

## Comparison between smart and traditional building materials to achieve sustainability

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### ABSTRACT

Building materials have been leading architecture since its inception and with the development of building materials throughout history, gives architecture a broader scope for development, whether at the level of plans, facades or sections. From the first dwelling created by man to contemporary architecture, where the building is the true embodiment of building materials, and traditional building materials based on bricks, wood and iron have developed greatly in terms of appearance and efficiency of use in contemporary architecture, Man seeks when using building materials to reduce the amount of materials used and with the highest functional, structural and aesthetic efficiency, in order to invest them in an optimal manner, leading to the sustainability of building materials. Therefore, the research problem was (The need to know the difference between the sustainability of traditional and contemporary building materials in architecture) The research determined the hypothesis (there is a disparity between the sustainability of traditional and contemporary building materials in architecture) To reach the main objective (studying the sustainability of traditional and contemporary building materials and the construction capabilities of each). This will be done through the study of traditional building materials and contemporary and sustainability of each of them down to a comparison between them in terms of sustainability through the analysis of some architectural examples.

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### Keywords:

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### 1. Introduction

Recently, the term “sustainability” has emerged, which began to spread, especially after the 1992 Rio Conference, in all fields, including architecture, which aims to reduce negative impacts on the environment and introduce new methods for dealing with building materials to reduce material consumption, recycling and energy conservation. These techniques have also been used in traditional architecture through various environmental treatments, leading to sustainable contemporary materials at the present time, as well as their economic benefits.

Keywords: traditional building materials, contemporary building materials, sustainability of building materials, energy consumption.

### 2. Sustainability

The first definition of sustainability as put forward at the World Conference on Development and Environment, which was established by WCED in 1987, was adopted. It fulfills the needs of society in the present without affecting future generations in meeting their future needs, the use of multiple natural resources in a way that does not reduce them or their renewable benefit for future generations to protect the stock of consumable natural resources such as energy, water and living organisms [1].

In the nineties of the twentieth century, the concept of "sustainable architecture and green" began to spread more effectively in professional circles in the sectors of the construction industry in the advanced industrial countries. But the roots of this movement can be traced back to many years in the past. The available resources, including land and local building materials, were utilized very efficiently. Which contributed greatly to creating an environmental compatibility between the building and the surrounding environment. In our Arab environment, benefiting from the lessons of traditional Arab architecture is the first step towards sustainability. Since its inception, this architecture has been sustainable, taking into account the environment socially, economically and climatically [2].

### **2.1 The concept of building materials**

The use of the appropriate material in the appropriate construction and the economic factor is a role in choosing materials, as there are natural materials such as rocks and iron, or industrial materials such as concrete, and the material with strong mechanical properties is called construction materials (or load-bearing materials), and they are materials capable of bearing forces and loads [3].

### **2.2 The relationship between building materials and architecture**

The choice of building materials affects the extent to which pollutants are generated for the environment at all stages of construction, Burning the energy-generating material produces huge amounts of pollutants such as sulfur dioxide, sulfur trioxide, carbon monoxide and lead, and the increase in central manufacturing facilities has not only increased environmental pollution, but also in transportation and the need for streets. Thus, in order to build an ordinary house, transportation energy equivalent to 10% of the energy used in construction [4].

The relationship between building materials and architecture remained simple in the old days until the Industrial Revolution, when materials were chosen either because of their availability or because of their external appearance. Locally available stones were often the basic building elements for walls and foundations.

Since the beginning of the nineteenth century, when the wide spread of steel structures, which led to the construction of long-lived and high buildings, the materials turned from being a means of building only to a way of working and thinking that allows the architect broader capabilities and greater construction capabilities.

The combination of the glass industry with the development of environmental systems has allowed the so-called (world-class) or transparent architecture that can be built anywhere and under any climate. Then it turned to the so-called smart materials, starting from the nineteenth century until now, where the architect had previously used traditional building materials such as stone and wood with their advantages and disadvantages together. Then the science of building materials developed and these materials became adjustable in their properties to suit the design proposed by the architect [5].

## **3. Traditional architecture**

The concept of sustainability is present in the way of life of traditional societies and in their lifestyle because the surrounding environment is the source of their life, Thus, they did not use the term sustainability as an expression of their way of living, how to provide sources of living and the way they build, but rather they lived the concept and applied it spontaneously and automatically. Their interaction with the surrounding environment and the optimal use of natural resources were part of ensuring their survival on this land in harmony with it [6].

### **3.1 Traditional building materials concepts**

The materials available in the environment are highly durable, such as bricks and stone that can live hundreds of years, as well as gypsum, palm trunks and fronds, in the construction of housing units and most of the buildings and architectural elements. These building materials are massive, such as bricks for walls and stone for foundations, and they are materials with a high heat capacity according to their thickness and have the ability to store the heat energy falling on them for long hours during the day and then re-transmit it to outdoor spaces again in the evening (after sunset) i.e. after an absence power source). After that, a thermal balance is achieved between the heat gained and lost through the building shell, which leads to a uniform internal distribution of heat inside the building by reducing the effect of external thermal burdens by storing it within the building block mass [7].

### **3.2 Environmental aspect**

The heat transfer between the external environment and the internal environment of the building in traditional architecture is controlled by the type of building materials, and the appropriate construction method, and use the architectural elements of the building in an appropriate manner. And the effectiveness of the role played by the outer envelope in determining the amount of heat transferred to and from the building, It depends on the selection of its material according to its thermal properties and the method of its design. The traditional local architecture has controlled the temperature inside the building by increasing the thermal resistance of the material, using the light exterior color, using high-density building materials, and increasing the flat shadows on the facade. To secure ventilation and to treat the roof as an environmental solution, some insulating materials such as wood, clay and light bricks were used to isolate the heat absorbed by the roof. Domes, vaults, and sometimes pitched and gabled roofs were also used. (2 ,P 380)

To reduce the impact of the harsh natural environment conditions such as the hot climate and the lack of relative humidity and the intensity of solar radiation, Therefore The architecture of the traditional dwelling relied on providing shade by itself through the juxtaposition of the housing units, reducing the width of the movement paths, especially in the Residential neighborhoods, and shading them with protrusions and overhangs, or even building a space or a room that extends over the alley or the path of movement [8].

### **3.3 Structural aspect**

Construction is an essential component of architecture, and this has continued since the dawn of history to the present time, the Building Envelope of the residential unit in the traditional architecture represents the main barrier between the interior and the exterior, as it is the medium through which the influence of the harsh external environment is mitigated to make the interior spaces comfortable for the residents [9].

## **4. Contemporary architecture**

Contemporary architecture faces many challenges to prove that it is capable of preserving the environment , and re-discover the principles of traditional architecture and choose what is appropriate for the local environment and environmental influences to develop and blend these principles with modern technologies and use them in our contemporary architecture.

### **4.1 Environmental aspect**

The elements of technology that achieve environmental and climatic goals, through internal walls and transform them to repel external conditions and control temperatures to achieve the comfort of users, as well as It contains solutions for thermal insulation of walls and ceilings, the use of smart glass, water recycling and rationalization of consumption [10].

### **4.2 Structural aspect**

The digital revolution has affected architecture at all levels, especially the construction aspect in terms of building materials or methods of implementation and its mechanisms, as the so-called smart building materials and that their production comes through the overlap of traditional materials with accurate electronic systems that have the ability to evaluate and repair subjective as well as a sense of temperature and adaptation to provide a suitable environment for the inhabitants [11].

## **5. Sustainable building materials in architecture**

The importance of knowledge of building materials is as important as building the origin, as different materials have different properties. The most popular and most widespread and effective building materials are small structural units (stone, brick and concrete), wood, reinforced concrete, steel, aluminum, plastic and finally cloth and glass. In this research, the comparison between common materials in traditional architecture and new building materials (bricks, wood, glass) and their method in achieving sustainability has been chosen.

### **5.1 Bricks**

The use of Wool Bricks, a type of bricks in which a percentage of wool and natural polymer found in seaweed has been added to the clay used in the manufacture of bricks, as they are 37% stronger than ordinary bricks and more able to resist the humid climate. They are also manufactured by the dry method and do not You need to burn like traditional bricks [12].



Figure 1. Air bricks [12]

Air bricks are made of cement and sand with inflorescence with aluminum powder as a pneumatic agent, so it is characterized by good thermal insulation and fire resistance as well as being a non-flammable material and does not emit toxic smoke during combustion, which makes it safe and environmentally friendly and resistant to moisture and external factors, as well as the speed of construction due to its lightness Its weight, large sizes and ease of carrying, so the construction speed using it is 4 times higher than the use of traditional construction, Figure (2) [13].

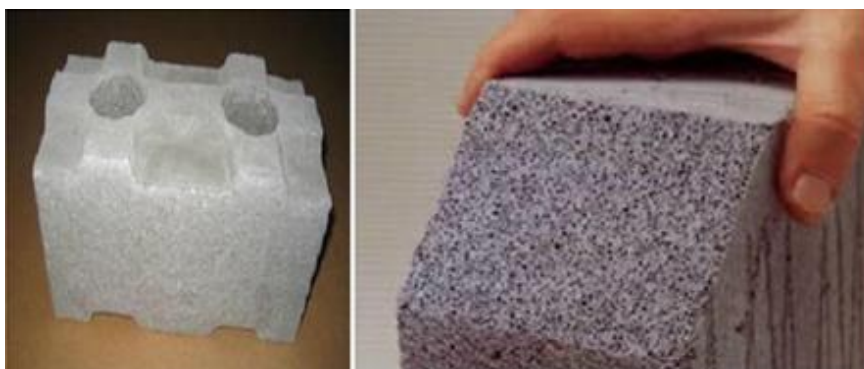


Figure 2. Air bricks [14]

Thermal insulation of the bricks, the rise in temperatures is reflected in the increased use of air conditioning devices to control comfort conditions to obtain the appropriate temperature within the internal space of the building and thus an increase in energy consumption, as most statistics indicate that air conditioning constitutes (66-70%) of the entire The electrical energy consumed, and non isolate the buildings well leads to a high rate of operation of mechanical devices, and consequently an increase in energy consumption and an increase in material burdens on the owner and the state [14].

Table 1. Comparison between commonly used bricks and sustainable air bricks [14]

Material	conductivity watt/meter.Kelvin	Density Density (kg/m) <sup>3</sup>
Ordinary (perforated) bricks Thickness 4.20 cm	1.37	1200
air bricks Autoclaved aerated concrete block	0.8 to 1.25 per inch. of thickness	20 to 50 pounds per cubic foot (pcf)—this is light enough to float in water

Eco-Block (ECO-BLOCK) system is used to make compatible and strong structures, especially for very hot and very cold areas, as well as areas prone to earthquakes and hurricanes. One of the most important features of this system

- A remarkable reduction in the time of construction by approximately 60%, compared to traditional construction systems.
- Saving more than 70% of electrical energy.
- Reducing the construction cost by 30%.
- Thermal insulation and high sound quality and efficiency.
- It gives more flexibility to the construction workers, which cannot be granted in traditional construction cases, as it takes a long time to construct and a large number of skilled workers.

6- This technology enjoys a great and important achievement to protect the environment and humans together and to secure a clean healthy home free of epidemics and waste that affect the general health of humans.

2. The BLOCK\_ ECO perimeter walls of the building are made using a wall system by attaching polystyrene materials from molds and it consists of an insulating layer with a thickness of 5 to 10 cm, and this depends on the insulation requirements [15].



Figure 3. Construction of a building using DCG & BLOCK\_ ECO technology [15]

## 5.2 The wood

Wood is one of the materials that have excellent environmental certification as a renewable resource. In addition to being a very popular natural material, wood is a tissue consisting of tubular cavities that are connected to each other by the resin and stacked in the form of bundles similar to bundles of straws. Therefore, the wood material is considered strong in its longitudinal direction in both tensile and compressive states, and weak along the opposite sides between the tissues[16].

Using liquid wood (arborform) as an alternative to plastic A team of German scientists at the Fernhofer Institute of Chemistry and Technology in Pfennenthal managed to invent (arborform) or liquid wood. Wood pulp and natural fibers, which are made from a mixture of natural lignin fibers such as flax and additives such as wax, and the mixture is heated or placed under high pressure and poured into various molds and used as an alternative free of harmful substances to the environment.) by 90%, and this makes it a safe product because it is free of chemicals, and it decomposes like wood in water.

## 5.3 The glass

Glass emerged from the limited role as a material for Ornament and decoration only to become an integrated building material, In the recent period, the use of glass has become large in various fields and for different purposes, and because of its acquisition of rigidity, which made it occupy a new position that was not familiar to it before. We see glass everywhere. Rather, we now see buildings that are almost completely glass if we exclude concrete structures of different types. The new trend towards geometric shapes, areas and colors, some of which are transparent, reflective or colored[17].

Using double-glazed glass with materials that insulate the spaces thermally, limiting heat transfer from the outside to the inside or vice versa[18].

At the environmental level, in the beginning, there was an emergence Glass facades in countries with cold climates To gain more energy solar terms, and with the passage of time and tremendous developmentIn the type of glass and methods of design and Modern technologies such as smart systems are becoming more and more popular Glass facades are suitable for different environments, including hot ones [19].

## 6.Studied buildings

A group of buildings will be presented to extract the variables that will be relied upon in the practical aspect.

### 6.1 The traditional dwelling in Hilla, Iraq

The traditional dwelling in Hilla is characterized by the use of materials available in the environment such as clay, stone and gypsum Palm trunks and fronds. These building materials are massive, such as bricks for walls and stone for foundations. They are materials with a high heat capacity depending on their thickness and have the ability to store heat energy falling on them for long periods in the hot period of the today (day) and then re-broadcast it to the interior spaces during the evening (after sunset) ) That is, after the absence of a power source.

The transfer of heat energy from the outer surfaces to the inner surfaces depends on the heat capacity and thickness of the building materials The ability of the material to store heat and delay its re-emission to the interior is proportional. It is called lag time in direct proportion to the thickness of the material. The traditional building materials are characterized by having a large time lag ranging from 12-15 hours depending on the type and thickness of the material (1980 Siani (so we find that the thickness of the walls in the traditional house ranges between (0.50 - 0.60 - 0.75) m) According to the location of the wall, while in modern housing, the thickness of the outer walls of bricks does not exceed (0.36- 0.24)[20].



Figure 4. A picture of a dwelling in the Mahdia area in the old Kasbah in Hilla, Iraq (Researchers)



Figure 5. The shape of the bricks used in the traditional house (photographs by researchers)

### 6.2 The rural building in the Basilicata region of Italy:

The bricks in this building are made of raw clay soil mixed with barley or wheat straw, Wall materials have contributed to the improvement of traditional building components by adding natural fiber materials, wool or agricultural waste residues, to the elements of the clay bricks that are spread in this agricultural area to turn it into sustainable bricks using renewable materials or recycled materials from construction waste, in order to enable practices aimed at reducing resources Consumption, combating environmental degradation and creating better living environments. This type of block is characterized by its low cost, recyclable, thermal and sound insulation, and is associated with simple building methods that require reduced energy consumption [21].



Figure 6. The shape of the bricks used in the traditional house [21]

### 6.3 Wooden Shanasheel in the traditional house in Hilla

It is one of the original Arab architectural treatments created by the Arab architecture as a climatic, social and religious necessity, and it means the King's Council, which is the name that was commonly used in Iraq, where it was called the Mashrabiya [22].

The shanasheel protrudes towards the alley about (60-70 cm), which we see hanging on the facades of many houses in Iraq. It has a variety of shapes, and the most important thing in it is the windows with prominent wooden lattices, in which the upper part is fixed and the lower part is movable on delicate engraved perforated decorations. It is also characterized by being light in weight on the walls held on the ground floor because they are made of wood, and The Shanasheel rooms are based on a stepped wooden base and sometimes support on brick base that serve as a wooden support [23].



Figure 7. The shape of the wooden Figure (9) The shape of the wooden hooks inside and out (Photographs by researchers) inside and out (Photographs by researchers)

From the climatic point of view, its design allows the entry of air without sunlight and helps to break the intensity of light and moisten the house. Therefore, the lower parts worked in the form of narrow micro-lattices, while the upper parts worked in the form of wide and wide grilles to help lighting and ventilation. The mashrabiya provided high-efficiency lighting without increasing the temperature inside, and due to the increase in the area of the openings in the wall, the mashrabiya contributed to an increase in air flow by a high percentage, and thus increased ventilation and cooling of the rooms. The splendor of this architectural element lies in the integration of its function with its social and aesthetic value, where the mashrabiya added Aesthetic value to the street overlooked by the windows, without compromising the privacy of the architectural spaces behind these mashrabiya [24].



Figure 8. shows the wooden tiered plinth over the arched walls on the ground floor (photographs by researchers)

#### 6.4 External blinds at the University of Oregon in America

Tyler Short, an architect at the University of Oregon, demonstrates what the design looks like, an exterior curtains system designed as an alternative to traditional window shading to solve the residential building's dual problem of blocking afternoon sunlight and low evening sun. The curtains are rectangular wooden units that move in three dimensions to adapt to the sun's rays at different times of the day and thus form a horizontal canopy for the windows, and it can be controlled manually or automatically in a computerized manner [25].



Figure 9. External curtains at the University of Oregon [25]



### 5.6 The office building skyscraper in New York, USA, the Seagram Building

It is an office building skyscraper in New York built in 1958 from glass and bronze. It is the first models in which colored glass was used to absorb heat reduced to gain the sun's heat by 25-55%.

It was in this building that the idea of facades mounted directly on the structure developed by Mies van de Roe, becoming The facade is in the form of an external envelope that is installed on the structure from the outside in the form of curtains that cover the building From top to bottom on all sides as a separate element, the windows were an integral part called

Now the Curtain Wall shows his interest in the ability of light to reveal the space and to clarify its rigorously distributed elements [18].



Figure 10. The Seagram Building in Chicago [18]

### 6.6 A group of Center environmentally friendly buildings of the King Abdullah Almali

The plan to build the King Abdullah Financial District began in 2006, one of the largest projects in the capital, Riyadh, which extends over an area of 1.6 million square meters, in terms of using high-performance multi-layered glass panels oriented with thoughtful angles that achieve shading to protect from heat and sunlight and provide good insulation. The slanted glass facing down is completely transparent and allows perfect illumination of the interior spaces with a good view of the outside, while the panels facing up are painted to shade the interior spaces and protect them from the desert sun.



Figure 11. A group of Center environment-friendly buildings in the King Abdullah almali, inside and out [18]

In terms of the design of the external structure of some buildings , such as the pavilion of desert butterflies, which helped in the formation of shades on the facades to reduce exposure to sunlight. Some buildings are designed with a central core as a vertical inner courtyard that connects the entire building to provide

protection from high heat and solar loads, and this core is more efficient from a structural point of view. In addition to the design of the financial center buildings around many wooded interior courtyards to help moisten the climate and create shadows to reduce temperatures, with the presence of internal gardens within the buildings, and electrical energy has been enhanced through the installation of panels to generate solar energy and integrating them within the double glazing unit in the external facades [18].

### 7. Analysis of the case study

The impact of the use of building materials on achieving sustainability in traditional and contemporary buildings has been addressed, Based on what was presented in the research , so the case studies will be analyzed in terms of these variables (construction method, internal environmental efficiency, energy consumption rationalization, response to occupants' needs, temperature control and ventilation) and according to the table below, the variables are summarized In each building according to the studied element and the coding of buildings and variables.

Table 2. shows the method of measuring the percentage of variables Source: (researchers)

The building's name	The studied element	X1 Structural installation method	X2 Efficient Indoor Environment	X3 rationalization of energy consumption	X4 Responding to the needs of the occupants	X5 temperature control	X6 ventilation
A1 The traditional dwelling in Hilla, Iraq	bricks traditional	Use simple structural methods	Energy conservation after the absence of a power source	It has the ability to store thermal energy	It adapts to the needs of the occupants	It has a high heat capacity depending on its thickness	Did not achieve natural ventilation
A2 The country house in Basilicata, Italy	Clay bricks mixed with barley straw or wheat and wool	Use simple structural methods	Creates better living environments	Reducing consumption resources	Combating environmental degradation	Provides heat and sound insulation	achieve ventilation
A3 -Wooden Shanasheel in the traditional house in Hilla	traditional wood	A gradient wooden base that acts as a wooden stand	Temperature control inside	Achieving efficient lighting	Integration of its function with its social and aesthetic value	High air flow increase and room cooling increase	Allows the entry of air and increased ventilation
A4 Exterior blinds at the University of Oregon	movable wooden units	Rectangular wooden units move in three dimensions	Prevents sunlight in the afternoon and evening	Works as a horizontal awning for windows	Its mission is to solve a double problem for an apartment building	Adaptation to sunlight and temperature control	Allows cold air to pass through

The building's name	The studied element	X1 Structural installation method	X2 Efficient Indoor Environment	X3 rationalization of energy consumption	X4 Responding to the needs of the occupants	X5 temperature control	X6 ventilation
A5 - Seagram Building	heat absorbing colored glass	The facade is in the form of an outer shell that is mounted on the structure from the outside	The ability of light to show the place	Solar heat gain by 25-55%	Clarify the distributed items in a strict order	High because curtains cover the building from top to bottom from all sides	Windows are an integral part called Curtain Wall
A6 - King Abdullah Almalik Center Building Group	Multi-layered glass with thoughtful angles	Multi-layer oriented panels at deliberate angles and panels facing upwards	Check shading to protect from heat and sunlight and provide good insulation	Installing solar panels and integrating them into the double glazing unit	Inspired by the reality of the local environment, such as the wings of desert butterflies	Central core to provide protection from high heat and solar loads	The presence of many internal courtyards to help wooded climate moisturizing

Table 4 shows the determination of the method of measuring variables within Table 3 at the levels related to vocabulary using a method based on descriptive analytical measurement and according to the elected premises, based on the sign that the value of the variable is not achieved, partially achieved and fully achieved.

The data is analyzed by calculating the percentage of each variable according to the mathematical equation. (Equation for calculating the percentage  $N = (n/6) \times 100$ )

- It is low when it gets (0-2), i.e. (0-33.3%)
- It is average when it gets (2-4), i.e. (33.3%-66.6%).
- It is high when it gets (4-6), i.e. (66.6%-100%).

Brick is the first building material that is studied to achieve sustainability and was compared in samples A1 and A2, we note that the traditional brick in sample A1 achieved a sustainability rate of 66.6% and the contemporary clay brick in sample A2 achieves a sustainability rate of 50% .

Table 3. Results of the variables to measure the sustainability of traditional and contemporary bricks (Source: Researchers)

sample code / Variables	A1	A2
X1	○	○
X2	●	⊖
X3	⊖	●

X4	●	⊖
X5	⊖	●
X6	○	●
Percentage of achieving sustainability	% 50	% 66.6

Wood is the second building material dealt with in the research. We find that the traditional wood in the A3 sample achieves a sustainability rate of 75%, and the movable wooden units in the A4 sample achieve a sustainability rate of 83.3%.

Table 4. Results of the variables to measure the sustainability of traditional and contemporary wood (Source: Researchers)

sample code Variables	A3	A4
X1	●	●
X2	●	●
X3	⊖	⊖
X4	⊖	●
X5	⊖	●
X6	●	⊖
Percentage of achieving sustainability	75%	83.3%

Glass emerges as an important era of building materials to achieve sustainability, and its use will be compared traditionally and contemporary, as in samples A5 and A6, where it was found that the heat-absorbing colored glass in sample A5 achieved a sustainability rate of 58.3%, while multi-layered glass with studied angles achieved a percentage of 100%.

Table 5. shows the results of the variables to measure the sustainability of traditional and contemporary glass (Source: Researchers)

sample code Variables	A5	A6
X1	●	●
X2	⊖	●
X3	●	●
X4	○	●
X5	●	●

X6	○	●
Percentage of achieving sustainability	%58.3	%100

From the study, we find that there is a discrepancy in the nature of achieving sustainability for traditional and contemporary materials, and it depends on the method and type of materials that are used in buildings.as in chart (1).

The chart shows the comparison between the sustainability of the three materials selected in the six samples, where the sustainability rate of contemporary materials reached 58% and the sustainability of traditional materials by 42%, meaning that the sustainability of contemporary materials is 13% higher than sustainability of traditional materials as in Chart 2.

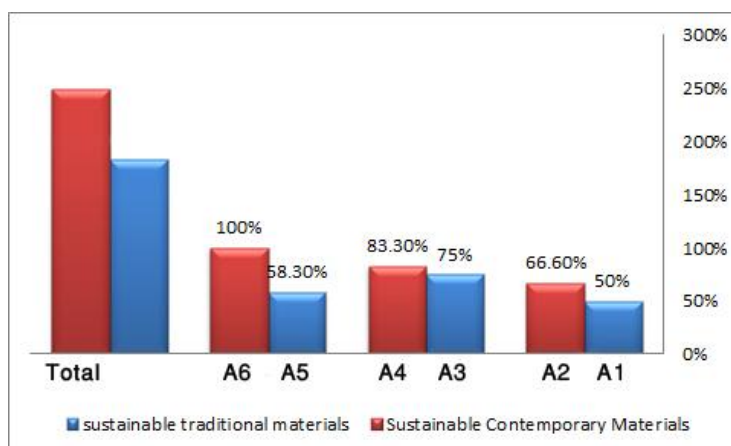


Chart 1. Material Sustainability Comparison in selected projects (researchers)

■ sustainable traditional materials   ■ Sustainable Contemporary Materials   ■ more sustainable

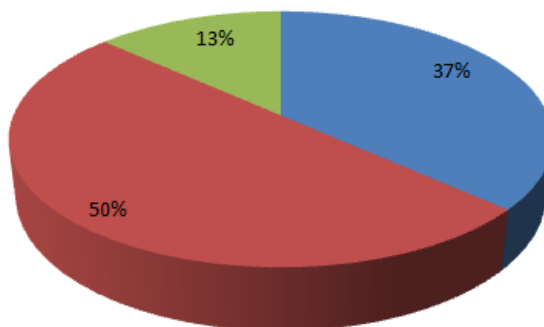


Chart 2. Increasing the sustainability of contemporary materials over traditional ones by 13% (researchers)

### 8. Conclusions and recommendations

1. Building units with traditional bricks are characterized by their average ability to store thermal energy because they have a high thermal capacity depending on the thickness and provide medium thermal comfort inside the spaces, while the use of clay bricks mixed with fibers rationalizes energy consumption at a high rate and controls the internal temperature and ventilation significantly.
2. The structural installation method is high-tech in traditional wood and can efficiently control the thermal environment indoors, adapt to sunlight and control temperatures in an average way and work to ventilate greatly, while in movable wooden units it is moving in directions in a complex installation method and greatly control Sunlight and temperature control It guides the consumption of thermal energy in an average way and allows the entry of cold air significantly.

3. The method of installing the traditional high-tech heat-absorbing colored glass is in the form of a cover that surrounds the building and works to gain the sun's heat in a high percentage and controls the temperature inside the building because the curtains cover the building from top to bottom from all sides and do not care for ventilation, while in contemporary multi-layered glass with studied angles, it is achieved Shading with a high degree of protection from heat and sunlight. Solar energy is generated by panels and integrated into the glass unit and provides high protection from heat and solar loads, and good ventilation due to the presence of many courtyards interior patios to help moisturize the climate.
4. Contemporary architecture in some of the studied buildings adopted the inspiration from traditional architecture in a modern way to activate some aspects of sustainability, and that borrowing some elements of traditional architecture was selective to play environmental roles, achieving at the same time social and economic sustainability, as is the case in quoting the idea of Mashrabiya.
5. Contemporary architecture must rediscover the principles of traditional architecture and take what suits the local environment and environmental conditions to develop the blending of these techniques with modern technologies and their use in our contemporary architecture.
6. Creating local standards through which to ensure the evaluation of sustainable buildings.
7. Activating the benefit of the natural resources and energies available in our country, including solar energy, to provide renewable energy in the long term.

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