regulations windows are supposed to be in average size.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

It was easier because walls were thermally insulated. They used to use mud to build their houses with around 1m thick which gave an excellent insulation.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

I would choose smaller windows.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

I think it does. Because it has a good sized windows and it is 2.8m higher than ground level.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

My current house's windows are shaded which is really good for preventing sunshine to enter in hot summer days.

Q 5.12 Would you pay more money for a more sustainable house?

Yes, I would, because what I am paying now will make my life easier in future.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

Traditional building were better as they were made from mud and just the way they were constructed in. Maybe, they need a lot of maintenance, so it depends on that.

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

Yes, it is thermally insulated. And if it wasn't, I wouldn't mind thicker walls in order to get thermal insulation.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

I don't like to use it in the main time, but a lot of people does,

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

Yes, I wouldn't mind use recycled materials if it's safe to use.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes of course I would prefer them.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

If local sourced materials have high quality, then I don't mind use it.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Yes, it does.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yes, I do.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

I think it is important, but the only place we have to meet is the mosque. I would like if we had a green place we could meet in there.

Q 6.3 How much do you know about Jordan building codes and regulations?

How much do you know about Jordan green building guide?

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why?

I do know a bit, and yes, I know about Jordan green building guide, that it's about plot area it should be bigger. No, I haven't asked any because I'm not interested in it in main time.

Q 6.4 Any issues regarding laws or regulation you are aware of?

They are really strict regulations which is in my view a good thing.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

I don't think so because there is good distance between a building and other.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yes, is do think that, because bedrooms are separate from guest room, also bedrooms are distributed where privacy is provided.

Q 7.2 Where do you host your guests?

In the guest room. It is a must have room for our culture.

Q 7.3 Do you have a balcony, garden, or patio in your house?

What do you use it for?

How important do you think it is?

Which is more important? Why?

As a multi-floor building, I guess it is a must for every floor to have a balcony. But for me because I am living in a ground floor, I would choose a garden as the most important one. None of us can relax on the balcony…. It is located on the building's side where adjusted balconies and windows from the next

buildings are also stationed. It is not comfortable at all, even the window of the balcony is too big, and we must hide behind curtains all the time.

Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?

Yes, I really do, because got used to live in a city where there are no more countryside houses. And yes, I think my guest room has a lot of internal elements that reflect my values and the country's culture.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
What are these elements? What makes a house traditional?

My house is a rented one. And no, I didn't use traditional elements.

Q 8.2 How much do you think your house suits your financial statue?
How much was the land price or house price a reason in choosing it?
Do you think house prices here equal its value?
Why?

In general, yes it suits my financial statue. And houses here in general don't equal their values but these are the prices, you know.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

Yes, you can find some good prices and you can find some expensive ones.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

Yes, I would prefer that.

Q 8.5Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?

I would prefer to live independently with my children.

Q 8.6 Which do you value more?
Traditional life or modern one?
Individual life and personal space or Collection and community life
Special looking house or similar looking houses?

I would prefer to live a modern and personal life with a similar looking house to other houses.

Q 8.7 Any additional comments/observations?

Yes, actually, I wish if we could get more public spaces and barks and keep eyes on them because there are some people stay late at night in them, and when they see no one is watching them they start to ruin it.

Case and interview reference number: A16

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture

It's alright so far, we only did portion of the house, but it has not yet finished construction, it will be better when it's fully done. We plan to do so as our family grow. For sure this house is only fit to modern lifestyle and modern Jordanian culture. I mean we still have these cultures of houses to be closed into itself and not be so exposed for people in the outside, to have much control for privacy which is a shared point with traditional houses. Covered windows, balconies are not so exposed and so are the other floor, it's a shared point with most houses here in Jordan. Some houses the kitchen would be open to the living space which I don't like, and I think is a foreign feature that got imported from houses in Europe or America. I prefer the old style. And nothing goes with religion as well. Even inside the house rooms are separated by this sail (separator wall) no one could see the inside of the house if you had guests or even from the outside if we are setting outside, the rights of the neighbours are preserved.

Q 2.2 What did you liked about your current house?
What did you dislike?

I like it all (laughs) the seating area we have at the garden, how quite this neighbourhood is. I feel so comfortable now. At the beginning it was hard to adjust living in an area so close to the main road with all its cars. It's so nice here, clean, it's so soothing especially in wintertime. In summer it's livelier of course. Specially changing from an apartment building to a detached house. I didn't dislike that this part of the city is far from the Zarqa city centre away from amenities and services. I used to enjoy people watching back then (laughs)

Q 2.3 What do you like about your previous house?

What did you dislike?

Why did you move?

I liked it was close to my folks we didn't live far from them and how close it was to services. The only thing I didn't like was the fact it was an apartment block; you don't get that feeling of independence and having your own place. At the end it was like living in a big house where all of our lives are connected, and people would intervene in everything to the point I could not handle it and wanted to move out. When I first moved out here the house was still halfway through construction (laugh).

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what, and why?

Just expanding the house now when I first bought this land, I didn't know it's going to be an attached house type of lots. I didn't like it at all. That's the only thing I would change about it if I could, they look like a single house rather than two that's how I feel. Detached houses cost more so it would have depended on cost and availability as well.

Yea once the house is finished it will be good, we only have two bedrooms now and a single living room once it's done there would be two more rooms and a guest room as well, that's how we planned it and the living rooms will be more inside the house where that quarter would have another entrance beside the one the guests have because it's on two streets.

Q 3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

Just construction related changes, we didn't have a fence, no outer gate, no outer tiles, the garden and the street were one. Slow changes over time.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

Yea once the house is finished it will be good, we only have two bedrooms now and a single living room once it's done there would be two more rooms and a guest room as well, that's how we planned it and the living rooms will be more inside the house where that quarter would have another entrance beside the one the guests have because it's on two streets. The guest room would have its own small bathroom, so guests won't have to go inside the house if there was no need.

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

Yes, it can, even once it's done but it would be more restricted due to lack of space and because of laws and regulations. The hardest things about it are again the services and that there is still no-good transportation to here. I would say regulation are bit strict here, even when we wanted to move here, they denied us the licence up until we finished all the outside works and even planted a tree here. Its good but sometimes it's hard if you are bit out of cash. Also, that there is no prober transportation yet. You need to have a car to live here. I had to learn driving and use the car here.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

I think it might be B. I felt so because it has a lot of narrow large windows that allows for enough ventilation and sun to go inside to make the house healthy, it has enough space to grow a garden, I think. Unlike A or C., they also look cramped and busy, b looks like it hosts fewer families than the other two.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

Hmm type of stone, I think B is more Arabic than the others plus the reasons I mentioned, the third might actually be the similar to mine, its built-in stone and looks modern and new like mine.

Q 4.3 Which of the following buildings would you like to live in?

Why?

Second, I like buildings with history or Arabic older houses, plus the reasons I have mentioned too.

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

I did not like the first one at all, I used to view them before buying this lot and I would think yea I can live there but then I would go home and start imagining how life would be there, or how I would look

like living in one of these affordable apartments and then I would say no way, I just could not adjust with them , they look dull and lifeless and also the house is small and the apartments has just too many families. Unlike B or even C. C at least has better looking and materials it has a nice design and nice balconies. Even that colour it looks like a desert, even the slight colour change of a stone makes a different. The first one A represent current architecture now sadly, maybe the third one too depends on the social class of the area.

Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?
It reminds me of old Arabic houses like the ones in Damascus, or at Madaba or so, they represent comfort and leisure, times of my grandpa (laughs) time of traditional life and architecture, whenever I see a house like that I think about how nice and clean towns used to be.

Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
No, sadly, nothing so far expects it's a single-family house like old houses mostly used to be that is.

Q 4.7 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?
No, I have not lived in them I just visited my grandfather's house, families there grow in number, they had better jobs and afford living on their own, each family would use a bedroom in that house, so they moved from there gradually. Everyone built their own house.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
Do you mean the building that are last longer or can have living condition that you don't need to amend them too much? It always confused me.

Q 5.2 What makes a sustainable house in your opinion?
I don't know, as I said it confuses me this term

Q 5.3 What construction material you think suits Jordan best? What colours?
Stone certainly it even gives certain look and character to the building, they are on high demands and people like them a lot.

Q 5.4 How comfortable is your house in:
Winter?
Summer*?*
Why?
Well, we still use fans and AC for sure it can be quite hot, the old house was much warmer and cooler, it much colder because it was an apartment within building that shielded it. The only way I could think to fix this is install a central heating system.

Q 5.5 Is there a season where utility bill increases?
It's much colder in winter

Q 5.6 Is there a room where you think it's hotter or colder? Why?
Our master bedroom, the other room is warmer as it's on the same wall as our neighbour so its shielded, the bedroom has two windows so its hotter and colder.
What type of activities do you do in this room?
It is a bedroom.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
I prefer mechanical natural won't help cool or warm my house.

Q 5.8 Would you want bigger windows or smaller windows? And why?
Bigger looks much better and allow for more natural light to come in they look nice too although they are harder to clean) laughs) when the rooms are not that big too, they gives a feeling the room is larger and roomier.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?
I don't think so, I heard that because it was made from mud so made it cooler in summer and warmer in winter, but I remember it was as cold and hot at my old grandpa house.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area
smaller windows area

pay more for insulation

View from house windows

I know they would be harder to control temperature in, but I still like big windows and high ceilings, small windows look like I am living in a dungeon. I would pay more money rather than the others at all. The look is a priority for me

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

I think it's just fine.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

If it looks good, I will not mind, if it was some type of a mesh or shader or metal I would not like that.

Q 5.12 Would you pay more money for a more sustainable house?

I Would do it too.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

Hesitates- no I don't think I would like that specially in materials like mud but if it was in our advantages maybe, why not.

Q 5.14 Do you know if your house was thermally insulated?

Yes, I think we did insulate.

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

I do mind it making the wall to wide to some extent.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

Maybe if it was in advantage.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

No, I don't think I'll like it.

Q 5.17 Would you prefer to use local soursed material or imported one? Why?

I would prefer imported one I know they usually have better quality.

Q 5.18 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, for sure and we are thinking about that.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

No, they don't, unlike my old house, I thought it would be the same but it's not, I like my neighbours but when you live in an apartment its different, but to be honest I prefer this now

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yes, I do like them. I would give it 5/5 its very important and I like to ask about them, people have busy lifestyle now, but we are there for each other's.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what, and where would you like it? Show on the map?

There is the local sport centre that's it.

Q 6.3 How much do you know about Jordan building codes and regulations?

I don't know anything.

How much do you know about Jordan green building guide?

No, never.

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why

He did not at all, I would certainly be interested to know about them then. For the environment and to save bills later. Even if he guided us to plant more trees we would have. I do care about the environment; I would love to help sustaining it.

Q 6.4 Any issues regarding laws or regulation you are aware of?

Nothing I know about.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Nothing I know about.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yea I think it's very good, up until we finish constructing all the rooms it would be better, everyone would have his own room.

Q 7.2 Where do you host your guests?

Mostly here in the living and in the future, we will have a guestroom. For sure (X3 times).

Q 7.3 Do you have a balcony, garden, or patio in your house?

Yea the bedroom terrace.

What do you use it for?

How important do you think it is?
Which is more important? Why?
I like setting in the terrace it's just a place to leisure I have been living in dense place enough and I want my garden and porch (laughs)
Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
I do yea, I am a traditional woman.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
Built it myself, and no we didn't use any direct element of these.
What are these elements? What makes a house traditional?
Hmm, everything, like having a courtyard, having a small fountain,
Q 8.2 How much do you think your house suits your financial statue?
Its ok for the time being
How much was the land price or house price a reason in choosing it?
It was bit expensive even for us that's why we could not finish the whole house on one go
Do you think house prices here equal its value?
Why?
People were buying and reselling lands which made it more expensive and way overpriced for what its worth's.
Q 8.3 Do you think commercial building slandered takes financial conditions for people?
No, they don't at all.
Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
Not too cheap but I would prefer a good place that fill our needs with not a lot of paying just a humble house.
Q 8.5 Would you prefer to:
Live only with your children as they grow?
Love with my extended
Live with your children's family or parents in the same building?
House other relatives in the same building?
Q 8.6 Which do you value more?
Traditional life or modern one?
traditional life
Traditional building or modern?
Traditional one
Rural life or urban lifestyle
rural life all has its good and bad
Individual life and personal space or Collection and community life
Individual one
Special looking house or similar looking houses?
looking similar is better
Q 8.7 Any additional comments/observations?
I think the government should use the wide empty spaces we have in Jordan and build good infrastructure in it, in this way the overpopulation in Amman, Zarqa and Irbid will be reduced when people see that they have other spaces with good facilitates.

Case and interview reference number: A22

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion
Well, as a percent, my house supports 90% of my household, also it supports Jordanian traditional lifestyle. I also think it is hard for someone to move from traditional house and live in this type of houses.
Q 2.2 What did you like about your current house?
What did you dislike?
In my house's neighbourhood it is not allowed to build more than 2 floors within one building, I like that so much, so you don't feel it like a commercial building's neighbourhood. There is nothing I don't like about.
Q 2.3 What do you like about your previous house?

What did you dislike?

Why did you move?

I liked how close it was from the market so I could get what I want easily. I didn't like it because it was an apartment within a commercial building which was the reason why I moved out.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what, and why?

No, I wouldn't its good as it is, no need for more space, rooms and I decorated it when I moved here.

Q3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

No, I haven't since I moved in 8 years ago.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

Yeas they are, because there are two bathrooms, one for my wife and I, the other for kids. Also being the house in a big size will provide more convenient residency

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

I believe it can adapt my future needs really well because it has a big size. There are any constraints could face making changes in the house.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

I think none of them could be considered as a sustainable house, because I think you need to put more green areas in any house in order to be sustainable.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

Though there are so many differences, but I see building C is the best compare to mine. One of the similarities is that both houses have a palm tree located at house entrance.

Q 4.3 Which of the following buildings would you like to live in?

Why?

To be honest, none of them because they all have so many apartments within, which doesn't provide privacy and independency.

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

I think building A currently is the best representative of Jordanian architecture, I don't like about all of them that they all contain a lot of apartments which make a crowded place.

Q 4.5Have you seen any building like in picture number b?

What does it represent to you?

Yes, I have. In Amman and Irbid, I think it represents traditional lifestyle.

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

I think it doesn't. with no reason.

Q 4.7 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

No, I haven't ever.

Q 4.8why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

Because traditional houses need wide space, which is hard this time to get a wide land because it's so expensive.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

Yes, I think it is the building that has trees and plants within.

Q 5.2 What makes a sustainable house in your opinion?

Trees and plants.

Q 5.3 What construction material you think suits Jordan best? What colours?

I think the best one that suits Jordan is structural stone, because it gives a nice view for the building and protects it from harsh weather conditions. And yes, maybe the direct cost will be higher than plastering or painting but at the same time it doesn't need frequent maintenance as they do.

Q 5.4 How comfortable is your house in:

Winter?

Summer?

Why?

It's not bad in winter, but it's really hard in simmer not because of the house itself but Zarqa desert weather. I think the best ways to deal with these high temperatures are by; growing more trees and plants around the house, cover building's windows to protect it from direct sunshine, and by using ACs.

Q5.5 Is there a season where utility bill increases?

Yes, at summer.

Q5.6 Is there a room where you think it's hotter or colder? Why?

What type of activities do you do in this room?

My bedroom is hotter in summer and colder in winter because it is located in the building's edge, which exposes it to different weather conditions

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

Natural ventilation for sure, but sometimes there will be hard wind outside which will make me use AC.

Q 5.8 Would you want bigger windows or smaller windows? And why?

I like how they are currently because they have a good size.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

Traditional buildings were way better than the current ones in regulating temperature because it had been built using mud which is really good in thermal insulating.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

I would pay more money for insulation because paying for something is better than losing something important instead.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

Yes, I do. Because I have an independnt house with good ventilation around.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

I wouldn't use shading devices because I can use sunshine to generate electricity using solar panels.

Q 5.12 Would you pay more money for a more sustainable house?

Yes, I would.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

No, I wouldn't. because they are not durable materials as what we use nowadays, also people looking for improvements.

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

It is thermally insulated though I wish if it was insulated more, but the financial statue back then was not enough. Also, no I don't mind if the walls get thicker in order to get good, insulated house because it will not take that much of space.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

No, I wouldn't. because they are not as durable materials as nowadays', also people looking for improvements.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

If it could make my house more sustainable then why not!

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?
Yes, I would.
Q 5.18 Would you prefer using local sourced material or imported one? Why?
If it has good quality, then why not!

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?
Yes, it does, because most of the neighbors here own their houses, so everyone knows his neighbors for long time which make us like a family and care about each other's houses. Also, we do have neighborhood's mosque which allow us to meet frequently.
Q 6.2 Do you value your neighbours and neighbourhood? Why?
I do value them so much; everyone cares about each other's properties.
Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what, and where would you like it? Show on the map?
It is really important; I really wish to have one. I would suggest collecting an amount of money from every neighbour and build/buy a space where we all can meet.
Q 6.3 How much do you know about Jordan building codes and regulations?
How much do you know about Jordan green building guide?
Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
Would you have interested in them? Why?
I do know some building regulations regarding my neighbourhood, such as the distance that should be between me and my neighbours and building area ... etc.
I know a bit about Jordan green building book, which contains how to make Jordan green by growing more trees. And yes, I have been asked by the engineer about insulating my house thermally, but I wasn't interested.
Q 6.4 Any issues regarding laws or regulation you are aware of?
Yes actually, regulations here say that we are not allowed to have brick roofs, though I have one but I am conedered against the law.
Q 6.5 Any issues regarding how the neighbourhood have been designed?
Everything is just wonderful.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Yes, I do think that.
Q 7.2 Where do you host your guests?
In the guest room.
Q 7.3 Do you have a balcony, garden, or patio in your house?
What do you use it for?
How important do you think it is?
Which is more important? Why?
I have a balcony, but I think the most important one to have is the garden, because you can get fresh air there.
Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
Yes, I do think that. Though people think us rich people because we are living in such area but believe we are not, and if you don't know you can do amazing decorates for your house without a big difference in the cost of a normal one. Not really, I don't have any elements reflect that.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
What are these elements? What makes a house traditional?
I build it by myself. I don't really use traditional elements, but I have a fountain made of red blocks. I think windows shapes could make the house look traditional.
Q 8.2 How much do you think your house suits your financial statue?
How much was the land price or house price a reason in choosing it?
Do you think house prices here equal its value?
Why?
It suits my financial state really well, and I think houses prices her equal their values.
Q 8.3 Do you think commercial building slandered takes financial conditions for people?
I believe it doesn't.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
Actually, I am really comfortable about what I have now.
Q 8.5Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I would prefer to live with one son's family and the others to be near me all the time.
Q 8.6 Which do you value more?
Traditional life or modern one?
Individual life and personal space or Collection and community life
Special looking house or similar looking houses?
I prefer a traditional and community life with a similar looking house.
Q 8.7 Any additional comments/observations?
I think the government should use the wide empty spaces we have in Jordan and build good infrastructure in it, in this way the overpopulation in Amman, Zarqa and Irbid will be reduced when people see that they have other spaces with good facilitates.

Case and interview reference number: A26

2.0 cultural Indicators
Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion
The house really supports my family's current lifestyle there is nothing that can hold that back, on the other hand I think it won't suite a traditional family lifestyle as building requirement and housing specification are very different now from how it used to be, but still this house still represent the local culture I think although not many people still like living in apartments buildings and prefer their own independent home.
Q 2.2 What did you liked about your current house?
What did you dislike?
I like the balcony (laughs) it's nice to just nice to relax there when the weather is nice. And I dislike how noisy the building can be, I don't mean that the neighbours are noisy but because I used to live in a separate one level house I still haven't adjusted well to this type of buildings and I feel its crowded and discomfort sometimes. I just don't think there is a good noise insulation system in the building.
Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?
I felt more independent living there with my mother but had to move after she died and now living with my brother in his flat. I liked that place more as it was a separate quite house.
3.0 House organization and space arrangement
Q 3.1 Would you like to change anything in your house? If so, what, and why?
There are a lot of things actually like turning my room into a master bedroom (laughing) it's quite tight to put everything I want. I also would like to add an extra room on the roof to use it as a storage, because currently I am using one of the house's rooms for that.
Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?
There was another balcony that was added to the kitchen to increase its size, and we added an arabesque (wooden decorated panel) as a separator between the living room and the hallway that leads to the bedrooms. Although I liked that balcony as well. The separators were necessary as guest are being hosted in the living room and give more privacy to the bedrooms.
Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?
By adding the separator, it became better now and very adequate, the flat is cosy and the hallway between rooms is wide and good for circulating around the rooms.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?
The house is too small to make any changes, I would like to have a garden like I had in my old house. I would see its much safer here than the other place and that's why I came here people here are close to each other's and help one another.

4.0 vernacular architecture related metrics
Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain
Second picture, it's an old-style building (vernacular) and although it's an old it still looks cleaner and am sure it doesn't house too many families like here.
Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?
First one, it's a low-cost apartment block with only concrete finishing and it's probably as small as here with no noticeable differences it almost looks the same. I like how buildings A and C have good number of balconies and distributed really well. and as I said before I like how building B has wide outside areas. what I dislike about building that it doesn't build with structural stones which will make it hard to protect the building from harsh weather conditions. Also, I think building B represents Jordanian architecture the most, because old buildings were made in the same way and it has wide outside areas.
Q 4.3 Which of the following buildings would you like to live in?
Why?
Second one I really like This type of building although the third one looks newer and nicer, maybe I feel nostalgic and traditional but this the type of building I relate to the most or feel attracted to and where I really would like to live. I like how buildings A and C have good number of balconies and distributed really well. and as I said before I like how building B has wide outside areas. what I dislike about building that it doesn't build with structural stones which will make it hard to protect the building from harsh weather conditions.
Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.
I didn't like a lot about the first one but perhaps that it has a nice balcony it seems too small. The third one that it's so new and seems well organised and designed.
The second one can be bit noisy as it's in a downtown, the third one is just too modern and sleek for my taste (laughs) I don't like these types of modern buildings and I don't think I'll enjoy living in one. Maybe I just feel too nostalgic for these periods of time and what architecture was popular then. The second one for sure represent the history and culture of Jordan and would definitely suite todays life even all these years. These types of buildings are eternal.
Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?
All parts of Amman's downtown and other cities like Zarqa, Irbid and Madaba. they represent the cultural heritage of Jordan say that time.
Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
No, not at all nothing in this apartment relates to these kinds of building expect maybe they are all cubic (laughs).
Q 4.7 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?
Yes, it was bit old but not as old as that building, that building changed a lot, but you can still see some of the mud brick walls in some of the rooms there. I liked how big and independent it was, and how it had a large garden I can grow plants in it. And because it was too big, and some walls are made of mud it needed a lot of effort to keep clean and to renovate it. New buildings require less effort to maintain.
The only reason I left was because of family circumstances and I would not have left if that didn't occur. Also, I am come from a Bedouin bloodline and I still would prefer an open system house where it looks winder and spacious over closed one with a lot of walls and separations (laughing).

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

What makes a sustainable house in your opinion?

What construction material you think suits Jordan best? What colours?

You do hear that term consonantly, but I don't really know anything about how these buildings function. For a building materials stone I think relate more and ground and white colours as I think they represent nature and relate to old buildings more.

Q 5.2 How comfortable is your house in:

Winter?

Summer*?*

Why?

It is very comfortable I think in summertime specially that I have the balcony which is shaded and can spend a lot of time there. In winter it is very cool and very discomforting. I don't know why that is.

Q 5.3 Is there a season where utility bill increases?

In winter it increases drastically as we use electric heaters to heat the spaces in the apartment.

Q 5.4 Is there a room where you think it's hotter or colder? Why?

What type of activities do you do in this room?

The living room is warmer in winter as sunrays enter it in winter.

Q 5.5 Do you prefer natural ventilation for cooling or AC? Why?

Natural ventilation, I hate Air-conditions I can't stand them, and I always get sick when I set in a place that has an AC.

Q 5.6 Would you want bigger windows or smaller windows? And why?

I would say if they were bit bigger it would be better to make lighter and air flow inside. They are already covered by meshes for bugs and safety bars for the children as it's an apartments multi f

floors block, which limits light and air from coming inside, it feels like its closed fixed walls.

Q 5.7 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

Traditional building was definitely Easier to control temperature, I have no idea why, but I sensed it and everyone also who experienced living there says the exact same thing.

Q 5.8 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

If it will certainly help making better condition at the apartment certainly why not? I would use any expect making the house smaller it's already small. And I don't want to lose the view from my balcony

Q 5.9 Do you think your house suits Jordan environment and climate? Why?

As I said it's not suitable in winter and we suffer a lot.

Q 5.10 would you use shading devices on your walls and windows for better thermal comfort?

Probably I would if it's going to help us, yes.

Q 5.11 Would you pay more money for a more sustainable house?

Yes, I would, definitely I would use no issue.

Q 5.12 Would you use traditional methods or materials in order to have a sustainable house? Why?

Yes, I would, I would not mind at all.

Q 5.13 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

I think it is not insulated and would wish if it was insulated as it will help control temperature in harsh weather conditions. Even if that was on the expense of losing some area or paying more money.

Q 5.14 Would you agree to use traditional methods and materials in your house? why?

Yes, I don't mind at all.

Q 5.15 Would you agree to use recycled or reused materials for your house? Why?

I don't mind doing that either. As long as it gives a better or good performance.

Q 5.16 Would you prefer high-tech methods and materials like solar panels? Why?

I would really like to do that; I love that idea and was thinking about that for a while now.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

I think apartments buildings are more communal and allow for much more social interaction than other type of houses where neighbours meet easily and it's so close to each other's and cosier.

Yes, I do very much. People are friendly and it's easy to bond with them when you all live this close and door to door from each other's. The neighbourhood is distributed simply, which make it easy to interact with your beloved neighbours, also there are wide spaces between buildings which helps in keeping away from people you don't like.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what, and where would you like it? Show on the map?

Yes, it would be something very great. We don't have any at this point, a small gathering square or space in front of the building would be vital for people to interact and knew each other's. When I first moved here it was hard for me to know people living here and really wished for an easier way to see them and say hi to them.

Q 6.3 How much do you know about Jordan building codes and regulations?
Nothing at all sadly.
How much do you know about Jordan green building guide?
Nothing at all too
Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

No, I don't know I never been told, but I would certainly be interested. It would help make the home comfortable and save us money
Would you have interested in them? Why

I would but we didn't build it.

Q 6.4 Any issues regarding laws or regulation you are aware of?
Nothing too important, its well organized here, I remember back in my old house there would be some disputes from between neighbours who built an extra floor and how it conflicts with solar rights and ventilation and so on but nothing in this neighbourhood.

Q 6.5 Any issues regarding how the neighbourhood have been designed?
Not in kings Abdulla city I didn't face any issues and never heard about such things, I just wish they finish all the services area and amenities already.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Yea I think it does, everyone has his room and as we are elevated, we don't have to worry about setting in front of windows or on the balcony.

Q 7.2 Where do you host your guests?
Yes, the living room, and that's why we added the arabesque separate, to help create privacy for the bedrooms which strange or very formal guests don't go to without prober invitation.
Are there places in the house they can't go to normally?
Yes, private bedroom
What are they? Why?
They are too private to be gone there without a prober Couse or invitation

Q 7.3 Do you have a balcony, garden, or patio in your house?
What do you use it for?
How important do you think it is?
Which is more important? Why?
Yes, they are very important, the balcony is my favourite spot in the house.
The balcony for apartments and garden for ground levels houses I would still; my garden because I love gardening.

Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
Yes, I would say a Jordanian house is a spacious house with an area top host guests and as this apartment is small with no such space, I would say it does not reflect these values and with nothing related to that expect some decoration (like adding stone tiles indoor of the room) in our living area. I used some wooden elements which I see it as a traditional one. I think arch-shaped windows and balconies are examples for what could make buildings traditional.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
Yes, I would like that
What are these elements? What makes a house traditional?
Q 8.2 How much do you think your house suits your financial statue? Do you think investors take that in consideration?
How much was the land price or house price a reason in choosing it?

It's very suitable, it was very cheap when we bought the apartment. Although Its way more expensive now and overpriced now even renting a not so good apartment would still cost around 180-200 JD which you would never rent before for 80 JD, and I don't think they actually care now, this project was supposed to be for lower income people, but land prices and apartments are too expensive for them.

I would not mind a bit expensive house if it was going to be more durable and sustainable.

Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?

I prefer each with his family, it's not a think to live with your extended family. Even with a big traditional house.

Q 8.6 Which do you value more?
Traditional life or modern one?

I would value more a traditional life with mix house between modern and traditional style. Also, I feel I am living in a countryside within a city, which I like so much. And I value more to live in a neighbourhood with special looking houses but within some standards, all of them to be built with structural stone for instant.

Rural life or urban lifestyle
Urban life
Individual life and personal space or Collection and community life
personal
Special looking house or similar looking houses?
Looking similar is nicer even if it wasn't better.

Q 8.7 Any additional comments/observations?

Case and interview reference number: A27

2.0 cultural Indicators
Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion

I think my house supports 100% of my household needs because it is a big sized house, and it is located in a quiet neighbourhood. Also, it supports a traditional lifestyle a little. And of course, it supports the country's culture.

Q 2.2 What did you like about your current house?
What did you dislike?

I do like the location of the house; it is nice and calm place. On the other hand, I don't like how my house located between multi-stores buildings which make it hard to get good natural ventilation or sunlight.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?

Actually, I didn't like anything about it. I hated it the most because of how noisy it was around. The reason why we moved was because it was small, and we looked for improvement

3.0 House organization and space arrangement
Q 3.1 Would you like to change anything in your house? If so, what, and why?

Yes, I would like to move the house beside the street so I could get good natural ventilation and sunlight. Also, internally, the living room and the kitchen are open to each other which make it hard to regulate their temperature during summer of winter.

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?

We didn't make any changes, but I would like to change the location of the kitchen, so I can see my children playing either in garden while I am doing my daily chores so I can have control over what they are doing and also spend time with them.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

We do have a large family, so I wish if every member could get his/her own bedroom even if it was small one.

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

I think the separation between the kitchen and the living room is easy to do, also ii think it can be done to build new floor for the house. also, I think that the biggest constraint is the financial capability.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

I think it is building C, because it is independent and has no buildings around it, also it looks it has good natural ventilation and nice view.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

I think it is building C, because both of this one and mine built with structural stone and has some trees around. I think they are differing in store numbers

Q 4.3 Which of the following buildings would you like to live in?

Why?

I would like to live in building C because it looks so quiet and fancy there.

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

I think that building A and C are the best representative for Jordanian architecture.

Q 4.5 Have you seen any building like in picture number b?

What does it represent to you?

Yes, I have, actually one of my relatives has one in Amman. it represents Jordanian old buildings to me.

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

It doesn't at all actually.

Q 4.7 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

No, I haven't before. I like how simple these houses are, but I don't like how they look.

Q 4.8 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

I don't think they are backward, but people were looking for improvements and what is easier and that drove traditional buildings to go extinct. You won't even find anyone who could construct a building using these methods. I personally would not wish to live or use these traditional methods.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

No, I don't sadly. Sorry

Q 5.2 What makes a sustainable house in your opinion?

I think construction materials what make a house sustainable.

Q 5.3 What construction material you think suits Jordan best? What colours?

Cement, blocks, stone, and reinforcement steel.

Q 5.4 How comfortable is your house in:

Winter?

Summer*?*

Why?

It is 60-70% comfortable in summer, and around 80% in winter. This is because as I told you before that we have poor natural ventilation, also we are located in a low-level area. I think the best solution is to add new store or to move the house up to a mountain.

Q 5.5 Is there a season where utility bill increases?

Yes, in summer because of ACs.

Q 5.6 Is there a room where you think it's hotter or colder? Why?
What type of activities do you do in this room?
Yes, because some rooms have only one window which will be really hot in summer, while there are other rooms with two windows which will make it cooler. They are bedrooms.
Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
Of course, natural ventilation, and actually we are suffering because we don't have it.
Q 5.8 Would you want bigger windows or smaller windows? And why?
I think it doesn't matter. But if there were "window shutters" this maybe will make the rooms warmer in winter.
Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?
I think it was harder because those building were not thermally insulated. I think they used to open the house windows to regulate the house temperature.
Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area
smaller windows area
pay more for insulation
View from house windows
I would choose to pay more money for insulation.
Q 5.11 Do you think your house suits Jordan environment and climate? Why?
I think it's in the average, because weather here in jordan is not that hot or cold.
Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?
Actually, I would prefer using such devises.
Q 5.12 Would you pay more money for a more sustainable house?
Yes, I would.
Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?
Yes, I would if I was living in a countryside, but I don't prefer them in a city.
Q 5.14 Do you know if your house was thermally insulated?
Would you like if it was insulated?
Why didn't you care about insulating it?
Would you mind if it the walls were thicker, and your room size were smaller? Why?
It is thermally insulated house, and I don't mind the walls to be 10cm thicker in order to get thermal insulation.
Q 5.15 Would you agree to use traditional methods and materials in your house? why?
Yes, I would if I was living in a countryside, but I don't prefer them in a city.
Q 5.16 Would you agree to use recycled or reused materials for your house? Why?
If it doesn't have side effects, then why not to use it!
Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?
Yesm of course I would prefer to use them.
Q 5.18 Would you prefer using local sourced material or imported one? Why?
The majority if the local materials don't have good quality, but you know there still some good materials and I don't mind using it.

6.0 Zoning and regulation
Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?
Yes, I think so, because people here know each other, also we have Quran and training centres which allow people to interact with each other.
Q 6.2 Do you value your neighbours and neighbourhood? Why?
In scale from 1 to 5 I would give them 4.5
Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what, and where would you like it? Show on the map?
Yes, I think it is important, but unfortunately, we don't have one. I wish if there were one near the mosque.
Q 6.3 How much do you know about Jordan building codes and regulations?
How much do you know about Jordan green building guide?
Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
Would you have interested in them? Why?
Actually, I know nothing about these codes and regulations. Also, I don't know about the green building guide. Yes, we have asked the engineer and he guided us to insulate the house thermally, which we did.
Q 6.4 Any issues regarding laws or regulation you are aware of?

No, actually I like them, because it is not allowed to build more than 2 stores which helps to not have commercial buildings in the neighbourhood.

Q 6.5 Any issues regarding how the neighbourhood have been designed?
No issues.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Not that much actually, because you can hear voices through walls.

Q 7.2 Where do you host your guests?
In the guest or the living room.

Q 7.3 Do you have a balcony, garden, or patio in your house?
What do you use it for?
How important do you think it is?
Which is more important? Why?
I have a terrace where I usually set to relax. I think having a garden is the most important because it has nice looking.

Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
I really don't know how to answer the question. And we don't have such elements.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
What are these elements? What makes a house traditional?
We built it. Yes, I would use structural stone because it gives really nice looking to the house.

Q 8.2 How much do you think your house suits your financial statue?
How much was the land price or house price a reason in choosing it?
Do you think house prices here equal its value?
Why?
It's very suitable, it was very cheap when we bought the apartment. Although Its way more expensive now and overpriced now even renting a not so good apartment would still cost around 180-200 JD which you would never rent before for 80 JD, and I don't think they actually care now, this project was supposed to be for lower income people, but land prices and apartments are too expensive for them.
I would not mind a bit expensive house if it was going to be more durable and sustainable.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?
I think most new development are very commercially oriented and overpriced for their quality due to high land prices inside the cities. Normal folks would never be able to afford most of these commercial developments.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
Yes, I would.

Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I would prefer to live only with my children in the future.

Q 8.6 Which do you value more?
Traditional life or modern one?
Individual life and personal space or Collection and community life
Special looking house or similar looking houses?
I value more to live in a modern house with a modern lifestyle with a community life in a special looking building.

Q 8.7 Any additional comments/observations?
We are facing a problem with this location which is markets and services are far to get from the house.

Case and interview reference number: A34

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion
It is just ok; I would say it suites 60% of my family's needs right now. The most notable thing I miss here is being in an independent or detached house. I live in an apartment building and you see. It does not fulfil my personal modern needs and certainly will not satisfy a traditional family who is used to their

own house that house family members and their extended family and not living in the same building with somehow strangers. It would certainly suit many people and dose not goes against culture or religion. Am maybe bit of a sensitive person, for me personally it does not, and I plan to change the house as soon as possible.

Q 2.2 What did you liked about your current house?
What did you dislike?
I like how close it is to my work and my wife's work it is very convenient for us here as young professionals with one child. I did not like its bit small too.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?
It was a family house, we were living in the same complex as my parents and siblings, and that was more comfortable, we had our own garage, a garden a place we can relax and breathe is, it was way more comfortable than a closed house. For something I did not like I would only mention it getting older and needs more and more maintenance. I moved to get more independence.

3.0 House organization and space arrangement
Q 3.1 Would you like to change anything in your house? If so, what, and why?
I am not just thinking about changing something here, am thinking about changing the whole house (laughs). The house came without a kitchen, so we bought one (means cabinets, fridges cookers and washing machines, etc.), some decoration elements like lightings, paints and so one, no major changes.

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?
Just the things I mentioned about area, space, and independence.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?
Yea it is very suitable and has good layout. Everything is separated and no issues has rose since we moved here beside issues about having my own house rather than an apartment.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?
It cannot at all, very rigid plan, and it's an apartment what can you change here?

4.0 vernacular architecture related metrics
Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain
I would say the second or third ones, they look less cramped and with much opportunity to change and adapt over time.

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?
The third one, looks like an apartment building that is not too cramped and have similar finishing materials although very different designs, the second one looks like a historic or traditional building isn't it?

Q 4.3 Which of the following buildings would you like to live in?
Why?
Third one. It is new less cramped than the other same to the first one just better material.

Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.
second one, third one is modern stone building like mine, only different is that mine is an apartment block. First one looks so dense and cramped with the second and thirds one I also think I have bigger garden than these two and can have a garage there while they cannot. I think the third and first one is the most common type of buildings you can find here in Jordan nowadays. Although they should not build something like the first building, it looks like it has somewhere between 16-20 apartments, this is too much for our culture I think, people are still not used into sharing buildings with so many families, each

building should maybe have 4 stories with 2 apartments maximum at each level, this building we share 3 apartments at each level on 5 stories. This is too much.

Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?
Yea sometimes in old cities downtown. Represent architecture of old time and traditional methods.

Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
No not mine but some people do still have an extended family house which is about one or two floors tall and house more than one family that is related to each other's. although visually they are quite different, I think, people still use stone in their houses but that is it, techniques and construction material are quite difference.

Q 4.7 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?
No. never.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
Not too much to be honest, does it mean you need to have a lot of garden and green spaces, I guess.

Q 5.2 What makes a sustainable house in your opinion?
Just to using a lot of vegetation and generate electricity using sun or wind

Q 5.3 What construction material you think suits Jordan best? What colours?
The most popular building materials are cement blocks, concrete and stone for cladding. Stone is really as it can gives you extra insulation and has quite longer lifespan.

Q 5.4 How comfortable is your house in:
Winter?
Summer?
Why?
It is warm in winter, but quite hot in summer we would have to use the fan in it.

Q 5.5 Is there a season where utility bill increases?
Summer bills are higher with the fans and AC sometimes.

Q 5.6 Is there a room where you think it's hotter or colder? Why?
I think as a size and proportion its very suitable if it was bigger it will not suite the small walls of the rooms. The guests hosting room, kitchen and entrance hall are always the coolest in summer as they are not affected by much direct sunshine and receive lovely cool southern brees. Sadly, our living and bedrooms are always hot in the summer and cold in winter, which makes it inconvenient as we use these rooms the most
What type of activities do you do in this room?
All the same.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
Natural of course but as I said not much space to breath or have privacy to set near a window or a balcony as the building are quite new to each other's sadly.

Q 5.8 Would you want bigger windows or smaller windows? And why?
This is good size smaller, and it will be suffocating and bigger and it will be less privacy.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?
Traditional building was better and cooler, not like todays buildings, I think it is the type of stone and mud materials they used back then, it must have played a part in it.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area
smaller windows area
pay more for insulation
View from house windows
I would mostly prefer adding extra costs including insulation with less preferences to other choices although I would sacrifice view or windows size.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?
It does to some extend its sheltered from sun and cold wind and good insulated.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?
I yea I would not mind that, but I do not have any issues with excessive sun heat.
Q 5.12 Would you pay more money for a more sustainable house?
I would certainly as it would make things easier and healthier for me. We all like the environment too
Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?
Maybe depends on muds and stones worked for a good while as people did not have anything beside them, but as traders start importing and then manufacturing new materials people started looking for what is modern and new, they do not want the old anymore, I don't think personally that mud is a back warded material or that houses built by mud are a sign of that I would just prefer more efficient modern materials.
Q 5.14 Do you know if your house was thermally insulated?
Yes, it is
Would you like if it were insulated?
Why didn't you care about insulating it?
Would you mind if it the walls were thicker, and your room size were smaller? Why?
Q 5.15 Would you agree to use traditional methods and materials in your house? why?
Maybe, they need a lot of maintenance or how good will it look so it depends on that. I would love to help the environment though of course.
Q 5.16 Would you agree to use recycled or reused materials for your house? Why?
If it will help saving the environment I would.
Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?
Yes, I might use it depends on the cost.
Q 5.18 Would you prefer using local sourced material or imported one? Why?
If it was good quality, why not!

6.0 Zoning and regulation
Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?
In this building no, and sadly there are yet no gardens or parks built around here yet. Just any of places they advertise for would be good. Although I do not think it is important in modern life.
Q 6.2 Do you value your neighbours and neighbourhood? Why?
Yea I do, I just like most of the people here.
Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what, and where would you like it? Show on the map?
Each house has a garden or a guest reception place, I know for the men they meet at the local mosque people can meet at school squares.
Q 6.3 How much do you know about Jordan building codes and regulations?
Things like building limits and how many levels can you construct and similar things.
How much do you know about Jordan green building guide?
Never heard about it.
Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
Would you have interested in them? Why
No but I would be interested as its environmentally friendly and will save costs and energy.
Q 6.4 Any issues regarding laws or regulation you are aware of?
No nothing. Its just bit structs. They do not aloe people to have direct entrance from the street level to the ground levels apartments or sub level.
Q 6.5 Any issues regarding how the neighbourhood have been designed?
The entrance is designed to be on the side of the apartment and you have to go near the garden of the lower floor which does not give them a lot of privacy and noise concealing to rooms in that side, also the garage space is behind the building with no direct footpath to the entrance of the building, I think it was an architectural or engineering grave error, you would have to walk all the way around the building to get to the entrance, also with 4 levels building there are no lifts here.

7.0 social relations and privacy indicators
Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Not quite sadly, as I said balconies and windows are close to each other's that does not allow you to set too near an exposed window.
Q 7.2 Where do you host your guests?
In this living room.
Q 7.3 Do you have a balcony, garden, or patio in your house?
Yea the balcony.
What do you use it for?
Do not use it often we use mostly for laundry (laughs)
How important do you think it is?

The garden its more specious and breathable space.
Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
No. but the house is not different from other people's houses too. I would prefer a house that embrace independent and where I do not have to share entrance, stairs with so many people.

8.0 Ownership and lifestyle indicators
Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
All depends on how it would cost (laughs) I think achieving things like in building 2 would cost quite a lot now.
What are these elements? What makes a house traditional?
Elongated shaped windows that represent rectangular, arches, stone, having trees in a certain set can give these elements.
Q 8.2 How much do you think your house suits your financial statue?
Its ok.
How much was the land price or house price a reason in choosing it?
It was a big part of it on the start of building our family.
Do you think house prices here equal its value?
It is yes very reasonable.
Why?
Q 8.3 Do you think commercial building slandered takes financial conditions for people?
No do not think so.
Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
Not too expensive I hope, not much extra costs.
Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I prefer live with my family
Q 8.6 Which do you value more?
Traditional life or modern one?
traditional life
Rural life or urban lifestyle
Urban life
Individual life and personal space or Collection and community life
collective
Special looking house or similar looking houses?
looking similar is better
Q 8.7 Any additional comments/observations?
A traditional building is very nice.

Case and interview reference number: A36

2.0 cultural Indicators
Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion
I think my house support my family completely and our lifestyle, its spacious with room for every kid on its own and enough garden space to allow them to play as they want, I think a house like mine – a detached single family house- is the type of house that suites Jordanian culture and lifestyle the most, not many people enjoy living in apartments.
Q 2.2 What did you liked about your current house?
What did you dislike?
Everything really, I enjoyed living here since the beginning, I think I got a very good deal on the land here and I built my house by myself so its suites all my needs. Being so close to the main street of the development I could noticed how it's getting busier and nosier, that might be the only down of the house but it's also something enjoyable (laughs) setting on my patio and watch the cars and people passing by.
Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?

I liked that it was part of the complex or house in which my parents also lived in, so whenever they needed something, I would just pop up directly, it was convenient living so close to them. Living above them. The bedrooms were also adjoining the living room. You would open the door of the bedroom and then you are in the living room. No hall or corridor separated them, and it was rather uncomfortable. it was noisy, and you never feel like have a private room. I just moved to have my own independence, also anyone likes to have a nicer or bigger house, to evolve or upgrade his life standers.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what, and why?

I wished I could have added the land lot behind my house, which I also owns- and create one big garden for myself, that's maybe the only thing I wish now.

Q 3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

Yes, I have, when I first built this house it was divided into two apartments or smaller houses, when my family got bigger during the 10 years I was in here, I tore down the wall and combined the two houses together, that was two years ago, so it means adding new rooms to the house.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

Well, given the fact that I added two apartments together, I would say it's not ideal, it would have been if an architect did the whole layout from the start, some issues arise since like, the living room and the guest room are separated now, it would have been better if they were close together.

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

Yea definitely I am still allowed to add another floor level but no need for that now. I don't want that, not even to lend it for others, and my children are young, so it's very far ahead. Nothing can stand against that really.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

I can't really tell, the first and third one are popular form of apartments block you can see all through Jordan, the second one I think represents old type of buildings we used to have here, I can't know which would be more sustainable, maybe number b? maybe because it would house less people in it not like the newer buildings, they look nice and I think traditional buildings used to house only the extended family only.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

Maybe the last one, its new, it uses stone it looks somehow similar to my house. Difference is that it's an apartment block while mine is a single-family single floor house.

Q 4.3 Which of the following buildings would you like to live in?

Why?

Second one. It seems it has a smaller number of levels and apartments it looks nice and seems to have more space around it and far less quitter than mine.

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

In the first and third one it seems there are a lot of people living there, the number of apartments seems high there. Although it has a balcony and seems to have a garage for the car the third one looks much nicer than the first one but still an apartment block but with better finishing materials. I think you can find all of these types in Jordan specially the one in third one, most of the high-end housing projects looks like that now. B is the traditional form of lower rise and less floor levels which I think might suit people's nature and culture more. Having so many people living in the same building is a new thing to our society people used to live in a single-family house. Having a building with few apartments is alright but just not too many families. It's a very commercial oriented market force that led to projects like the one I live in and the one in the first picture to start appearing all over the place.

Q 4.5 Have you seen any building like in picture b?

What does it represent to you?

I think I saw similar one in salt and Madaba, old cities.

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

No not mine nothing at all between them. I mean I use stone and it's a single-family house, we have a lot of plants around the house and have some arches on some windows, but don't think my house looks the one in b in anything beside that

Q 4.7 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

Traditional buildings required a lot of space and land, land prices went up and there was higher demand that didn't allow people to construct houses as they used to, every house used to have its own garden or court, this garden kept shrinking that some houses now barley have a setback between them and the next house, this is sometimes the only breathing area a family can have and its gone. The nice things about traditional and vernacular buildings were that it had a large ground that can host the entire family.

Q 4.8 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

No. never.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

Does it include buildings that use sustainable energy sources? I have a solar energy panel if that counts, maybe also using insulation as it reduces the energy used to heat or cooling.

Q 5.2 What makes a sustainable house in your opinion?

Does it include buildings that use sustainable energy sources? I have a solar energy panel if that counts, maybe also using insulation as it reduces the energy used to heat or cooling.

Q 5.3 What construction material you think suits Jordan best? What colours?

The most common type of construction in Jordan is cladding with stone which is a thing that got carried out from vernacular heritage and I personally think it suites Jordan the most.

Q 5.4 How comfortable is your house in:

Winter?

Summer*?*

Why?

Its ok I guess, I have both insulation and solar panels, and it does get uncomfortable still in the hottest or coldest days in which I have to use heating or cooling active systems.

Q 5.5 Is there a season where utility bill increases?

Both summer and cold days.

Q 5.6 Is there a room where you think it's hotter or colder? Why?

The big halls when we don't use them for sometimes might it get colder or hotter since no one uses them

What type of activities do you do in this room?

Guestrooms.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

Natural of course but as I said not much space to breath or have privacy to set near a window or a balcony as the building are quite new to each other's sadly.

Q 5.8 Would you want bigger windows or smaller windows? And why?

I think their size is good as it as, am not sure how a bigger or a smaller window would affect me, but beside that I think here there are some regulation and design criteria for the shape of the windows that people can't go against, it should be rectangular and in up straight shape

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

Am not sure, I think mud houses are much cooler than cement blocks one, that house was so old, about 200 years old and was vaulted as well. I liked how they were constructed they were charming, they are indeed much cooler in summer, although I haven't used them in winter. It had a very thick wall.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

I would mostly prefer adding extra costs including insulation with less preferences to other choices although I would sacrifice view or windows size. If the windows were smaller but there would be more, I would agree to that it all just depends. I would not want the house to be smaller as its already very small. I already did so much to proof my house and help me reduce costs

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

I think it's a normal house that is insulated Its not more or less suitable than other houses, its good in winter but built hot in summer as I said.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

I already use roll down shutter, I would certainly object to something more efficient and looks good then I don't mind.

Q 5.12 Would you pay more money for a more sustainable house?

I would certainly as it would make things easier and healthier for me.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

It just doesn't exist anymore, and no one can build with them, I like that house but I am not sure how much I will like it.

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

Yes, it is, if would have been much worse if it wasn't, one of the few good things about this building is its well-built and well insulated.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

They don't exist, anymore do they?

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

Yes, I would, and I did. Many materials like steel pipes and so on were recycled and reused

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, I am already using them.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

If it has good quality, why not.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Yea its good so far, I work far from town, so I don't spend that much time socialise with neighbours, I know many people here are retired and have plenty of time to do so (laughs)

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Well, I think it's all about the well, the people around here are well connected on the phone and texting, it would be better if there was something like that but beside meeting at someone's house there are no place like that am afraid. And not thinking about a specific place. Like the mosque maybe, or someone to donate a land for a new square or a community centre.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what, and where would you like it? Show on the map?

Yea it would definitely be better to have a place near the neighbourhood that allows for such interaction but there is nothing so far. One of the planned gardens or someone to donate a community centre.

Q 6.3 How much do you know about Jordan building codes and regulations?

I know it's very strict here, it took me more than a year and a half in constructing my house (laughs). Say something about garages.

How much do you know about Jordan green building guide?

This is the first time I hear about it.

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why

No, I was looking for something and suggesting them for the engineer and the contractor really.

Q 6.4 Any issues regarding laws or regulation you are aware of?

It's getting so busy on the main road as they opened it toward the motor way to connect the city and Zarqa city as well while it should have been just a local road. That's the only thing I can think of.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Not issues and problems rather than bureaucratic complications.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yes, it does have rooms for girls and boys, but I have the ability to add more rooms in the future.

Q 7.2 Where do you host your guests?

In this guest room.

Q 7.3 Do you have a balcony, garden, or patio in your house?

Yea at either of the terraces or patios.

What do you use it for?

Yes, it's very important it's a breathing place for the house.

How important do you think it is?

Which is more important? Why?

The garden its more specious and breathable space.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

No nothing really, I prefer something practical and cheap rather than unnecessary decoration. I know people use stone and arches to reflect such heritage.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

No nothing really, I prefer something practical and cheap rather than unnecessary decoration. I know people use stone and arches to reflect such heritage.

What are these elements? What makes a house traditional?

No nothing really, I prefer something practical and cheap rather than unnecessary decoration. I know people use stone and arches to reflect such heritage, things I mentioned earlier.

Q 8.2 How much do you think your house suits your financial statue?

It suits us now.

How much was the land price or house price a reason in choosing it?

It was a big part of it on the start of building our family.

Do you think house prices here equal its value?

Its way overpriced now when the project started it was cheaper and reasonable.

Why?

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

No, they don't they only look for profit.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

Not too expensive I hope, not much extra costs.

Q 8.5 Would you prefer to:

Live only with your children as they grow?

Live with your children's family or parents in the same building?

House other relatives in the same building?

Depends on how financially stable they would be. I would not prefer to live with close relatives rather than parents or children.

Q 8.6 Which do you value more?

Traditional life or modern one?

Traditional life and traditional type buildings.

Rural life or urban lifestyle

Rural places.

Individual life and personal space or Collection and community life

Individual is more convenient as work would not allow us to socials a lot.

Special looking house or similar looking houses?

Similar looking is nice.

Q 8.7 Any additional comments/observations?

A traditional building is very nice.

None

Case and interview reference number: A39

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:

Household

traditional Lifestyle

Modern lifestyle

Culture

Religion

It supports a modern lifestyle because it is so comfortable and cover all my needs, as well as supporting culture and religion.

Q 2.2 What did you like about your current house?
What did you dislike?

I like being it independent and there are no noises around it, which make it really comfortable to live. On the other hand, I feel it doesn't have good ventilation or good sunlight enter to it.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?

I liked how it was near to all utilities and whatever I wanted, also its area was covered with active public transportation. I moved out because it was full of humidity and floor tiles were a disaster.

House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what, and why?

Yes, I really would, such as separating the guest room to have some privacy one my husband's guests come for a visit.

Q 3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?

I didn't do any changes yet, but I planned to do a lot. They are all internal changes, and not adding rooms or spaces.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?

Yes, they are, but the problem is that bathrooms and bedrooms are small in size. I would combine 2 rooms with each other to have one big room.
Also, spaces are not ideally distributed ideally, because they are so close to each other.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?

I believe it can't adapt my future need not even in a 1%. It will remain uncomfortable for me. The constraints contain 1- financially 2-the size of the house.

vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain

It is building (it is not clear which building it is) because it is independent, and the sunlight enters inside, and it has *good* ventilation.

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?

It's building A, it looks almost the same, they both have too many stores with too many apartments some of them have ventilation and some don't have.

Q 4.3 Which of the following buildings would you like to live in?
Why?

It is building (not clear), because it is independent and has ventilation from all directions, also because it has trees within.

Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.

I didn't like how building A has so many apartments. (the rest is not clear)
I think building A represents Jordanian architecture the best. The house that represents community values is (not clear) because it is independent and provides visual privacy.

Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?

Yes, I did. In Salt. It represents old and traditional buildings.

Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?

No, it doesn't. neither architecturally nor by the material used.

Q 4.7 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

No, I haven't.

Q 4.8 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

I think it is not good for today's living, because the situation nowadays is different, such as now people separate boys from girls in bedrooms but in the past they didn't. also, I think they stopped making them because now we have better materials such as cement and structural stone.

Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

No, I don't.

Q 5.2 What makes a sustainable house in your opinion?

I have no idea.

Q 5.3 What construction material you think suits Jordan best? What colours?

I think structural stone suits Jordan the best, and the white colour.

Q 5.4 How comfortable is your house in:

Winter?

Summer?

Why?

In summer it is really comfortable as well as in winter, because I have AC for summer, and I have heater for winter.

Q 5.5 Is there a season where utility bill increases?

Yes, in summer and winter. because I use AC in summer, and I use electrical heater in winter.

Q 5.6 Is there a room where you think it's hotter or colder? Why?

What type of activities do you do in this room?

Yes, the room that located in the middle is the warmer in winter and usually we gathered there, I think it is like that because of its location. It is a living room.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

I prefer an AC.

Q 5.8 Would you want bigger windows or smaller windows? And why?

I like them in their current size.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

I think it was easier, because it was warm in winter and cool in summer, because there were not overpopulated back then as we have nowadays. I think they used to use fans to regulate temperature, in addition to put or take off house's carpets. If it was built from mud or structural stone, it will be easier to regulate temperature. I don't know but they didn't use thermal insulation.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

On this side which is southern I want bigger and more windows. The architect made a mistake making the windows here small and he made the windows in the bedrooms big where annoying sun comes from and it gets really hot because of that.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

Of course no, because it is not thermally insulated

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

Yes, I would, and actually I see it is better to use that.

Q 5.12 Would you pay more money for a more sustainable house?

Yes, I would, to have a comfortable life.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

Yes, I would. If they will give me a better house with durability, then why not to use them

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

They said it is thermally insulated, but I don't think so, and I wish if it was. Yes, I would mind because rooms are already small.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

Yes, I would agree.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

Yes, I would if it was cheaper and has the same quality.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes of course, and actually I wish so.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

Yes, I would prefer it.

Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Yes, it does.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yes, I love them all.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what, and where would you like it? Show on the map?

Yes, it is important, we don't have one, but I really wish if we have one. I think it could be between the buildings or there is an empty space near us they could use it for that.

Q 6.3 How much do you know about Jordan building codes and regulations?

How much do you know about Jordan green building guide?

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why?

No, I don't really know anything about them.

Q 6.4 Any issues regarding laws or regulation you are aware of?

No issues I am aware of honestly..

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Yes, all buildings are near to each other which make it annoying.

social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yes, it does provide visual privacy because all rooms are separated.

Q 7.2 Where do you host your guests?

In the living room, they are not allowed to enter to bedrooms.

Q 7.3 Do you have a balcony, garden, or patio in your house?

What do you use it for?

How important do you think it is?

Which is more important? Why?

I have a balcony. The balcony is tiny for us to enjoy and you can only access it from the kitchen, so we only use it for drying laundry

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

Yes, I think it does.

Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

What are these elements? What makes a house traditional?

I bought it. yes, I would use traditional elements and I have some, such as accessories and traditional pillows.

Q 8.2 How much do you think your house suits your financial statue?

How much was the land price or house price a reason in choosing it?

Do you think house prices here equal its value?

Why?

Yes, I think it suits it. if it was more expensive, I wouldn't buy it. and I think houses cost more than their values because they are small and expensive.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

No, of course.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

Yes, if I have money of course I would prefer that.

Q 8.5 Would you prefer to:

Live only with your children as they grow?

Live with your children's family or parents in the same building?

House other relatives in the same building?

I would prefer to live only with my children.

Q 8.6 Which do you value more?
Traditional life or modern one?
Individual life and personal space or Collection and community life
Special looking house or similar looking houses?
I value a modern life in a modern house within a city individually with special looking house.
Q 8.7 Any additional comments/observations?
If anyone has enough money, I recommend him/her to live their life with ultimate comfort.

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion

It supports 80% of my household, because bedrooms are not enough for me and my children. I think everything were different 80 years ago, for instant I don't think they would agree putting bathrooms inside the house. also, it totally supports the culture and religion of the country, such as the guest room are separate to two parts, one for men and the other for women, as well as the kitchen is not open to guest room.

Q 2.2 What did you like about your current house?
What did you dislike?
I liked being the house near to all utilities, having nice views with 4 terraces, I just loved living there. Because the house was really old, the water and sewage networks were all externally which made it look ugly. We moved to get independent because we were renting in an apartment which I didn't like. Apartment buildings are dense and too close to each other and hight density places with a lot of residents like that one does not suit local culture and mentality

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?
I liked it because it was close to my parents' house and near to all utilities. I didn't like it because it wasn't mine where I was renting. I moved out to get independent.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what, and why?
No, I wouldn't like to change anything, because I feel it suits me.

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?
No, I haven't. except that I have painted it internally.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?
Yes, they are. Because it covers my needs for me and my family. But rooms are slightly small.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?
Yes, it can adapt until a limit, because we are not allowed to build more than 2 stores in this area, and as you know everyone would like to provide apartments to their children which is kind of hard with only 2 stores.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain
I think building B because it is independent house with good ventilation and trees.

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?
It is building A; it looks the same because both of them are commercial buildings.

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Q 4.3 Which of the following buildings would you like to live in?
Why?
The villa because it is more independent and sustainable.
Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.
I think building B is the best representative for Jordanian architecture, also I think it is the best representative for the community values. I didn't like anything about building A. I like building B to visit but not to live in because it is really old., also I think it represents our history and our heritage. I think all buildings in the picture represent community values, because they are different from some today's commercial buildings where there are a lot of shared facilities between men and women which is against our culture and our religion.
Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?
Yes, in downtown Amman, it represents Jordanian heritage.
Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
No, it doesn't at all architecturally nor material.
Q 4.7 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?
no, I haven't.
Q 4.8 why have people stopped making vernacular buildings?
Do you think it's good for today's living?
Do you think traditional materials is good for today or is it backward?
Because it is so expensive, and people cannot afford it. I think they are good materials, but they don't suit our nowadays life.

5.0 Sustainability Indicators
Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
No, I don't.
Q 5.2 What makes a sustainable house in your opinion?
I don't really know.
Q 5.3 What construction material you think suits Jordan best? What colours?
I think structural stone and steel is the best materials.
Q 5.4 How comfortable is your house in:
Winter?
Summer?
Why?
It is comfortable in both summer and winter. Maybe because the direction of the house with the sun.
Q 5.5 Is there a season where utility bill increases?
Yes, in summer, because I use AC.
Q 5.6 Is there a room where you think it's hotter or colder? Why?
What type of activities do you do in this room?
Yes, rooms with located to the street are hotter because they have more windows which allow for more sunshine to enter the house. it is a living room.
Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
In hot weather I prefer to use AC
Q 5.8 Would you want bigger windows or smaller windows? And why?
I like them in their current size
Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?
It was easier because they used to use mud for building their houses.
Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area
smaller windows area
pay more for insulation

View from house windows

I would choose to pay more for insulation.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

Of course no.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

Yes, I would use them.

Q 5.12 Would you pay more money for a more sustainable house?

Yes, I would if I am capable of.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

Yes, I would in order to get a sustainable house.

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

It is not thermally insulated, but I wish if it was. And yes, I would mind thicker walls because my house is already small.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

No, I wouldn't agree.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

Yes, I would agree. Because it will be cheaper.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, of course.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

Yes, I would, because it will be cheaper.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Yes, it does.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yes, I do value them   I think it will be nice to have a park in the neighbourhood, and I don't know where it could be locating the best.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what, and where would you like it? Show on the map?

Yes, I think it is important, and I wish if there was something like a park where we could meet.

Q 6.3 How much do you know about Jordan building codes and regulations?

How much do you know about Jordan green building guide?

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why?

I don't know anything about the regulations nor green building guide. And no, I didn't ask any engineer.

Q 6.4 Any issues regarding laws or regulation you are aware of?

No issues.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Yes, it is so crowded and has no parks.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yes, I do think so because rooms are separated.

Q 7.2 Where do you host your guests?

In the living room. And guests are not allowed to enter to bedrooms.

Q 7.3 Do you have a balcony, garden, or patio in your house?

What do you use it for?

How important do you think it is?

Which is more important? Why?

I set in the balcony to get relaxed, but I think the most important one to have is a garden.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

Yes, I do think so. and no there is no such elements.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

What are these elements? What makes a house traditional?

I bought it. and yes, I use some traditional elements such as traditional carpets and antiques.

Q 8.2 How much do you think your house suits your financial statue?

How much was the land price or house price a reason in choosing it?

Do you think house prices here equal its value?

Why?

It suits my financial statue. I think if it was higher in price, I couldn't afford it. and not of course houses here don't equal their value, because they are small and expensive.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

No, I don't think so.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

Yes, I would prefer more expensive house with less bell costs.

Q 8.5 Would you prefer to:

Live only with your children as they grow?

Live with your children's family or parents in the same building?

House other relatives in the same building?

With only my children as they grow.

Q 8.6 Which do you value more?

Traditional life or modern one?

Individual life and personal space or Collection and community life

Special looking house or similar looking houses?

I value more a modern lifestyle and house within a city and a community life, in a special looking house to others.

Q 8.7 Any additional comments/observations?

I would like to live in a house in between traditional and modern lifestyle, within a city and a community life, with a special looking house.

Case and interview reference number: A45

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:

Household

traditional Lifestyle

Modern lifestyle

Culture

Religion

It supports 60% of my household, because it is small in size and there are so many apartments in the building. I don't think it could suite a traditional family because it is not independent house. also, I think it doesn't support country's culture. And it is hard to say if a house supports or doesn't support the religion because it depends on people in it.

Q 2.2 What did you like about your current house?

What did you dislike?

I like its location so much; I hate being the house so small and there are no facilities such as parks.

Q 2.3 What do you like about your previous house?

What did you dislike?

Why did you move?

I liked it because it was independent and being near to my parents. But I didn't like the location which was a main reason to move in my current house.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what, and why?

No, I wouldn't.

Q 3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

No, I haven't, only small changes such as painting.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

Yes, they are. But the problem is with house size.

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

I guess there are no opportunities except being away from relatives which make it more independent and comfortable.

The house is so small, and there are no spaces to add rooms, this is the biggest constraint.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

It is building C, because of type of the building, balconies, sunlight enters freely to it. But I don't think building B is environmentally friendly because there is no distance between it and other houses.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

Building A, it looks almost the same.

Q 4.3 Which of the following buildings would you like to live in?

Why?

Building C for sure.

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

Building A looks the same of mine. Building B looks so close to other buildings.

I think building B represents Jordanian architecture the best, also it represents the community values as well. Traditional houses like this one are low rise with a few floor levels which I think suits people's nature and culture more. Having so many people living in the same building is a new thing for our society people used to live in a single-family house

Q 4.5 Have you seen any building like in picture number b?

What does it represent to you?

Yes, actually I have lived in one before.

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

I don't see any relation.

Q 4.7 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

Yes, I have. I liked how wide it was, for instance these houses used to have outside spaces bigger in size than the house itself. I didn't like it because it provides no privacy or independency.

Q 4.8 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

Because people look for privacy and independency. Also, because people now build their buildings vertically not horizontally, to provide houses for their children as well. *i*t is more expensive and needs more expertise to build it. also, I think it is better than today's houses because it has better ventilation and wider spaces. I think traditional materials are not good for today's living except structural stone.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

Yes, I do.

Q 5.2 What makes a sustainable house in your opinion?

Wide spaces, ventilation and have the ability to save energy.

Q 5.3 What construction material you think suits Jordan best? What colours?

Cement and structural stone.

Q 5.4 How comfortable is your house in:

Winter?

Summer*?*

Why?

It is 70% comfortable, because by living in an apartment within a commercial building I have a whole face of the building with no windows.

Q 5.5 Is there a season where utility bill increases?

Usually in winter.

Q 5.6 Is there a room where you think it's hotter or colder? Why?

What type of activities do you do in this room?

Yes, there is, my bedroom is cooler than other rooms, I don't know why.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

Natural ventilation for sure because all new devices have side effects on health.

Q 5.8 Would you want bigger windows or smaller windows? And why?

If it was bigger it will be better, because it will allow for more sunlight and air to enter inside.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

It was easier, where it was warm in winter and cool in summer, because it is built from mud which will save winter water inside and in summer it will work as a cooler device.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

I would choose to pay more for insulation.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

I think it suits 70% the climate here

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

Yes, I would prefer that for sure.

Q 5.12 Would you pay more money for a more sustainable house?

Yes, I would.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

Nom I wouldn't use because they are not practical these days, maybe we could use them only as decorates.

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

I really don't know, of course I would like it to be insulated. Walls are already thick.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

No, I wouldn't, because they are not practical for these days.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

In general, so many of the people use them, so I don't think it is a problem.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, maybe I would, because it is so expensive.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

It depends on the quality if it has good quality then yes of course

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

I think it is hard, because most of the people here are really poor and they work all day, which make it hard to meet with the neighbours.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

In scale from 1 to 5 I would choose 3

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

Of course, it is important, and I wish if there was, when I bought my house, they told us there will be but we still have nothing, I think it is because of corruption

Q 6.3 How much do you know about Jordan building codes and regulations?

How much do you know about Jordan green building guide?

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why?

I don't know about regulations or green building guide. Also no one had told me before about such elements. I would be interested if I have more money.

Q 6.4 Any issues regarding laws or regulation you are aware of?

Yes, I bought my house 7 years ago and I still didn't get an ownersip prof.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Yes, it doesn't have good utilities or facilities for public activities.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

It provides 90% visual privacy.

Q 7.2 Where do you host your guests?

In the living room.

Q 7.3 Do you have a balcony, garden, or patio in your house?

What do you use it for?

How important do you think it is?

Which is more important? Why?

I have a balcony, where usually I set for relaxation. I think the most important one to have is a patio.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

it is kind of acceptable.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

What are these elements? What makes a house traditional?

I bought it. yes, I would use such elements for sure if it was independent house, such as adding a water fountain, but in it's hard to do in commercial buildings.

Q 8.2 How much do you think your house suits your financial statue?

How much was the land price or house price a reason in choosing it?

Do you think house prices here equal its value?

Why?

Of course, it doesn't equal its value, I bought it for 42,000 JOD while teachers bought it for 12,000 JOD by ministry of education it is not fair.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

Of course, they don't.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

Yes, I would if I have more money.

Q 8.5 Would you prefer to:

Live only with your children as they grow?

Live with your children's family or parents in the same building?

House other relatives in the same building?

I would live with my children as they grow.

Q 8.6 Which do you value more?

Traditional life or modern one?

Individual life and personal space or Collection and community life

Special looking house or similar looking houses?

I value more a modern house and lifestyle, with a special looking house that provides privacy.

Q 8.7 Any additional comments/observations?

Case and interview reference number: A47

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:

Household

traditional Lifestyle

Modern lifestyle

Culture

Religion

Its good as it is now, I think, it does not go against our lifestyle, and I think even a traditional family would be happy here with no issues at all.

Q 2.2 What did you liked about your current house?

What did you dislike?

I used to live in an apartment building and this house has more independent than the old own, in an apartment block you don't own the entrance, you have to share the hallway plus you can't clean the outside of the building on your own and how just it's independent. The only think I dislike about it is that its duplex I find it exhausting going up and down the stairs and moving between the rooms also I don't feel it's safe, what if someone fell from them. Just a simple task like doing the laundry is tiring and need planning. In winter we separate the house and stay downstairs and rarely go up.

Q 2.3 What do you like about your previous house?

What did you dislike?

Why did you move?

I liked it's not a duplex (laughs) and I think the house organization was better, how the rooms were layout were better than now, the living room was separated from the guest room, I don't have one here which I think is bit inconvenient. The space that was intended to be used for guests is way inside the ground floor

that the guest have to walk all the house to get there. So, I preferred to turn it into a second living room. As I said the issue of not having your independent place there and how clean it can be are the main things I didn't like about that place. And that's why I moved.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

Changing the guestroom and maybe try to add a one on its own outside plus taking the bedroom and putting them down (laughs) it's a big place I wish it was smaller too our family is not that big.

Q 3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

Decoration mainly, like floor tiling and doors we added a separation between the entrance hall living room and stairs the stairs would go to the roof, so we added another door between the start of the stairs of the first floor, so I don't feel like am living in such huge place plus its cleaner and warmer in winter time instead of leaving it open. It's nice that there is a separation between living rooms and bedroom I feel it would be cleaner quitter when you ask them to go to their rooms and play there

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

stairs would go to the roof, so we added another door between the start of the stairs of the first floor, so I don't feel like am living in such huge place plus its cleaner and warmer in winter time instead of leaving it open. It's nice that there is a separation between living rooms and bedroom I feel it would be cleaner quitter when you ask them to go to their rooms and play there

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

Yes, it can possibly change can't think of any constrains now. Maybe the inner staircase (laughs)

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

I would guess the third one, it looks nice and not in a dense place and new, new buildings are better performance unlike other ones.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

The second one. Looks more of a multi-story house rather than an apartment building. They have the same type of stone, same big balcony

Q 4.3 Which of the following buildings would you like to live in?

Why?

Third one. It looks nice.

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

I liked the stone type in the second and third one, I didn't like how dense the third and first one is, the first one has small balconies, the second one feels like an old building it looks similar to size to mine but it does not look like a modern house you live in, it looks like historical building you would visit or stay in as a hotel. Am not used to it, I would say it doesn't even suite the culture or it's a house that belong to another culture. The third and first one looks like buildings here in Jordan that's how we are used to.

Q 4.5 Have you seen any building like in picture number b?

What does it represent to you?

Old parts of Amman's and other downtowns,

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

Just size and stone maybe.

Q 4.7 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

I don't know really why.

Q 4.8 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

No. never.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

I think sustainable buildings would have a fewer number of apartments than non-sustainable ones... it would also have a good space between it and the other buildings in the neighbourhood to have optimal ventilation and sunlight, and so you can plant trees between them.

Q 5.2 What makes a sustainable house in your opinion?

Q 5.3 What construction material you think suits Jordan best? What colours?

I think the current material is suitable, stone blocks and concrete.

Q 5.4 How comfortable is your house in:

Winter?

Summer*?*

Why?

It can get cold in the upper floor I don't know why.

Q 5.5 Is there a season where utility bill increases?

Summer bills are higher with the fans and AC sometimes.

Q 5.6 Is there a room where you think it's hotter or colder? Why?

I think they are all the same.

What type of activities do you do in this room?

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

Natural of course its healthier

Q 5.8 Would you want bigger windows or smaller windows? And why?

Its bit small in my opinion, bigger windows give you better ventilation and sunlight, we have to use curtains so it reduced the light we have, if it was bigger it would allow lighter to come in even if it was still covered, the apartments next to us are close so we can't keep them uncovered for long time.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

I would not know; some people say old buildings were better in that aspect.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

I would mostly prefer adding extra costs including insulation with less preferences to other choices although I would sacrifice view or windows size. If the windows were smaller but there would be more, I would agree to that it all just depends. I would not want the house to be smaller as its already very small.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

I think it's a normal house that is insulated Its not more or less suitable than other houses, its good in winter but built hot in summer as I said.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

Windows are bit small and I would not necessary like covering them more, we already use a lot of certain but if it could help protect from heat, I might just use them, our neighbour is covering his balcony and it help create better place and better conditions.

Q 5.12 Would you pay more money for a more sustainable house?

I would certainly as it would make things easier and healthier for me. We all like the environment too

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

Maybe depends on muds and stones worked for a good while as people didn't have anything beside them, but as traders start importing and then manufacturing new materials people started looking for what is modern and new, they don't want the old anymore, I don't think personally that mud is a back warded material or that houses built by mud are a sign of that I would just prefer more efficient modern materials.

Q 5.14 Do you know if your house was thermally insulated?
Would you like if it was insulated?
Why didn't you care about insulating it?
Would you mind if it the walls were thicker, and your room size were smaller? Why?

Yes, it is, if would have been much worse if it wasn't, one of the few good things about this building is its well-built and well insulated.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

Maybe, they need a lot of maintenance or how good will it look so it depends on that. I would love to help the environment though of course.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

As long as it will help saving the environment I would.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, we are thinking about that. But how much the cost would be

Q 5.18 Would you prefer using local sourced material or imported one? Why?

If it will help environment and has good quality, why not.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

There are too many people with4 doors opening into each other's so social interaction is a must here (laugh)

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yea I do, but there are so many people living here that you can't just keep in contact with them all not mentioning the surrounding buildings.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what and where would you like it? Show on the map?

Yea it would definitely be better to have a place near the neighbourhood that allows for such interaction but there is nothing so far. One of the planned gardens or a using the school hall would be a good idea.

Q 6.3 How much do you know about Jordan building codes and regulations?

Not much honestly. Can't recall anything.

How much do you know about Jordan green building guide?

This is the first time I hear about it.

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
Would you have interested in them? Why

No but insulation really and it wasn't from any engineer or architect. And I would definitely be interested, it would be better and would help my house sustain for long time.

Q 6.4 Any issues regarding laws or regulation you are aware of?

No nothing. It's just bit streets. They don't aloe people to have direct entrance from the street level to the ground levels apartments or sub level.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

The entrance is designed to be on the side of the apartment and you have to go near the garden of the lower floor which done not give them a lot of privacy and noise cancelation to rooms in that side, also the garage space is behind the building with no direct footbath to the entrance of the building, I think it was an architectural or engineering grave error, you would have to walk all the way around the building to get to the entrance, also with 4 levels building there are no lifts here.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Not quite sadly, as I said balconies and windows are close to each other's that doesn't allow you to set too near an exposed window. Also, the proximity issue is severing, we share the walls with some neighbours and sometimes I can hear their morning alarm clock.

Q 7.2 Where do you host your guests?

In this living room.

Q 7.3 Do you have a balcony, garden, or patio in your house?

Yea the balcony.

What do you use it for?

Don't use it often we use mostly for laundry we rarely use it its very exposed to other buildings. And it's just too small

How important do you think it is?
Which is more important? Why?

The garden its more specious and breathable space.

Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?

No. but the house isn't different from other people's houses too. I would prefer a house that embrace independent and where I don't have to share entrance, stairs with so many people. Even going in and out you would find boys setting there, if I had a daughter and she would want to go out then she will find them and it is just not comfortable to do so, this is against our values, I guess.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
Nothing so far but I would like that.
What are these elements? What makes a house traditional?
Materials like mud and stone, its form, lay out, and how the rooms are arranged around an inner hall or space, it had the old type of shutter windows the layout of the traditional house of halls and big rooms to house many children and extended family, it had a high ceiling and so on.
Q 8.2 How much do you think your house suits your financial statue?
It suits us now as it's hard for us to build our own independent traditional house now.
How much was the land price or house price a reason in choosing it?
It was a big part of it on the start of building our family.
Do you think house prices here equal its value?
It's yes very reasonable. If it was more expensive, I would not buy it
Why?
Q 8.3 Do you think commercial building slandered takes financial conditions for people?
Yea at some pint it is, it's reasonable priced house in a place not so far from work and city centre.
Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
Not too expensive I hope, not much extra costs.
Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I prefer live with my family only, core one only. If it was a big house, I would not share a n apartment building with few relative families together not so many stranger people like here.
Q 8.6 Which do you value more?
Traditional life or modern one?
traditional life and traditional type buildings.
Rural life or urban lifestyle
Rural places.
Individual life and personal space or Collection and community life
Individual is more convenient as work would not allow us to socials a lot.
Special looking house or similar looking houses?
special looking is nice.
Q 8.7 Any additional comments/observations?
A traditional building is very nice.

Case and interview reference number: A51

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion
It doesn't support my household needs, the culture, and the religion. But it supports a modern lifestyle more than a traditional one.
Q 2.2 What did you like about your current house?
What did you dislike?
I don't like anything about it but how small it is, because it wasn't my design or my choice.
Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?
I liked how big it was, the garden it had, and my family were there. I moved out from it to live in Amman.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?
Yes, I would change the internal design because there are a lot of mistakes made in it.
Q 3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

I haven't done any changes, also I don't plan to do any changes currently. If it is allowed to apply a brick roof, I would do one, but it is against laws and regulations. All changes I would do are internal not external.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

No, they are not, the distribution is not convenient. The only solution to fix this is by demolishing and rebuilding.

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

Yes, it can adapt my future needs but with doing some changes. Constraints to make changes are 1-I can't start demolishing while I am inside, so I need to find a house temporarily. 2-The cost 3-Regulations for external changes.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

It is building B, because I don't like multi-stores building where you don't have privacy and independency. Also, in this building you have a garden, and you can do whatever you want with your property.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

Building B, the similarities; both of the houses are independent. Differences are the outside looking and the size.

Q 4.3 Which of the following buildings would you like to live in?

Why?

Building B because it is independent.

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

I don't like anything about any building but building B and its independency. Because I don't like commercial and multi-stores buildings. I think buildings A and C represent the Jordanian architecture. I think building B represents the community values because it is independent as Jordanian houses used to be in the past.

Q 4.5 Have you seen any building like in picture number b?

What does it represent to you?

Yes, I have. It represents Jordanian heritage.

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

Yes, it does relate, Architecturally and by materials.

Q 4.7 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

No, I haven't. but I used to go to my grandparents' house which was vernacular building, I liked how the windows looked and the doors as well, it was so beautiful, I think we had to stay in such buildings and improve it, not to leave it at all!

Q 4.8 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

Because it is way expensive than apartments within multi-stores buildings. And yes, I think it is good for today's living. And I think traditional materials are good for today's living as well.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

Yes, I do.

Q 5.2 What makes a sustainable house in your opinion?

The design of the house and its windows and doors… etc. and having a garden.

Q 5.3 What construction material you think suits Jordan best? What colours?

Structural stone because it is good insulation material.

Q 5.4 How comfortable is your house in:

Winter?

Summer?

Why?

I have a big problem which is when the engineer who designed and built the house, he put the house entrance in the western direction, and that causes really hot days in summer because sunlight enters freely inside and causes cold days in winter because the entrance is in the same direction of the cold wind. Which make the house uncomfortable in summer and winter?

Q 5.5 Is there a season where utility bill increases?

Yes, summer and winter, because of heating and cooling devices.

Q 5.6 Is there a room where you think it's hotter or colder? Why?

What type of activities do you do in this room?

Yes, my bedroom is the cooler in summer because sunshine doesn't hit it directly.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

I prefer natural ventilation but sometimes we need to use ACs.

Q 5.8 Would you want bigger windows or smaller windows? And why?

I like it in its current size, because it doesn't matter having a bigger or smaller window because you will get the same ventilation, so why I use bigger windows and lose more spaces while I'll be getting the same value.!

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

It was easier, because they used to use thermal insulation by using thick walls from mud and stone with empty space in the middle of the wall.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

I would choose smaller windows or paying more money for insulation.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

Yes, I do think so.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

Yes, of course to reduce hotness in summer and coldness in winter.

Q 5.12 Would you pay more money for a more sustainable house?

Yes, I would, because it will stay my own house for ever.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

Yes, of course. Because I love them.

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

It is not thermally insulated, but I wish if it was. I tried it before, but we don't have good quality materials, also it will reduce the house size which is not ok to me. But I don't mind thicker walls in order to get my house insulated.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

Yes, I would.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

Yes, I would agree.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, I would.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

Yes, I would of course.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

I think the developer did a bad job planning the lots here. They could have made it better organised where each dwelling entrance should be far from main roads to provide security, interaction and privacy for each adjacent lot

Q 6.2 Do you value your neighbours and neighbourhood? Why?
I value everyone.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what and where would you like it? Show on the map?
It is important, and on the city's map there is a park in the area but it still no applied. I wish if there were one.

Q 6.3 How much do you know about Jordan building codes and regulations?
How much do you know about Jordan green building guide?
Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
Would you have interested in them? Why?
I know a lot about them, and know I never knew about Jordan green building guide. No, I never been asked from an engineer about these elements, and of course I am interested in them.

Q 6.4 Any issues regarding laws or regulation you are aware of?
Yes, it is not allowed to have a brick roof.

Q 6.5 Any issues regarding how the neighbourhood have been designed?
The design is really bad, there are buildings without sidewalk while there are buildings in the same area have huge one! Also parks and garages!

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Not totally.

Q 7.2 Where do you host your guests?
In the living room. And they are not allowed to enter bedrooms.

Q 7.3 Do you have a balcony, garden, or patio in your house?
What do you use it for?
How important do you think it is?
Which is more important? Why?
I like to enter in my daughter room because it has a nice chair, I set on it and do my work there. I have a balcony, but I can't set in it because sun is hitting it directly.

Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
I don't think so. And no, I don't have such elements.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
What are these elements? What makes a house traditional?
I built it by myself. And no, I don't use such elements. I think traditional materials what make building a traditional one.

Q 8.2 How much do you think your house suits your financial statue?
How much was the land price or house price a reason in choosing it?
Do you think house prices here equal its value?
Why?
It suits my financial statue. The price was really important for buying the land because it was cheap. Yes, I think they equal their values.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?
I do think so.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
I would prefer cheap house and I do all changes I want to make sustainable.

Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I prefer to live only with my children.

Q 8.6 Which do you value more?
Traditional life or modern one?
Individual life and personal space or Collection and community life
Special looking house or similar looking houses?
I value more modern lifestyle with modern house in a city, individually. Also, I would value more a similar looking house.

Q 8.7 Any additional comments/observations?

Case and interview reference number: B01

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion

Yes, it supports my household needs in the main time. It supports modern lifestyle but not traditional one. Also, it supports culture and religion.

Q 2.2 What did you like about your current house?
What did you dislike?

I like its independency; I don't like how noisy it is around.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?

I liked how we were connected as a family, and I like it because it was warm in winter and cold in summer. I moved out because I got married.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

In the main time, no.

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?

Yes, I have, I am planning to combine living room with the guest room to have more spaces and get more sunlight.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?

Yes, they are. Because according to our culture we separate girls and boys in bedrooms, so if there was one more room in the house it will be great for my family and for guests and their privacy.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?

No, it can be changed to adapt my future needs. A constraint associated with living in my current house is spaces or distance between my building and others.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain

I think Building B, because old stone used to be better in thermal insulation, also such buildings have really thick walls which help in that as well.

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?

Building A, the same way of building, windows and entrance, also both houses have ground spaces. The difference is floors and population number.

Q 4.3 Which of the following buildings would you like to live in?
Why?

Building B.

Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.

I like ground floor in building A. also I like how building C looks, but it sounds so noisy inside because it has so many windows. Of course, building B represents Jordanian architecture and community value the best because all buildings were the same of it in the past.

Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?
Yes, everywhere; in Salt, Amman, Jerusalem... etc. it represents Jordanian heritage and our traditional values.

Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
No, it doesn't, neither architecturally nor by materials used.

Q 4.7 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?
Yes, I have in my early age, I liked it because it had free and empty spaces inside it which provided more privacy. I didn't like its internal distribution.

Q 4.8 why have people stopped making vernacular buildings?
Do you think it's good for today's living?
Do you think traditional materials is good for today or is it backward?
They are not backward just very hard to replicate and maintain. No one use them anymore because they required the whole house to maintain them once or twice a year.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
Yes, I do.

Q 5.2 What makes a sustainable house in your opinion?
I think it is the building that relate to nature and all its materials from it, also it doesn't need so much energy. And they are more beautiful and regulate its temperature in a good way.

Q 5.3 What construction material you think suits Jordan best? What colours?
I think Cement is the best one, but it doesn't suit all locations in Jordan. For example, areas don't have so much rain and have so hot weather shouldn't be built with cement. I think white color is the best.

Q 5.4 How comfortable is your house in:
Winter?
Summer*?*
Why?
It is not comfortable in both seasons, because of cement. It needs cooling and heating devices, or to do thermal insulation.

Q 5.5 Is there a season where utility bill increases?
Yes, in summer and winter,

Q 5.6 Is there a room where you think it's hotter or colder? Why?
What type of activities do you do in this room?
Yes, rooms located in western north direction are usually colder, and in eastern south are hotter or warmer. Because of the sun. the first one for bedrooms, the second one foe guest rooms.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
Natural ventilation.

Q 5.8 Would you want bigger windows or smaller windows? And why?
Bigger windows because they will provide more sunlight to the house.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?
It was easier, because old stone used to be better in thermal insulation, also such buildings have really thick walls which help in that as well. In the traditional neighbourhood buildings were all low rise that allowed my house to receive a lot of sunshine and air.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area
smaller windows area
pay more for insulation
View from house windows
I would choose to pay more money.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

No, It doesn't because it is built with cement.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

Yes, I would use.

Q 5.12 Would you pay more money for a more sustainable house?

Yes, I would within the budget.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

Yes, I would but the problem is we don't have traditional materials anymore, they are all different. And you can't use only mud to build a house because it will need so much maintenance.

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

It is not insulated. And I do mind have thicker walls because it will make rooms smaller.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

Yes, I would but the problem is we don't have traditional materials anymore, they are all different. And you can't use only mud to build a house because it will need so much maintenance.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

Yes, I would.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, I would.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

No answer.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Yes, it does.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

On a scale from 1 to 5 I would give them 3.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

Yes, it is. And we do these meeting in mosque.

Q 6.3 How much do you know about Jordan building codes and regulations?

How much do you know about Jordan green building guide?

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why?

I have good knowledge about building codes and regulations. And no, I didn't hear about green building guide. And no, I didn't ask any engineer about them, and of course I would care about them because they will make the house better for future.

Q 6.4 Any issues regarding laws or regulation you are aware of?

No issues.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Yes, streets are so narrow, like 1940's streets.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yes, kind of.

Q 7.2 Where do you host your guests?

In a guest room. And they are not allowed to enter to bedrooms for privacy.

Q 7.3 Do you have a balcony, garden, or patio in your house?

What do you use it for?

How important do you think it is?

Which is more important? Why?

I usually set in the living room to relax. I think the most important one to have is a garden where you can get fresh air.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

Yes, I do think so. Yes, I have such elements like arches.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

What are these elements? What makes a house traditional?

In between building and buying it. I would put an empty space in middle of the house as a traditional element.

Q 8.2 How much do you think your house suits your financial statue?
How much was the land price or house price a reason in choosing it?
Do you think house prices here equal its value?
Why?
It suits my financial statue well. and yes, the price was a reason to buy it, if its price was higher, I wouldn't buy it back then. And no, I don't think houses here equal their values, their prices are higher because of lands price.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?
No, I don't think so.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
Yes, I would prefer that.

Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I would prefer to live only by my own.

Q 8.6 Which do you value more?
Traditional life or modern one?
Individual life and personal space or Collection and community life
Special looking house or similar looking houses?
I value more a traditional house and lifestyle, In a countryside, individually, with a similar looking house.

Q 8.7 Any additional comments/observations?
Yes, there must be more organizing for the area, and building materials should be affordable.

Case and interview reference number: B02

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion
There is no such thing as perfections, in such an old traditional house like this, but we feel so proud to be living in such a heritage place like this and with the modification we made I think it suits us just fine taking in account our finance and we love living close to the centre and don't think it goes against our lifestyle expect it would have been better if it had one more room. Even tourist comes to see these types of buildings (laughs). I think it suites us as much as it suited a traditional family, the flat is smaller than it used to be as the landlord divided the floors into flats and this one has only 3 rooms and a kitchen and a bathroom that we added up alongside plumbing system which it did not have before.

Q 2.2 What did you liked about your current house?
What did you dislike?
Living here gives a piece of mind and I like the idea of living in a place with history and connected to my heritage, it makes me feel more bounded to the place and history of the city. The location is good being central and all also have a lot of advantage where you don't have to own a car or pay for transport to work, school or the market. As well, nothing specific I didn't like.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?
It was also in a good location nothing specific I didn't like.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?
the flat is smaller than it used to be as the landlord divided the floors into flats and this one has only 3 rooms and a kitchen and a bathroom that we added up alongside plumbing system which it did not have before. Beside these we changed the doors and do regular maintained and painting for the house. There is a room inside, but it comes below the street level and thus it does not have any windows we tried converting it and I think it was good.

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?
Well, we had to add the bathroom on the outside as you see so it's near the main entrance door which is

still not optimal. The house is old, and dose not even have its garden anymore or much space around it, it's very hard for it to change anymore. The government helped us renovate it and fix the balcony outside anymore. We are plan on changing the house as our family is growing. We just need a bigger house, and we won't change it if it wasn't for that.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?
Well, we had to add the bathroom on the outside as you see so it's near the main entrance door which is still not optimal. The house is old, and dose not even have its garden anymore or much space around it, it's very hard for it to change anymore. The government helped us renovate it and fix the balcony outside anymore. We are plan on changing the house as our family is growing. We just need a bigger house, and we won't change it if it wasn't for that.
Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?
I think now after all that we have done there is no possibility for any more changes we are bounded by the area and size of the house and regulation now.

vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
I think traditional buildings like B, but it doesn't mean than newer modern buildings can't be like that if they were planned to. I think any of them can represent an example of Jordan architecture depends on where to look think c looks good too and I would like to live in one of them too.
In what way? Please explain
Q 4.2 Which example best compare with your own home?
Second one of course
What are the similarities?
What are the differences?
Same windows and same stone colour, it's one of salt buildings isn't it?
Q 4.3 Which of the following buildings would you like to live in?
Third picture
Why?
It looks more modern and newer
Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.
, the second it represents traditional type of architecture, and the third because it looks modern and new, bigger windows, the traditional one doesn't fir peoples mind nowadays
Second one, The second for old and the first for new. It has arches and arches vault, some prefer it because it Islamic or traditional, having an elevator is important if you have more than 3 stories buildings. I like modern buildings like the third one, its comfortable clean and have all the privacy that modern lifestyle need.
Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?
yes, a lot in old town centres like Amman, Irbid and As-Salt
The Arabic/ Jordanian traditional house style the Salti type of houses
Q 4.6 Does your house/or houses in Jordan in general relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
No but I think it all go back to the owner weather he wants to mimic traditional design or not, or his image or view to these buildings, we had to make a lot of changes to suit everyday modern life, even our house I think it's a hybrid between what's old and new , without that living here would be very hard, we can connect new buildings with old by taking elements from old design like stones windows and doors and so on, but from the inside it all goes back to the owner and what does he wants.
Q 4.7 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?
Yes, I have
I liked how thick the walls are that made the house cool in summer and warm in winter

Nothing really, everyone like them

For work, so I moved to another region

Q 4.7 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

It would be related to what people think is classy and civilised and to from where they get their influence from, for me it's still usable and so are the materials.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

Yes, I have some limited knowledge about them

Q 5.2 What makes a sustainable house in your opinion? What makes vernacular buildings sustainable

Materials and construction of course, this house has very thought walls, some can reach a whole meter in thickness, this mad it suitable for both hot summer and cold winter, the courtyard used to help in cooling too, sadly after we added the roof it's been warmer in summertime as ventilation decreased.

Q 5.3 What construction material you think suits Jordan best? What colours?

Stone I think suits JORDAN AND CEMENT, concrete, it's easy to construct now. I love the yellow and beige colour stone it's an amazing shade.

Q 5.4 How comfortable is your house in:

Winter?

Its ok now was better before adding the roof

Summer?

Why?

I don't know

Q 5.5 Is there a season where utility bill increases?

Q 5.6 Is there a room where you think it's hotter or colder? Why?

The northern rooms are bit warmer in winter and summer as a good portion of them comes underground behind the cliff the house was built into, they are bit underground and we use them to sleep

What type of activities do you do in this room?

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

Natural ventilation, it's cheaper and healthier

Q 5.8 Would you want bigger windows or smaller windows? And why?

I think their size is good now

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Traditional building was Easier to control temperature, I think the walls were thick and insulated better then modern buildings in Jordan.

Do you have any idea how people used to do to insulate or regulate house temperature?

Just how the house was constructed they didn't need anything else

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this includes better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

Walls are already very thick and suitable, and the windows has shutters on them although the orientation of the sun dose not hit these sides of the house too much

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

Its suits it with the size of windows and size of the house

Q 5.12 Would you pay more money for a more sustainable house?

Yes, I would, because it will save me money in the future

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

No answer

Q 5.14 Do you know if your house was thermally insulated?

It is insulated by how thick the walls are

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

As I told you I would certainly use traditional elements infused with new ones, new designs of windows do not allow anyone to see who is inside anyway.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

If they were good also why not, if it was recycled and safe

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, I would really like to, its eco-friendly and would save me a lot of money in the future

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Definity dose and too much (laughs) the houses are close, and all the neighbours know each other's well

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yes, I do a lot, people here are nice and easy going and no major issues happened to make me not like the people and the neighbourhood. Except for noises and the fact that we can actually hear each other's sometimes

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what and where would you like it? Show on the map?

Yes, we meet on the old stairs and squire scattered around the market and al-hammam street and we can host each other's in houses or on the patio/balcony

Q 6.3 How much do you know about Jordan building codes and regulations?

A little enough about setback laws and building ratio/ cars parking and so on, in the laws also was part of the reasons why we can't build traditional buildings now, within the city centre in salt now all buildings should be built in yellow stone

How much do you know about Jordan green building guide?

Nothing really

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

No never,

Would you have interested in them? Why

I would but I bought my apartment and didn't definitely in the future.

Q 6.4 Any issues regarding laws or regulation you are aware of?

Nothing too important

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Nothing I feel wrong no.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yea I think all room are isolated from each other's and public rooms, even the guest room has its own entrance which is good

Q 7.2 Where do you host your guests?

Yes, the guest room

Are there places in the house they can't go to normally?

Yes, private bedroom

What are they? Why?

They are too private to be gone there without a prober Couse or invitation

Q 7.3 Do you have a balcony, garden, or patio in your house?

Yes, they are very important

What do you use it for?
How important do you think it is?
Which is more important? Why?

The balcony for apartments and garden for ground levels houses

Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?

Yes, the peasant traditional house is not feasible, and people learned how to accept apartments

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?

We inherited it

What are these elements? What makes a house traditional?

I would copy elements like the courtyard, garden, windows and stone to my future house.

Q 8.2 How much do you think your house suits your financial statue?

Its ok for the time being

How much was the land price or house price a reason in choosing it?

Yes, it was

Do you think house prices here equal its value?
Why?

There are good cheap houses here

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

Yes, I would it would be better

Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I prefer each with his family
Q 8.6 Which do you value more?
Traditional life or modern one?
Modern life
Rural life or urban lifestyle
urban life
Individual life and personal space or Collection and community life
personal
Special looking house or similar looking houses?
looking similar is better
Q 8.7 Any additional comments/observations?

Case and interview reference number: B03

2.0 cultural Indicators
Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion
My current one dose, the old vernacular (traditional) one would not have, it does not give you much individual privacy, the bathroom and kitchen were outside the rooms. It was just two big volumes arched volumes/rooms where all the family share, it was a very simple peasant type of house where the peasants use only in some short periods of time while the rest, they would spend in the fields working. It just won't suit modern day life at all. Also, by the way how many of these peasants, country houses were divided by inheritance, no one would be able to have for himself.
Q 2.2 What did you liked about your current house?
What did you dislike?
I like everything about it, it's the first apartment we bought me, and my late husband and it quickly became our home. You feel comfortable and peace of mind in it. The previous house was too small, here is much bigger and roomy.
Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?
The things I liked about it was the attachment I had with it and the people I lived in with, you feel belonging to these days. I had two of my kids there,

3.0 House organization and space arrangement
Q 3.1 Would you like to change anything in your house? If so, what and why?
Apart from decoration nothing her, that house needed a lot of work to make it inhabitable by todays standers, adding new bathroom, kitchen, separating spaces, and it still would not fit to todays need anyway. Many of the people living there are living by rent and they can't do much in them.
Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?
Apart from decoration nothing her, that house needed a lot of work to make it inhabitable by todays standers, adding new bathroom, kitchen, separating spaces, and it still would not fit to todays need anyway. Many of the people living there are living by rent and they can't do much in them.
Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?
In this house they are good, no need to change anything. After the house or apartment being built it would be very hard to make any other changes.

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

In this house they are good, no need to change anything. After the house or apartment being built it would be very hard to make any other changes.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

I would guess the second ones, old traditional houses like the one I lived in didn't need much energy like new ones, they were cool in summer and warm in winter. The thick walls acted like natural insulation.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

The third one looks like my current house and the second one is built with yellowish stone like the old one. Except mine is just one-story height.

Q 4.3 Which of the following buildings would you like to live in?

Why?

Third maybe its new and modern I lived in a traditional place before and I didn't like it.

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

I liked the third one because it looks like my current house, the second one looks nice but these building can deceive you; they look nice from the outside, but they need a lot of work from the inside, Neglecting maintenance would not help too, they were good once and nice to live in them but perhaps not now.

Q 4.5 Have you seen any building like in picture number b?

What does it represent to you?

People still live in them, in wadi al-akrad, I think some people build with Yellow stone here

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

No not mine but People still live in them, in wadi al-akrad, I think some people build with Yellow stone here.

Q 4.7 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

People still live in them, in wadi al-akrad area many houses there are still inhabited, once people convert them to suit todays need why not, it represents pride for people who still value these houses and buildings, that shows both the city and their family heritage, they renovated them and live there comfortably.

Q 4.8 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

Yes, I did for couple of years, it does not give you much individual privacy, the bathroom and kitchen were outside the rooms. It was just two big volumes arched volumes/rooms where all the family share, it was a very simple peasant type of house where the peasants use only in some short periods of time while the rest, they would spend in the fields working. It just won't suit modern day life at all. Also, by the way how many of these peasants, country houses were divided by inheritance, no one would be able to have for himself.

Q 4.7 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

Just that it consumes less energy.

Q 5.2 What makes a sustainable house in your opinion?

Am not sure I know.

Q 5.3 What construction material you think suits Jordan best? What colours?

I think the current material is suitable, stone blocks and so.

Q 5.4 How comfortable is your house in:

Winter?

Summer*?*

Why?

This house is very cold, the old one as I said was warm in winter and cool in summer.

Q 5.5 Is there a season where utility bill increases?

Summer bills are higher with the fans and AC sometimes.

Q 5.6 Is there a room where you think it's hotter or colder? Why?

I think they are all the same, all windows come with one window for each.

What type of activities do you do in this room?

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

Natural of course but as I said not much space to breath or have privacy to set near a window or a balcony as the building are quite new to each other's sadly.

Q 5.8 Would you want bigger windows or smaller windows? And why?

In the old house the windows were very small and that's why it was also warm in winter and cold in summer.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

Traditional building was better and cooler, especially with its thick walls, they kept a good feeling inside.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

We already insulated this house from the inside which made walls bit thicker and we pain a lot of money, windows are part of the reason why it's so cold here so I would not mind smaller or fewer windows. I just like the view from my house as its very high on a hill.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

Its ok, just many flaws in construction that mad it like that.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

yes, I would not mind that if they were necessary, but I don't have issue with sun now

Q 5.12 Would you pay more money for a more sustainable house?

I would certainly as it would make things easier and healthier for me. We all like the environment too

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

The traditional house I lived in was a bad experience that I do not want to repeat. Rooms were open to each other with little privacy. The exterior walls were still made of mud. It was not even covered with limestone or poured cement like other houses that required much effort to maintain and clean them. Some techniques and material are certainly not suitable today

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

Now it is, we insulated it recently

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

Maybe, they need a lot of maintenance or how good will it look so it depends on that. I would love to help the environment though of course.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

As long as it will help saving the environment I would.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, we are thinking about that. But how much the cost would be

Q 5.18 Would you prefer using local sourced material or imported one? Why?

If it will help environment and has good quality, why not.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Old houses certainly gave more chances for people to meet and to be closer and more intimate, even between neighbours, not like now, people would be at each other's house all day, every day at a new person.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yea I do, but still, I prefer old neighbourhood more. It's just about being connected to that place, I had my two kids there and I started my life there too.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?
Not necessary, we didn't have a place like that, and everyone was welcomed in each other's house, people notion about privacy, gender segregation and role were much difference from today, people were in modest cloths all day even in home and there was no issues of hosting each other's all day.
Q 6.3 How much do you know about Jordan building codes and regulations?
Not much honestly. Can't recall anything.
How much do you know about Jordan green building guide?
This is the first time I hear about it.
Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
Would you have interested in them? Why
Yea we were told about the indoor insulation by one.
Q 6.4 Any issues regarding laws or regulation you are aware of?
No nothing.
Q 6.5 Any issues regarding how the neighbourhood have been designed?
Nothing I can feel directly, no

7.0 social relations and privacy indicators
Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Yes, it doses I feel so comfortable and safe here.
Q 7.2 Where do you host your guests?
In the living room or the guest room
Q 7.3 Do you have a balcony, garden, or patio in your house?
Yea the balcony.
What do you use it for?
Yea am setting there all day (laughs) it's my special place.
How important do you think it is?
Which is more important? Why?
I prefer the view from here over setting on the ground level, also no one can directly see me from up here.
Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
no nothing really.
8.0 Ownership and lifestyle indicators
Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
Nothing so far but I would like that.
What are these elements? What makes a house traditional?
Materials like mud and stone, arches inside the house,
Q 8.2 How much do you think your house suits your financial statue?
It ok now.
How much was the land price or house price a reason in choosing it?
Yea this apartment worth three times what we paid for when we bought it.
Do you think house prices here equal its value?
Not anymore everything is getting too expensive
Why?
Q 8.3 Do you think commercial building slandered takes financial conditions for people?
Not at all, they only want profit.
Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
Not too expensive I hope, not much extra costs.
Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I prefer live with my family only, core one only. I tried living with my extended one and I didn't like it at all.
Q 8.6 Which do you value more?
Traditional life or modern one?
modern life and traditional type buildings.
Rural life or urban lifestyle
Rural places.
Individual life and personal space or Collection and community life
Individual is more convenient as work would not allow us to socials a lot.
Special looking house or similar looking houses?

similar looking is nice.

Q 8.7 Any additional comments/observations?
A traditional building is very nice.

Case and interview reference number: B05

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion

Back then it was just fine and living in it was good, but now you can't do that life has changed so much today's kids won't handle it, it lacks a lot of the amenities have now.

Q 2.2 What did you liked about your current house?
What did you dislike?

I like that I have my garden in it also and its quite dense area. Proper housing place.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?

I liked the big courtyard and how we used it for simple farming and plants. There was nothing I disliked about it.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?
We added another floor just to house bigger family it was dramatic change to a mud and stone house.

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?

The whole house was basically few rooms arranged over a central courtyard; proper peasant house nothing was issue with that back then that's how all the houses were. Not much of a walk in a house. No rain or sun were bothering us.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?

I think older houses had their independence and were self-sustain by having your own small farm and some people used to keep chicken or rabbets at them as well this modern house lacks, and people can't be bothered growing their own food anymore.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain

I would guess the second ones; I feel it's bigger and roomier and have better ventilation and space to allow people to breath. Others are simple too many levels and floor and too dense and packed with people. You would not know who is your neighboured.

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?

The second one same material and so on.

Q 4.3 Which of the following buildings would you like to live in?
Why?

Third maybe its new and modern I lived in a traditional place before and I didn't like it.

Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.

Nothing about houses with many levels. Although they are the ones representing architecture today. People can't afford having big land for buildings like in number two.

Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?
Old city centres and old towns.

Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
No, it does not in materials but mine grow from basic family to house tow of my sons in deferent floors, so it has things in common with old buildings.

Q 4.7 why have people stopped making vernacular buildings?
Do you think it's good for today's living?
Do you think traditional materials is good for today or is it backward?
Can't afford them you need a lot of lands and lad lots became smaller and expensive. And no one to build similar buildings anymore.

Q 4.8 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?
Yes, I did. Back then it was just fine and living in it was good, but now you can't do that life has changed so much today's kids won't handle it, it lacks a lot of the amenities have now.

The whole house was basically few rooms arranged over a central courtyard; proper peasant house nothing was issue with that back then that's how all the houses were. Not much of a walk in a house. No rain or sun were bothering us.

I think older houses had their independence and were self-sustain by having your own small farm and some people used to keep chicken or rabbets at them as well this modern house lacks, and people can't be bothered growing their own food anymore.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
Nothing at all

Q 5.2 What makes a sustainable house in your opinion?
I don't know.

Q 5.3 What construction material you think suits Jordan best? What colours?
Don't have an opinion.

Q 5.4 How comfortable is your house in:
Winter?
Summer?
Why?
It can much better than today's buildings even in hotter days people would use the courtyard.

Q 5.5 Is there a season where utility bill increases?
Summer bills are higher with the fans and AC.

Q 5.6 Is there a room where you think it's hotter or colder? Why?
--------------------.
What type of activities do you do in this room?

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
Natural of course but as I said not much space to breath or have privacy to set near a window or a balcony as the building are quite new to each other's sadly.

Q 5.8 Would you want bigger windows or smaller windows? And why?
As they are not too big for privacy and for sun glare issues.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?
I think a sustainable place should have many trees and enough space to have a garden of your own where you can relax and enjoy some fresh, clean air in summer days. houses like this one has more greenery around them and look closer to the environment than the others

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area
smaller windows area
pay more for insulation

View from house windows

I would not mind any of them as long as it helps, I don't have that much of a view.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

Its ok, just many flaws in construction that made it like that.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

No, I would not like that.

Q 5.12 Would you pay more money for a more sustainable house?

I would certainly as it would make things easier and healthier for me. We all like the environment too

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

There is no one to build like that anymore, I don't know if I would do it even if I sound one.

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

As long as it will help saving the environment I would.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, we are thinking about that. But how much the cost would be

Q 5.18 Would you prefer using local sourced material or imported one? Why?

If it will help environment and has good quality, why not.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Old houses certainly gave more chances for people to meet and to be closer and more intimate, even between neighbours, not like now, people would be at each other's house all day, every day at a new person.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yea I do, but still, I prefer old neighbourhood more. It's just about being connected to that place, I had my two kids there and I started my life there too.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

Not necessary, we didn't have a place like that, and everyone was welcomed in each other's house, people notion about privacy, gender segregation and role were much difference from today, people were in modest cloths all day even in home and there was no issues of hosting each other's all day.

Q 6.3 How much do you know about Jordan building codes and regulations?

Not much honestly. Can't recall anything.

How much do you know about Jordan green building guide?

This is the first time I hear about it.

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why

Yea we were told about the indoor insulation by one.

Q 6.4 Any issues regarding laws or regulation you are aware of?

No nothing.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Nothing I can feel directly, no

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yes, it doses I feel so comfortable and safe here.

Q 7.2 Where do you host your guests?

In the living room or the guest room

Q 7.3 Do you have a balcony, garden, or patio in your house?

Yea the balcony.

What do you use it for?

Yea am setting there all day (laughs) it's my special place.

How important do you think it is?

Which is more important? Why?

I prefer the view from here over setting on the ground level, also no one can directly see me from up here.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

no nothing really.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

Nothing so far but I would like that.

What are these elements? What makes a house traditional?

Materials like mud and stone, arches inside the house,

Q 8.2 How much do you think your house suits your financial statue?

It ok now.

How much was the land price or house price a reason in choosing it?

Yea this apartment worth three times what we paid for when we bought it.

Do you think house prices here equal its value?

Not anymore everything is getting too expensive

Why?

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

Not at all, they only want profit.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

Not too expensive I hope, not much extra costs.

Q 8.5 Would you prefer to:

Live only with your children as they grow?

Live with your children's family or parents in the same building?

House other relatives in the same building?

I prefer live with my family only, core one only. I tried living with my extended one and I didn't like it at all.

Q 8.6 Which do you value more?

Traditional life or modern one?

modern life and traditional type buildings.

Rural life or urban lifestyle

Rural places.

Individual life and personal space or Collection and community life

Individual is more convenient as work would not allow us to socials a lot.

Special looking house or similar looking houses?

similar looking is nice.

Q 8.7 Any additional comments/observations?

A traditional building is very nice.

Case and interview reference number: B06

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:

Household

traditional Lifestyle

Modern lifestyle

Culture

Religion

The old vernacular (traditional) one would not have, new generation want its own place and freedom, the old family was much bigger and poorer than now, newlywed children could not afford their own house right away and used to stay with the extended family meanwhile. Family now has more money and could afford more luxuries.

Q 2.2 What did you liked about your current house?

What did you dislike?

My luxuries and how more comfortable and have better standards of life than the old one.

Q 2.3 What do you like about your previous house?

What did you dislike?

Why did you move?

It used to give more piece of mind; I liked the people my family that used to live there with them. It was more sociable, and people were more connected than now taken their lifestyle.

There was nothing I disliked about that.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

Apart from decoration nothing at the current one,

Q 3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

That old vernacular house we added couple of rooms over time to house more members. The house had a courtyard which allowed for that, we then moved the washing sinks and bathroom from outside to inside as water and swearer reached the area. It was much easier to tear apart, or add new things to old house, the materials and way of constructions were flexible. In mud and so

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

In that house each room was standing on its own with passages and courtyard between them, there was not much of a function for each room, they all looked and were used for similar things, life was simpler than now and was suitable for how people lived and expected.

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

As I said it was easier to change or add new rooms and up until we filled all the spaced it adapted to that lifestyle for decades before it was obsolete, now it needs a lot of changing to suit newer families.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

I would guess the second ones, houses like this one have more greenery around them and look healthier than the others.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

The first one looks like my current apartment block but this one is smaller and has smaller balconies which I don't like.

Q 4.3 Which of the following buildings would you like to live in?

Why?

Third maybe if the whole floor was a single apartment but if it was two then it would be too small for me and my family and would be too inconvenient to live in.

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

The second one, they look heritage buildings and traditional forms like how people used to build in our region, the stone is in the old shape. There is no connection sadly, they used to be built manually and by the people sharing them to be built by themselves. Now it's a profession on its own, which can be more convenient and better. Also, there are more shapes and design that people can choose from.

Q 4.5 Have you seen any building like in picture number b?

What does it represent to you?

People still live in them, all around the region in Jordan and Syria.

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

No not at all, they used to be built manually and by the people sharing them to be built by themselves. Now it's a profession on its own, which can be more convenient and better. Also, there are more shapes and design that people can choose from.

Q 4.7 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

I think the first factor is the economic situation; no one can afford to build vernacular buildings anymore, land prices have increased and lived inside the city cost so much that apartments block started appearing everywhere, as they are more economically viable for both investors and cheaper for buyers

Q 4.8 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

Yes, I did for couple of years, it does not give you much individual privacy, the bathroom and kitchen were outside the rooms in the courtyard. It was just few big separate rooms where all the family share, it just won't suit modern day life at all. Also, by the way how many of these peasants, country houses were divided by inheritance, no one would be able to have for himself.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
Just that it consumes less energy.

Q 5.2 What makes a sustainable house in your opinion?
no

Q 5.3 What construction material you think suits Jordan best? What colours?
I think the current material is suitable, stone blocks and so.

Q 5.4 How comfortable is your house in:
Winter?
Summer*?*
Why?
This house is very cold, the old one as I said was warm in winter and cool in summer.

Q 5.5 Is there a season where utility bill increases?
Summer bills are higher with the fans and AC sometimes.

Q 5.6 Is there a room where you think it's hotter or colder? Why?
I think they are all the same, all windows come with one window for each.
What type of activities do you do in this room?

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
Natural of course but as I said not much space to breath or have privacy to set near a window or a balcony as the building are quite new to each other's sadly.

Q 5.8 Would you want bigger windows or smaller windows? And why?
In the old house the windows were very small and that's why it was also warm in winter and cold in summer.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?
It was warmer in winter and cooler in summer because the mud wall was so thick, and mud and hay acted as a natural insulator.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area
smaller windows area
pay more for insulation
View from house windows
I prefer bigger windows the more sun the better, my current house is not insulated, and I wish I did, I live in the last floor which is exposed to heat and cold wind. Beside these two things I would not like a smaller window.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?
Its ok, just many flaws in construction that mad it like that.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?
Yes, I would not mind that if they were necessary, but I don't have issue with sun now, we look for sun and ventilation especially in summer.

Q 5.12 Would you pay more money for a more sustainable house?
I would certainly do its important now as energy is more expensive.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?
No, I would not do, these methods were the product of their time, the circumstances and environment now are changed, people didn't have much money and they used to build by mud only, who have more money or access to stone would build by it and so on.

Q 5.14 Do you know if your house was thermally insulated?
Would you like if it was insulated?
Why didn't you care about insulating it?
Would you mind if it the walls were thicker, and your room size were smaller? Why?
No. yea it won't hurt a lot for the walls to be thicker

Q 5.15 Would you agree to use traditional methods and materials in your house? why?
No, I would not do, these methods were the product of their time, the circumstances and environment now are changed, people didn't have much money and they used to build by mud only, who have more money or access to stone would build by it and so on.

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Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

As long as it will help saving the environment I would.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, we are thinking about that. But how much the cost would be

Q 5.18 Would you prefer using local sourced material or imported one? Why?

If it will help environment and has good quality, why not.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Maybe with the separate setbacks there are more space for people to meet maybe and its much healthier than it used to be

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yea I do, I've been living here for a long time.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

Not necessary, we didn't have a place like that, and everyone was welcomed in each other's house, people notion about privacy, gender segregation and role were much difference from today, people were in modest cloths all day even in home and there were no issues of hosting each other's all day.

Q 6.3 How much do you know about Jordan building codes and regulations?

Not much honestly.

How much do you know about Jordan green building guide?

Never before

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why

No not until recently

Q 6.4 Any issues regarding laws or regulation you are aware of?

No nothing.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Nothing I can feel directly, no

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yes, it doses I feel so comfortable and safe here. The old house would not it was just big rooms where mutable people slept at

Q 7.2 Where do you host your guests?

In the living room or the guest room, and in the old one in

Q 7.3 Do you have a balcony, garden, or patio in your house?

Yea the balcony.

What do you use it for?

Just the roof top as we have a greenery there

How important do you think it is?

Which is more important? Why?

I prefer the view from here over setting on the ground level, also no one can directly see me from up here.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

nothing really. I think technology made old things obsolete and what left is the nostalgic feeling it had, just it

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

Nothing so far but I would like that.

What are these elements? What makes a house traditional?

Materials like mud and stone, arches inside the house,

Q 8.2 How much do you think your house suits your financial statue?

It ok now.

How much was the land price or house price a reason in choosing it?

Yea this apartment worth three times what we paid for when we bought it.

Do you think house prices here equal its value?

Not anymore everything is getting too expensive

Why?

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

Not at all, they only want profit.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

Not too expensive I hope, not much extra costs.

Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?

I prefer live with my family only, core one only. I tried living with my extended one and I didn't like it at all.

Q 8.6 Which do you value more?
Traditional life or modern one?

modern life and traditional type buildings.

Rural life or urban lifestyle

Rural places.

Individual life and personal space or Collection and community life

Individual is more convenient as work would not allow us to socials a lot.

Special looking house or similar looking houses?

similar looking is nice.

Q 8.7 Any additional comments/observations?
A traditional building is very nice.

Case and interview reference number: B08

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion

To be honest with we just got used to it, it might not suit another family, but we learned to live with it with few modifications. We did a lot of renovations and alternations to change it from a traditional house to modern one.

Q 2.2 What did you liked about your current house?
What did you dislike?

I think old things are blessed, and I liked it since the moment we decided to buy it, if it wasn't good it would not have lasted all this long. This is a few hundred years old house.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?

We lived in another house nearby and we changed it for a bigger one. It was tiny and our family was growing.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

We added a divider to make a new roam in the back of this courtyard, this courtyard we added a roof in top of it and turned it into a living room besides changing the tiles and paint. It didn't have tiling, we also added jimson boards on the walls are the stone walls were wet and full of holes and ashes.

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?

We added a divider to make a new roam in the back of this courtyard, this courtyard we added a roof in top of it and turned it into a living room besides changing the tiles and paint. It didn't have tiling, we also added jimson boards on the walls are the stone walls were wet and full of holes.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?

I think it's very good, we have three bedrooms a living room a kitchen and two bathrooms, its bit unorthodox compared to a modern house but I live here alone with my son so it's alright.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?

As you see the bathroom is somewhere external, but I think is alright. There is no chance to change much as I don't have money to do so.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain
I would say the third one. It looks new with bigger windows and balconies

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?
The second one perhaps I am not sure if there is anyone resembles mine. I think they have the same arched tall windows and stone.

Q 4.3 Which of the following buildings would you like to live in?
Why?
I would say the third one. It looks new with bigger windows and balconies

Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.
I would say the third one. It looks new with bigger windows and balconies. They all look nice. I think the second one is more traditionally represent Jordanian architecture, but you can see many of the other ones in all abroad Jordan too.

Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?
Yea here in salt many buildings look like that one

Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
Not the current one, I don't think so.

Q 4.7 why have people stopped making vernacular buildings?
Do you think it's good for today's living?
Do you think traditional materials is good for today or is it backward?
People look for progression and have decided that this does not suit them for a period of time, and as how much money they have they would build then.

Q 4.8 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?

5.0 Sustainability Indicator

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
Just that it consumes less energy.

Q 5.2 What makes a sustainable house in your opinion?
Am not sure I know.

Q 5.3 What construction material you think suits Jordan best? What colours?
I think the current material is suitable, stone blocks and so

Q 5.4 How comfortable is your house in:
Winter?
Summer?
Why?
It's warm in winter and cool in summer, look how thick the walls can be (point to the entrance door wall)

Q 5.5 Is there a season where utility bill increases?
Both are ok.

Q 5.6 Is there a room where you think it's hotter or colder? Why?
I think they are all the same.
What type of activities do you do in this room?

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
Natural of course it's better and healthier and weather here is nice. I have a breathing and a heart condition I can't use AC anyway and when I open the door in summertime, I can get a cool nice breeze from here.

Q 5.8 Would you want bigger windows or smaller windows? And why?
The windows are big and pretty although because we covered the courtyard and make a divider, we ended

up with a room which its windows open to the living area. The windows are arched one and look pretty as they are.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

Traditional building was better and cooler, especially with its thick walls, they kept a good feeling inside.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

I would not mind doing any of these as long as it's going to help the environment or me financially (laughs), the climate indeed is changing, and we need to do something about that.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

Its ok, just many flaws in construction that mad it like that.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

No, I would mind I love the sun coming inside.

Q 5.12 Would you pay more money for a more sustainable house?

I would certainly as it would make things easier and healthier for me.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

it all goes back to the owner whether he wants to mimic traditional design or not, or his image or view to these buildings, we had to make many changes to suit everyday modern life, even our house I think it is a hybrid between what is old and new, without that living here would be very hard, we can connect new buildings with old by taking elements from old design like stones windows and doors

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

I don't know, and I would like that, I would even add double glazed windows and roll shutters to help protect for solar gains and winds in winters.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

I don't think it's possible now everyone who knew how to build using them are dead now, its lost now.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

As long as it will help saving the environment I would.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, we are thinking about that. But depends on how affordable they are.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

If it will help environment and has good quality, why not.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Where we lived there were not many houses, but the way people lived and interacted with each other's was more sociable and people would meet every night at someone's house. Relationships were much stronger. Also, this area is very old and there were no regulations and thus you see the houses are very close to each other's. People would gather on the steps between the houses.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yea I do.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

Not necessary, we didn't have a place like that, and everyone was welcomed in each other's house, people notion about privacy, gender segregation and role were much difference from today, people were in modest cloths all day even in home and there were no issues of hosting each other's all day.

Q 6.3 How much do you know about Jordan building codes and regulations?

Not much honestly. Can't recall anything.

How much do you know about Jordan green building guide?

This is the first time I hear about it.

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why

no

Q 6.4 Any issues regarding laws or regulation you are aware of?

No nothing.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Nothing I can feel directly, no

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Old houses didn't have individual privacy at all, all sort of different people and guest were coming and going all night. And all the rooms have opening to the main courtyard. This house dose though it has many separate rooms here unlike older versions.

Q 7.2 Where do you host your guests?

In this living room which is not ideal as it is in the middle of the house and all the other rooms lead here which makes it rather inconvenient for my family members when I have guests over.

Q 7.3 Do you have a balcony, garden, or patio in your house?

The balcony, it's very nice.

What do you use it for?

Relax there

How important do you think it is?

Which is more important? Why?

I prefer the view from here over setting on the ground level, also no one can directly see me from up here.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

Yes, we still have the old library with many of old trinket and antiques here. The house is listed which makes me happy to live in

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

We bought it

What are these elements? What makes a house traditional?

Materials like mud and stone, arches inside the house, the long-shaped windows. These building didn't even suffer from dampness and had such thick walls. Indoor closets that were used for storing grains and dried food, there were no architects back then and people were poorer than now, they only built houses to house them and to meet their simple needs back then. High ceiling now and archer domes. It's hard to build houses like old times because they needed a lot of space that with current land prices you can't afford or fined.

Q 8.2 How much do you think your house suits your financial statue?

It ok now.

How much was the land price or house price a reason in choosing it?

Yes, was good

Do you think house prices here equal its value?

Not anymore everything is getting too expensive

Why? People are demanding more now.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

Not at all, they only want profit.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

I would not mind in my financial abilities.

Q 8.5 Would you prefer to:

Live only with your children as they grow?

Live with your children's family or parents in the same building?

House other relatives in the same building?

I prefer live with my family only, core one only. No one would like that anymore (laughs)

Q 8.6 Which do you value more?

Traditional life or modern one?

Traditional life and traditional type buildings.

Rural life or urban lifestyle

Rural places.

Individual life and personal space or Collection and community life

Individual is more convenient as work would not allow us to socials a lot.

Special looking house or similar looking houses?

Special looking is nice.

Q 8.7 Any additional comments/observations?

Traditional buildings are very nice to look at but not so much to live in that's all I want to say.

Case and interview reference number: B10

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion

My house supports my current and future my household needs and modern lifestyle, also it completely supports our culture and religion.

Q 2.2 What did you like about your current house?
What did you dislike?

I like it because it is in middle of a market, and people here in the area know each other, not as in commercial buildings. I dislike the most that the neighbourhood started to be full of foreigners which is not convenient.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?

I liked that my parents' house was in middle of a market as well. I moved out because of marriage.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

Yes, I would of course, to add new rooms for my kids when they grow up.

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?

Yes, I have made, such as I added wall ceramic tiles to protect the house because it is so old. Also, I added new concrete columns to build a new store.
I made these changes to renew our life, and to protect the house.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?

No, they are not. Because bathroom is directed to the living room which is not comfortable at all. But on the other hand, other rooms are well distributed and so big as well, such as 6.00*6.00m is my daughters room dimensions!

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?

It can adapt my future needs of course. Also, tourism ministry gave us a permission to open a restaurant in my house because it is traditional, which is a special opportunity to host guests and tourists.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain

I think building B, because it is covered with structural stone which make the house war, in winter and cool in summer. Also, it has the ability for adding new spaces and rooms.

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?

Building B, both have same windows shape, same type of structural stone.

Q 4.3 Which of the following buildings would you like to live in?
Why?

I would choose building B, I don't like multi-stores buildings because it is not comfortable for me and doesn't provide good privacy. I did not like this type of affordable apartments that are not built using natural stone, and they look dull and lifeless to me

Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.

Building A and C, and multi-stores building in general, support modern lifestyle, which is the only good thing I like about, but still not as good as independent buildings.
Building B represents Jordanian architecture for sure.

Q 4.5 Have you seen any building like in picture number b?

What does it represent to you?

Yes, I have, here in the area. It represents traditional buildings, restaurants, and museums.

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

Absolutely it does, and I am planning to open it as a traditional restaurant. Architecturally, it has special internal designs, really thick walls, and old squared windows. And by the materials used; stone and mud.

Q 4.7 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

My current house is one of them.

Q 4.8 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

Actually, people now trying to go back in time and build their buildings so much like traditional buildings.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

Yes, I do.

Q 5.2 What makes a sustainable house in your opinion?

I think they are independent houses with a garden where you can grow trees and plants which give you fresh air at night.

Q 5.3 What construction material you think suits Jordan best? What colours?

White structural stone and cement.

Q 5.4 How comfortable is your house in:

Winter?

Summer*?*

Why?

It is really comfortable in both summer and winter.

Q 5.5 Is there a season where utility bill increases?

The house is really good in summer and winter time so not really.

Q 5.6 Is there a room where you think it's hotter or colder? Why?

What type of activities do you do in this room?

Yes, my bedroom is colder in summer and warmer in winter than other rooms in my house, because behind its wall there are a lot of rocks, also it has good ventilation.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

I prefer natural ventilation. Its better and healthier to have fresh air I the house.

Q 5.8 Would you want bigger windows or smaller windows? And why?

I like them in their current size.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

It was easier for sure, because it is built with structural stone because it works as a thermal insulation.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

I choose a bigger house (laughing)

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

Yes, of course, because it is built with structural stone.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

No, I wouldn't prefer, because I don't have that much of sunlight.

Q 5.12 Would you pay more money for a more sustainable house?

Yes, I would.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

It is already a traditional house.

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

It is not thermal insulated, but mud and stonework as a thermal insulation system.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

It is already a traditional house. I am not sure I would use traditional materials in my next house. They need a lot of maintenance and the house can get dusty from them easily.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

Yes, I would agree, and in my nature, I recycle and reuse a lot of materials and things.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, I would, because it will reduce utilitiy bells.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

Yes, I would.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Yes, it does.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yes, I do.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

It is important, we have a lot of communal spaces between the streets and alleys here in Khader street and it really makes you feel connected with everyone. There are also few squares scattered across downtown like Al-Ain square where elderly meet and play dice and Mangala

Q 6.3 How much do you know about Jordan building codes and regulations?

How much do you know about Jordan green building guide?

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why?

Not so much, but I heard from my sisters.

I never heard of green building guide. And yes of course I would be interested in sustainability elements in my house.

Q 6.4 Any issues regarding laws or regulation you are aware of?

No issues.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

The only problem is having so much empty houses; they are not used either from their owners or from the ministry itself.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yes, it does.

Q 7.2 Where do you host your guests?

In the guest room.

Q 7.3 Do you have a balcony, garden, or patio in your house?

What do you use it for?

How important do you think it is?

Which is more important? Why?

I have a garden and a roof. And I think roof is the most important one to me.

Usually, I set in my bedroom to relax.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

Yes, for sure. It reflects my values and my taste.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

What are these elements? What makes a house traditional?

I bought it. yes, I do have traditional elements, and actually my husband did a traditional festival here one day.

Q 8.2 How much do you think your house suits your financial statue?

How much was the land price or house price a reason in choosing it?

Do you think house prices here equal its value?

Why?

It suits my financial statue really well. and the price was a big reason in choosing it. and yes, it equals its value.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

I would prefer to build a house as I want because I am tired of modifying and improving.

Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?

I would live with my children as they grow.

Q 8.6 Which do you value more?
Traditional life or modern one?
Individual life and personal space or Collection and community life
Special looking house or similar looking houses?

I value more an in between traditional and modern house and lifestyle, within a countryside, within a community, with a special looking house.

Q 8.7 Any additional comments/observations?

Case and interview reference number: B12

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion

I love my house and it supports all my household needs. And of course, it supports traditional lifestyle. Also, it supports culture for me but that doesn't mean it supports it for other people, because it is a traditional house.

Q 2.2 What did you like about your current house?
What did you dislike?

I love all the house, and I love its location. There is nothing I don't like about.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?

I have been living in Zarqa in my family house which I liked it because of them. And no, there is nothing I don't like about.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?
No, I wouldn't like to do any changes.

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?

Yes, I have. I added gypsum boards for the ceiling to minimize its height, because it used to get so cold in winter because of that. Also, windows were so old, so I changed them.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?

Before, internal spaces didn't suit my family needs, there were no privacy provided because all rooms were open to each other, also bathroom was in the corridor. But I changed all these things. And I added a plaster layer above the stone wall because it wasn't convenient.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?

I think it can't be changed more than this.
There are no internal constraints, but the regulations are a constraint in making external changes.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain

I have no idea to be honest.

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?
Q 4.3 Which of the following buildings would you like to live in?
Why?
Building B, I just don't like any type of buildings but traditional.
Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.
For me, I am always in the side of traditional buildings, so I only like them. And I think all these new buildings in Jordan are far away from our original culture and heritage.
Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?
I already live in one.
Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
I believe there are no relations at all between traditional and nowadays buildings.
Q 4.7 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?
I am already living in one, I like how comfortable I feel by living here, also my guests feel the same way when they come to a visit,
Q 4.8 why have people stopped making vernacular buildings?
Do you think it's good for today's living?
Do you think traditional materials is good for today or is it backward?
Because we imitate what other countries and people do. And of course, traditional buildings and materials still good for today's living.

5.0 Sustainability Indicators
Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
No, I don't.
Q 5.2 What makes a sustainable house in your opinion?
I have no idea.
Q 5.3 What construction material you think suits Jordan best? What colours?

I really don't know that much about materials, but structural stone I think.
Q 5.4 How comfortable is your house in:
Winter?
Summer?
Why?
It was really cold in winter because the ceiling was really high, so we minimized it to solve the problem. But in winter it is comfortable.
Q 5.5 Is there a season where utility bill increases?
No answer.
Q 5.6 Is there a room where you think it's hotter or colder? Why?
What type of activities do you do in this room?
Yes, I have a really cold bedroom because sunlight don't enter it for long time. But on the other hand, I have another room which is really hot. I think it depends on house location and direction.
Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
We don't use ACs, and actually we started to use fans recently.
Q 5.8 Would you want bigger windows or smaller windows? And why?
I would like if they were bigger for providing more sunlight.
Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?
It was easier because of the materials used, walls thickness, ventilation system…
Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area

smaller windows area

pay more for insulation

View from house windows

No answer.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

No answer.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

I already use them.

Q 5.12 Would you pay more money for a more sustainable house?

No answer.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

If I want to build a new building, yes, I will use traditional materials and methods.

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

It is not thermally insulated.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

If I want to build a new building, yes, I will use traditional materials and methods

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

No answer.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, I would prefer.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

No answer.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Yes, it does. There are plenty of open spaces to use and the alleys are shaded which makes it nice to sit in in summertime

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yes, I do. I have lived here all my life

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

We don't have such a place, but we usually meet in each other houses, especially in the morning.

And actually, I am planning to convert the house beside me to a restaurant or a café with a traditional look.

Q 6.3 How much do you know about Jordan building codes and regulations?

How much do you know about Jordan green building guide?

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why?

No, in never heard of green building guide. And yes, I ask my brother (architectural engineer) frequently about any changes or suggestions regarding the house.

Q 6.4 Any issues regarding laws or regulation you are aware of?

No issues.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

No issues.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

It does provide privacy but not as modern buildings.

Q 7.2 Where do you host your guests?

No answer.

Q 7.3 Do you have a balcony, garden, or patio in your house?

What do you use it for?

How important do you think it is?

Which is more important? Why?

I usually set in the patio to relax, which contains a nice view and some plants.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

No answer.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

What are these elements? What makes a house traditional?

It is a family house.

If I would like to build a new house, I would like to use arches, structural stone and windows with traditional look, with a low height ceiling.

Q 8.2 How much do you think your house suits your financial statue?

How much was the land price or house price a reason in choosing it?

Do you think house prices here equal its value?

Why?

I think traditional houses prices nowadays are so expensive.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

I don't think so.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

No answer.

Q 8.5 Would you prefer to:

Live only with your children as they grow?

Live with your children's family or parents in the same building?

House other relatives in the same building?

I would live with my children as they grow.

Q 8.6 Which do you value more?

Traditional life or modern one?

Individual life and personal space or Collection and community life

Special looking house or similar looking houses?

I value more a traditional lifestyle in a traditional and a special looking house within a community life.

Q 8.7 Any additional comments/observations?

Case and interview reference number: B13

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:

Household

traditional Lifestyle

Modern lifestyle

Culture

Religion

My house kind of support a modern lifestyle because it has 3 bedrooms but with only one bathroom. And I think it supports traditional lifestyle as well. and it supports our culture and religion.

Q 2.2 What did you like about your current house?

What did you dislike?

I like its location so much because it is a traditional location full of traditional houses.

Q 2.3 What do you like about your previous house?

What did you dislike?

Why did you move?

I was living in an older house with my family, but I moved out because of marriage.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

Yes, I would like to change windows to new ones because they are so old.

Q 3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

Yes, I have planned to change its windows.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

I like it but the problem is with the bathroom, because we only have one and it is located in front of the house which/ means it is open to the guests when they come and provides no privacy.

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?
It can adapt my future needs by doing some changes. And regulations are not an obstacle.

4.0 vernacular architecture related metrics
Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain
I think building B because it has so many windows, balconies, gardens and trees.

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?
Building B is the best compare to mine, both of them have so many windows and have a roof.
Differences are my house doesn't have neither balcony nor gardens and trees, also mine is not built of stone
Q 4.3 Which of the following buildings would you like to live in?
Why?
Building B because I like old buildings more.
Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.
I like about building B its windows, the roof, and the free play area it has. I don't like anything about buildings A and C because I feel new buildings more likely as boxes, they also look so crowded.
Of course, building B represents Jordanian architecture the best with its old-style building, yellow stone and windows shape.
Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?
Yes, of course all around the city, they are really beautiful buildings and I feel so comfortable by only looking at it.
Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
My house relates not to very old buildings, kind of architecturally but not by materials.
Q 4.7 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?
Yes, I have. I moved out because of marriage.
Q 4.8 why have people stopped making vernacular buildings?
Do you think it's good for today's living?
Do you think traditional materials is good for today or is it backward?
I think because people looking for improvements and more modern life. And yes, I think these buildings suit nowadays living, but traditional materials don't suit todays needs so much.
5.0 Sustainability Indicators
Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
No, I don't.
Q 5.2 What makes a sustainable house in your opinion?
Maybe by having so many windows that provide fresh air and sunlight to the house, also by having trees and plants within it.
Q 5.3 What construction material you think suits Jordan best? What colours?
Cement and blocks. But for me I prefer old structural stone.
Q 5.4 How comfortable is your house in:
Winter?
Summer*?*
Why?
It is not comfortable in both summer and winter, so I use fans and heating devices.
Q 5.5 Is there a season where utility bill increases?
Yes, in winter because I use heating devices, and in winter because I use cooling devices.
Q 5.6 Is there a room where you think it's hotter or colder? Why?
What type of activities do you do in this room?
No answer.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

Natural ventilation for sure.

Q 5.8 Would you want bigger windows or smaller windows? And why?

I like them in their current size.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

I think it was easier, because in summer is cooler and in winter is warmer, I guess because of using mud maybe and thick walls.

I think they used to use tow stones with empty space in between to insulate the house thermally.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

I would choose smaller house and paying more money in order to have sustainable house.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

Yes, I do think so.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

I wouldn't use, I don't like them.

Q 5.12 Would you pay more money for a more sustainable house?

Yes, I would.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

If they will be good for the house, then why not!

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

It is not thermally insulated. And I don't really have interested in thermal insulation because I never tried it. also, I do mind getting thicker walls because house will be smaller.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

If they will be good for the house, then why not!

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

If it has good quality and good price, then why not to use it!

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

I would prefer yes,

Q 5.18 Would you prefer using local sourced material or imported one? Why?

If it is high quality material, then why not!

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Yes, it does.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

I do value them of course.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

I would prefer that actually, but we don't have one. I would like to have one in my house if I have space for it.

Q 6.3 How much do you know about Jordan building codes and regulations?

How much do you know about Jordan green building guide?

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why?

I don't know about them, also I don't know about green buildings guide.

And no, I never been asked from an engineer about such elements.

Q 6.4 Any issues regarding laws or regulation you are aware of?

No issues.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Yes, I hate being houses so close to each other.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Not really, because I have a shared wall with my neighbours which provides no privacy at all.

Q 7.2 Where do you host your guests?
In a guest room. And guests are not allowed to enter rest of the house.
Q 7.3 Do you have a balcony, garden, or patio in your house?
What do you use it for?
How important do you think it is?
Which is more important? Why?
I set on the roof. I don't have a balcony or a garden, but I think garden is the most important one to have.
Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
Yes, I think so. For example, we have separate places to host guests, for men and women.

8.0 Ownership and lifestyle indicators
Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
What are these elements? What makes a house traditional?
I had from my uncle. And yes, I would like to use traditional elements such as arches and old windows.
Q 8.2 How much do you think your house suits your financial statue?
How much was the land price or house price a reason in choosing it?
Do you think house prices here equal its value?
Why?
It suits my financial statue really well. and I think its price is good.
Q 8.3 Do you think commercial building slandered takes financial conditions for people?
No, they are expensive.
Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
I would prefer a cheap house with a garden then I will improve it by my own.
Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I prefer to live with my children as they grow, also I don't mind if they want to stay with me while they marred.
Q 8.6 Which do you value more?
Traditional life or modern one?
Individual life and personal space or Collection and community life
Special looking house or similar looking houses?
I prefer an in between traditional and modern lifestyle, a traditional building, in a countryside, with community life, and a special looking house with a yard.

Case and interview reference number: B22

2.0 cultural Indicators
Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion
My house supports traditional and modern lifestyle, as well as county's culture and religions.
Q 2.2 What did you like about your current house?
What did you dislike?
I like how it still has the Jordanian heritage soul. And o like every single stone in it.
Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?
I was living in a traditional house as well. I moved out because it was small in size and I wanted a bigger one.

3.0 House organization and space arrangement
Q 3.1 Would you like to change anything in your house? If so, what and why?
No, I wouldn't like to change anything.
Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

I haven't made any changes, but I renewed and improved my kitchen to become cleaner and bigger, and other small changes like painting walls.

No external changes.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

Yes, they are. Because I have a small family, and everyone is comfortable.

Every single spot is utilized.

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

Actually, I am planning to convert it to a restaurant or a hotel, but money is the only constraint.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

I think building B, because it is big in size, has so many windows and the location been nice.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

Building B, both have the same windows, same structural stone, and same balconies. And there are no differences.

Q 4.3 Which of the following buildings would you like to live in?

Why?

Building B, because it has nice ottoman windows, and I like the smell of old stone. Also, it is warm in winter and cold in summer.

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

Building C looks like modern buildings, but I don't like it because I feel it is complicated. I like simple houses more. Building A looks a commercial building, I only like to live in its ground floor only.

Building B represents Jordanian architecture and community values because it reminds us with our heritage and our history.

Q 4.5 Have you seen any building like in picture number b?

What does it represent to you?

Yes, in Salt city and in Syria. I like the vibes that these houses give to me.

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

Yes, there are a lot. Architecturally and by the materials used. It has a yellow stone, unique old looking entrance, old windows as well.

Q 4.7 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

I live in one already.

Q 4.8 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

I think because traditional materials are not available anymore. And of course, traditional buildings are suitable for today's living, and I think they are better and healthier.

And if traditional materials are available, I don't think they would suit today's needs.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

No, I don't know anything about it.

Q 5.2 What makes a sustainable house in your opinion?

I think it is a house with solar panels.

Q 5.3 What construction material you think suits Jordan best? What colours?

I think brown colour is the best.

Q 5.4 How comfortable is your house in:
Winter?
Summer?
Why?
It is comfortable in both summer and winter. Because of the stone which save energy.
Q 5.5 Is there a season where utility bill increases?
When I have so much work.
Q 5.6 Is there a room where you think it's hotter or colder? Why?
What type of activities do you do in this room?
Yes, boys' room is colder in summer and warmer in winter because it has windows in both east and west direction, as well as living rooms.
Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
Natural ventilation.
Q 5.8 Would you want bigger windows or smaller windows? And why?
I like them as they are now
Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?
They were easier, because of the stone as I mentioned before, and by natural ventilation from windows.
Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area
smaller windows area
pay more for insulation
View from house windows
I would choose to pay more money.
Q 5.11 Do you think your house suits Jordan environment and climate? Why?
Yes, I do think so.
Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?
I will use it if I have to use it.
Q 5.12 Would you pay more money for a more sustainable house?
Yes, I wouldn't mind.
Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?
If it was available yes of course I would use it.
Q 5.14 Do you know if your house was thermally insulated?
Would you like if it was insulated?
Why didn't you care about insulating it?
Would you mind if it the walls were thicker, and your room size were smaller? Why?
No, it is not insulated, but its stone works as an insulation material. And yes, I would mind thicker walls.
Q 5.15 Would you agree to use traditional methods and materials in your house? why?
If it was available yes of course I would use it.
Q 5.16 Would you agree to use recycled or reused materials for your house? Why?
Yes, I would agree.
Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?
Yes, I would prefer.
Q 5.18 Would you prefer using local sourced material or imported one? Why?
Yes, I would prefer.

6.0 Zoning and regulation
Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?
Yes, it does.
Q 6.2 Do you value your neighbours and neighbourhood? Why?
Yes, I do value them.
Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what and where would you like it? Show on the map?
We don't have such a place, but we usually meet in each other's houses.
Q 6.3 How much do you know about Jordan building codes and regulations?
How much do you know about Jordan green building guide?
Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
Would you have interested in them? Why?
No, I don't know anything about them.
Q 6.4 Any issues regarding laws or regulation you are aware of?

No issues.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Yes, it is so old and have so many stairs, and sadly it is hard to be organized.

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Yes, of course. In all rooms because I designed it by myself.

Q 7.2 Where do you host your guests?

In the guest room. And they are not allowed to enter other rooms.

Q 7.3 Do you have a balcony, garden, or patio in your house?

What do you use it for?

How important do you think it is?

Which is more important? Why?

I have a balcony, but I set usually in the living room to relax.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

Yes, of course, my house is everything to me.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

What are these elements? What makes a house traditional?

It is a rented house.

Almost all of it contains traditional elements, such as windows, entrance, and stone.

Q 8.2 How much do you think your house suits your financial statue?

How much was the land price or house price a reason in choosing it?

Do you think house prices here equal its value?

Why?

Yes, it suits my financial statue, and I think houses prices here equal their values.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

No, I don't think so.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

I want to buy a cheap house and improve and design it by my own.

Q 8.5 Would you prefer to:

Live only with your children as they grow?

Live with your children's family or parents in the same building?

House other relatives in the same building?

I want to live only with your children as they grow.

Q 8.6 Which do you value more?

Traditional life or modern one?

Individual life and personal space or Collection and community life

Special looking house or similar looking houses?

I value more a traditional lifestyle and house, within a countryside, with a community life, and a special looking house.

Q 8.7 Any additional comments/observations?

Case and interview reference number: B26

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:

Household

traditional Lifestyle

Modern lifestyle

Culture

Religion

Not at this point but this is what we can afford now. Also, it's a rented house so not much we can do to it while it's not our house.

Q 2.2 What did you liked about your current house?

What did you dislike?

The ceiling is in a very bad condition and needs repairing desperately, I just like its location as its close to the market and schools and to where my husband works

Q 2.3 What do you like about your previous house?

What did you dislike?

Why did you move?

We lived in another house nearby and we changed it for a bigger one. It was tiny and our family was growing.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

There is so much we need to do, the courtyard needs to be cleaned from building materials we used to repair the house, also renovation work and making the kitchen more suitable.

Q 3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

Just general repairing works and adding cement coating to the walls and roofs for winter times. It's just two-bedroom house with a kitchen and a bathroom with a courtyard, proper old-style house.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?

Explain why, why not

Do you think that spaces in your house are ideally distributed?

. It's just two-bedroom house with a kitchen and a bathroom with a courtyard, proper old-style house. We are fine to that if we were able to fix it

Q 3.4 How much do you think your house can adapt to your future needs?

What are the opportunities and constraints associated with living in your house?

What are the constraints to making changes to suit your needs?

As you see the bathroom is somewhere external, but I think is alright. There is no chance to change much as I don't have money to do so. And the house is not ours.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?

In what way? Please explain

I don't like apartments or living high above the ground but maybe the second house suits me better, I've lived in similar old houses and it really makes you comfortable and gives you more privacy and peace of mind.

Q 4.2 Which example best compare with your own home?

What are the similarities?

What are the differences?

The second one perhaps I am not sure if there is anyone resembles mine. Same type of stone.

Q 4.3 Which of the following buildings would you like to live in?

Why?

I would say the third one. It looks new with bigger windows and balconies

Q 4.4 What do you like about each one?

What do you dislike?

Which of the buildings best represent Jordanian architecture in your view? Why?

In what way? Please explain.

I would say the third one. It looks new with bigger windows and balconies. They all look nice. I think the second one is more traditionally represent Jordanian architecture, but you can see many of the other ones in all abroad Jordan too.

Q 4.5 Have you seen any building like in picture number b?

What does it represent to you?

Yea here in salt many buildings look like that one

Q 4.6 Does your house relate to the architectural heritage in Jordan?

How?

Aesthetically and form?

Material?

Not the current one, I don't think so.

Q 4.7 why have people stopped making vernacular buildings?

Do you think it's good for today's living?

Do you think traditional materials is good for today or is it backward?

I think that the materials used to build them got depleted also no one now living knows how build like these, new materials and methods of construction were created.

Q 4.8 Have you ever lived or are living in vernacular building?

What do you like about it?

What do you hate?

(Why did you move)?

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

Don't know anything

Q 5.2 What makes a sustainable house in your opinion?

Am not sure I know.

Q 5.3 What construction material you think suits Jordan best? What colours?

I think the current material is suitable, stone blocks and so

Q 5.4 How comfortable is your house in:

Winter?

Summer*?*

Why?

It's warm in winter and cool in summer,

Q 5.5 Is there a season where utility bill increases?

Both ok.

Q 5.6 Is there a room where you think it's hotter or colder? Why?

I think they are all the same.

What type of activities do you do in this room?

No answer

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

Natural of course it's better and healthier and weather here is nice. I have a breathing and a heart condition I can't use AC anyway and when I open the door in summertime, I can get a cool nice breeze from here.

Q 5.8 Would you want bigger windows or smaller windows? And why?

The windows are big and pretty, but I would add more windows to the house,

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

Traditional building was better and cooler, especially with its thick walls, they kept a good feeling inside.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

I would not mind doing any of these as long as it's going to help me financially (laughs), but again I can't afford them

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

Its ok, just many flaws in construction that made it like that.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

No, I would mind I love the sun coming inside.

Q 5.12 Would you pay more money for a more sustainable house?

I would certainly as it would make things easier and healthier for me.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

I am very convinced. with how it is but I think if I built a new one, I would not use the same materials. I would make a modern one of course everyone wants a better thing or an upgrade. You would not find them anyway. It is just too expensive for me

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

I don't know, it's an old house beside the old materials I don't think it was.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

I don't think it's possible now everyone who knew how to build using them are dead now, its lost now.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

If its amore affordable and better yes

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, we are thinking about that. But depends on how affordable they are.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

Definitely

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Where we lived there were not many houses, but the way people lived and interacted with each other's was more sociable and people would meet every night at someone's house. Relationships were much

stronger. Also, this area is very old and there were no regulations and thus you see the houses are very close to each other's. People would gather on the steps between the houses.

Q 6.2 Do you value your neighbours and neighbourhood? Why?
Yea I do.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what and where would you like it? Show on the map?
Not necessary, we didn't have a place like that, and everyone was welcomed in each other's house, people notion about privacy, gender segregation and role were much difference from today, people were in modest cloths all day even in home and there were no issues of hosting each other's all day.

Q 6.3 How much do you know about Jordan building codes and regulations?
Not much honestly. Can't recall anything.
How much do you know about Jordan green building guide?
This is the first time I hear about it.
Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
Would you have interested in them? Why
no

Q 6.4 Any issues regarding laws or regulation you are aware of?
No nothing.

Q 6.5 Any issues regarding how the neighbourhood have been designed?
Nothing I can feel directly, no

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Yes, my house dose provides enough privacy, and I feel so comfortable and safe here. However, vernacular houses usually did not provide individual. They would only have few big communal rooms that served all life purposes from sleeping to living, cooking, working and even hosting guests. Sound transmission is also an issue as materials and stone do not conceal sound well, and houses are very close to each other

Q 7.2 Where do you host your guests?
No answer

Q 7.3 Do you have a balcony, garden, or patio in your house?
The courtyard, I like in summer as its cooler and allows for cool breezes to go inside the house
What do you use it for?
Relax there
How important do you think it is?
Which is more important? Why?
I prefer the view from here over setting on the ground level, also no one can directly see me from up here.

Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
Yes, we still have the old library with many of old trinket and antiques here. The house is listed which makes me happy to live in.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
We bought it
What are these elements? What makes a house traditional?
Materials like mud and stone, arches inside the house, the long-shaped windows. These building didn't even suffer from dampness and had such thick walls. Indoor closets that were used for storing grains and dried food, there were no architects back then and people were poorer than now, they only built houses to house them and to meet their simple needs back then. High ceiling now and archer domes. It's hard to build houses like old times because they needed a lot of space that with current land prices you can't afford or fined.

Q 8.2 How much do you think your house suits your financial statue?
It ok now.
How much was the land price or house price a reason in choosing it?
Yes, was good
Do you think house prices here equal its value?
Not anymore everything is getting too expensive
Why? People are demanding more now.
Q 8.3 Do you think commercial building slandered takes financial conditions for people?
Not at all, they only want profit.

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
I would not mind in my financial abilities.

Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I prefer live with my family only, core one only. No one would like that anymore (laughs)

Q 8.6 Which do you value more?
Traditional life or modern one?
Traditional life and traditional type buildings.
Rural life or urban lifestyle
Rural places.
Individual life and personal space or Collection and community life
Individual is more convenient as work would not allow us to socials a lot.
Special looking house or similar looking houses?
Special looking is nice.

Q 8.7 Any additional comments/observations?
A traditional building is very nice.

Case and interview reference number: B27

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture
Religion

I think traditional built houses like this suit both winter and summer, but it needs bit more of renovation work every now and then. I lived with my family here and all my kids grow up here, we were just living as our finance allowed us to. No one sadly would be convinced to live in a house like this special room's layout is not to today's standers.

Q 2.2 What did you liked about your current house?
What did you dislike?
I liked it just because I've been living here for a long time, this is where I raised my family, since 1955. As I said its small and layout is not suitable for modern life.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?
No answer

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?
Ye, maintenance work. Fixing the ceiling, adding tiles to prevent water from coming in, paintwork and so on. Even if we have the money now, we do not feel encouraged to do it as it will not last long. It was less than a year since we did the ceiling and look, paint is falling off already

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?
I did tremendous work over the years. I connected the house to the water network when it arrived, to the sewage network as well and added an inside bathroom beside the one that you see in the outside (in the courtyard), electricity, paint works, adding tiles to the courtyard floor (it was just a simple laid cover made of old type of cement and mud people used to build with), changed the doors, we added a new room and divided the big arched hall into two.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?
I said its small and layout is not suitable for modern life. It's just three rooms surround this outside open area.

Q 3.4 How much do you think your house can adapt to your future needs?

I think this is as far as it can be done, the rooms only windows are towards this semi-courtyard, I can't cover it or build more rooms in front of them and the structure wont held another level (its already part of a bigger building complex with two stories. Also, I can't afford to do kore, laws say do what you want inside just don't touch the outside.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain

I would guess the second ones, old traditional houses like the one I lived they were much better and didn't need much energy to sustain. Plus, they are way less dense than newer ones.

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?

The second one looks like my current house.

Q 4.3 Which of the following buildings would you like to live in?
Why?

Same place I would not like living in dense apartment buildings.

Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.

The second one looks nice also the newer buildings and apartments blocks won't have a breathing space beside the small balcony they have, small windows as well as windows and aluminium cost more than blocks and stones.

Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?

Many houses here in Salt looks like them.

Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?

Nothing at all.

Q 4.7 why have people stopped making vernacular buildings?
Do you think it's good for today's living?
Do you think traditional materials is good for today or is it backward?

They just can't afford or know how to make buildings like these, with current cost building a traditional house would cost more and it last for generations before needing to fix it, not like cheap building materials of today's buildings.

Q 4.8 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?

Yes, I did for couple of years, it does not give you much individual privacy, the bathroom and kitchen were outside the rooms. It was just two big volumes arched volumes/rooms where all the family share, it was a very simple peasant type of house where the peasants use only in some short periods of time while the rest, they would spend in the fields working. It just won't suit modern day life at all. Also, by the way how many of these peasants, country houses were divided by inheritance, no one would be able to have for himself.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

Just that it consumes less energy.

Q 5.2 What makes a sustainable house in your opinion?

Am not sure I know.

Q 5.3 What construction material you think suits Jordan best? What colours?

I think the current material is suitable, stone blocks and so. Just better quality not like todays materials

Q 5.4 How comfortable is your house in:
Winter?
Summer?
Why?

It's warm in winter and cool in summer

Q 5.5 Is there a season where utility bill increases?

Same really

Q 5.6 Is there a room where you think it's hotter or colder? Why?

I think they are all the same.

What type of activities do you do in this room?

No answer

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?

Natural of course

Q 5.8 Would you want bigger windows or smaller windows? And why?

We have big windows as the windows open to this semi-internal space as it shades the house

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?

Do you have any idea how people used to do to insulate or regulate house temperature?

Traditional building was better and cooler, especially with its thick walls, they kept a good feeling inside.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)

smaller house area

smaller windows area

pay more for insulation

View from house windows

With its thick walls it is.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?

Its ok.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?

yes, I would not mind that if they were necessary, but I don't have issue with sun now

Q 5.12 Would you pay more money for a more sustainable house?

I would certainly as it would make things easier and healthier for me.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?

I would if I can find, this house is good it just needs more renovation and upgrade.

Q 5.14 Do you know if your house was thermally insulated?

Would you like if it was insulated?

Why didn't you care about insulating it?

Would you mind if it the walls were thicker, and your room size were smaller? Why?

No answer

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

Maybe, they need a lot of maintenance or how good will it look so it depends on that.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

As long as it will help saving the environment I would.

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, we are thinking about that. But how much the cost would be

Q 5.18 Would you prefer using local sourced material or imported one? Why?

If it will help environment and has good quality, why not.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Old houses certainly gave more chances for people to meet and to be closer and more intimate, even between neighbours, not like now, people would be at each other's house all day, every day at a new person.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yea I do, but still, I prefer old neighbourhood more. It's just about being connected to that place, I had my two kids there and I started my life there too.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

Not necessary, we didn't have a place like that, and everyone was welcomed in each other's house, people notion about privacy, gender segregation and role were much difference from today, people were in modest cloths all day even in home and there were no issues of hosting each other's all day.

Q 6.3 How much do you know about Jordan building codes and regulations?

Not much honestly. Can't recall anything.

How much do you know about Jordan green building guide?

This is the first time I hear about it.

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why

Yea we were told about the indoor insulation by one.

Q 6.4 Any issues regarding laws or regulation you are aware of?
No nothing.
Q 6.5 Any issues regarding how the neighbourhood have been designed?
Nothing I can feel directly, no

7.0 social relations and privacy indicators
Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Yes, it doses I feel so comfortable and safe here.
Q 7.2 Where do you host your guests?
In the living room or the guest room
Q 7.3 Do you have a balcony, garden, or patio in your house?
Yea the balcony.
What do you use it for?
Yea am setting there all day (laughs) it's my special place.
How important do you think it is?
Which is more important? Why?
I prefer the view from here over setting on the ground level, also no one can directly see me from up here.
Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
no nothing really.

8.0 Ownership and lifestyle indicators
Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
Nothing so far but I would like that.
What are these elements? What makes a house traditional?
Materials like mud and stone, arches inside the house, holes in the walls (cupboards) that was used as storage and in walls closets and things like that
Q 8.2 How much do you think your house suits your financial statue?
It ok now.
How much was the land price or house price a reason in choosing it?
Yea this apartment worth three times what we paid for when we bought it.
Do you think house prices here equal its value?
Not anymore everything is getting too expensive
Why?
Q 8.3 Do you think commercial building slandered takes financial conditions for people?
Not at all, they only want profit.
Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
Not too expensive I hope, not much extra costs.
Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I prefer live with my family only, core one only. I tried living with my extended one and I didn't like it at all.
Q 8.6 Which do you value more?
Traditional life or modern one?
modern life and traditional type buildings.
Rural life or urban lifestyle
Rural places.
Individual life and personal space or Collection and community life
Individual is more convenient as work would not allow us to socials a lot.
Special looking house or similar looking houses?
Similar looking is nice.
Q 8.7 Any additional comments/observations?
A traditional building is very nice.

Case and interview reference number: B28

2.0 cultural Indicators
Q 2.1 To what extent does your current house support your:
Household
traditional Lifestyle
Modern lifestyle
Culture

Religion

To be honest I don't think it suites modern life, it certainly suites old lifestyle and suites the essence of our culture just won't suits any modern family

Q 2.2 What did you liked about your current house?
What did you dislike?

I liked the history I had in it and that I raised my kids in it, the memories and how close people are here and how they stood for each other's. It needs a lot of work, I like how the balcony and the windows look now, the government helped us fixing them.

Q 2.3 What do you like about your previous house?
What did you dislike?
Why did you move?

I liked it was wide and had a big inner court that made you feel comfortable and had a scene of comfortable and peace of mind to it. It was such a big house. It was in bad condition as the mud was shown and uncovered.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

Tiles and decoration, we change some walls, we added a bathroom inside. We separated a room from each other's and fixed it, it's more covered so we use it in winter. We added plumbing system as well.

Q 3.2 Have you made or plan to make any changes in your house?
What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?
Are these changes internal or external of your home?
Does this involve additional rooms or spaces, vertical or horizontal spaces?
Why would you make these changes?

Tiles and decoration, we change some walls, we added a bathroom inside. We separated a room from each other's and fixed it, it's more covered so we use it in winter. We added plumbing system as well

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?

The flat is very small as the old house was multi stores, but the owner divided it to get more rent from mulita-stories and levels, we share two rooms between, as the family grows, and the kids grow and see more you would start wanting and needing more and expect more from the house or how people should be living like. There is no more space or ability to do more in the house now.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?

There is no more space or ability to do more in the house now. Its small and the house is not ours either.

4.0 vernacular architecture related metrics

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?

The second one looks like my current house same materials, windows and balconies. It just looks bigger than mine.

Q 4.3 Which of the following buildings would you like to live in?
Why?

The second one of course, they look better, and they represent old culture and history I would love to live there now.

Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.

I liked the third one because it has wide balconies, I don't like the first building as it looks dense and it's not a type of building, I can relate to, I didn't grow in one. For old architecture certainly the second one but for modern ones building like the third or first one represents that better.

Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?

Yea here in salt many buildings look like that one

Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?

Yes, it doses as I said, layout, materials, windows… etc it is an old traditional house.

Q 4.7 why have people stopped making vernacular buildings?
Do you think it's good for today's living?
Do you think traditional materials is good for today or is it backward?

Commercial building apartments and contracting took over, social interaction and connection got weaker and land prices went up sharply.

Q 4.8 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?

If the house was big enough why not, people stopped building like that because they wanted something newer and modern that fit today's needs, I live in one of them and I think its fine, I just like their history and how nice they look.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
Nothing at all to be honest

Q 5.2 What makes a sustainable house in your opinion?
Am not sure I know.

Q 5.3 What construction material you think suits Jordan best? What colours?
I think the current material is suitable, stone blocks and so. Better type of cement if we need to use it.

Q 5.4 How comfortable is your house in:
Winter?
Summer*?*
Why?

They are warm in winter and cool in summer

Q 5.5 Is there a season where utility bill increases?
Same for each season.

Q 5.6 Is there a room where you think it's hotter or colder? Why?
I think they are all the same. The inner room is cooler and warmer in winter as it's shielded and open from one side.
What type of activities do you do in this room?
We set and sleep in it.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
Natural of course it's better and healthier and weather here is nice.

Q 5.8 Would you want bigger windows or smaller windows? And why?
I just love seeing sun getting inside the house and the windows looks perfect and don't want to change them, I can't anyway.

Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?

Traditional building was better and cooler, especially with its thick walls, they kept a good feeling inside.

Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area
smaller windows area
pay more for insulation
View from house windows

I would not mind doing any of these as long as it's going to help the environment or me financially, the climate indeed is changing, and we need to do something about that.

Q 5.11 Do you think your house suits Jordan environment and climate? Why?
It's perfect I think, we barley use any heating or fans.

Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?
We already have shutters on the windows and don't think we need any

Q 5.12 Would you pay more money for a more sustainable house?
I would certainly as it would make things easier and healthier.

Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?
I would certainly, an old material methods house with same stone, balconies and windows but with modern layout would be perfect.

Q 5.14 Do you know if your house was thermally insulated?
Would you like if it was insulated?
Why didn't you care about insulating it?
Would you mind if it the walls were thicker, and your room size were smaller? Why?

The walls are thick, and I think it makes it insulated even without insulation materials.

Q 5.15 Would you agree to use traditional methods and materials in your house? why?

I don't think it's possible now everyone who knew how to build using them are dead now, its lost now.

Q 5.16 Would you agree to use recycled or reused materials for your house? Why?

Yea maybe, don't know

Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?

Yes, we are thinking about that. But depends on how affordable they are.

Q 5.18 Would you prefer using local sourced material or imported one? Why?

Yes, maybe too depends on how good.

6.0 Zoning and regulation

Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?

Where we lived there were not many houses, but the way people lived and interacted with each other's was more sociable and people would meet every night at someone's house. Relationships were much stronger.

Q 6.2 Do you value your neighbours and neighbourhood? Why?

Yea I do, but still, I prefer old neighbourhood more. It's just about being connected to that place, I had my two kids there and I started my life there too.

Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?

Do you have this? Where?

If not, what and where would you like it? Show on the map?

Not necessary, we didn't have a place like that, and everyone was welcomed in each other's house, people notion about privacy, gender segregation and role were much difference from today, people were in modest cloths all day even in home and there were no issues of hosting each other's all day.

Q 6.3 How much do you know about Jordan building codes and regulations?

Not much honestly. Can't recall anything.

How much do you know about Jordan green building guide?

This is the first time I hear about it.

Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?

Would you have interested in them? Why

Yea we were told about the indoor insulation by one.

Q 6.4 Any issues regarding laws or regulation you are aware of?

No nothing.

Q 6.5 Any issues regarding how the neighbourhood have been designed?

Nothing I can feel directly, no

7.0 social relations and privacy indicators

Q 7.1 Do you think your house provide enough visual privacy in principal rooms?

Old houses didn't have individual privacy at all, all sort of different people and guest were coming and going all night. And all the rooms have opening to the main courtyard

Q 7.2 Where do you host your guests?

In old houses they would use any of the rooms even empty one if necessary. Any place it was traditions.

Q 7.3 Do you have a balcony, garden, or patio in your house?

The veranda, entrance patio, it's very important and a place that is semi-indoor/outdoor for the house owners to have some breathing space and just relax there in good weather.

What do you use it for?

Relax there

How important do you think it is?

Which is more important? Why?

I prefer the view from here over setting on the ground level, also no one can directly see me from up here.

Q7.4 Do you think you house reflect your values? How?

Any external or internal elements or spaces that reflect that?

no nothing so special really. We do feel belonging there and we decorated it to how we please and by the years you feel attached to it.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

Nothing so far but I would like that.

What are these elements? What makes a house traditional?

Materials like mud and stone, arches inside the house, the long-shaped windows. These building didn't even suffer from dampness and had such thick walls. Indoor closets that were used for storing grains and dried food, there were no architects back then and people were poorer than now, they only built houses to house them and to meet their simple needs back then. High ceiling now and archer domes. It's hard to build houses like old times because they needed a lot of space that with current land prices you can't afford or fined.

Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?
Explain why, why not
Do you think that spaces in your house are ideally distributed?
The spacing between rooms are good.
Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?
Yes, there is an opportunity for more changes and improvements.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain
The second one.
Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?
The second one looks like my current house. The similarities that my house is directly on the street and it's in the upper floor.
Q 4.3 Which of the following buildings would you like to live in?
Why?
No answer.
Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.
What I like about picture C, that it's new and what I don't like about it that I prefer independent houses.
Picture B is the one that represent Jordanian architecture whit its yellow stones.
Q 4.5 Have you seen any building like in picture number b?
In Jadaa-Salt
What does it represent to you?
Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?
Q 4.7 why have people stopped making vernacular buildings?
Do you think it's good for today's living?
Do you think traditional materials is good for today or is it backward?
People stopped building that kind of buildings because there are no more yellow stones. People now love to give the rooms more privacy.
Q 4.8 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?
No, I don't.
Q 5.2 What makes a sustainable house in your opinion?
Q 5.3 What construction material you think suits Jordan best? What colours?
Stone I think.
Q 5.4 How comfortable is your house in:
Winter?
Summer?
Why?
It's cold in summer and worm in winter.
Q 5.5 Is there a season where utility bill increases?
No.
Q 5.6 Is there a room where you think it's hotter or colder? Why?
The room with the arc constriction methods, it's better in seasons.
What type of activities do you do in this room?
We sleep in it.
Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
Natural ventilation of course.

Q 5.8 Would you want bigger windows or smaller windows? And why?
I would prefer if they were bigger, to have better ventilation.
Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?
Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area
smaller windows area
pay more for insulation
View from house windows
No answer
Q 5.11 Do you think your house suits Jordan environment and climate? Why?
Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?
No, I wouldn't use them.
Q 5.12 Would you pay more money for a more sustainable house?
Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?
Yes, I will use that, actually I will not use other materials than mud and stones.
Q 5.14 Do you know if your house was thermally insulated?
Would you like if it was insulated?
Why didn't you care about insulating it?
Would you mind if it the walls were thicker, and your room size were smaller? Why?
I think it is thermally insulated by the old traditional methods, as the house is old.
Q 5.15 Would you agree to use traditional methods and materials in your house? why?
No answer
Q 5.16 Would you agree to use recycled or reused materials for your house? Why?
No answer
Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?
Yes I would use theme.
Q 5.18 Would you prefer using local sourced material or imported one? Why?
No answer

6.0 Zoning and regulation
Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?
Yes, it allows that.
Q 6.2 Do you value your neighbours and neighbourhood? Why?
Yes, I do, Old houses certainly gave more chances for people to meet and to be closer and more intimate, even between neighbours
Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what and where would you like it? Show on the map?
No there is none, we usually meet in front of the houses. Yes, I would prefer that.
Q 6.3 How much do you know about Jordan building codes and regulations?
Not much honestly.
How much do you know about Jordan green building guide?
No, I haven't.
Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
Would you have interested in them? Why
No answer
Q 6.4 Any issues regarding laws or regulation you are aware of?
No answer
Q 6.5 Any issues regarding how the neighbourhood have been designed?
No answer

7.0 social relations and privacy indicators
Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Yes, it provides privacy.
Q 7.2 Where do you host your guests?
Usually outside the house.
Q 7.3 Do you have a balcony, garden, or patio in your house?
Balcony.
What do you use it for?
How important do you think it is?
Which is more important? Why?

Any external or internal elements or spaces that reflect that?

No, I don't have any.

8.0 Ownership and lifestyle indicators

Q 8.1 Did you build your house or bought it?

Did you use/ would you use traditional elements in your house?

What are these elements? What makes a house traditional?

No answer

Q 8.2 How much do you think your house suits your financial statue?

How much was the land price or house price a reason in choosing it?

…. No answer

Do you think house prices here equal its value?

Why? People are demanding more now.

Q 8.3 Do you think commercial building slandered takes financial conditions for people?

Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?

No answer

Q 8.5 Would you prefer to:

Live only with your children as they grow?

Live with your children's family or parents in the same building?

House other relatives in the same building?

My son lives with us.

Q 8.6 Which do you value more?

Traditional life or modern one?

Traditional life and traditional type buildings.

Rural life or urban lifestyle

Rural places.

Individual life and personal space or Collection and community life

Community life.

Special looking house or similar looking houses?

Similar looking.

Case and interview reference number: B32

2.0 cultural Indicators

Q 2.1 To what extent does your current house support your:

Household

traditional Lifestyle

Modern lifestyle

Culture

Religion

It doesn't support my household so much because there is moisture is walls and it leaks water in winter inside the house. Also, it supports traditional lifestyle, culture and religion.

Q 2.2 What did you like about your current house?

What did you dislike?

I just love it, and I love its roof and its wide outside spaces.

Q 2.3 What do you like about your previous house?

What did you dislike?

Why did you move?

I moved out because it was so noisy around and I need to climb 100 stairs to reach it.

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why?

Yes, I would. To add a new room, but I can't because we are just renting it.

Q 3.2 Have you made or plan to make any changes in your house?

What are these changes e.g., redecorating, change in elements (e.g., windows, or doors), and changing materials?

Are these changes internal or external of your home?

Does this involve additional rooms or spaces, vertical or horizontal spaces?

Why would you make these changes?

Yes, I have, I added psoralen tiles and marble to the kitchen as well as the bathroom because they were really old. And I paint the house every year. They are all internal and minor changes.

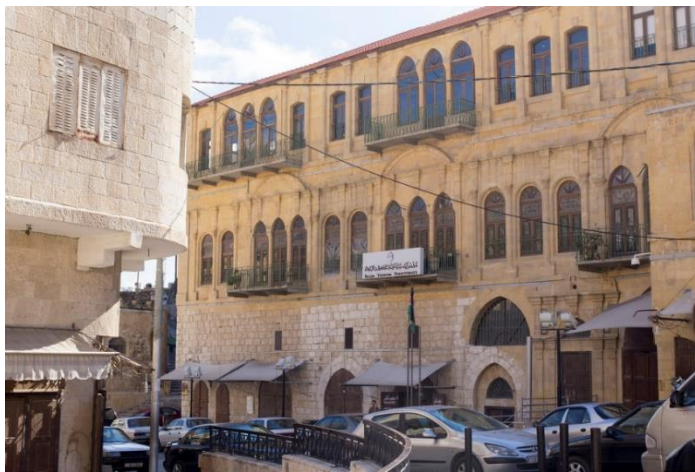*Q 3.3 Are your internal spaces (e.g., bedroom, bathrooms) located in the right places to suit your needs and preferences?*

Explain why, why not

Do you think that spaces in your house are ideally distributed?

No, not really. Because it is so small with only one bathroom which is not comfortable when I have guests. And there is no solution unless we build another bathroom. And yes, there are so many empty spaces.

Q 3.4 How much do you think your house can adapt to your future needs?
What are the opportunities and constraints associated with living in your house?
What are the constraints to making changes to suit your needs?

It can adapt my future needs if the house owner would allow me to do major changes, also the financial statue is a constraint.

4.0 vernacular architecture related metrics

Q 4.1 Which of the following buildings would you consider to be sustainable?
In what way? Please explain

Building B, because it is a mix between modern and traditional building, and it makes me comfortable internally.

Q 4.2 Which example best compare with your own home?
What are the similarities?
What are the differences?

Building B, both they are old buildings. Differences: my house's windows are squared.

Q 4.3 Which of the following buildings would you like to live in?
Why?

Building B of course, because my children will have a better life in it, and it is a nice-looking house.

Q 4.4 What do you like about each one?
What do you dislike?
Which of the buildings best represent Jordanian architecture in your view? Why?
In what way? Please explain.

I think building C represents Jordanian architecture, while building B represents community values because people have warm memories with such buildings.

Q 4.5 Have you seen any building like in picture number b?
What does it represent to you?

Yes, in our neighbourhood. It represents Jordanian heritage.

Q 4.6 Does your house relate to the architectural heritage in Jordan?
How?
Aesthetically and form?
Material?

Yes, it does relate with it architecturally from outside. As well as in materials that used.

Q 4.7 Have you ever lived or are living in vernacular building?
What do you like about it?
What do you hate?
(Why did you move)?

Yes, I have. And I live in a such building already.

Q 4.8 why have people stopped making vernacular buildings?
Do you think it's good for today's living?
Do you think traditional materials is good for today or is it backward?

Because today's generation don't really value traditional buildings. And I think traditional buildings and materials are suitable for today's living.

5.0 Sustainability Indicators

Q 5.1 Do you possess any knowledge anything about sustainable or environmentally friendly building or architecture?

No, I don't.

Q 5.2 What makes a sustainable house in your opinion?

I don't really know.

Q 5.3 What construction material you think suits Jordan best? What colours?

I don't really know, but maybe structural stone.

Q 5.4 How comfortable is your house in:
Winter?
Summer*?*
Why?

It is comfortable in summer, but it is cold in winter. The solution is to add a new ceiling but sadly I can't afford it.

Q 5.5 Is there a season where utility bill increases?

No answer.

Q 5.6 Is there a room where you think it's hotter or colder? Why?
What type of activities do you do in this room?

No, there is not.

Q 5.7 Do you prefer natural ventilation for cooling or AC? Why?
Natural ventilation is better.
Q 5.8 Would you want bigger windows or smaller windows? And why?
I like them in their current size.
Q 5.9 Do you think that vernacular traditional buildings were easier or harder to regulate their temperature? Why?
Do you have any idea how people used to do to insulate or regulate house temperature?
It is cool in summer, and it is so cold in winter. People used to use fireplace to warm their houses in the past, but now they are using heating devices.
Q 5.10 Which of these are you willing to change in a house in exchange for a more sustainable house? (this include better thermal comfort and smaller bells)
smaller house area
smaller windows area
pay more for insulation
View from house windows
I would choose a smaller house and to pay more money if I have.
Q 5.11 Do you think your house suits Jordan environment and climate? Why?
Yes, I do think that.
Q 5.11 would you use shading devices on your walls and windows for better thermal comfort?
Yes, I would, but not all of it because it is important to have sunlight in the house.
Q 5.12 Would you pay more money for a more sustainable house?
Yes, I would.
Q 5.13 Would you use traditional methods or materials in order to have a sustainable house? Why?
Yes, I would.
Q 5.14 Do you know if your house was thermally insulated?
Would you like if it was insulated?
Why didn't you care about insulating it?
Would you mind if it the walls were thicker, and your room size were smaller? Why?
It is not thermally insulated, and yes, I would mind thicker walls.
Q 5.15 Would you agree to use traditional methods and materials in your house? why?
Yes, I would agree.
Q 5.16 Would you agree to use recycled or reused materials for your house? Why?
No answer.
Q 5.17 Would you prefer high-tech methods and materials like solar panels? Why?
Yes, I would.
Q 5.18 Would you prefer using local sourced material or imported one? Why?
Yes, I would prefer.

6.0 Zoning and regulation
Q 6.1 Does the layout of your building, apartment and neighbourhood allow for social interaction?
Yes, it does.
Q 6.2 Do you value your neighbours and neighbourhood? Why?
Yes, I value them so much.
Q 6.2 Is it important to have appropriate communal places where you and your neighbours meet?
Do you have this? Where?
If not, what and where would you like it? Show on the map?
We don't have one, but I wish if we can have a weekly meeting in each other's houses.
Q 6.3 How much do you know about Jordan building codes and regulations?
How much do you know about Jordan green building guide?
Have you ever asked an architect or your house seller about energy saving or sustainability elements in your house? Why?
Would you have interested in them? Why?
No, I don't know anything about them.
Q 6.4 Any issues regarding laws or regulation you are aware of?
No answer.
Q 6.5 Any issues regarding how the neighbourhood have been designed?
No answer.

7.0 social relations and privacy indicators
Q 7.1 Do you think your house provide enough visual privacy in principal rooms?
Yes, it does provide privacy.
Q 7.2 Where do you host your guests?
In the outside setting area.
Q 7.3 Do you have a balcony, garden, or patio in your house?
What do you use it for?

How important do you think it is?
Which is more important? Why?
I usually set in the kitchen to relax. I have a patio and a roof.
Q7.4 Do you think you house reflect your values? How?
Any external or internal elements or spaces that reflect that?
No answer.
8.0 Ownership and lifestyle indicators
Q 8.1 Did you build your house or bought it?
Did you use/ would you use traditional elements in your house?
What are these elements? What makes a house traditional?
It is rented house. I think roof and the outside space are what makes my house a traditional house.
Q 8.2 How much do you think your house suits your financial statue?
How much was the land price or house price a reason in choosing it?
Do you think house prices here equal its value?
Why?
It suits my financial statue.
And its price was a main reason why I choose it.
Q 8.3 Do you think commercial building slandered takes financial conditions for people?
No answer.
Q 8.4 Would you prefer more expansive house in exchange for more durability and less bell costs?
Yes, I would if I have the ability.
Q 8.5 Would you prefer to:
Live only with your children as they grow?
Live with your children's family or parents in the same building?
House other relatives in the same building?
I would prefer to live with my children as they grow.
Q 8.6 Which do you value more?
Traditional life or modern one?
Individual life and personal space or Collection and community life
Special looking house or similar looking houses?
I value more a traditional lifestyle and house, within a countryside, with a community life, in a special looking house.

Appendix D: Sample of coding and analysis process

Semi –structured questions	
2.0 cultural Indicators	
Q 2.1 To what extent does your current house support your: *Household* *traditional Lifestyle* *Modern lifestyle* *Culture* *Religion* It's alright so far, we only did a part of the house, but <mark>it has not yet finished construction,</mark> it will be better when it's fully done. We plan to do so as our family <mark>grow</mark>. For sure this house is only fit to modern lifestyle and modern <mark>Jordanian culture</mark>. I mean we still have this culture of houses to be <mark>closed into itself</mark> and not be so exposed for people in the outside, to have much control for <mark>privacy</mark> which is a shared point with <mark>traditional houses</mark>. <mark>Covered windows</mark>, <mark>balconies</mark> are not so exposed and so are the other floor, it's a shared point with most houses here in Jordan. Some houses the kitchen would be open to the living space which I don't like, and I think is a <mark>foreign feature</mark> that got imported from houses in <mark>Europe or America</mark>. I prefer <mark>the old style</mark>. And nothing goes <mark>with religion</mark> as well. Even inside the house rooms are <mark>separated by this sail</mark> (separator wall) no one can see the inside of the house if you had <mark>guests</mark> or even from the outside if we are setting outside, the <mark>neighbours</mark> would not be exposed to us and their privacy will be preserved.	Physical Properties Ability to grow Common Values Culture Organization pattern Hierarchy of spaces Privacy Openings Semi-outdoor spaces Globalisation Common believes Vernacular architecture Circulation Social relationships Neighbourhood

for people view on how a modern house should look like or how their aspiration for a home includes size, room numbers, where it to at least have three bedrooms, two separate living areas, dining area is a big plus also kitchen and 2 or three bathrooms with one for guests so they don't have to cross the entire of the house to get there.

this gives a lot of insight of how value affects the built environment in the modern time, the notions about the use of separators, balconies, hidden point and breaks in the house from the inside and outside can gives a lot of opportunities to design a modern- cultured oriented- passive and sustainable house based on its contexts.

although the main issue of implementing such guide or system of work to create this type of houses and building might lies in A) peoples notion of how a house would look like and cost, B) how architect works and design buildings and C) which is the most important and challenging is the set of laws and regulation that governs the production of such houses.

She also mentioned the imported elements from globalized architecture in homes like kitchen opened to living rooms, open big living space and L shapes saloons which many interviews also complained notably in the notion of segregation and hosting guests and privacy.

| Q 2.2 What did you <mark>liked</mark> about your current house?
What did you <mark>dislike</mark>?
I like it all (laughs) the seating area we have at <mark>the garden</mark>, how <mark>quite</mark> this <mark>neighbourhood</mark> is. I feel so <mark>comfortable now</mark>. At the beginning it was hard to adjust living in an area so close to the <mark>main road with all its cars.</mark> It's so nice here, <mark>clean</mark>, it's so soothing especially in <mark>wintertime. In summer</mark> it's livelier of course. Specially changing from an <mark>apartment building to a detached house.</mark> I didn't dislike that this part of the city is <mark>far from the Zarqa</mark> | Semi-outdoor spaces
Noise
Level of comfort
Services
Typology |

city centre away from ==amenities and services==. I used to enjoy people watching back then (laughs)	
Independent House *are normally mentioned in the interviews as that which is located on a independent Plot and having its own* ==boundary== *wall, and entrance.The land on which the house is built belongs to the person who owns the house.*	
Q 2.3 What do you like about your previous house? *What did you dislike?* *Why did you move?* I liked it was ==close to my folks== we didn't ==live far from them== and how close it was to ==services==. The only thing I didn't like was the fact it was an ==apartment block==; you don't get that ==feeling of independence== and having your own place. At the end it was like living in a big house where all ==our lives are connected==, and people would intervene in everything to the point I could not handle it and wanted to move out. When I first moved out here the house was still halfway through construction (laugh).	Social relationships Services and amenities Typology Privacy Social relationships
similar point to another interviewee people seems to settle in though now. and another insight that people would be open to new dwellings type if it had better constrain or cost to normal detached ones. this is how people in Jordan started experimenting with apartments block and why most families lives in one nowadays, when land prices rockets in city centres that it was more profitable for developer and more cheaper for buyers to build and live in apartments. private built apartments block varies in quality, size, number of dwellings but it's always less dense and better than mass housing projects like the one located in King Abdulla project.	

3.0 House organization and space arrangement

Q 3.1 Would you like to change anything in your house? If so, what and why? Just ==expanding the house== now when I first bought this land, I didn't know it's going to be an ==attached house type== of lots. I didn't like it at all. That's the only thing I would change about it if I could, they look like a ==single house rather than two== that's how I feel. ==Detached houses== ==cost more== so it would have depended on cost and availability as well. Yea once the house is finished it will be good.	Size and Area Typology Economic factors House organization Layout
similar point to another interviewee where people seems to settle in though now. and another insight that people would be open to new dwellings type if it had better properties or cost to normal detached ones. this is how people in Jordan started experimenting with apartments block and why most families live in one nowadays, when land prices rocketed in city centres that it was more profitable for developer and cheaper for buyers to build and live in apartments. private built apartments block varies in quality, size, number of dwellings but it's always less dense and better than mass housing projects like the one located in King Abdulla project.	
Q 3.2 Have you made or plan to make any changes in your house? *What are these changes e.g. redecorating, change in elements (e.g. windows, or doors), and changing materials?* *Are these changes internal or external of your home?* *Does this involve additional rooms or spaces, vertical or horizontal spaces?* *Why would you make these changes?* Just construction related changes, we didn't have ==a fence, no outer gate, no outer tiles, the garden and the street were one==. Slow changes over time.	Bounders Security Semi-outdoor spaces

Q 3.3 Are your internal spaces (e.g. bedroom, bathrooms) located in the right places to suit your needs and preferences? *Explain why, why not* *Do you think that spaces in your house are ideally distributed?* Yea once the house is finished it will be good we only have two bedrooms now and a single living room once it's done there would be two more rooms and a guest room as well, that's how we planned it and the living rooms will be more inside the house where that quarter would have another entrance beside the one the guests have because it's on two streets. The guest room would have its own small bathroom so guests won't have to go inside the house if there was no need.	House organization Layout Hospitality Segregation between genders Entrances Privacy Segregation between family members and guests
the toolkit will be a partially a design guide and rating/point system that will be implemented inside the green building guide under social and cultural sustainability.	
Q 3.4 How much do you think your house can adapt to your future needs? *What are the opportunities and constraints associated with living in your house?* *What are the constraints to making changes to suit your needs?* Yes, it can, even once it's done but it would be more restricted due to lack of space and because of laws and regulations. The hardest things about it are again the services and that there is still no good transportation to here. I would say regulation are bit strict here, even when we wanted to move here, they denied us the licence up until we finished all the outside works and even planted a tree here. Its good but sometimes it's hard if you are bit out of cash. Also, that there is no prober transportation yet. You need to have a car to live here. I had to learn driving and use the car here.	Constrains Size and area Laws and regulation Services Vegetation Economic factors
maybe implement things for urban design level?? check the possibilities *the main objective would be to increase the period a family would be living in their house before changing to another one? maybe? is it feasible?* *white callers and merchants mostly had their own houses.* *main reason for people to leave was moving to a new house the bought/built* *main reason for people that they want to change the house of make changes was size, number of rooms, privacy, and most important having a detached house if their economical statues allowed to.* *low income people lived in apartments blocks. (governmental employees, teachers, military and police workers)*	
4.0 vernacular architecture related metrics	

Please take a look at these three buildings:

A)

B)

C)

Q 4.1 Which of the following buildings would you consider to be sustainable? *In what way? Please explain* I think it <mark>might be B</mark>. I felt so because it has a <mark>lot of narrow large windows</mark> that allows for enough <mark>ventilation and sun</mark> to go inside to make the house healthy, it <mark>has enough space to grow a garden,</mark> I think. Unlike A or C., they	Openings Light and ventilation Sustainability Semi-outdoor spaces Vegetation

==also look cramped and busy==, b looks like it hosts fewer families than the other two.	Density Typology
Q 4.2 Which example best compare with your own home? *What are the similarities?* *What are the differences?* Hmm ==type of stone==, I think B is ==more Arabic== than the others plus the reasons I mentioned, the third might be the like mine, ==its built-in stone== and ==looks modern== and new like mine.	Materials Cultural factors Modern typology vs Vernacular typology
Q 4.3 Which of the following buildings would you like to live in? *Why?* Second, ==I like buildings with history or Arabic older houses,== plus the reasons I have mentioned too.	Heritage
Q 4.4 What do you like about each one? *What do you dislike?* *Which of the buildings best represent Jordanian architecture in your view?* *Why?* *In what way? Please explain*. ==I did not like the first one at all, I used to view them before buying this lot and I would think yea I can live there but then I would go home and start imagining how life would be there==, or how I would look like living in one of these affordable apartments and then I would say no way, I just could not adjust with them , ==they look dull and lifeless== and also the house ==is small and the apartments has just too many families==. Unlike B or even C. C at least has ==better looking and materials== it has a nice design ==and nice balconies==. Even that colour it looks like a desert, even the slight colour change of a stone makes a different. The first one A represent current architecture now sadly, maybe the third one too depends on the ==social class of the area==.	Aesthetics. Size and area Multi-level apartments block Density Crowding issues Materials Semi-outdoor spaces Balconies Social relations Social Classes
many people gave a number of that each building block should not have more than 8 families in it (this comes from what most buildings have where by law each residential building should not have more than 4 stories above ground level and where the lot size usually does not allow to build more the two apartments each level separated by stairs and elevator shaft. (should I do another survey to investigate this point? would be useful or practical?	

Appendix E: Eco cultural design tool V1

Main researcher	Yahya Qtaishat
Project	Integrated Architecture of Tradition, Culture, Identity and Sustainability.
	Eco-cultural design guide and toolkit
Supervisors	Dr Kemi Adeyeye and Prof. Stephen Emmitt

UNIVERSITY OF BATH

Introduction

This tool is indented to help assess the environmental performance and socio-cultural suitability of residential dwelling units for residents needs and Jordan climate.

The guide and toolkit present key issues identified through fieldwork and interviews with residents in traditional vernacular houses in Salt city and a modern urban project in Zarqa Jordan that tries to bridge the gap between contemporary and vernacular local architecture in an eco-cultural design that suites residents various needs in a home.

Present solution and design guidelines are the results of fieldwork.

It lists the issues we have identified from our fieldwork and, where possible, provides guidance in the form of a tool or a pointer to a report or academic paper.

This tool represents a work in progress and does not include all the possible solutions or issues but tries to fill the critical gap in the Jordanian sustainability in building codes represented in the Jordanian green building guide and comes second to it.

What is required from you, dear participant is to try and assess one of your projects which you think to present a unique view into solving sustainability and socio-cultural needs of building users using this tool.

We ask you kindly if you agreed in participating in providing the project plans, paperwork and documents to try and test the useability and functionality of this tool and make any amendment and solve any issues with it.

The toolkit covers the following five categories of impact, which were chosen because they have the greatest potential to reduce a building's environmental impact and remove the most commonly encountered issues barriers to eco-cultural design:

Site sustainability	Social Relationship	Flexibility and Adaptability	indoor comfortable environment	Cultural and perceptual	Impact on local context and neighbours	Energy and resources efficiency	Scoresheet and summary

Each category is then further divided into subcategories for more detailed analysis. For each subcategory, there are several sections that covers the objective and the indicator(s) needed to be measured to achieve this category. Other information includes the analysis method and relevant information sources plus any other required design criteria and how many points you will get by achieving them.

Start using the Assessment Tool by clicking on the User's Guide tab.

After completing the assessment, Toolkit users will have a tabulated set of criteria in design that will help to promote sustainable development and green building; and/or prevent the building community from developing in concert with the Eco-cultural goals. With the assessment complete, the Toolkit help architects chart out a transparent and open pathway for discussing potential changes to the design with clients and local community.

The Toolkit can help the user design an approach for implementing the necessary criteria and permitting changes to allow for more sustainable design and green building In doing so, local governments can find ways to encourage developers, contractors, and design professionals to plan for and use sustainable design tools and techniques.

The Resource Guide provides links to studies, research, documents, model codes/ordinances, and organizations which offer additional tools and techniques to help architects and engineers that are looking for more information on sustainable design and green building. The Resource Guide provides resources for each of the Toolkit tabs as well as a general information section on green building and design.

A screenshot showing the introduction page of the tool

Main researcher	Yahya Qtaishat
Project	Integrated Architecture of Tradition, Culture, Identity and Sustainability.
	Eco-cultural design guide and toolkit
Supervisors	Dr Kemi Adeyeye and Prof. Stephen Emmitt

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BATH

Users Guide and instructions

(for each subcategory, i.e. "S.2. Provision of public open space(s)" under "S-Social Relationships" worksheet):

1. Read the Objective and Rationale

2. Read and understand what is the indicator used to measure the success or failure of this sub-category (there are also some references provided for your general knowledge)

3. Read the assessment criteria and what Potential Tools and Techniques to use

4. Evaluate your design using the assessment criteria in regards to the indicator / sub-issues

5. Choose the option from the drop-down menu that best fits your response to the assessment criteria

6. the sheet will present your score for this sub-issue

7. Click the links in the Resources column to access related resources

8. The possible scoring for the whole sheet and for every sub-issue are on a scale ranging from "Poor" to "Best Practice"

9. Each score gives a colour-rating in the final column as green, yellow, or red

Green- the design is doing well and should continue with current plan

Yellow- room for improvement

Red- the current design should identify and remove cause of barrier

10. Repeat until all questions are answered

11. Complete these steps for each subcategory of each category, A-E

Notes

The totals for each colour are tallied and recorded after each subcategory's table, as well as the overall category's totals at the end of the worksheet.

The last sheet entitled "Score and Summary " gives a simple view of all of the results, broken down by category, along with a chart.

This tool can be expanded or modified to fit the needs of your design. Therefore, if you need to add sections or areas that are not currently addressed by the assessment tool, these sections can be added in the future based on your feedback as needed and you may copy and paste the drop down menus and formulas to generate the automatic pie charts and summary tables.

A screenshot showing the user guide page of the tool

S	Site Sustainability and Development

S 1.1	Flood risk

Objective	Study and selection of a suitable site that minimises the negative environmental impact by avoiding zones of flood risk or fragile eco-system sites.
Applicable for	Multi and single type of dwellings
Indicator(s)	Location of Site in relative to zones of flood risk and if any measures have been taken to reduce the effect of flash floods
Analysis method	Site plan, landscaping plans, land use plan report

Relevant information sources	Prohibited development environmental features		green building code Annex.pdf	
	Flash flood risk assessment for Jordan	https://reliefweb.int/sites/reliefweb.int/files/resources/WFP-0000106848.pdf	Google Earth	http://floodtools.com/Map.aspx
	Buffer zone design requirement and risk assessment information		https://www.epa.gov/sites/production/files/2014-07/documents/flood-resilience-checklist.pdf	

Assessment Criteria	a) Prevalent soft landscaping or with porous paving: to allow for excess rainwater to be absorbed by the ground.
	b) The planned ground level of the buildings and access to the buildings and the site are designed (or zoned) so they are above possible flash floods levels and rainwater especially if they were constructed near natural waterfalls and rain streams.
	c) include waterproofing and water-resistant coatings and sealants in flood zones levels in which the assessed development is located
	d) Maximize open and green spaces ratio around the building and purpose bigger portion of the site for open spaces and green areas to absorb rainwater and sustain local nature.

	Assessment	Number of Criteria	Score
Negative	No Criteria or buffer zone is made when the site is located on natural eco-system site or flood risk zone	0	-3
Minimum practice	There is low risk of flash floods or the inhabited basement level of the building is below street level with no open grid system but with water proofing and coating for the building component	1	0
Good Practice	Inhabited level is at least 600 mm above street level with water proofing and coating and with suitable rain drainage or pump for basement levels..	2	3
Best Practice	Inhabited level is at least 600 mm above street level with water proofing and coating and with suitable rain drainage or pump for basement levels. And with open grid pavement for lower levels and parking spaces to absorb rainwater.	3	5

Scoring (choose the number of achieved criteria)	3	5

A screenshot showing the flood risk category within the Site sustainability page of the tool

S	Site Sustainability and Development

S 1.2	Use of vegetation to provide ambient outdoor cooling.

Objective	To assess the role of vegetation on the site and on roofs in cooling ambient conditions through evapotranspiration.
Applicable for	Multi and single type of dwellings
Indicator(s)	Ratio of total vegetated surface area (on ground and on roofs, and including trees), divided by total site area. The result is known as or Leaf Area Index.
Analysis method	Site plan, landscaping plans, land use plan
Relevant information	a) See "Ground-based measurements of leaf area index: a review of methods, instruments and current controversies"; Nathalie Bréda, in J. Exp. Bot. 54 (392): 2403-2417.	https://watermark.silverchair.com/...pdf?token=AQECAHi208BE49Ooan9kkhW_Ercy7Dm3ZL_9Cf3qfKAc485ysgAAAlMwggJPBgkqhkiG9w0BBwagggJAMIICPAIBADCCAjUGCSqGSIb3DQEHATAeBglghkgBZQMEAS4wEQQM5ZLTA27Z1bjP1w3vAgEQgIICBili81K2-qmmgDpB1jW9JOWVZv8qkwPOiOrxd9wfit
	b) From "The Potential of Vegetation in Reducing Summer Cooling Loads in Residential Buildings"; by Huang, Y.J. et al; in Journal of Applied Meteorology, Vol. 26, Issue 9, pp. 1103-1116, Sep. 1987: "Parametric analysis reveals that most of the savings can be attributed to the effects of increased plant evapotranspiration, and only 10% to 30% to shading.	https://journals.ametsoc.org/doi/pdf/10.1175/1520-0450%281987%29026%3C1103%3ATPOVIR%3E2.0.CO%3B2
	c) "The cooling effect of green spaces as a contribution to the mitigation of urban heat: A case study in Lisbon"; Building and Environment, Volume 46, Issue 11, November 2011, Pages 2186-2194; Sandra Oliveira, Henrique Andrade, Teresa Vaz	https://www.sciencedirect.com/science/article/pii/S0360132311001363
Assessment Criteria	Leaf area index (LAI) is the total one-sided area of leaf tissue per unit ground surface area. It is a key parameter in ecophysiology, especially for scaling up the gas exchange from leaf to canopy level... It is one of the most difficult to quantify properly, owing to large spatial and temporal variability. Many methods have been developed to quantify LAI from the ground and some of them are also suitable for describing other structural parameters of the canopy.		

	Assessment	Metric	Score
Negative	The Leaf Area Index (LAI) or the ratio of total m2 vegetated surface, on ground and on roofs and including trees, divided by total m2 site area, is:	<25%	-3
Minimum practice		25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

Scoring (choose the number of criteria)	50%-74%	3

A screenshot showing the Use of vegetation category within the Site sustainability page of the tool

S	Site Sustainability and Development

S 1.3	Urban heat island effect

Objective	Reduce the effect of the urban heat island effect by reducing the total built up and paved area of the project.
Applicable for	Multi and single type of dwellings
Indicator(s)	Ratio of dark and low albedo surfaces in urban structures and ground pavement and presence of plants or shading structures. Green roof specifications.
Analysis method	Site plan, landscaping plans.

Relevant information	https://www.sciencedirect.com/science/article/pii/S136403211300 3602	The city and urban heat islands: A review of strategies to mitigate adverse effects Author links open overlay panelE.J.Gago 2013
	https://www.epa.gov/heat-islands/heat-island-cooling-strategies	• Green parking specifications. • Green street specifications. • Incentives for reducing heat islands. • Low reflectance roof coverings. • Permeable pavement

Assessment criteria

a) Use the existing plant material or install plants that provide shade over the paving areas on the site within 10 years of plant material installation.

b) Provide shade with structures covered by energy generation systems, such as solar thermal collectors, photovoltaics, and wind turbines, that produce energy used to offset some non-renewable resource use.

c) Provide shade with architectural devices or structures that have a three-year aged solar reflectance (SR) value of at least 0.28. If three-year aged value information is not available, use materials with an initial SR of at least 0.33 at installation,

d) Provide shade with vegetated structures.

e) Use paving materials with a three-year aged solar reflectance (SR) value of at least 0.28. If three-year aged value information is not available, use materials with an initial SR of at least 0.33 at installation.

f) Use an open-grid pavement system (at least 50% unbound). The use of seasonal plants in streetscapes where it can create shades in summertime and allow for plenty of desired winter sun to (Landscaping, open spaces).

e) Using of green roofs and facades. A "green roof" is simply a roof that includes plants and vegetation. Green roofs harness the same evaporative cooling effect that cities lose when they hack away vegetation.

g) Increase the percentage of green spaces and presence of trees and vegetation.

	Assessment	Metric	Score
Negative	Drawings and specifications indicate that the area of landscaped open area plus paved areas with a surface reflectance of 60% or greater, as a percentage of total open area is :	<25%	-3
Minimum practice		25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

Scoring (choose the number of criteria)	25%-49%	0

Total Score for site sustainability	8

A screenshot showing the Urban heat island category and the final score of the site sustainability page of the tool

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R	Social Relationships

R 1.1	Overlooking Dwellings

Objective	treatment for housing project and building layout in a way that encourages social exchange between residents and promote security and walkability in the project.
Applicable for	Multi-dwelling planning and design
Indicator(s)	treatments for housing project and building layout in a way that encourages social exchange between residents.
Assessment method	Desktop space planning analysis see :
	https://www.firstinarchitecture.co.uk/space-planning-basics/
Relevant information	Social group size and exposure has a direct influence on the quality and intensity of trusting relationships that people develop. People who live in spaces that give them a greater sense of control over their exposure to others are more likely to build positive social connections.	https://thehappycity.com/resources/happy-homes/social-group-size-principle/ https://thehappycity.com/resources/happy-homes/exposure-principle/
Assessment criteria(s)	1) Availability of common use and gathering space in the building or between group of units in the neighbourhood by arranging units to create shaded mutual semi-public zones where neighbours can meet.
	2) Limit number of dwelling that share a semi-public zone or courtyard to no more than 12. And limit the number of dwellings that share one entrance to 8 units. In multi-story development. It is always favourable to design 3 or 4 levels
	3) Arrange dwelling entrances in the street or in one level of an apartment block to be overlooking and share one regular shape landing or lobby.
	4) Gear views from room's windows, balconies and terraces to street and nearby playing ground or gardens to maximize social interaction and increase safety and security.

	Assessment	Number of achieved metrics	Score
Negative	Dwellings entrance location is not clear and hidden from other dwellings in the street or within the same shared semi-public zone	0	-3
Minimum practice	Dwellings entrance location is visible from 50% other dwellings in the street or within the same shared semi-public zone	1	0
Good Practice	Dwellings entrance location is visible from 50% -70% other dwellings in the street or within the same shared semi-public zone with about 12-9 sharing the same entrance of the semi-private zone or building	2	3
Best Practice	Dwellings entrance location is visible from 90% + of other dwellings in the street or within the same shared semi-public zone with about 8 sharing the same entrance of the semi-private zone or building with maximum of 4 floors of inhabited floors	4	5

Scooring (choose the number of criteria)	2	3

A screenshot showing the overlooking dwellings category within the social relationship page of the tool

R	Social Relationships

R 1.2	Walkable streets and pathways

Objective	To assess the extent and quality of walkways for occupants and users.
Applicable for	Multi-dwelling planning and design
Indicator(s)	Type and extent of walkways in the project, extent of walkways sheltered from rain, snow or excess sunshine.
Analysis method	Site plans and contract documentation.
Relevant information sources	Well-located and designed walkways on the site encourage walking, which promotes human health. Relevant information includes type and extent of walkways in the project, precautions against vehicle traffic hazards, and percent of walkway length that is sheltered from rain or snow and that is sheltered from excess sunshine. https://dmampodemo.files.wordpress.com/2015/03/flexible-street-design-updated-aug-8.pdf
Assessment criteria	1) Clear division between street and sidewalks and separate them from boundaries of the building by tree of vegetation line. 2) Avoid creating dark and leftover spaces around your project with no lighting, visibility from nearby windows and opening. And that does not lead to any functional areas as it encourages nearby resident to take over ownership and promote vandalism, neglect and illegal activities. 3) Offer plenty of shading using trees or shading elements 4) provide even non-slippery surfaces with no obstacles or minimum levels or steps on the walkways to the entrance of the project.

	Assessment	Number of Criteria	Score
Negative	Walkaways and sidewalks are not sheltered from climate, with less than 25% of the walkways adequate planted trees r sheltered from the sun, with uneven surfaces which is not accessible from the street and cross path with cars	0	-3
Minimum practice	10 percent of the walkway length connecting building entrances to sidewalks or parking areas is sheltered from rain or snow and more than 25% is sheltered from excess sunshine.	1	0
Good Practice	Pedestrians have dedicated walkways that provide access to most sections of the building. More than 20 percent of the walkway length connecting building entrances to parking areas is sheltered from rain or snow and more than 50% is sheltered from excess sunshine. Provide even surface for the walkways with no levels needed to go inside or walk around the lot and is only 10 cm above street level	2	3
Best Practice	Pedestrians have dedicated walkways that provide access to all sections of the project. Very few walkways cross vehicle roadways and, where this occurs, precautions are taken to minimize traffic hazards. More than 30 percent of the walkway length connecting building entrances to public transport stops or parking areas is sheltered from rain or snow and more than 75% is sheltered from excess sunshine.	4	5

Scooring (choose the number of criteria)	1	0

A screenshot showing the street walkability category within the social relationship page of the tool

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R	Social Relationships
R 1.3	**Proximity to services**

Objective	*To assess and stimulate plans for using suitable transportation methods and reduce long trips and pollution emitted by privately used vehicles*
Applicable for	Multi and single type of dwellings
Indicator	The site location is located on pre-developed area or in proximity to various services and amenities
Analysis method	Site plan, land use maps.
Relevant information sources	You can use Google Earth to define your Points of Interest and draw radios from your site to these points https://www.solidterrainmodeling.com/how-to-use-google-earth-to-define-your-points-of-interest/
Assessment criteria	a) Amenities and Support services: Are there a very near health facility located within at least 500M Are there a Fairly near health facility located between 500-1000m Are there a house of worship within 1000 m Are there a Café or community centre/house 1km
	b) Retail that includes: Local food retail shop very near (within 500m) Local food retail shop fairly near (500m- 1km) Major commercial centre or commercial street within 2km
	c) Schools: Are there a pre-school very near (within 500m) Are there a pre-school fairly near (between 500-1km) are there a primary school very near (within 500m) Are there a primary school fairly near (between 500-1km) are there a high school within 1km? Are there a high school within 2km?
	d) Transportation: are there a bus rout within 500 m? are there any bus rout between 500-1km?
	e) Play and leisure: are there any toddler play area within sight of dwellings? Are there park/play facilities very near (within500m) are there park/play facilities fairly between 500m-1km

	Assessment	number	Score
Negative	Number of yes answered to the assessment questions	0-4	-3
Minimum practice		5-9	0
Good Practice		10-15	3
Best Practice		15 and more	5

A screenshot showing the services proximity category within the social relationship page of the tool

R	Social Relationships

R 1.4	Provision of public open space(s)

Objective	Parks, open spaces, gardens, and ecological areas are particularly important for urban environments where green space and places of refuge can be in short supply. Proximity to parks is often associated with increased physical activity, more social interaction, and reduced stress.
Applicable for	Multi-dwelling planning and design
Indicator(s)	Availability and special treatments of design and vegetation in private and semi-private open spaces to accompany the micro-climate and demographics needs.
Analysis method	Availability of common use and gathering space in the building or between group of units in the neighbourhood.
Relevant information sources	Site plan, landscaping plans. Design documentation; building permit; planning department in local government
	https://www.psrc.org/sites/default/files/sustainable_parks_and_open_space.pdf http://www.greenexamacademy.com/ss5-2/
	1) there IS a local code for open space restriction, open space should exceed local code by 25%
	2) Case 2: there is NO code (campuses or military bases), open space is to be 50% of the size as building footprint
	3) there IS a local code, but ZERO open space requirement: open space should be 75% of site area
	For all cases the design of shared and semi-private spaces of the dwelling can be counted into the assessment criteria
	vegetated roof areas can count toward assessment criteria
	pedestrian oriented hardscape areas can count toward credit compliance (min. 25% open space must be vegetated)
	The design of shared and semi-private spaces should provide: a) variation of hard and soft landscape with trees and plants. b) local climate-appropriate shelter from harsh sun in common outdoor and semi-private spaces on site or on landscaping c) Use of small water features (e.g. fountain) incorporated into the site and appropriately protected' to cool ambient air.
At least quarter of that open space must be vegetated or have overhead vegetation. Open spaces must be designed for one or more of the following uses: social gathering, gardening, physical activity, or natural habitat that includes elements for human interaction. Vegetated roofs can be counted in certain circumstances., there are both shaded and sunny areas, and the design makes it very attractive for users.

	Assessment		Score
Negative	The project must provide open space percentage in comparison to built up area equal :	<25%	-3
Minimum practice		25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

Scooring (choose the number of criteria)	<25%	-3

Total Score for social reltionships	-3

A screenshot showing the open space provision category and total score of the social relationship page of the tool

F	Flexibility and Adaptability

F 1.1	Potential for horizontal or vertical space modification.

Objective	To assess the potential of the structure for future vertical or horizontal expansion of the building,
Indicator(s)	Degree of technical and design difficulty and capital cost requirements linked to expansion possibilities.
Analysis method	Review of contract documents and specifications of proposed system(s), and review of analysis provided by design team.
Relevant information sources	https://www.123plans.co.uk/uploads/frontend/media/documents/dudley.pdf	Extension design guide
Assessment criteria (s)	Design housing with flexible spaces such as dividable rooms, secondary suites and possibility to make exterior addition and customization to doors and semi-private spaces like the option of adding shading panel and changing door colour.
	Horizontal expansion should be compatible with site availability, configuration of existing nearby buildings; for vertical expansion, bearing capacity of structure and issues related to extension of vertical services. For both, the configuration of the existing building that may constrain expansion design solution and affect neighbours and laws and regulations.

	Assessment	Score
Negative	Structure or other type of adaptability are not possible, because of site constraints, design constraints, or structural limitations. Or it would affect nearby neighbours where the extension will decrease privacy and/or solar access significantly	-3
Minimum practice	Vertical and/or horizontal expansion and/or changing in layout is possible, although site, design, or structural limitations will result in high capital costs and compromises in design and/or function of the addition(s).	0
Good Practice	Vertical and/or horizontal expansion is possible, with site, design, or structural limitations resulting in acceptable capital costs and compromises in design and/or function of the addition(s).	3
Best Practice	Vertical and/or horizontal expansion is possible, with site, design, or structural limitations resulting in moderate capital costs and few compromises in design and/or function of the addition(s).	5

Scoring (choose the score that meet the assessment)	3

A screenshot showing the potential for space modification category within the flexibility and adaptability page of the tool

F	Flexibility and Adaptability

F 1.2	Maintenance of building components

Objective	To ensure that detailed design allow for easy and long-term maintenance of the building
Indicator(s)	Degree of technical and design difficulty and capital cost requirements linked to expansion possibilities.
Analysis method	Check to ascertain compliance.
Relevant information sources	Methods for designing building envelope components prepared for repair and maintenance https://orbit.dtu.dk/ws/files/5550070/Methods%20for%20designing%20building%20envelope%20components%20prepared%20for%20repair%20and%20maintenance.pdf
Assessment criteria (s)	1) Ceiling lights installed that can only be accessed and changed out with scaffolding. 2) Lights installed in new buildings that are not accessible at all; ultimately, these will be abandoned when the lamps fail. 3) Lights, pipes or electricity wiring requiring panels, walls or celling to be partially or completely cut throw or demolished 4) High-cost, custom lighting fixtures/lamps installed in parking garages. As they fail, these will be replaced with lower-cost fixtures. 5) Rooftop equipment units with no elevator access to bring replacement or maintenance/refilling chemicals or equipment. 6) Trees planted very close to new buildings. 7) Lack of enough telephone, electrical, and computer outlets/cables. 8) Equipment, piping, wiring installed easily during construction that is nearly inaccessible after final walls and other appurtenances are completed. 9) High-maintenance equipment installed with no local vendor support. 10) The main pipes lines goes underfloor or casted inside the wall where it's unaccusable after building and will eventually lead to moisture and water leaking inside the envelope.

	Assessment	Score
Negative	No criteria have been meet for future maintenance and efficient operation of the facility.	-3
Minimum practice	at least 3 criteria have been meet for future maintenance and efficient operation of the facility.	0
Good Practice	at least 6 criteria have been meet for future maintenance and efficient operation of the facility.	3
Best Practice	All 10 criteria have been meet for future maintenance and efficient operation of the facility.	5

Scoring (choose the score that meet the assessment)	3

A screenshot showing building maintenance category within the flexibility and adaptability page of the tool

F	Flexibility and Adaptability

F 1.3	Adaptability to add renewable energy sources

Objective	To ensure that the building can, in the future, be adapted to run on a different fuel from that originally anticipated, or to install photovoltaic systems.
Indicator(s)	The ease or difficulty in installing heating or cooling equipment that require a different fuel, or to install photovoltaic systems.
Analysis method	Review of contract documents and specifications of proposed system(s), and review of analysis provided by design team.
Relevant information sources	https://www.nrel.gov/docs/fy10osti/46078.pdf	Solar Ready Buildings Planning Guide
	https://www.energystar.gov/ia/partners/bldrs_lenders_raters/rerh/docs/Renewable_Energy_PV.pdf	Solar photovoltaic: specification, checklist and guide
Assessment criteria (s)	Characteristics of roofs and walls as well ass orientation and degree of shading on the building may support or hinder the installation and/or operation of photovoltaic or solar thermal systems.

	Assessment	Score
Negative	Adapting the building to a new fuel source or installing photovoltaics will not be possible without major renovations and due to unsuitable roof properties.	-3
Minimum practice	Adapting the building to a new fuel source will be possible with a moderate level of renovations, but installing photovoltaics will require major renovations.	0
Good Practice	Adapting the building to a new fuel source will be easy, and installing photovoltaics will require only a minor level of renovations.	3
Best Practice	Adapting the building to a new fuel source or installing photovoltaics will require only minor adjustments to architectural, HVAC or electrical systems.	5

Scoring (choose the score that meet the assessment)	3

A screenshot showing renewable energy adaptability category within the flexibility and adaptability page of the tool

F	Flexibility and Adaptability

F 1.4	Potential for Internal space modification.

Objective	To assess the potential of the structure for future vertical or horizontal expansion of the building,
Indicator(s)	Degree of technical and design difficulty and capital cost requirements linked to expansion possibilities.
Analysis method	Review of contract documents and specifications of proposed system(s), and review of analysis provided by design team.
Relevant information sources	https://www.123plans.co.uk/uploads/frontend/media/documents/dudley.pdf	Extension design guide
Assessment criteria (s)	Design housing with flexible spaces such as dividable rooms, secondary suites and possibility to make exterior addition and customization to doors and semi-private spaces like the option of adding shading panel and changing door colour.
	Horizontal expansion should be compatible with site availability, configuration of existing nearby buildings; for vertical expansion, bearing capacity of structure and issues related to extension of vertical services. For both, the configuration of the existing building that may constrain expansion design solution and affect neighbours and laws and regulations.

	Assessment	Score
Negative	Structure or other type of adaptability are not possible, because of site constraints, design constraints, or structural limitations. Or it would affect nearby neighbours where the extension will decrease privacy and/or solar access significantly	-3
Minimum practice	Vertical and/or horizontal expansion and/or changing in layout is possible, although site, design, or structural limitations will result in high capital costs and compromises in design and/or function of the addition(s).	0
Good Practice	Vertical and/or horizontal expansion is possible, with site, design, or structural limitations resulting in acceptable capital costs and compromises in design and/or function of the addition(s).	3
Best Practice	Vertical and/or horizontal expansion is possible, with site, design, or structural limitations resulting in moderate capital costs and few compromises in design and/or function of the addition(s).	5

Scoring (choose the score that meet the assessment)	3

Total Score	12

A screenshot showing internal space modification category and total score for the flexibility and adaptability page of the tool

K	Indoor comfortable environment

K 1.2	Appropriate daylighting in primary occupancy areas.

Objective	To ensure an adequate level of daylighting in all primary occupied spaces.
Indicator(s)	The predicted Daylight Factor in a typical occupancy area located on the ground floor of the building, as indicated by drawings and specifications.
Assessment method	Review of contract documents by an illumination specialist.
Relevant information	Daylight Factors calculator — https://people.bath.ac.uk/zw305/ROOM/daylightfactortab.php
	Developments that do not meet this minimum should be able to demonstrate how site constraints and orientation prohibit these standards from being achieved, and how issues of internal environment comfort are going to be solved. — http://www.yourhome.gov.au/passive-design/orientation
Assessment criteria(s)	Maximize access to natural daylight in interior shared spaces with at least two hours a day of sunlight. This can be done by creating skylight or shared inner courtyard and using clerestory windows and fanlights to supplement daylight access.
	Consider using two-story and mezzanine arrangements to increase daylight access to the living rooms and private open spaces of apartments with limited daylight (e.g. ground floor apartments)
	Using dual aspect apartments when the long elevation of the building faces east and west. Avoiding single aspect apartments with a southern aspect and limiting the depth of single aspect apartments.
	Single aspect apartments with a southerly aspect (southwest to southeast) should account for a maximum of 10 per cent of the total units proposed.
	Locating living areas and gardens to the north and service areas to the south of dwelling.
	At least 70 per cent of living rooms and private open spaces in a development should receive a minimum of three hours direct sunlight between 9am and 3pm in mid-winter (against 50% stated by the green building guide)
	The rooms which need light the most should be arranged to the East and South direction like the kitchen, bathroom, drawing room, etc. (see orientation) Following things should be kept in mind while arranging the rooms: (1) The kitchen should be given the direction between North East and South East (2). living areas should be in the extreme of South East direction because much light is available there (3). The bedrooms should be given the direction between South East and North West (4). The suitable place for store and staircase is between North-East and North-West because less time is spent there, and they need less light (5). The verandas are constructed in the direction of South West because the Sunlight is severe in summer in this direction (6).

	Assessment	number	Score
Negative	The percentage of dwelling units in the building whose principal daytime living areas have direct sunlight for at least 2 hours per day at 12 noon on Winter Solstice, is:	<25%	-3
Minimum practice		25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

A screenshot showing daylighting category within the indoor environment page of the tool

K	Indoor comfortable environment

K 1.1	Effectiveness of functionality and Internal circulation

Objective	To assess the appropriateness of interior layouts to functional requirements of tenancies or occupants.
Indicator(s)	Goodness of fit of provided layouts (shape, ease of access) with functional requirements.
Analysis method	Review of plans provided by design team.
Relevant information sources	The location and adjacency characteristics of space provided for various specific functional requirements. Circulation should also promote desirable hierarchy of space from public to communal and semi-private to most private ones.
Assessment criteria(s)	a) The layout of the building should promote hexarchy of spaces from most private (bedrooms) to less private or living area and kitchen to guest hosting spaces and main entrance. b) Enclosing spaces to each other and each function type to create a single thermal controlled zone with enhanced privacy for the family in the following matter: There should be strong relationship between dining room, secondary bathroom and guest rooms (1) There should, be strong relationship between living area, kitchen and pantry. (2) There should be much relationship between the bedroom, bathrooms, dressing room, and study room. (3) Direct access or via lobby from kitchen, guest hosting area to private open space. (4) c) in case of an apartment block with undesirable position or more than one fixed aspect from, All the parts of a building that is exposed to excess solar gain should be covered through a passage like a veranda or a corridor and isolated from other rooms to minimize heating and cooling load required. d) Increased external sources of ventilation and sunlight by appropriately positioning opening and the use of shading devices to allow for more indirect daylight and repelling of excessive solar heat gain. (see building envelop and sharing devices). e) The windows be fixed in narrow from the inside and wide from the outside to narrow vision angle from the outside and provide more privacy and prevent the direct undesirable sunlight from entering. f) The rooms which need light the most should be arranged to the East and South direction like the kitchen, bathroom, drawing room, etc. (see orientation) Following things should be kept in mind while arranging the rooms: (1) The kitchen should be given the direction between North East and South East (2). living areas should be in the extreme of South East direction because much light is available there (3). The bedrooms should be given the direction between South East and North West (4). The suitable place for store and staircase is between North-East and North-West because less time is spent there, and they need less light (5). The verandas are constructed in the direction of South West because the Sunlight is severe in summer in this direction (6).

	Assessment	number of achieved criteria	Score
Negative	Design promote no clear hierarchy or private zones are directly accessible from main entrance or the living area is part of the circulation when there is no dedicated guest hosting area.	0	-3
Minimum practice	Design promote some hierarchy or private zones are not directly accessible from main entrance but the living area or guest hosting area is part of the circulation.	2	0
Good Practice	Design promote clear hierarchy from private to private zones.	4	3
Best Practice	Design promote clear hierarchy from private to private zones are not directly accessible from main entrance and the living area is separated from the guest hosting area and neither are part of the circulation	6	5

Scoring (choose the number of criteria)	4	3

A screenshot showing effectiveness functionality within the indoor environment page of the tool

K	Indoor comfortable environment

K 1.3	Noise and Acoustics control between primary occupancy rooms

Objective	To ensure that measures have been taken to reduce noise impacts between all tenancies and occupancy types.
Indicator(s)	Minimum Sound Transmission Class of partitions between primary occupancy areas, as indicated by design characteristics.
Assessment method	Review of design team analysis.
Relevant information	STC through various building components — http://www.cmacn.org/PDF/Legacy Documents/Noise_Control_with_Concrete_Masonry.pdf — Sound isolation calculator — Sound_Isolation_Calculator.xls
Assessment criteria(s)	Make sure that materials, thickness of materials forming exterior doors, walls and windows has a shall have an average laboratory sound transmission class (STC) rating that follow the below assessment benchmark numbers STC means a single-number rating for describing sound transmission loss of a wall, partition, window or door.

	Assessment	STC	Score
Negative	Design documents indicate that the Minimum Sound Transmission Class of partitions between primary occupancy areas (through dividing walls and doors) will be :	23.0 or less	-3
Minimum practice		23.0 - 25.0	0
Good Practice		25.0 - 31.0	3
Best Practice		31.0 or more	5

Scoring (choose the number of criteria)	23.0 - 25.0	0

A screenshot showing internal noise control category within the indoor environment page of the tool

K	Indoor comfortable environment

K 1.4	Noise and Acoustics control through the exterior envelope

Objective	Ensure that noise attenuation through the wall facing the noisiest site boundary is adequate to provide interior noise levels that will not interfere with normal tasks.
Indicator(s)	The predicted noise attenuation performance of the exterior wall most exposed to potential sources of noise, as indicated by design characteristics.
Assessment method	Review of design team analysis.
Relevant information	Sound Control / http://www.eaglerocksupply.com/application/files/4514/4890/6046/Sound_Control.pdf / NOISE ATTENUATION STANDARDS / https://www.codepublishing.com/WA/OakHarbor/html/OakHarbor17/OakHarbor1730.html
Assessment criteria(s)	Make sure that materials, thickness of materials forming exterior doors, walls and windows has a shall have an average laboratory sound transmission class (STC) rating that follow the below assessment benchmark numbers STC means a single-number rating for describing sound transmission loss of a wall, partition, window or door.

Assessment	STC	Score
Negative	27.5 or less	-3
Minimum practice	Design documents indicate that windows in the exterior wall of the Design exposed to the most significant sources of external noise will have a Sound Transmission Class, or equivalent, of : → 27.5 - 29.7	0
Good Practice	29.7 - 34.1	3
Best Practice	34.1 or more	5

Scoring (choose the number of criteria)	29.7 - 34.1	3

Total Score for indoor environment	9

A screenshot showing external noise control category and total score of the indoor environment page of the tool

C	Cultural and perceptual

C 1.1	Visual privacy in principal areas of dwelling units.

Objective	*To assess the level of privacy in bedroom and living areas of dwelling units in the building.*
Applicable for	Multi and single type of dwellings
Indicator(s)	The percentage of dwelling units whose bedroom and living areas are open to horizontal or downward views from a point within 20 m of the exterior windows.
Analysis method	Review of analysis prepared by the design team.
Relevant information sources	Development control plan	http://www.norfolkisland.gov.nf/sites/default/files/docs/planandbuild/NIPlan/Development%20Control%20Plan%20No.%203%20-%20Multi%20Units.pdf
	Visual privacy recognition in residential areas through amendment of building regulations	1999_JourUrbDes_ResidentialVisualPrivacy.pdf
Assessment criteria(s)	(a) A minimum of 9m separation should be provided between the living area windows of facing dwelling units. (b) Where the distance between windows or balconies/verandas of dwelling units is less than 12m, direct views between living area rooms of dwelling units into the principle area of private open space of other adjoining units should be screened or obscured. (c) Views may be obscured through the use of solid fences, semi-permeable screening (e.g. lattice), or planting, and by offsetting the placement of windows on facing buildings so as not to create direct views between them. (d) Site layouts should ensure shared driveways have a line of separation of at least 3m from bedroom windows. (e) Separation could be achieved either by distance or changes in levels. Provide semi-open and semi-private areas of the dwelling with enough visual privacy. This includes terraces, balconies not adjacent to other opening/ balconies from nearby buildings. And for back gardens have high enough boundary or tree line to protect them. (f) Relocate semi-open and semi-private areas of the dwelling to face street or avoid locating them next to semi-private areas and direct contact from windows of the next building. (g) Applying maximum grading allowance where the position of the building garden level above ground do not exceed the original level of site before development to decrease exposure to neighbours' semi-private zones and gardens.

	Assessment	number	Score
Negative	The percentage of dwelling units whose bedroom and living areas are open to horizontal or downward views by others, from a point within 20 m of the exterior windows :	≥75%	-3
Minimum practice		50%-74%	0
Good Practice		25%-49%	3
Best Practice		<25%	5

Scoring (choose the number of criteria)	50%-74%	0

A screenshot showing privacy category of the culture and perceptual page of the tool

C	Cultural and perceptual

C 1.2	Project aesthetic

Objective	*To assess the aesthetic quality of the building interior and exterior*
Applicable for	Multi and single type of dwellings
Indicator(s)	Various aspects of site development that affect perceptions, including continuity and harmony with other nearby buildings, presence of vegetation, Natural view (view type, view quality and social density), geometry of windows (openings), amount of glazing, colour, texture, volume/size of the room
Analysis method	Review by an outside design team of an analysis prepared by the design team.
Relevant information source	Indoor Comfort in Dwellings: An Exploratory Study of Diverse Design Approaches — https://www.ijrter.com/papers/volume-3/issue-12/indoor-comfort-in-dwellings-an-exploratory-study-of-diverse-design-approaches.pdf
Assessment criteria(s)	(1) Aesthetics and identity could be achieved by: preserving harmonious groupings, rhythms typology and sizes between the buildings,
	(2) By using specific repeated style and size /material of opening area of glazing
	(3) special treatments of external elements like walls and fences.
	(4) Landscaping including private open spaces where varied local plants are could be used to create visual interest in different seasons using heights, colours, textures.

	Assessment	Number of Criteria	Score
Negative	Many major architectural features of the Design, such as height, bulk, and set-back from the street, are clearly incompatible with adjacent buildings. And dose not meet another criteria.	0	-3
Minimum practice	Some architectural features of the Design, such as window size and height, colour or type of materials, are clearly incompatible with adjacent buildings. but at least 2 other criteria have been achieved.	1	0
Good Practice	Most architectural features of the Design, such as height, bulk, set-back from the street, window size and height, colour or type of materials, are somewhat compatible with features of adjacent buildings, as well as at least 4 other criteria	2	3
Best Practice	Architectural features of the Design, such as height, bulk, set-back from the street, window size and height, colour or type of materials, are very compatible with features of adjacent buildings as well as all the 6 other criteria.	4	5

Scoring (choose the number of criteria)	1	0

A screenshot showing project aesthetics category of the culture and perceptual page of the tool

C	Cultural and perceptual

C 1.3	Relevance to vernacular architecture

Objective	*To assess the extent to which traditional local materials and construction techniques will used in the execution of the project.*
Applicable for	Multi and single type of dwellings
Indicator(s)	Architect's estimate of the percent of the non-structural elements of the building will be constructed using traditional local materials and construction techniques.
Analysis method	Review by an outside design team of an analysis prepared by the design team.
Relevant information sources	Traditional Buildings elements of the Middle East — Traditional Buildings elements of the Middle East.pdf
Assessment criteria(s)	The use of vernacular inspired element is also encouraged. Vernacular elements include long arched windows styles, shading devices, proportions, compactness and massing, large terraces and balconies, or even materials and colours like limestone. (see attachment) Vernacular elements could work as both visual and climatic enhance the local environment conditions enhancer. Integrate vernacular or traditional architectural elements into the envelop design that can aid in energy saving and thermal comfort such as opening shape, size and ratio.

	Assessment	Number of elements	Score
Negative	Most of the building's architectural features and elements such as height, materials and configuration are incompatible with vernacular building concepts.	<25%	-3
Minimum practice	Some architectural features of the Design, such as windows, size and height, colour or type of materials, are incompatible with vernacular buildings.	25%-49%	0
Good Practice	Most architectural features of the Design, such as height, bulk, set-back from the street, window size and height, colour or type of materials, are somewhat compatible with features of vernacular buildings.	50%-74%	3
Best Practice	Architectural features of the Design, such as height, bulk, set-back from the street, window size and height, colour or type of materials, are mostly compatible with features of adjacent buildings.	≥75%	5

Scoring (choose the number of criteria)	50%-74%	3

A screenshot showing relevance to vernacular architecture category of the culture and perceptual page of the tool

C	Cultural and perceptual

C 1.4	Access to a private open space

Objective	*To assess the extent to which occupants of dwelling units have easy access to private outdoor space that is compatible with local cultural values*
Indicator(s)	Minimum area and dimensions, in m2 and m. and adequate protection from excessive solar exposure and enhanced privacy.
Analysis method	Desk analysis of design plans and drawings
Relevant information sources	Various open space specification and codes	https://www.planning.act.gov.au/__data/assets/pdf_file/0004/895405/DV_306_Private_open_space_and_communal_open_space.pdf http://newcastle.nsw.gov.au/getmedia/65239865-f8ee-4344-a5ec-ca2e11c89bac/3-02-Single-Dwellings-Ancillary-Development_amended-090516.aspx
Assessment criteria(s)	Private outdoor space is defined for apartment units as balconies, rooftop, gardens or terraces having a minimum area of 6 m2 and a minimum dimension of 2m, and for ground-level units as having a minimum area of 16 m2 and a minimum dimension of 4m. Adequate protection from excessive solar exposure and privacy is to be provided.

	Assessment		Score
Negative	The percentage of dwelling units in the project that have private open space meeting or exceeding the minimum area, dimensional and solar protection / privacy criteria.is :	<25%	-3
Minimum practice		25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

Scoring (choose the number of criteria)	50%-74%	3

A screenshot showing access to private open space category of the culture and perceptual page of the tool

C	Cultural and perceptual

C 1.5	Access to exterior views

Objective	To assess the quality of exterior views available to an observer located in an interior space of a main occupancy.
Indicator(s)	Visual quality from inside to outside or natural objects and their distance from the viewer.
Analysis method	Review of design prepared by the design team.
Assessment criteria(s)	Prediction of possible view corridors using physical or CAD models, and/or reactions of expert or lay panels. The tall building provides no significant high-quality views, even from top floors.

	Assessment	Exterior objects distance	Score
Negative	Exterior objects that are seen from upper levels windows are less than 10 m away. or views are not significant even from roof level..	5m or less	-3
Minimum practice	Exterior objects that are seen from upper levels windows are no closer than 15 m. or views are visually acceptable from top floors	5m-10m	0
Good Practice	Exterior objects that are seen are no closer than 20 m and views include features of interest or natural features that can be seen starting from mid to top levels	10m-15m	3
Best Practice	Exterior objects that high levels windows are more than 20 m and views include features of considerable interest or natural features that are visually attractive.	20m or more	5

Scoring (choose the number of criteria)	5m or less	-3

Total Score for social relationships	3

A screenshot showing access to exterior views category of the culture and perceptual page of the tool

N	Impact on context

N 1.1	Solar access

Objective	To assess the degree to which the building, topography and massing of the building affect natural ventilation and solar access of inhabitants and neighbours To ensure that the height, bulk or location on the site of the Design does not significantly degrade the access to direct daylight of an existing or future building on adjacent properties.
Indicator	heights and typology of building in relationship to distance between them. Percentage of nearest face of an existing building or a future building designed on an adjacent site in accordance with existing regulations, that will be shaded by the Design.
Information source	Design and contract documentation, and information on massing and fenestration of adjacent buildings on the shaded side of the subject property.
Relevant sources	https://legistarweb-production.s3.amazonaws.com/uploads/attachment/pdf/244435/SolarBrochure_WebFormat.pdf	C:\Users\yq326\Downloads\Low energy architecture and solar rights Restructuring urban regulations, view from Jordan Hussain H. Alzoubi a, Abdulsalam A. Alshboul.pdf
Assessment method	Review of schematic plans and design team analysis.
	The Solar Setback is measured along a line parallel to the northern lot line and is the minimum distance that the tallest shade producing point casting the longest shadow to the north is to be setback from the northern lot line.
	suns path modelling on eco-techt, design builder or sketch up to validate that all dwelling must receive a minimum of 1 hour of sunshine between 21/march -21 of September

	Assessment	number	Score
Negative	Computer modelling and simulation shows that the percentage of the nearest face of an existing or future building on an adjacent property that will be shaded by the design on December 21st is:	≥75%	-3
Minimum practice		50%-74%	0
Good Practice		25%-49%	3
Best Practice		<25%	5

Scoring (choose the number of criteria)	25%-49%	3

A screenshot showing solar access category of the impact on context page of the tool

N 1.2	Density and crowdedness (number of dwelling)

Objective	To encourage the efficient use of urban land, within the context of an urban development plan. Without increasing the feeling of over crowdedness.
Indicator	reducing feeling of crowdedness expressed as the number of dwellings sharing one entrance or semi-public zone in relationship to building typology and massing
Information source	Site plan, land use maps.
Relevant information	occupant perception of density is related to typology rather than being an issue of how many people are living within one square km or unit space. This aligns with what this study found; that perception of density is related to buildings form, typology, location of windows and setbacks between buildings
Assessment method	Review of site and development plans
Standards or references	https://www.mountainview.gov/civicax/filebank/blobdload.aspx?BlobID=2516	Zoning calculations methods , definitions, and clarifications
	C:\Users\yq326\Downloads\Dave-2011-Sustainable_Development.pdf	Neighbourhood Density and Social Sustainability in Cities of Developing Countries

	Assessment	number	Score
Negative		A≥15/B≥13	-3
Minimum practice	number of dwelling that share a semi-public zone or courtyard (A) or number of dwellings that share one entrance hall in multi apartment buildings (B)	A≤12/B≤10	0
Good Practice		A≤10/B≤8	3
Best Practice		A≤8/B≤6	5

Scoring (choose the number of criteria)	A≥15/B≥13	-3

A screenshot showing density and crowdedness (number of dwelling) category within the impact on context page of the tool

N	Impact on context
N 1.3	Density and crowdedness (Spaces and setbacks between buildings)

Objective	To encourage the efficient use of urban land, within the context of an urban development plan. Without increasing the feeling of over crowdedness.
Indicator	reducing feeling of crowdedness expressed by the optimal use of spaces between buildings and increasing setbacks proportionally with buildings heights
Information source	Site plan, land use maps.
Relevant information	Consider the possible development of adjacent sites and ensure that the proposed development is guards against any potential adverse effects. Checking the neighbour's rights and building envelopes of adjacent sites will allow principal living spaces and primary views to be located where they will not be blocked. Although access point location may look obvious and convenient consider changing or moving the entrance to create more accessible entrance by less-abled demographics or increase social interaction or provide more privacy for adjacent neighbours. ventilation and privacy for all adjacent dwelling, where flexible setbacks to match or be consistence with nearby buildings Building height variance in the building to allow desirable sun to reach your neighbours.
Assessment method	Review of site and development plans
Standards or references	https://www.mountainview.gov/civicax/filebank/blobdload.aspx?BlobID=2516 — Zoning calculations methods, definitions, and clarifications C:\Users\yq326\Downloads\Dave-2011-Sustainable_Development.pdf — Neighbourhood Density and Social Sustainability in Cities of Developing Countries Position the level of spaces between the building and street on the access level of the street to promote the social use of that space. Create clear hierarchy and distinct of private zones inside the house, to overlooking semi-private and semi-open zones like the garden and balconies and semi-public areas that is shared between group of buildings or dwellings to completely public zones of pedestrian paths and streets In multi-story development. It is always favourable to design 3 or 4 levels only that offer beside the semi-private and open zone a direct connection to street. Proportional setbacks between buildings where the distance between tow buildings should be half of the average heights of them. (H1+H2/2)= min Distance between these buildings.

	Assessment	number	Score
Negative		MinD < (H1+H2/2) from 3 sides	-3
Minimum practice	Minimum distance (MinD) between a number of adjacent buildings is :	MinD = (H1+H2/2) from two sides	0
Good Practice		MinD = (H1+H2/2) from all sides	3
Best Practice		MinD > (H1+H2/2) from at least the back side	5

A screenshot showing density and crowdedness (building setbacks) category within the impact on context page of the tool

N	Impact on context

N 1.4	Typology and massing

Objective	The surface area to volume (S/V) ratio (the three dimensional extrapolation of the P/A ratio) is an important factor determining heat loss and gain.
Indicator	The greater the surface area the more the heat gain/ loss through it. So small S/V ratios imply minimum heat gain and minimum heat loss.
Information source	Site plan, land use maps.
Relevant information	To minimize the losses and gains through the fabric of a building a compact shape is desirable. The most compact orthogonal building would then be a cube. This configuration, however, may place a large portion of the floor area far from perimeter daylighting. Contrary to this, a building massing that optimizes daylighting and ventilation would be elongated so that more of the building area is closer to the perimeter. While this may appear to compromise the thermal performance of the building, the electrical load and cooling load savings achieved by a well-designed daylighting system will more than compensate for the increased fabric losses.
Assessment method	
	In hot dry climates S/V ratio should be as low as possible as this would minimize heat gain. In cold-dry climates also S/V ratios should be as low as possible to minimize heat losses. In warm-humid climates the prime concern is creating airy spaces. This might not necessarily minimize the S/V ratio. Further, the materials of construction should be such that they do not store heat.
Standards or references	the cubic or compact shape is the best shape for hot dry climate with cold winters as it minimize heat transfer the least and when combined with compactness and shading can help provide more privacy and create shaded semi-private zones

	Assessment	as number	Score
Negative		s/v ≥ 2.5	-3
Minimum practice	S/V ratio and typology/compactness of the building	2.0 ≥ s/v > 2.5	0
Good Practice		1.5 ≥ s/v > 2.0	3
Best Practice		1.5 > s/v	5

Scoring (choose the number of criteria)	1.5 ≥ s/v > 2.0	3

A screenshot showing the typology and massing category within the impact on context page of the tool

N	Impact on context

N 1.5	On-site parking

Objective	To determine the extent and type of parking facilities for private vehicles on the site in order to discourage the use of private vehicles by occupants and users.
Indicator	The ratio of parking spaces for private vehicles per dwelling unit, plus the ratio of parking spaces for private vehicles per 100 m2 of usable area (UA) of non-residential occupancies.
Information source	desktop analysis of Site plan, land use maps.
Relevant information	
	Number of exterior and interior parking spaces, the total number of dwelling units and the total usable area of non-residential occupancies in m2.
Assessment method	

	Assessment	as number	Score
Negative	The ratio of parking spaces for private vehicles per dwelling unit, plus the ratio of parking spaces for private vehicles per 100 m2 of usable area (UA) of non-residential occupancies is :	≥75%	-3
Minimum practice		50%-74%	0
Good Practice		25%-49%	3
Best Practice		<25%	5

Scoring (choose the number of criteria)	50%-74%	0

Total Score	6

A screenshot showing on-site parking category and final score of the impact on context page of the tool

E	Energy and resources efficiency

E 1.1	Building orientation

Objective	To assess the impact that the orientation of the building may have on its passive solar potential in order to encourage a passive solar approach.
Indicator(s)	Deviation, in degrees (º) of main building axis from East-West (to ensure a maximum possible insolation)..
Analysis method	Building simulation or solar and shading calculator using computer software
Relevant information sources	The simplest case is a building with a rectangular footprint with its long axis oriented as much as possible in an East-West orientation. More complex cases occur with more compact buildings, or projects with multiple buildings or blocks.
	https://builditsolar.com/References/SunChartRS.htm · http://www.yourhome.gov.au/passive-design/orientation
Assessment criteria	Avoid shading from trees, buildings, etc. (especially during peak sunlight hours) for the south facing side of the building.
	Avoided placement of semi-open spaces of dwellings in exposed or reduced privacy manner between adjacent property.
	Orientate the building(s) toward an inner courtyard that can provide extra shading and compactness that allow for more privacy of inner and outer spaces.
	Orientate buildings so that the most habitable rooms face south like living areas.
	Allocate courtyards and gardens in between units in a rectangular shape about a longitudinal axis. To the south north to create shaded cooled spaces.

	Assessment		Score
Negative	The long axis of the building is oriented within Xº of East-West. Where X ranges between:	90º-46º	-3
Minimum practice		45º-15º	0
Good Practice		14º-5º	3
Best Practice		5º or less	5

Scoring (choose the number of criteria)	14º-5º	3

A screenshot showing the building orientation category within the energy and resources page of the tool

E	Energy and resources efficiency

E 1.3	Shading device

Objective	Use Shading devises on openings and walls exposed to the high solar heat where plants and trees cannot be planted to increase privacy without compromising access to light and air.
Indicator(s)	Percent of operable covered openings facing undesirable sun with either shading devices or plants
Analysis method	Site plan, land use maps.
Relevant information sources	https://www.wbdg.org/resources/sun-control-and-shading-devices http://www.pvresources.com/en/site analysis/shadinganalysis.php
Standards or references	a) Use Shading devises on openings and walls exposed to the high solar heat where plants and trees cannot be planted to increase privacy without compromising access to light and air. b) Design options may include: Offset windows or balconies on elevations that face each other (1). using shaded films and screes, recessed balconies and or vertical fins between adjacent balconies (2). Solid or semi-solid balustrades on balconies (3). Louvres or screen panels on windows and or balconies (4). Planter boxes vegetation as a screen between spaces and on walls (5) c) Consider shading the roof even if there are no skylights since the roof is a major source of transmitted solar gain into the building. d) Screening balconies and ground level private open spaces. Screening devices and fences are effective on the first floor. Onsite planting will screen up to three stories on most sites, but higher planting will be required in a park or large communal area.

	Assessment	Score
Negative	No shading measures or devices have been used	-3
Minimum practice	Shading devices has only been used on south side of the building and for reducing heat gains only	0
Good Practice	Shading devices has been used around the building to fight heat gains and increase privacy and/or aesthetic	3
Best Practice	Shading devices have been used around the building and roof fight heat gains and increase privacy and/or aesthetic	5

Scoring (choose the score)	3

A screenshot showing the shading devices category within the energy and resources page of the tool

E	Energy and resources efficiency

E 1.4	Shading of building(s) by deciduous trees.

Objective	To encourage the use of trees for sequestration of carbon dioxide, and to reduce energy use for cooling of the building, by providing evapotranspiration and shading of the building during the hot season.
Indicator(s)	Native trees retained or planted, according to landscaping plans and specifications; measured as percent of building frontage facing the equator, at a height of 5 m. that will be covered by foliage during the warm season within 5 years.
Analysis method	Review of site plan by an outside landscape architect or botanist.
Standards or references	Deciduous trees fulfil several valuable functions if they are located on the side of the building most exposed to solar gain during the warm season (South and West in the northern hemisphere, North and West in the southern). Benefits include shading of people, reduction of heat gains into the building, CO2 sequestration and aesthetic enhancement. Note that benefits are maximised for low-rise buildings and may be negligible for high-rise buildings.
	From "The Potential of Vegetation in Reducing Summer Cooling Loads in Residential Buildings"; by Huang, Y.J. et al; in Journal of Applied Meteorology, Vol. 26, Issue 9, pp. 1103-1116, Sep. 1987: "Parametric analysis reveals that most of the savings can be attributed to the effects of increased plant evapotranspiration, and only 10% to 30% to shading.

	Assessment criteria for total project	number	Score
Negative	According to landscaping plans and specifications, native trees will provide shade at a height of 5 m. on the building frontage facing the equator, equal to or more than :	<25%	-3
Minimum practice		25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

Scoring (choose the number of criteria)	50%-74%	3

A screenshot showing the shading of building using trees category within the energy and resources page of the tool

E	Energy and resources efficiency

E 1.4	Use of local materials

Objective	To assess the extent to which local materials and construction techniques will used in the execution of the project.
Indicator(s)	Architect's estimate of the percent of the non-structural elements of the building will be constructed using local materials and construction techniques.
Analysis method	Review by an outside design team of an analysis prepared by the design team.
Standards or references	Estimate of percentage of traditional local materials to be used relative to total non-structural materials, by value.

	Assessment criteria for total project	number	Score
Negative		<25%	-3
Minimum practice	The estimated percentage of local materials to be used relative to total non-structural materials, by value, is:	25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

Scoring (choose the number of criteria)	25%-49%	0

total Score	9

A screenshot showing the use of local materials category and the final score of the energy and resources page of the tool

Site sustainability	Social Relationship	Cultural and perceptual	Flexibility and Adaptability	indoor comfortable environment	Energy and resources efficiency	Impact on local context and neighbours
5	3	0	0	0	3	3
3	0	0	0	3	0	-3
0	-3	3	0	0	3	3
	-3	3	0	3	3	3
		-3			0	0
8.00	-3.00	3.00	0.00	9.00	9.00	6.00
9	15	15	12	12	18	15
-9	-15	-15	-12	-12	-18	-15

-9	Poor
-8	
-7	
-6	
-5	
-4	
-3	
-2	
-1	
0	Moderate
1	
2	
3	
4	
5	Good
6	
7	
8	
9	
10	
11	Best Practice
12	
13	
14	
15	

Assessments by Section

■ Total Score

A screenshot showing the final summery page of the too

Appendix F Eco cultural design tool V2

Main researcher	Yahya Qtaishat
Project	Eco-cultural design guide and toolkit / Integrated Architecture of Tradition, Culture, Identity and Sustainability.
Supervisors	Dr Kemi Adeyeye and Prof. Stephen Emmitt

Eco-cultural design guide and toolkit

UNIVERSITY OF BATH

Introduction	User Guide	Table of content	Site sustainability	Social Relationship	Cultural and Perceptual	Adaptability and flexibility	Internal healthy environment	Energy and resources efficiency	Summary

Next

Finish

This tool is intended to help assess the enviroenmtal performance and socio-cultural suitability of resedental dwelling units for resedents needs and Jordan climat.

The guide and toolkit present key issues identified throuw feild work and interviews with resedents in traditional vernacular houses in Salt city and a modern urban project in Zarqa Jordan that tries to bridge the gab between contembrery and vernacular local architecture in an eco-cultural design that suites resedents various needs in a home

presented soloution and design guidlines are the result of feild work.

It lists the issues we have identified from our field work and, where possible, provides guidance in the form of a tool or a pointer to a report or academic paper.

This tool represent a work in progress and dose not include all the possible soloution or issues but tries to fill the critical gap in the Jordanian sustainbility in building codes represented in the Jordanian green building guide and comes second to it.

What is required from you dear participent is to to try and assess one of your projects which you think present a unique view into solving sustainability and socio-cultural needs of building users using this tool..

We ask you kindly if you agreed in participating to provide the project plans, paperworks and documents to try and test the usuability and functionality of this tool and make any amendment and solve any issues with it.

The toolkit covers the following five categories of impact, which were chosen because they have the greatest potential to reduce a building's environmental impact and remove the most commonly encountered issues barriers to eco-cultural design:

Start using the Assessment Tool by clicking on the User's Guide tab.

After completing the assessment, Toolkit users will have a tabulated set of criteria in design that will help to promote sustainable development and green building; and/or prevent the building community from developing in concert with the Eco-cultural goals. With the assessment complete, the Toolkit help architects chart out a transparent and open pathway for discussing potential changes to the design with clients and local comunity.

A screenshot showing the introduction page of the modified tool

Main researcher	Yahya Qtaishat		
Project	Eco-cultural design guide and toolkit	Eco-cultural design guide and toolkit	UNIVERSITY OF BATH
	Integrated Architecture of Tradition, Culture, Identity and		
Supervisors	Kemi Adeyeye and Prof. Stephen Emr		

User guide and instructions

First: Please fill in the project specifications like location, area, climatic region, type of construction….etc

Dark green represent the current page

You can move through the tool using the buttons found at the bottome of each page:

| Introduction | User Guide | Site Data | Content table | Site sustainability | Social Relationship | Cultural and Perceptual | Adaptability and flexibility | Internal healthy environment | Energy and resources efficiency | Summery |
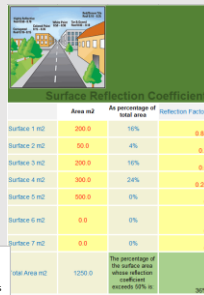
You can also use the navigation bar at the bottom of the screen

Users Guide | S. Site Sustainability | R. Social Relations | C. Cultural and perceptual | F. Flexibility and Adaptability | K Indoor environ …

Every main category is given a code letter and then sub-categories are given number coding. (for each subcategory, i.e. "R.2. Provision of public open space(s)" under "S-Social Relationships" worksheet):

First before starting you need to fill basic data about the project which includes type, area, location, climatic data, if there is any flood risk. Other data includes type of energy source and if there is any active HVAC systems installed. After filling the Necessary data move to the first tab and do as follow:

Sub-category headline

This Examples uses a screen shot from Site sustainability section

1. Read the Objective and Rationale

2. Read and understand what is the indicator used to measure the success or failure of this sub-category (there are also some references provided for your general knowledge)

3. Read the assessment criteria and what Potential Tools and Techniques to use
4. Evaluate your design using the assessment criteria in regards to the indicator / sub-issues
5. Choose the option from the drop-down menu that best fits your response to the assessment criteria

6. the sheet will present your score for this sub-issue

7. Click the links in the Resources column to access related resources

S 4	Urban heat island effect
Objective	Reduce the effect of the urban heat island effect by reducing the total built up and paved area of the project.
Applicable for	Multi and single type of dwellings
Indicator(s)	Ratio of dark and low albedo surfaces in urban structures and ground pavement and presence of plants or shading structures. Green roof specifications.
Assesor	Architect only
Assessment Criteria	1) Use plants that can provide shadows over paved areas and on low-reflectance coats on site 2) Providing shades by covering the surfaces with thermal or optical complexes, which produce energy to cover surfaces exposed to too much solar radiation. 3) Provide shades by covering surfaces with reflective shading tools of at least 50% 4) The use of ground paving and cover material with a minimum reflectivity of 50% 5) Use green roofs and green facades. A "green roof" is simply a vegetated roof. 6) Reducing the parking area of cars on the surface of the site and replacing them with specifications under the building structure or underground, or replacing asphalt with porous materials for water with a reflectivity of at least 50%

Surface Reflection Coefficient

	Area m2	As a percentage of total area	Reflection Factor
Surface 1 m2	200.0	16%	0.85
Surface 2 m2	50.0	4%	0.7
Surface 3 m2	200.0	16%	0.6
Surface 4 m2	300.0	24%	0.25
Surface 5 m2	500.0	0%	0
Surface 6 m2	0.0	0%	0
Surface 7 m2	0.0	0%	0
Total Area m2	1250.0	The percentage of the surface area whose reflection coefficient exceeds 50% is:	36%

Or use the tool (where available) to help with calculations

You can go to an aid to help you with various calculations

The total score you got (or lost) in this section

Assessment	Reflection Coefficient Calculator	Metric	Score
The plans indicate that the area of the open area with vegetation in addition to the built-up areas and surfaces with a reflection coefficient equal to 50% or greater, as a percentage of the total open area (includes the roof of the building) is:		<25%	-3
	Minimum practice	25%-49%	0
	Good Practice	50%-74%	3
	Best Practice	≥75%	5
Choose the value that matches your calculations	25%-49%		0
Total Score		3	
Progress		50%	

Choose the resulted accounts on are compa

Progress bar for this section of the tool

8. The possible scoring for the whole sheet and for every sub-issue are on a scale ranging from "Poor" to "Best Practice"

9. the tool will calculate the points you have got for achieving each criteria for each category

10. Repeat until all questions are answered, Complete these steps for each subcategory,S-E
11. The totals for each colour are tallied and recorded after each subcategory's table, as well as the overall category's totals at the end of the worksheet.
12. The totals for each colour

Notes

This tool can be expanded or modified to fit the needs of your design. Therefore, if you need to add sections or areas that are not currently addressed by the assessment tool, these sections can be added in the future based on your feedback as needed and you may copy and paste the drop down menus and formulas to generate the automatic pie charts and summary tables.

Each score gives a colour-rating in the final column as green, yellow, or red

Green- the design is doing well and should continue with current plan

Yellow- room for improvement

Red- the current design should identify and remove cause of barrier

Prev | Next | Finish

| Introduction | User Guide | Table of Content | Site Sustainability | Social Relationship | Cultural and Perceptual | Flexibility and Adaptability | Indoor Environment | Energy and Resources | Summery | Resources |

A screenshot showing the user instruction page of the modified tool

Eco-cultural design guide and toolkit	Completion check
Table of contents	

s.		Site Sustainability	
	S.1	Flood risk	● 1
	S.2	Use of vegetation to provide ambient outdoor cooling.	● 1
	S.3	Use of suitable local type of plants	● 1
	S.4	Urban heat island effect	● 1
	S.5	Solar access right	● 1

R.		Social Relationships	
	R.1	Interactive dwellings	● 1
	R.2	Walkable streets and pathways	● 1
	R.3	Proximity to services	● 1
	R.4	Provision of public open space(s)	

C .		Cultural and perceptual	
	C.1	Visual privacy in principal areas of dwelling units.	● 1
	C.2	Relevance to vernacular architecture	● 1
	C.3	Access to a private open space	● 1
	C.4	Access to exterior views	● 1
	C.5	Project aesthetic	● 1
	C.6	Density and crowdedness	● 1

F.		Flexibility and Adaptability	
	F.1	Potential for horizontal or vertical space modification.	● 1
	F.2	Maintenance of building components	● 1
	F.3	Adaptability to add renewable energy sources	● 1
	F.4	Potential for Internal or external space modification.	● 1

K.		Indoor environment	
	K.1	Effectiveness of functionality and Internal circulation	● 0
	K.2	Appropriate daylighting in primary occupancy areas.	● 0
	K.3	Noise and Acoustics control between primary occupancy rooms	● 0

E.		Energy resources efficiency	
	E.1	Building orientation	● 0
	E.2	Building envelop	● 0
	E.3	Shading devices	● 0
	E.4	Shading of building(s) by deciduous trees.	● 0
	E.5	Use of local materials and techniques	● 0
	E.6	Typology and massing	● 0

Prev   Next   Finish

Introduction	User Guide	Table of Content	Site Sustainability	Social Relationship	Cultural and Perceptual	Flexibility and Adaptability	Indoor Environment	Energy and Resources	Summery	Resources

A screenshot showing the content page of the modified tool

S	Site Sustainability and Development

S.1	Flood risk

Objective	Study and selection of a suitable site that minimises the negative environmental impact by avoiding zones of flood risk or fragile eco-system sites.
Applicable for	Multi and single type of dwellings
Indicator(s)	Location of Site in relative to zones of flood risk and if any measures have been taken to reduce the effect of flash floods
Responsible Assessor	Architect and Civil Engineer
Assessment method	Provide general floor, site plans or any structural or engineering detail drawing showing the requested achieved criteria
Related Resources	Flash flood risk assessment for Jordan / https://reliefweb.int/sites/reliefweb.int/files/resources/WFP-0000106848.pdf / Google Earth / http://floodtools.com/Map.aspx
Assessment Criteria	1) when site is located in flash flood zone (see appendix) the level of the lowest inhabited floor should be at least 1,60 m above street level.
	2) Green or planted zones should account for at least 25% of the total site area. It is also better to use high absorbent High porosity tiles and asphalt to help discharge excess rainwater.
	3) Properly waterproof building component that lays below natural ground level.
	4) Provide any architectural or structural details to minimize and deal with the impact of potential floods (see appendix)
	4) Damp proof course should be provided for the floor. water tight septic tanks with dispersion trenches for the disposal of effluent should be provided
	.5) For this open jointed tile drains made of porous materials can be used which will provide diffusion of effluent slowly.
	6) Plants with high affinity to water can be planted in this area. (See S.3 Use of region Native plants)
	7) Add Surface drains should be designed for the peak flow. It should be provided with RCC cover in order to avoid debris falling in it resulting clogging. Man holes to be provided in 75 mts to 100 mts interval.

	Assessment	Number of Criteria	Score
Negative	No Criteria or buffer zone is made when the site is located on natural eco-system site or flood risk zone	0	-3
Minimum practice	There is low risk of flash floods or the inhabited basement level of the building is below street level with no open grid system but with water proofing and coating for the building component	1	0
Good Practice	Inhabited level is at least 1600 mm above street level with water proofing and coating and with suitable rain drainage or pump for basement levels..	2	3
Best Practice	Inhabited level is at least 1600 mm above street level with water proofing and coating and with suitable rain drainage or pump for basement levels. And with open grid pavement for lower levels and parking spaces to absorb rainwater. And any other architectural or structural details to minimize floods impact	4	5

Scoring (choose the number of achieved criteria)	2		3

A screenshot showing the flood risk category of the site sustainability page of the modified tool

S	Site Sustainability and Development

S.2	Use of vegetation to provide ambient outdoor cooling.

Objective	To assess the role of vegetation on the site and on roofs in cooling ambient conditions through evapotranspiration.
Applicable for	Multi and single type of dwellings
Indicator(s)	The ratio of the total area of vegetation (on land and on roofs, including trees), divided by the total area of the site. The result is known as the Leaf Area Index.
Responsible Assessor	Architect and landscape architect
Analysis method	Site plan, landscaping plans, land use plan report
Assessment Criteria	P= Area used for planting plants (including green building roofs, plant pots and flowers) A= Total area of the outside squares (open spaces not included in the building area) Leaf Area Index= P/AX100%

	Assessment	Metric	Score
Negative	The Leaf Area Index (LAI) or the ratio of total m2 vegetated surface, on ground and on roofs and including trees, divided by total m2 site area, is:	<25%	-3
Minimum practice		25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

Scoring (choose the achieved percentage)	<25%		-3

A screenshot showing the use of vegetation category of the site sustainability page of the modified tool

S	Site Sustainability and Development
S.3	**Use of suitable local species of plants**

Objective	To assess the role of vegetation on the site and on roofs in cooling ambient conditions through evapotranspiration.
Applicable for	Multi and single type of dwellings
Indicator(s)	percentage of type of plants used from the total number of plants species used for site development and planning and landscaping
Responsible Assessor	Architect and Civil Engineer
Assessment method	Provide general landscape, and site plans showing the requested achieved criteria
Related Resources	Landscape Plants for Jordan and the Middle East Book	C:\Users\yq326\Downloads\نباتات تنسيق الحدائق.الاردن.pdf
Assessment Criteria	P= number of total plant types used for landscaping A= number of region suitable plants used Percentage of suitable plants and trees used equal= P/AX100%

	Assessment	**Metric**	**Score**
Negative	percentage of type of plants used from the total number of plants species used for site development and planning and landscaping=	<25%	-3
Minimum practice		25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5
Scoring (choose the achieved percentage)	25%-49%		0

A screenshot showing the use of suitable type of plants category of the site sustainability page of the modified tool

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S	Site Sustainability and Development
S.4	**Solar access right**

Objective	To assess the degree to which the building, topography and massing of the building affect natural ventilation and solar access of inhabitants and neighbours
Applicable for	Multi and single type of dwellings
Indicator(s)	Ensure that the height and shape of the building block do not lead to a significant decrease in direct sunlight access to neighbouring properties, especially those that are located on low floors. By calculating the percentage of shadow falling on the sides of the neighbouring buildings relative to the area of that total face
Responsible Assessor	Architect and Civil Engineer
Assessment method	Simulation of falling shadow from the building erected on the adjacent buildings.
Related Resources	Site Planning for Solar Access — https://books.google.co.uk/books?id=4Wbc46X SjEC&pg=PA141&lpg=PA141&dq=solar+access+se tbacks+equation+in+buildings&source=bl&ots=Y Vw6W9riOz&sig=ACfU3U0Yq3Z8J8fh_hwZBbMp5 _DOwb0pJA&hl=en&sa=X&ved=2ahUKEwiHw7ed mqrkAhWGThUIHfnTDNgQ6AEwAnoECAkQAQ#v =onepage&q=solar%20access%20setbacks%20eq uation%20in%20buildings&f=false
Assessment Criteria	Take into consideration the buildings surrounding the project, whether they are standing or could be developed in the future, and ensure that the proposed design does not prevent the right of the neighbours to access a sufficient degree of natural ventilation and privacy, as the rebounds must be commensurate with the height of the adjacent buildings. The solar setback distance is measured and it is the minimum distance you need in relation to the height of the building in order for the shadow level on the lower floors to exceed about 50% in the winter in relation to the location of the location: The following equations are used in determining the value of S based on the average height of adjacent buildings, as shown in figures and equations H1= Height of the highest shadow producing point in Building 1 H2 = height of the highest shadow producing point in Building 2 .... Hn = height of the highest shadow product in building n (H1 + H2 + ... Hn / n) = AvrH altitude

Assessment	shadow guide tool	Metric	Score
Negative		$0.34 \times AvrH > S$	-3
Minimum practice	the solar setback distance (S) =	$0.44 \times AvrH > S > 0.35 \times AvrH$	0
Good Practice		$0.64 \times AvrH > S > 0.45 \times AvrH$	3
Best Practice		$0.65 \times AvrH < S$	5

Choose the value that you calculated	$0.44 \times AvrH > S > 0.35 \times AvrH$		0

A screenshot showing solar access right category of the site sustainability page of the modified tool

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S	Site Sustainability and Development
S 5	Urban heat island effect

Objective	Reduce the effect of the urban heat island effect by reducing the total built up and paved area of the project.
Applicable for	Multi and single type of dwellings
Indicator(s)	Ratio of dark and low albedo surfaces in urban structures and ground pavement and presence of plants or shading structures. Green roof specifications.
Responsible Assessor	Architect only
Assessment method	Site plan, landscaping plans.
Related Resources	The city and urban heat islands: A review of strategies to mitigate adverse effects Author links open overlay panelE.J.Gago 2013 — https://www.sciencedirect.com/science/article/pii/S1364032113003602
Assessment Criteria	1) Use plants that can provide shadows over paved areas and on low-reflectance coats on site 2) Providing shades by covering the surfaces with thermal or optical complexes, which produce energy to cover surfaces exposed to too much solar radiation. 3) Provide shades by covering surfaces with reflective shading tools of at least 50% 4) The use of ground paving and cover material with a minimum reflectivity of 50% 5) Use green roofs and green facades. A "green roof" is simply a vegetated roof. 6) Reducing the parking area of cars on the surface of the site and replacing them with specifications under the building structure or underground, or replacing asphalt with porous materials for water with a reflectivity of at least 50%

	Assessment	Reflection Coefficient Calculator	Metric	Score
Negative	The plans indicate that the area of the open area with vegetation in addition to the built-up areas and surfaces with a reflection coefficient equal to 50% or greater, as a percentage of the total open area (includes the roof of the building) is:		<25%	-3
Minimum practice			25%-49%	0
Good Practice			50%-74%	3
Best Practice			≥75%	5

Choose the value that matches your calculations	25%-49%		0

Total Score	0
Section Progress	100%

A screenshot showing urban heat island effect category and the total score for the site sustainability page of the modified tool

R	Social Relations

R 1.1	Interactive Dwllings

Objective	treatment for housing project and building layout in a way that encourages social exchange between residents and promote security and walkability in the project.
Applicable for	Multi-dwelling planning and design.
Indicator(s)	treatments for housing project and building layout in a way that encourages social exchange between residents.
Responsible Assessor	Project devoloper /Owner
Assessment method	Desktop analysis
Related Resources	https://www.firstinarchitecture.co.uk/space-planning-basics/
Assessment Criteria	1) Availability of common use and gathering space in the building or between group of units in the neighbourhood by arranging units to create shaded mutual semi-public zones where neighbours can meet.
	2) Limit number of dwelling that share a semi-public zone or courtyard to no more than 12. And limit the number of dwellings that share one entrance to 8 units. In multi-story development. It is always favourable to design 3 or 4 levels
	3) Arrange dwelling entrances in the street or in one level of an apartment block to be overlooking and share one regular shape landing or lobby.
	4) Gear views from room's windows, balconies and terraces to street and nearby playing ground or gardens to maximize social interaction and increase safety and security.

	Assessment	Percentage	Score
Negative	The location of the housing entrances is clear to less than 25% of the other entrances to the housing on the street or within the same semi-public area common to buildings with floors	<25%	-3
Minimum practice	The location of the entrance to any housing can be seen from 50% of the entrances of other dwellings on the street or within the same common semi-public area or / and there are more than 12 housing units that share a common use area or one entrance	25%-49%	0
Good Practice	The location of the housing entrance can be seen from 50% to 74% of other housing on the street or within the same common semi-public area with about 12-9 participants in the same entrance to the semi-private area or the entrance to the building	50%-74%	3
Best Practice	The location of the housing entrance can be seen from 75% of other housing on the street or within the same common semi-public area with no more than 8 housing units that share the same entrance to the semi-private area or building with 4 floors of a maximum of inhabited floors	≥75%	5

Scoring (choose the number of achieved criteria)	25%-49%		0

A screenshot showing interactive dwellings category of the social relationship page of the modified tool

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R	Social Relations

R 1.2	Walkable streets and pathways

Objective	To assess the extent and quality of walkways for occupants and users.
Applicable for	<u>Multi-dwelling planning and design.</u>
Indicator(s)	Type and extent of walkways in the project, extent of walkways sheltered from rain, snow or excess sunshine.
Responsible Assessor	Project devoloper /Owner
Assessment method	Desktop analysis
Related Resources	Well-located and designed walkways on the site encourage walking, which promotes human health. Relevant information includes type and extent of walkways in the project, precautions against vehicle traffic hazards, and percent of walkway length that is sheltered from rain or snow and that is sheltered from excess sunshine. https://dmampodemo.files.wordpress.com/2015/03/flexible-street-design-updated-aug-8.pdf
Assessment Criteria	1) Clear division between street and sidewalks and separate them from boundaries of the building by tree of vegetation line. 2) Avoid creating dark and leftover spaces around your project with no lighting, visibility from nearby windows and opening. And that does not lead to any functional areas as it encourages nearby resident to take over ownership and promote vandalism, neglect and illegal activities. 3) Offer plenty of shading using trees or shading elements 4) provide even non-slippery surfaces with no obstacles or minimum levels or steps on the walkways to the entrance of the project.

	Assessment	Percentage	Score
Negative	Walkaways and sidewalks are not sheltered from climate, with less than 25% of the walkways adequate planted trees r sheltered from the sun, with uneven surfaces which is not accessible from the street and cross path with cars	<25%	-3
Minimum practice	10 percent of the walkway length connecting building entrances to sidewalks or parking areas is sheltered from rain or snow and more than 25% is sheltered from excess sunshine.	25%-49%	0
Good Practice	Pedestrians have dedicated walkways that provide access to most sections of the building. More than 20 percent of the walkway length connecting building entrances to parking areas is sheltered from rain or snow and more than 50% is sheltered from excess sunshine. Provide even surface for the walkways with no levels needed to go inside or walk around the lot and is only 10 cm above street level	50%-74%	3
Best Practice	Pedestrians have dedicated walkways that provide access to all sections of the project. Very few walkways cross vehicle roadways and, where this occurs, precautions are taken to minimize traffic hazards. More than 30 percent of the walkway length connecting building entrances to public transport stops or parking areas is sheltered from rain or snow and more than 75% is sheltered from excess sunshine.	≥75%	5

Scoring (choose the percentage of achieved criteria)	50%-74%		3

A screenshot showing street walkability category of the social relationship page of the modified tool

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R	Social Relations

R 1.3	Proximity to services

Objective	To assess and stimulate plans for using suitable transportation methods and reduce long trips and pollution emitted by privately used vehicles
Applicable for	Multi-dwelling planning and design. , Choose Not Applicable if one single dwelling
Indicator(s)	The site location is located on pre-developed area or in proximity to various services and amenities
Responsible Assessor	Project devoloper /Owner
Assessment method	To assess and stimulate plans for using suitable transportation methods and reduce long trips and pollution emitted by privately used vehicles
Related Resources	You can use Google Earth to define your Points of Interest and draw radios from your site to these points	https://www.solidterrainmodeling.com/how-to-use-google-earth-to-define-your-points-of-interest/

Assessment Criteria	a) Amenities and Support services	
	is there a very near health facility located within at least 500M	Yes
	Are there a Fairly near health facility located between 500-1000m	Yes
	Are there a house of worship within 1000 m	Yes
	Are there a Café or community centre/house 1km	Yes
	Retail that include	
	Local food retail shop very near (within 500m)	Yes
	Local food retail shop fairly near (500m- 1km)	Yes
	Major commercial centre or commercial street within 2km	Yes
	c) Schools:	
	Are there a pre-school very near (within 500m)	No
	Are there a pre-school fairly near (between 500-1km)	No
	are there a primary school very near (within 500m)	No
	Are there a primary school fairly near (between 500-1km)	Yes
	are there a high school within 1km?	No
	Are there a high school within 2km?	Yes
	d) Transportation:	
	are there a bus rout within 500 m?	No
	are there any bus rout between 500-1km?	Yes
	e) Play and leisure:	
	are there any toddler play area within sight of dwellings?	Yes
	Are there park/play facilities very near (within500m)	Yes
	are there park/play facilities fairly between 500m-1km	Yes
	Number of "Yes" answeres =	**0**

	Assessment	metric	Score
Negative		0-4	-3
Minimum practice	Number of "Yes" answeres =	5-9	0
Good Practice		10-15	3
Best Practice		15 and more	5

Scoring (choose the number of achieved criteria)	10-15		3

A screenshot showing proximity of services category of the social relationship page of the modified tool

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R	Social Relations

R 4	Provision of public open space(s)

Objective	Parks, open spaces, gardens, and ecological areas are particularly important for urban environments where green space and places of refuge can be in short supply. Proximity to parks is often associated with increased physical activity, more social interaction, and reduced stress.
Applicable for	<u>Multi-dwelling planning and design..</u>
Indicator(s)	Availability and special treatments of design and vegetation in private and semi-private open spaces to accompany the micro-climate and demographics needs.
Responsible Assessor	Project Architect and Project devoloper /Owner
Analysis method	Site plan, landscaping plans. Design documentation; building permit; planning department in local government
Relevant information source	https://www.psrc.org/sites/default/files/sustainable_parks_and_open_space.pdf Site plan, landscaping plans. Design documentation; building permit; planning department in local government
Assessment Criteria	1) there IS a local code for open space restriction, open space should exceed local code by 25%
	2) Case 2: there is NO code (campuses or military bases), open space is to be 50% of the size as building footprint
	3) there IS a local code, but ZERO open space requirement: open space should be 75% of site area
	For all cases the design of shared and semi-private spaces of the dwelling can be counted into the assessment criteria
	vegetated roof areas can count toward assessment criteria
	pedestrian oriented hardscape areas can count toward credit compliance (min. 25% open space must be vegetated)
	The design of shared and semi-private spaces should provide: a) variation of hard and soft landscape with trees and plants. b) local climate-appropriate shelter from harsh sun in common outdoor and semi-private spaces on site or on landscaping c) Use of small water features (e.g. fountain) incorporated into the site and appropriately protected' to cool ambient air. At least quarter of that open space must be vegetated or have overhead vegetation. Open spaces must be designed for one or more of the following uses: social gathering, gardening, physical activity, or natural habitat that includes elements for human interaction. Vegetated roofs can be counted in certain circumstances., there are both shaded and sunny areas, and the design makes it very attractive for users.

	Assessment	metric	Score
Negative	The project must provide open space percentage in comperasion to built up area equal :	<25%	-3
Minimum practice		25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

Scoring (choose the number of achieved criteria)	50%-74%	3

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A screenshot showing provision of public space category and final score of the social relationship page of the modified tool

C	Cultural and perceptual

C 1	Visual privacy in principal areas of dwelling units.

Objective	*To assess the level of privacy in bedroom and living areas of dwelling units in the building.*
Applicable for	Multi and single type of dwellings
Indicator(s)	The percentage of the number of housing units in which the bedrooms and living rooms are exposed and located within sight. Or windows of adjacent buildings located at a distance less than the recommended separation distance
Analysis method	Using a general site and architectural plan that shows the setbacks and location of rooms.
Relevant information source	Visual privacy recognition in residential areas through amendment of building regulations / 1999_JourUrbDes_ResidentialVisualPrivacy.pdf
Assessment criteria(s)	(a) A minimum of 9m separation should be provided between the living area windows of facing dwelling units. (b) Where the distance between windows or balconies/verandas of dwelling units is less than 12m, direct views between living area rooms of dwelling units into the principle area of private open space of other adjoining units should be screened or obscured. (c) Views may be obscured through the use of solid fences, semi-permeable screening (e.g. lattice), or planting, and by offsetting the placement of windows on facing buildings so as not to create direct views between them. (d) Site layouts should ensure shared driveways have a line of separation of at least 3m from bedroom windows. (e) Separation could be achieved either by distance or changes in levels. Provide semi-open and semi-private areas of the dwelling with enough visual privacy. This includes terraces, balconies not adjacent to other opening/ balconies from nearby buildings. And for back gardens have high enough boundary or tree line to protect them. (f) Relocate semi-open and semi-private areas of the dwelling to face street or avoid locating them next to semi-private areas and direct contact from windows of the next building. (g) Applying maximum grading allowance where the position of the building garden level above ground do not exceed the original level of site before development to decrease exposure to neighbours' semi-private zones and gardens.

C 1	Multi type of dwellings

	Assessment	metric	Score
Negative		≥75%	-3
Minimum practice	The percentage of dwelling units whose bedroom and living areas are open to horizontal or downward views by others, from a point within 20 m of the exterior windows :	50%-74%	0
Good Practice		25%-49%	3
Best Practice		<25%	5

Scoring (choose the number of achieved criteria)	50%-74%	0

A screenshot showing the visual privacy category and of the culture and perceptual page of the modified tool

C	Cultural and perceptual
C 2	Relevance to vernacular architecture

Objective	To assess the extent to which traditional local materials and construction techniques will used in the execution of the project.
Applicable for	Multi and single type of dwellings
Indicator(s)	Architect's estimate of the percent of the non-structural elements of the building will be constructed using traditional local materials and construction techniques.
Analysis method	Review by an outside design team of an analysis prepared by the design team.
Relevant information source	Traditional Buildings elements of the Middle East **Traditional Buildings elements of the Middle East.pdf**
Assessment criteria(s)	The use of vernacular inspired element is also encouraged. Vernacular elements include long arched windows styles, shading devices, proportions, compactness and massing, large terraces and balconies, or even materials and colours like limestone. (see attachment) Vernacular elements could work as both visual and climatic enhance the local environment conditions enhancer. Integrate vernacular or traditional architectural elements into the envelop design that can aid in energy saving and thermal comfort such as opening shape, size and ratio.

	Assessment	Metric	Score
Negative	Most of the building's architectural features and elements such as height, materials and configuration are incompatible with vernacular building concepts.	<25%	-3
Minimum practice	Some architectural features of the Design, such as windows, size and height, colour or type of materials, are incompatible with vernacular buildings.	25%-49%	0
Good Practice	Most architectural features of the Design, such as height, bulk, set-back from the street, window size and height, colour or type of materials, are somewhat compatible with features of vernacular buildings.	50%-74%	3
Best Practice	Architectural features of the Design, such as height, bulk, set-back from the street, window size and height, colour or type of materials, are mostly compatible with features of adjacent buildings.	≥75%	5

Scoring (choose the number of achieved criteria)	50%-74%	3

A screenshot showing relevance to vernacular architecture category of the culture and perceptual page in the modified tool

C 2	**Relevance to vernacular architecture**

C 3	Access to a private open space

Objective	To assess the extent to which occupants of dwelling units have easy access to private outdoor space that is compatible with local cultural values
Applicable for	Multiple dwellings
Indicator(s)	Minimum area and dimensions, in m2 and m. and adequate protection from excessive solar exposure and enhanced privacy.
Analysis method	Desktop analysis of design and architectural sketches
Relevant resources	Various open space specification and codes	https://www.planning.act.gov.au/__data/assets/pdf_file/0004/895405/DV_306_Private_open_space_and_communal_open_space.pdf http://newcastle.nsw.gov.au/getmedia/65239865-f8ee-4344-a5ec-ca2e11c89bac/3-02-Single-Dwellings-Ancillary-Development_amended-
Assessment criteria(s)	Private outdoor space is defined for apartment units as balconies, rooftop, gardens or terraces having a minimum area of 6 m2 and a minimum dimension of 2m, and for ground-level units as having a minimum area of 16 m2 and a minimum dimension of 4m. Adequate protection from excessive solar exposure and privacy is to be provided.

	Assessment	Metric	Score
Negative	The percentage of housing units in the project that have access to a private external space with the specifications indicated:	<25%	-3
Minimum practice		25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

Scoring (choose the percentage of achieved criteria)	50%-74%	3

A screenshot showing access to private open space category of the culture and perceptual page in the modified tool

C 2	Relevance to vernacular architecture
C 4	Access to exterior views

Objective	To assess the quality of exterior views available to an observer located in an interior space of a main occupancy.
Indicator(s)	Visual quality from inside to outside or natural objects and their distance from the viewer.
Analysis method	Review of design prepared by the design team.
Assessment criteria(s)	Prediction of possible view corridors using physical or CAD models, and/or reactions of expert or lay panels. The tall building provides no significant high-quality views, even from top floors.

	Assessment	Exterior objects distance	Score
Negative	Exterior objects that are seen from upper levels windows are less than 10 m away. or views are not significant even from roof level..	5m or less	-3
Minimum practice	Exterior objects that are seen from upper levels windows are no closer than 15 m. or views are visually acceptable from top floors	5m-10m	0
Good Practice	Exterior objects that are seen are no closer than 20 m and views include features of interest or natural features that can be seen starting from mid to top levels	10m-15m	3
Best Practice	Exterior objects that high levels windows are more than 20 m and views include features of considerable interest or natural features that are visually attractive.	20m or more	5

Scoring (choose the number of achieved criteria)	5m or less	-3

A screenshot showing access to private open space category of the culture and perceptual page in the modified tool

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C 2	Relevance to vernacular architecture

C 5	Project aesthetic

Objective	To assess the aesthetic quality of the building interior and exterior
Applicable for	Multi and single type of dwellings
Indicator(s)	Various aspects of site development that affect perceptions, including continuity and harmony with other nearby buildings, presence of vegetation, Natural view (view type, view quality and social density), geometry of windows (openings), amount of glazing, colour, texture, volume/size of the room
Analysis method	Review by an outside design team of an analysis prepared by the design team.
Relevant information source	Indoor Comfort in Dwellings: An Exploratory Study of Diverse Design Approaches / https://www.ijrter.com/papers/volume-3/issue-12/indoor-comfort-in-dwellings-an-exploratory-study-of-diverse-design-approaches.pdf
Assessment criteria(s)	(1) Aesthetics and identity could be achieved by: preserving harmonious groupings, rhythms typology and sizes between the buildings,
	(2) By using specific repeated style and size /material of opening area of glazing
	(3) special treatments of external elements like walls and fences.
	(4) Landscaping including private open spaces where varied local plants are could be used to create visual interest in different seasons using heights, colours, textures.

	Assessment	Number of Criteria	Score
Negative	Many major architectural features of the Design, such as height, bulk, and set-back from the street, are clearly incompatible with adjacent buildings. And dose not meet another criteria.	0	-3
Minimum practice	Some architectural features of the Design, such as window size and height, colour or type of materials, are clearly incompatible with adjacent buildings. but at least 2 other criteria have been achieved.	1	0
Good Practice	Most architectural features of the Design, such as height, bulk, set-back from the street, window size and height, colour or type of materials, are somewhat compatible with features of adjacent buildings, as well as at least 4 other criteria	2	3
Best Practice	Architectural features of the Design, such as height, bulk, set-back from the street, window size and height, colour or type of materials, are very compatible with features of adjacent buildings as well as all the 6 other criteria.	4	5

Scoring (choose the number of criteria)	1	0

A screenshot showing project aesthetics category of the culture and perceptual page in the modified tool

C 2	Relevance to vernacular architecture
C 6	Density and crowdedness

Objective	To encourage the efficient use of urban land, within the context of an urban development plan. Without increasing the feeling of over crowdedness.
Applicable for	Multiple dwellings
Indicator(s)	reducing feeling of crowdedness expressed by the optimal use of spaces between buildings and increasing setbacks proportionally with buildings heights
Analysis method	Review of general site plans
Relevant information source	https://www.mountainview.gov/civicax/filebank/blobdload.aspx?BlobID=2516 — ZONING CALCULATIONS METHODS , DEFINITIONS,AND CLARIFICATIONS
	C:\Users\yg326\Downloads\Dave-2011-Sustainable_Development.pdf — Neighbourhood Density and Social Sustainability in Cities of Developing Countries
	https://www.mountainview.gov/civicax/filebank/blobdload.aspx?BlobID=2516 — ZONING CALCULATIONS METHODS , DEFINITIONS,AND CLARIFICATIONS
	C:\Users\yg326\Downloads\Dave-2011-Sustainable_Development.pdf — Neighbourhood Density and Social Sustainability in Cities of Developing Countries
Assessment criteria(s)	People's perception of density is not organically related to the number of people who live in an area of one kilometer or the area of a single housing unit as much as it is related to the shape and type of buildings and the distance of recessions between them, and this is confirmed by the above-mentioned studies and interviews conducted in the case studies in Jordan.

Always try to limit the total number of floors in buildings so that it does not exceed 3 or 4 floors to reduce the number of families who live in the same area and reduce the social group, which strengthens social relations and bonding between them. |

	Assessment	Metric	Score
Negative		12 or more	-3
Minimum practice	The number of houses that share a semi-public area or one yard, or the number of homes that share a single main entrance in multi-apartment buildings is equal to	between 10- 11	0
Good Practice		between 9-10	3
Best Practice		8 or less	5

Scoring (choose the number of achieved criteria)	between 9-10	3
Total Score		9

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A screenshot showing Density and crowdedness category and total score of the culture and perceptual page in the modified tool

F	Flexibility and Adaptability

F 1	Potential for horizontal or vertical space modification.

Objective	Evaluate the possibility of vertical or horizontal expansion of the building in the future.
Applicable for	Buildings with multiple or single residential units
Indicator(s)	The degree of technical and design difficulty and the impact on the neighbours' right to privacy or access to adequate sunlight, and the financial and construction cost requirements associated with expansion possibilities.
Analysis method	https://www.123plans.co.uk/uploads/frontend/media/documents/dudley.pdf Extension design guide
Analysis method	Review the contract documents and proposed design specifications, and review the analysis provided by the design team. With an explanation of the impact of this expansion
Assessment Criteria	The horizontal expansion must be compatible with the site's availability and the space required for that, taking into account the existing nearby buildings. For vertical expansion, the structural structure's bearing capacity and the issues related to the connection of vertical services, including insertion and water and electricity services, must be calculated. Consideration must be given to solving expansion problems that may affect the neighbours and conflict with the laws of the local codes.

	Assessment	Score
Negative	Structure or other type of adaptability are not possible, because of site constraints, design constraints, or structural limitations. Or it would affect nearby neighbours where the extension will decrease privacy and/or solar access significantly	-3
Minimum practice	Vertical and/or horizontal expansion and/or changing in layout is possible, although site, design, or structural limitations will result in high capital costs and compromises in design and/or function of the addition(s).	0
Good Practice	Vertical and/or horizontal expansion is possible, with site, design, or structural limitations resulting in acceptable capital costs and compromises in design and/or function of the addition(s).	3
Best Practice	Vertical and/or horizontal expansion is possible, with site, design, or structural limitations resulting in moderate capital costs and few compromises in design and/or function of the addition(s).	5

Scoring (choose the number of achieved criteria)	-3

A screenshot showing potentials for external space modification category of the flexibility and adaptability page in the modified tool

F	Flexibility and Adaptability

F 2	Maintenance of building components

Objective	To ensure that detailed design allow for easy and long-term maintenance of the building
Objective	Buildings with multiple or single residential units
Indicator(s)	Degree of technical and design difficulty and capital cost requirements linked to expansion possibilities.
Analysis method	Methods for designing building envelope components prepared for repair and maintenance — https://orbit.dtu.dk/ws/files/5550070/Methods%20for%20designing%20building%20envelope%20components%20prepared%20for%20repair%20and%20maintenance.pdf
Analysis method	A report from the design team and any details confirming the existence of the standards mentioned below
Assessment Criteria	1) Ceiling lights installed that can only be accessed and changed out with scaffolding. 2) Lights installed in new buildings that are not accessible at all; ultimately, these will be abandoned when the lamps fail. 3) Lights, pipes or electrical wiring requiring panels, walls or ceiling to be partially or completely cut throw or demolished 4) High-cost, custom lighting fixtures/lamps installed in parking garages. As they fail, these will be replaced with lower-cost fixtures. 5) Rooftop equipment units with no elevator access to bring replacement or maintenance/refilling chemicals or equipment. 6) Trees planted near the building's foundations 7) Lack of enough telephone, electrical, and computer outlets/cables. 8) Equipment, piping, wiring installed easily during construction that is nearly inaccessible after final walls and other appurtenances are completed. 9) High-maintenance equipment installed with no local vendor support. 10) The main pipes lines go underfloor or are cast inside the wall where it's inaccessible after building and will eventually lead to moisture and water leaking inside the envelope.

	Assessment	metric	Score
Negative	No criteria have been meet for future maintenance and efficient operation of the facility.	0	-3
Minimum practice	at least 3 criteria have been meet for future maintenance and efficient operation of the facility.	3	0
Good Practice	at least 6 criteria have been meet for future maintenance and efficient operation of the facility.	5	3
Best Practice	All 10 criteria have been meet for future maintenance and efficient operation of the facility.	7	5

Scoring (choose the number of achieved criteria)	7	5

A screenshot showing building maintenance category of the flexibility and adaptability page in the modified tool

F	Flexibility and Adaptability

F 3	Adaptability to add renewable energy sources

Objective	Ensure that the building in the future is capable of receiving alternative, renewable energy sources
Objective	Buildings with multiple or single residential units
Indicator(s)	Ease or difficulty of installing heating or cooling devices that require different fuels or installing solar / wind systems.
Analysis method	A report prepared by the design teams shows the structural ability of the building to receive such energy sources
Analysis method	https://www.nrel.gov/docs/fy10osti/46078.pdf	Solar Ready Buildings Planning Guide
Assessment Criteria	https://www.energystar.gov/ia/partners/bldrs_lenders_raters/rerh/docs/Renewable_Energy_PV.pdf	Solar photovoltaic: specification, checklist and guide
Assessment Criteria	The characteristics of the roof or roof of the building that support or impede the installation and/or operation of solar photovoltaic systems, solar energy or wind in relation to the characteristics of the roofs and walls as well as the orientation of the building in relation to the movement of the sun and wind and the degree of shading located on the roof of the building.	

	Assessment	Score
Negative	Adapting the building to a new fuel source or installing photovoltaics would not be possible without major renovations due to unsuitable roof characteristics.	-3
Minimum practice	It will be possible to adapt the building to a new fuel source with a moderate level of modifications. Still, the installation of photovoltaic cells will require major renovations and a large amount of money.	0
Good Practice	Adapting the building to a new source of fuel will be easy, and installing a photovoltaic cell will require only a small level of renovation.	3
Best Practice	Adapting a building to a new fuel source or installing photovoltaics will require only minor modifications to the architectural, HVAC, or electrical systems. The orientation of the roof and the amount of shading falling on it are very suitable for placing photoelectric cells on it.	5

Scoring (choose the number of achieved criteria)	5

A screenshot showing the renewable energy adaptability category of the flexibility and adaptability page in the modified tool

F	Flexibility and Adaptability
F 4	Potential for Internal or external space modification.

Objective	To assess the potential of the structure for future vertical or horizontal expansion of the building,
Objective	Buildings with multiple or single residential units
Indicator(s)	Degree of technical and design difficulty and capital cost requirements linked to expansion possibilities.
Analysis method	Review of contract documents and specifications of proposed system(s), and review of analysis provided by design team.
Analysis method	https://www.123plans.co.uk/uploads/frontend/media/documents/dudley.pdf — Extension design guide
Assessment Criteria	Design housing with flexible spaces such as dividable rooms, secondary suites and possibility to make exterior addition and customization to doors and semi-private spaces like the option of adding shading panel and changing door colour. Horizontal expansion should be compatible with site availability, configuration of existing nearby buildings; for vertical expansion, bearing capacity of structure and issues related to extension of vertical services. For both, the configuration of the existing building that may constrain expansion design solution and affect neighbours and laws and regulations.

	Assessment	Score
Negative	Structure or other type of adaptability are not possible, because of site constraints, design constraints, or structural limitations. Or it would affect nearby neighbours where the extension will decrease privacy and/or solar access significantly	-3
Minimum practice	Vertical and/or horizontal expansion and/or changing in layout is possible, although site, design, or structural limitations will result in high capital costs and compromises in design and/or function of the addition(s).	0
Good Practice	Vertical and/or horizontal expansion is possible, with site, design, or structural limitations resulting in acceptable capital costs and compromises in design and/or function of the addition(s).	3
Best Practice	Vertical and/or horizontal expansion is possible, with site, design, or structural limitations resulting in moderate capital costs and few compromises in design and/or function of the addition(s).	5

Scoring (choose the number of achieved criteria)	3
Total Score	5

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A screenshot showing potential for internal space modification category and total score of the flexibility and adaptability page in the modified tool

K	Indoor comfortable environment

K 1	Effectiveness of functionality and Internal circulation

Objective	To assess the appropriateness of interior layouts to functional requirements of tenancies or occupants.
Applicable for	Buildings with multiple or single residential units
Indicator(s)	Goodness of fit of provided layouts (shape, ease of access) with functional requirements.
Analysis method	Reviewing the internal plans and projections of the project

Assessment Criteria	a) The layout of the building should promote hexarchy of spaces from most private (bedrooms) to less private of living area and kitchen to guest hosting spaces and main entrance.	Yes
	There should be strong relationship between dining room, secondary bathroom and guest rooms (1)	Yes
	There should, be strong relationship between living area, kitchen and pantry and study. (2) T	Yes
	There should be much relationship between the bedroom, bathrooms, dressing room, and study room (3)	Yes
	Direct access or via lobby from kitchen, guest hosting area to private open space. (4)	Yes
	The living area is not essential for cerculation (not part of it)	No
	The rooms most in need of natural light should be arranged in an east and south direction such as the kitchen, bathroom, drawing room, etc. (see guiding the building) and the following should be taken into consideration when distributing rooms and blanks:	
	The kitchen should be given the direction between the northeast (7) and southeast	No
	The living areas should be in the far southeast, because there is (8). plenty of light available for them	Yes
	Bedrooms should be given a direction between the southeast and (9). northwest	No
	The suitable place for store and staircase is between North-East and North-West because less time is spent there, and they need less light	Yes
	The verandas are constructed in the direction of South West .(because the Sunlight is severe in summer in this direction	Yes
	The parts of the building that are exposed to an excessive amount of solar radiation are protected by a long passage of movement or spaces without a basic function such as a balcony or a corridor isolated from the other rooms .	No
	Number of "Yes" answeres = 0	

K 1	**For single housing units**

	Assessment	**Metric**	**Score**
Negative	Design promote no clear hierarchy or private zones are directly accessible from main entrance or the living area is part of the circulation when there is no dedicated guest hosting area.	2 or less	-3
Minimum practice	Design promote some hierarchy or private zones are not directly accessible from main entrance but the living area or guest hosting area is part of the circulation.	3-5	0
Good Practice	Design promote clear hierarchy from private to private zones.	6-8	3
Best Practice	Design promote clear hierarchy from private to private zones are not directly accessible from main entrance and the living area is separated from the guest hosting area and neither are part of the circulation	9 or more	5

Scoring (choose the number of achieved criteria)	6-8	3

A screenshot showing the effectiveness of functionality category of the indoor environment page in the modified tool

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K	Indoor comfortable environment
K 3	Appropriate daylighting in primary occupancy areas.

Objective	To ensure an adequate level of daylight in all essential occupied spaces.
Applicable for	Buildings with multiple or single residential units
Indicator(s)	Measuring the expected Daylight Factor in primary occupancy areas
Analysis method	Simulation or using the attached Daylight calculation tool

Relevant information source	Daylight Factors calculator	https://people.bath.ac.uk/zw305/ROOM/daylightfactortab.php
	Developments that do not meet this minimum should be able to demonstrate how site constraints and orientation prohibit these standards from being achieved, and how issues of internal environment comfort are going to be solved.	http://www.yourhome.gov.au/passive-design/orientation

Assessment Criteria

Maximize access to natural daylight in interior shared spaces with at least two hours a day of sunlight. This can be done by creating skylight or shared inner courtyard and using clerestory windows and fanlights to supplement daylight access.

Consider using two-story and mezzanine arrangements to increase daylight access to the living rooms and private open spaces of apartments with limited daylight (e.g. ground floor apartments)

Using dual aspect apartments when the long elevation of the building faces east and west. Avoiding single aspect apartments with a southern aspect and limiting the depth of single aspect apartments.

Single aspect apartments with a southerly aspect (southwest to southeast) should account for a maximum of 10 per cent of the total units proposed.

Locating living areas and gardens to the north and service areas to the south of dwelling.

At least 70 per cent of living rooms and private open spaces in a development should receive a minimum of three hours direct sunlight between 9am and 3pm in mid-winter (against 50% stated by the green building guide)

The rooms which need light the most should be arranged to the East and South direction like the kitchen, bathroom, drawing room, etc. (see orientation) Following things should be kept in mind while arranging the rooms: (1) The kitchen should be given the direction between North East and South East (2). living areas should be in the extreme of South East direction because much light is available there (3). The bedrooms should be given the direction between South East and North West (4). The suitable place for store and staircase is between North-East and North-West because less time is spent there, and they need less light (5). The verandas are constructed in the direction of South West because the Sunlight is severe in summer in this direction (6).

	Assessment	Daylight factor calculator	number	Score
Negative	Daylight coefficient in living rooms on the ground floor of a single apartment building or in a multi-apartment apartment is equal to =		Less than 1.00	-3
Minimum practice			1.00-1.5	0
Good Practice			1.50-2.00	3
Best Practice			More than 2.00	5

Scoring (choose the number of achieved criteria)	1.50-2.00	3

A screenshot showing daylighting category of the indoor environment page in the modified tool

K 2	Indoor comfortable environment

K 5	Noise and Acoustics control between primary occupancy rooms

Objective	To ensure that measures have been taken to reduce noise impacts between all tenancies and occupancy types.
Applicable for	Buildings with multiple or single residential units
Indicator(s)	Estimating the computation of the sound transmission class (STC) coefficient based on the building materials used in the building envelope and thickness or according to the material properties as provided by the supplier
Analysis method	Calculate the expected performance of the range of noise transmission through the exterior wall most exposed to potential noise sources, as indicated in the evaluation and design criteria.
Relevant information source	Sound Control — http://www.eaglerocksupply.com/application/files/4514/4890/6046/Sound_Control.pdf — Noise attenuation standards — https://www.codepublishing.com/WA/OakHarbor/html/OakHarbor17/OakHarbor1730.html
Assessment Criteria	Make sure that materials, thickness of materials forming exterior doors, walls and windows has a shall have an average laboratory sound transmission class (STC) rating that follow the below assessment benchmark numbers STC means a single-number rating for describing sound transmission loss of a wall, partition, window or door.

	Assessment	**STC value calculator**	**STC**	**Score**
Negative			27.5 or less	-3
Minimum practice	The design documentation indicates that the exterior envelope elements of the design that are exposed to the most important external noise sources will contain a STC coefficient:		27.5 - 29.7	0
Good Practice			29.7 - 34.1	3
Best Practice			34.1 or more	5

Scoring (choose the number of criteria)	**34.1 or more**	**5**
Total Score	**8**	

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A screenshot showing Noise control category of the indoor environment page in the modified tool

E	Energy and resources efficiency

E 1	Building orientation

Objective	To assess the impact that the orientation of the building may have on its passive solar potential in order to encourage a passive solar approach.
Applicable for	Buildings with multiple or single residential units
Indicator(s)	Deviation, in degrees (º) of main building axis from East-West (to ensure a maximum possible insolation)..
Analysis method	Scheme measuring how far the longest side of the building deviates from the geographic east-west line
Relevant information source	The simplest case is a building with a rectangular footprint with its long axis oriented as much as possible in an East-West orientation. More complex cases occur with more compact buildings, or projects with multiple buildings or blocks.
Assessment Criteria	https://builditsolar.com/References/SunChartRS.htm / http://www.yourhome.gov.au/passive-design/orientation
Assessment Criteria	Avoid shading from trees, buildings, etc. (especially during peak sunlight hours) for the south facing side of the building.
	Avoided placement of semi-open spaces of dwellings in exposed or reduced privacy manner between adjacent property.
	Orientate the building(s) toward an inner courtyard that can provide extra shading and compactness that allow for more privacy of inner and outer spaces.
	Allocate courtyards and gardens in between units in a rectangular shape about a longitudinal axis. To the south north to create shaded cooled spaces.
	Orientate buildings so that the most habitable rooms face south like living areas.

	Assessment	Deflection angle x	Score
Negative		90º-46º	-3
Minimum practice	The longest side of the building is oriented within an angle (o) degrees from the east-west axis, where x is approxmatly equals:	45º-15º	0
Good Practice		14º-5º	3
Best Practice		5º or less	5

Choose the deflection angle of the axis (east-west)	45º-15º	0

A screenshot showing building orientation category of the energy and resources page in the modified tool

E	Energy and resources efficiency
E 2	**Building envelop**

Objective	To encourage the design and construction of energy-efficient buildings envelop
Applicable for	The façade and envelop design should respond to any positive characteristics in the local area and street, and these should directly inform the design response. Envelop should also reflect existing local patterns, rhythms or dimensions.
Indicator(s)	Site plan, land use maps.
Analysis method	https://www.nrel.gov/docs/gen/fy11/51270.pdf — https://www.wbdg.org/resources/sustainability-building-envelope
Relevant information source	a) Extra Reduction of external heat gains by the use of double Facades or creating Massing and compactness with Verandas, balconies, porches, roof and over-hangers.
Assessment Criteria	b) Position openings of the envelop and balconies toward the street and avoided positioning them in direct contact to other balconies and windows of nearby buildings.
	c) Subdividing the façade to reflect existing local patterns, rhythms or dimensions.
	d) Design the façade to optimise its orientation to the street and to key views (e.g. Façade elements may be angled towards a water body) where frontages should include windows to main habitable rooms.
Assessment Criteria	e) Design of the envelope should take into consideration orientation of the building and change specification of the envelop to either maximise desired wind or sun position or minimise undesirable effect from sun and wind.eg: limit the amount of east and west glass since it is harder to shade than south glass. Consider the use of landscaping to shade east and west exposures (see site and shading)

	Assessment	Metric	Score
Negative	No measures from the Jordanian building code have been achieved	75% or less	-3
Minimum practice	Only the Jordanian building and envelope code have been meet	75-100%	0
Good Practice	Jordanian building and envelope code plus 3 eco-cultural criteria's	124-115%	3
Best Practice	Jordanian building and envelope code plus all-cultural criteria	125% or more	5

Points (choose the percentage that matches your design)	**125% or more**	**5**

A screenshot showing building envelop category of the energy and resources page in the modified tool

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E	Energy and resources efficiency
E 3	Shading device

Objective	Use shading devices on openings and walls exposed to high solar heat where plants and trees cannot be grown to increase privacy without compromising access to light and air.
Applicable for	Buildings with multiple or single residential units
Indicator(s)	Percentage of operable covered openings facing unwanted sunlight by shading devices
Analysis method	Architectural plans for façades exposed to the greater amount of solar radiation
Relevant information source	https://www.wbdg.org/resources/sun-control-and-shading-devices http://www.pvresources.com/en/siteanalysis/shadinganalysis.php
Assessment Criteria	a) Use Shading devises on openings and walls exposed to the high solar heat where plants and trees cannot be planted to increase privacy without compromising access to light and air.
Assessment Criteria	b) Design options may include: Offset windows or balconies on elevations that face each other (1). using shaded films and screes, recessed balconies and or vertical fins between adjacent balconies (2). Solid or semi-solid balustrades on balconies (3). Louvres or screen panels on windows and or balconies (4). Planter boxes vegetation as a screen between spaces and on walls (5)
	c) Consider shading the roof even if there are no skylights since the roof is a major source of transmitted solar gain into the building.
	d) Screening balconies and ground level private open spaces. Screening devices and fences are effective on the first floor. Onsite planting will screen up to three stories on most sites, but higher planting will be required in a park or large communal area.

	Assessment	Metric	Score
Negative	No measures from the Jordanian building code have been achieved	<25%	-3
Minimum practice	Only the Jordanian building and envelope code have been meet	25%-49%	0
Good Practice	Jordanian building and envelope code plus 3 eco-cultural criteria's	50%-74%	3
Best Practice	Jordanian building and envelope code plus all-cultural criteria	≥75%	5

Points (choose the percentage that matches your design)	≥75%	5

A screenshot showing shading devices category of the energy and resources page in the modified tool

E	Energy and resources efficiency

E 4	Shading of building(s) by deciduous trees.

Objective	Use Shading devises on openings and walls exposed to the high solar heat where plants and trees cannot be planted to increase privacy without compromising access to light and air.
Applicable for	Buildings with multiple or single residential units
Indicator(s)	Percent of operable covered openings facing undesirable sun with either shading devices or plants
Analysis method	Analysis of site layout plans or computer simulations of the amount of shadow falling on the façade on a typical summer day
Relevant information source	From "The Potential of Vegetation in Reducing Summer Cooling Loads in Residential Buildings"; by Huang, Y.J. et al; in Journal of Applied Meteorology, Vol. 26, Issue 9, pp. 1103-1116, Sep. 1987: "Parametric analysis reveals that most of the savings can be attributed to the effects of increased plant evapotranspiration, and only 10% to 30% to shading.
Assessment Criteria	Deciduous trees fulfil several valuable functions if they are located on the side of the building most exposed to solar gain during the warm season (South and West in the northern hemisphere, North and West in the southern). Benefits include shading of people, reduction of heat gains into the building, CO_2 sequestration and aesthetic enhancement. Note that benefits are maximised for low-rise buildings and may be negligible for high-rise buildings.

	Assessment	Metric	Score
Negative		<25%	-3
Minimum practice	According to the landscape plans and specifications, the original trees provide shade on the facade of the building for up to two floors, with respect to the facade area equal to or more of:	25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

Points (choose the percentage that matches your design)	<25%	-3

A screenshot showing shading of buildings using trees category of the energy and resources page in the modified tool

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E	Energy and resources efficiency

E 5	Use of local materials and techniques

Objective	To assess the extent to which local materials and construction techniques were used in the project implementation.
Applicable for	Buildings with multiple or single residential units
Indicator(s)	The percentage of the elements of a building constructed using building and finishing materials produced in Jordan.
Analysis method	The architect's estimate for this ratio is based on the quantities calculation tables

	Assessment	Metric	Score
Negative	The estimated percentage of local materials to be used relative to total non-structural materials, by value, is:	<25%	-3
Minimum practice		25%-49%	0
Good Practice		50%-74%	3
Best Practice		≥75%	5

Points (choose the percentage that matches your design)	50%-74%	3

A screenshot showing the use of local materials category of the energy and resources page in the modified tool

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E	Energy and resources efficiency

E. 7	Typology and massing

Objective	The surface area to volume (S/V) ratio (the three dimensional extrapolation of the P/A ratio) is an important factor determining heat loss and gain.
Applicable for	Buildings with multiple or single residential units
Indicator(s)	The greater the surface area the more the heat gain/ loss through it. So small S/V ratios imply minimum heat gain and minimum heat loss.
Analysis method	analysis of the building's surface area to volume ratio
Assessment Criteria	To minimize the losses and gains through the fabric of a building a compact shape is desirable. The most compact orthogonal building would then be a cube. This configuration, however, may place a large portion of the floor area far from perimeter daylighting. Contrary to this, a building massing that optimizes daylighting and ventilation would be elongated so that more of the building area is closer to the perimeter. While this may appear to compromise the thermal performance of the building, the electrical load and cooling load savings achieved by a well-designed daylighting system will more than compensate for the increased fabric losses.
Assessment Criteria	In hot dry climates S/V ratio should be as low as possible as this would minimize heat gain. In cold-dry climates also S/V ratios should be as low as possible to minimize heat losses. In warm-humid climates the prime concern is creating airy spaces. This might not necessarily minimize the S/V ratio. Further, the materials of construction should be such that they do not store heat.

	Assessment	as number	Score
Negative	S/V ratio and typology/compactness of the building	s/v ≥ 2.5	-3
Minimum practice		2.0 ≥ s/v > 2.5	0
Good Practice		1.5 ≥ s/v > 2.0	3
Best Practice		1.5 > s/v	5

Points (choose the value that matches your design)	1.5 ≥ s/v > 2.0	3
Total Score		**13**

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A screenshot showing building typology and massing category and final score of the energy and resources page in the modified tool

A screenshot showing the final summery page of the modified tool

Average Daylight Factor	#DIV/0!
Internal length of the room, L (m)	5.0
Internal height of the room, h (m)	6.0
Internal width of the room, w (m)	3.0
Area of all windows, (m²)	2
Visible sky angle [Effect of obstructions to window(s) on light entering shelter] How much of the sky can you see from the middle of your window?	80
Light Transmission of glazing/plastic etc	0.8
Dirt Correction Factor	0.6
Reflectance of internal surfaces — Walls	0.8
Ceiling	0.4
Floor	0.4

Examples of significant (<30), moderate (up to 60), and no obstructions (>88).

Typical number of layers is one so use 0.8 as default

Clean 0.9   Industrial 0.7   Very dirty/dusty 0.6

See attached table.....

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A screenshot showing daylight factor calculation page within the modified tool

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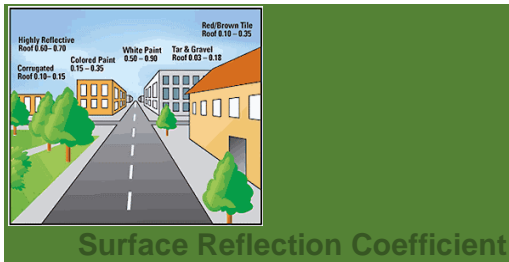
Surface Reflection Coefficient

	Area m2	As percentage of total area	Reflection Factor
Surface 1 m2	200.0	16%	0.85
Surface 2 m2	50.0	4%	0.7
Surface 3 m2	200.0	16%	0.6
Surface 4 m2	300.0	24%	0.25
Surface 5 m2	500.0	0%	0
Surface 6 m2	0.0	0%	0
Surface 7 m2	0.0	0%	0
Total Area m2	1250.0	The percentage of the surface area whose reflection coefficient exceeds 50% is:	36%

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A screenshot showing surface reflection factor calculation page within the modified tool

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STC Values table
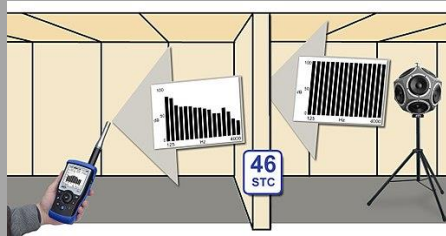
STC	Envelope Partition type	sketch
51	10 cm hollow bricks attached to mortar	
53	10 cm hollow bricks bonded with mortar +2. Layer or plaster board	
59	Two layers of 10 cm bricks, between them 2. A layer of 5 cm thermal insulation	
54	Layer of building stone + 2. Mortar and air vacuum or insulation + 1. Building bricks	
28	Aluminum frame window is about 1.5m by 2m and single glass	
32	Aluminum frame window is about 1.5 mx 2 m double insulated glazing	
24	Small aluminum and single glass window 75 cm by 50 cm	
51	A section of the roof or floor of reinforced concrete covered with a layer of tiles without insulation	
20	Hollow wooden door	
27	Solid wood door	
26	Steel-clad door, insulated with polyurethane	
34	Aluminum laminated solid wooden door, with one glass skylight.	
28	Sliding glass door	
27	(Dual pane glass window range is 26-32)"STC Ratings".	
46	15cm Hollow CMU (Concrete Masonry Unit)	
48	20cm Hollow CMU (Concrete Masonry Unit)	
50	25 Hollow CMU (Concrete Masonry Unit)	
54	20cm dense concrete block wall, painted both sides	
64	with 7cm Steel Studs, Fiberglass Insulation and Drywall on each side [21]	
72	20 cm concrete block wall, painted, with 1/2 drywall on independent steel stud walls, each side, insulation in cavities	

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A screenshot showing STC values page within the modified too

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