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## DESIGNING FOR A HEALTHY AND CULTUREINTEGRATIVE URBAN ENVIRONMENT: THECASE STUDY OF AL-DIRIYAH TRIANGLE

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# DESIGNING FOR A HEALTHY AND CULTUREINTEGRATIVE URBAN ENVIRONMENT: THECASE STUDY OF AL-DIRIYAH TRIANGLE

## Abstract

**Problem Definition:** The given situation is pushing urban designer and planner to think of solutions that could help alleviate the threats of the rapid growth repercussions and plan for a better living urban environment. **Aim and Objectives:** This paper examines the possibility of planning future urban developments through the application of modern sustainable urban models and solution as well as learn from century old environmentally responsive architectural and urban practices. **Methodology:** This paper will take the Case Study of Al-Diriyah Triangle project in Riyadh – Saudi Arabia, a new urban development bordering Wadi Hanifa and neighboring to the historic core of Al-Diriyah and UNESCO World Heritage site of Al-Turaif. The 90 hectares development is one of Saudi Vision 2030 projects and aims at enhancing the role of Al-Diriyah as a heritage, cultural and entertainment center respecting the historic, environmental and ecological specificities of the sites soft-mobility and green open spaces network to environmental architectural guidelines. Through the case study, the paper will demonstrate urban designers can participate in planning a healthy living environment and improving the wellbeing of urban societies.

## Keywords

Format, introduction, fonts, headings, figures (not more than five words)

# DESIGNING FOR A HEALTHY AND CULTURE INTEGRATIVE URBAN ENVIRONMENT: THE CASE STUDY OF AL-DIRIYAH TRIANGLE

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**ABSTRACT:** *Problem Definition: The given situation is pushing urban designer and planner to think of solutions that could help alleviate the threats of the rapid growth repercussions and plan for a better living urban environment.*

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## 1. A GROWING URBAN ENVIRONMENT

Since the beginning of the new Millennium, the world has been witnessing an exponential growth in urban population whereby “more than 90% of global growth in urban populations [is] taking place in less developed countries” (World Heritage Organization, [www.who.int](http://www.who.int)). This growth and population pressure is blurring boundaries between cities and adjacent agglomeration, forming massive built-up cover, spreading over the natural landscape, increasing the demand on environmental resources (such as water, agriculture, fuel) and threatening urban health. According to Nancy Rottle and Brice Maryman, the urban environment is subject to oil consumption, climate change, food crises, a documented decrease in human health as well as the environmental problems of diminishing biodiversity, watershed qualities, loss of productive and natural landscapes (Rottle and Maryman).

The subjects of urban livability and urban health became at stake, international organization such as World Health Organization, UNHabitat, ISOCARP, etc ., planners, economists, environmental, health experts are raising awareness about the importance of such subject and are developing criteria, methods, guidelines and strategies to alleviate the threats of the rapid urban growth, improve the quality of life within existing urban environments and plan for a better living urban environment. In that sense, new innovative technologies and environmentally sensitive design measures are being developed and incorporated.

However, the notion of urban health is not a new concept, it was always an integral part of the traditional ways of dwelling whether in rural areas with environmentally responsive architectural practices, or in urban context where hygiene became the core standard for urban regulation in Haussmanian Paris (following the inflation in urban agglomerations with the industrial revolution) and in the Tanzimat of the Ottoman Empire.

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This paper examines methods and strategies that are currently being studied and applied to ensure livable environments and will look at innovative technologies models as well as culturally rooted practices that help

achieve and sustain healthy environments. The case study of Al-Diriyah Triangle, a newly planned urban core in the city of Al-Riyadh KSA, will showcase innovative and culturally rooted urban design strategies that contribute to planning a healthy living environment and improving the wellbeing of urban societies.

## 2. INNOVATIVE URBAN GREEN STRATEGIES FOR A HEALTHY URBAN ENVIRONMENT

Urban health has been declining in cities over the last century, with high dependence on the car to commute and a limited physical activity of citizens. Cancer (lungs or other), cardiovascular diseases, obesity, chronic illness (i.e. Diabetes), stress, asthma, etc.. are becoming common health problems. Hundreds qualitative studies and quantitative researches have proved that the modern urbanization, rapid city growth rate, proximity of industries to urban fabric, vehicular mobility, fossil fuel consumption, and fragmentation of green spaces and peri-urban agriculture are detrimental factors to the environment causing air and noise pollution, urban heat effect, water pollution and water shortage.

As a reaction, new urban and environmental guidelines and paradigms are being developed to mitigate and reduce the damage caused to the environment and enhance urban health. The World Heritage Organization (WHO) is following up and defining standards for healthy cities, LEED rating system and environmental assessment are becoming a must for every development project, United Nation organizations (UNHabitat) are focusing on community health with relation to political and social factors. According to the WHO, a healthy urban environment is a living environment that affect people “health and chances of leading flourishing lives. Communities and neighborhoods that ensure access to basic goods, that are socially cohesive, that are designed to promote good physical and psychological wellbeing, and that are protective of the natural environment are essential for health equity” (Closing the gap in a generation, www.euro.who.int,2008). WHO vision of healthy cities include “places that deliver for people and the planet engaging the whole of society, encouraging the participation of all communities in the pursuit of peace and prosperity.’ To achieve this vision issues of inequalities, good governance, leadership for health and well-being, innovation, knowledge sharing and health diplomacy are required” (euro.who.int).



Fig. 1 WHO vision of healthy cities diagram  
Reference: WHO

On a design level, new paradigms and theories are being developed in urbanism to set guidelines to achieve urban betterment of which: New urbanism, Smart Growth, Green Infrastructure etc. All focus on a multi-disciplinary approach that combines urban, social, economic, environmental, landscape, infrastructure, traffic, cultural etc. expertise to achieve sustainable goals and solutions. Furthermore, urban planner and researchers have highlighted the importance of urban open spaces as key for enhancing human activity, health, social conviviality and economic activity. In fact, open urban spaces became a pillar in evaluating community livability and urban health and the access to green open space is a key criterion to measure landscape enhancement, environmentally sensitive practices, “community sustainability” and “healthy lifestyles” in the LivCom Award. The designers did implement livable and public green spaces into the master plan reflecting one of the core values that Dar Alomran carries into its designs, the spaces provided allow for pedestrian circulation and public gathering within the day time by carefully providing locally-tailored climate control solutions that softens the intense day-time heat and aridity such as water cooled passive air conditioning and studied sun shades. An example of such techniques that yield livable public spaces can be found in the King Abdulaziz Historical Centre of which has achieved the LivCom award for livable communities in 2007.



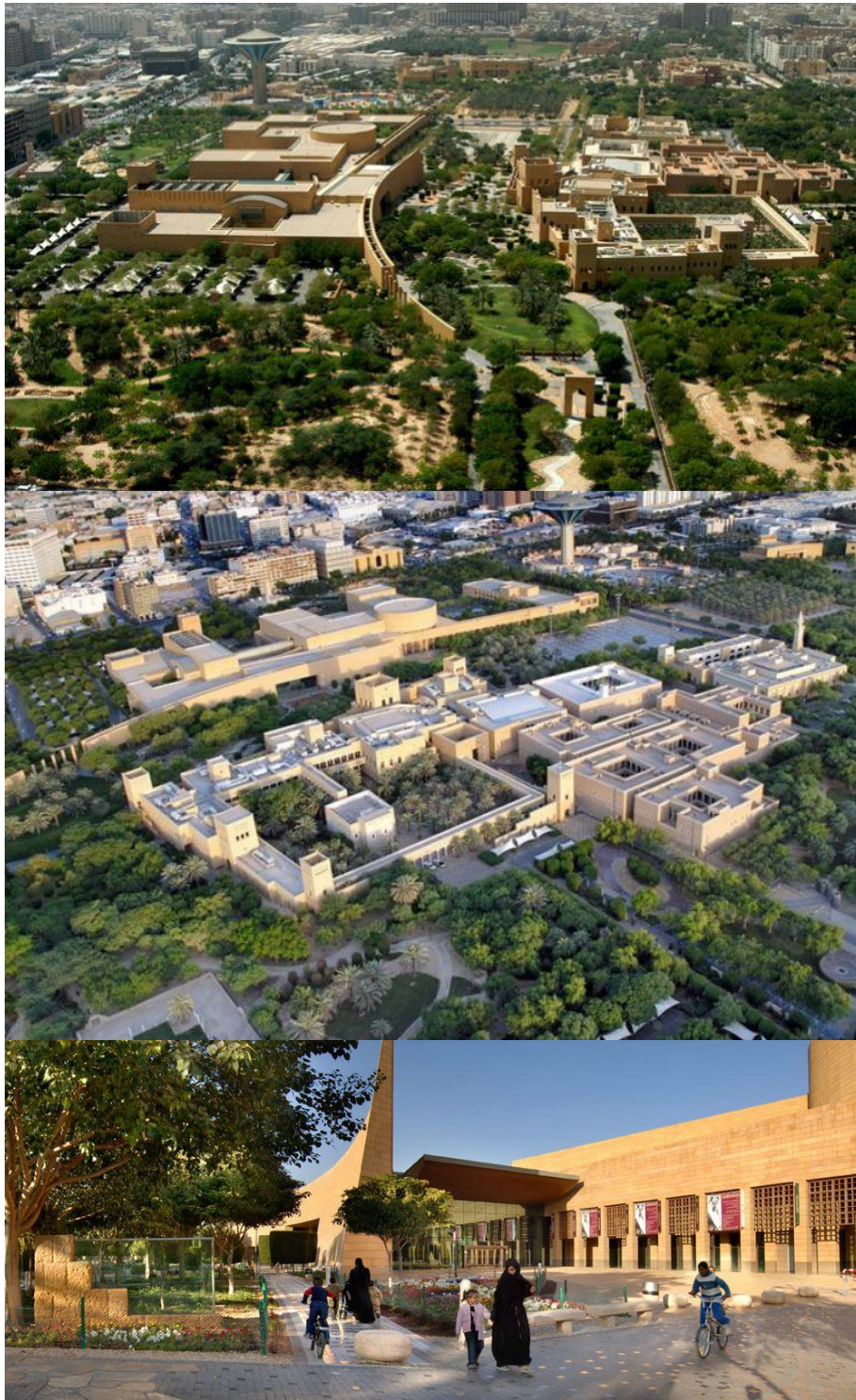


Fig. 2 King Abdulaziz Historical Centre  
Reference: ada.gov.sa

Moreover, physical exercise and proper nutrition are important for betterment of urban community health, hence the need to encourage the community to be less dependent on passive activities such as driving. Strategies such as mixed land-use including schools, retail, employment centers, connected with a network that ensures safe pedestrian and cycling lanes all together are key for encouraging physical activity.

In the New Urbanism Congress in 2011, urbanist have defined criteria for improving urban health that include: (a) walkable neighborhood, (b) mix residential fabric, (c) schools, commercial shops, amenities equally distributed and accessible with pedestrian or soft-mobility networks and (d) human scale development (Kennedy and Dannenberg). New urbanism is a holistic approach that focusses on placemaking and public space, walkable neighborhood, reclaiming underutilized and neglected and focusses more on the livability which indirectly enhances community health (Congress for the New Urbanism, [www.cnu.org](http://www.cnu.org)).

Additionally, Smart Growth comes as a complementary approach with the focus on smart technologies and innovative ways of thinking about urban space, and attention given to improving air and food quality. Measurements such as reducing air pollution for both human and environmental health are recommended: Vehicles with reduced emission (electric or hybrid cars), smart façade and architecture to reduce urban heat effect, renewable energy, alternative modes of transportation and many more are used to improve livability, community and connectivity (Kennedy and Dannenberg).

Parks and green open spaces contribute also to human physical and psychological health by providing space to actively and passively engage with nature away from the noisy cities through green walkways, cycling or seating areas (Cohen, McKenzie and Sehgal). Green spaces contribute also economically by enhancing land and property value in proximity and by encouraging retail and commercial activity. Environmentally, quality of air is improved by absorption of CO<sub>2</sub> and chemical emissions, enhancing the environment through the creation of a micro-climate reducing heat effect.

However, with the growing demand on land, large open spaces are luxury. For that Green Infrastructure/ Green Corridors is a new urban landscape concepts that make use of narrow and linear spaces to connect the urban tissue, pockets spaces and infrastructure network in an ecological and cultural manner that has an impact environmentally, socially and economically. Green Infrastructure combines function, esthetics and economy, it is “an open space that provides opportunities for human activity and health” (Rotte; Brice). It interconnects green (planted corridors, green open spaces) and blue (waterways, rivers) spaces of an environment to maximize the use and benefits of public realm in urban environment to benefit economy and health. Green infrastructure has been recognized by the as a substantial “ingredient for place making” in the World class Places: The Government’s strategy for improving quality of Place that proved in the past years to positively contributing to mitigating environmental challenge and to the betterment of the urban environment. (HM Government). With its multifunctional dimension and as demonstrated by Shawn through the case of North West England Green Infrastructure help improves:

- Livability by:
  - Promoting recreation and leisure
  - Enhancing quality of place and quality
  - Improving productivity
- Economic activity by:
  - Promoting tourism
  - Promoting economic growth and investments
  - Enhancing land and property value
- Ecological and urban environmental health through:
  - Flood alleviation and water management through sustainable drainage systems
  - Support natural and ecological processes through conserving biodiversity and connecting ecological corridors
  - Promoting health and wellbeing
  - Mitigation of pollution, climate change effects and ensures urban cooling

The multifunctional pathways of Green Infrastructure across urban fabric provide equal distribution and ensure equal accessibility to open green space and ensure ecological continuity and connectivity.

### 3. CULTURAL HERITAGE CONTRIBUTION TO URBAN LIVABILITY

According to Godschalk, the concept of urban livability is a matter of “everyday physical environment and place making” that is defined by “traditional city planning ideals of economy, ecology, equity” as well as use of public space, connectivity and urban fabric (Whelan). Moreover, the Organization of Partners for Living Communities complemented the factors contributing to livability with the social dimension notably factors of “social stability and equity, education and recreation possibilities”. These factors can be easily translated into tangible quantifiable elements such as economic growth rate (GDP and other), life expectancy rates, percent

of literacy, of employment, age group pyramid, pollution levels (air, water and noise), urban guideline of street-wall control, rates of walkability and coverage of public transport.

However, exist intangible factors – often ignored or forgotten - that contribute to livability and are essential to create sense of belonging and sense of the place: It is the cultural dimension. Every space builds its socio-cultural value over decades and is shaped and reshaped by traditions, values and practices that become integral to space users. In that sense, culture can strengthen the sense of civic pride, belonging, identity and social cohesion which contribute to collective well-being of a society. Hence, one cannot ignore the power of culturally rooted interventions in order to insure the success of an urban intervention in order to ensure livability.

How this is translated in practice? As explained earlier, livability is only achieved with a holistic sustainable cultural, economic, environmental, social and physical system. For that, most of the cities aiming to enhance that aspect, like Liverpool, define first a vision and a brand for the city, i.e. “capital of culture” and follow by articulating the vision with themes that focus on Economic “competitiveness”, “connectivity”, “sense of place”, “thriving Neighborhood” and “health and wellbeing”. Thereafter each of the following themes is complemented by a list of policies and goals in various fields (landuse, economic, environmental, infrastructural, health, education etc..) (David Shaw; Simon Pemberton, Alexander Nurse).

The cultural component is considered as a catalyst for social betterment and economic development if integrated within the urban strategy (Shaw et al, 2009). Several approaches can be applied in that direction of which is constructing the cultural infrastructure by building on existing practices and activities, enhancing and improving connectivity among these hubs and revamping and reinterpreting cultural practice to fit the 21st century needs. In that sense, Rotte provides a cultural based definition of Green Infrastructure and describes it as the “armature for low impact mobility” combining bicycle tracks, pedestrian green corridors and recreational spaces promoting non-polluting travel modes and human health, making Green Infrastructure a solution of ecological and cultural importance. It thus provides ways “to imagine human and natural relationship [and] to develop a hybrid system from ecology, culture and natural concerns” (Rotte).

This inclusive approach to culture enables social engagement and social cohesion, and the formation of a living environment identity that is specific to its society. The engagement of the inhabitants economically and socially in this infrastructure would contribute to enhance the individuals of civic pride.

### 3.1 Al-Dariyah Triangle: Planning for a healthy livable environment

Al-Dariyah Triangle project by in Riyadh – Saudi Arabia, by Dar Al-Omran, showcases a new urban development bordering Wadi Hanifa and neighboring to the historic core of Al-Dariyah and UNESCO World Heritage site of Al-Turaif. The development is one of Saudi Vision 2030 projects and aims at enhancing the role of Al-Dariyah as a heritage, cultural and entertainment center respecting the historic, environmental and ecological specificities of the sites and adopting new urbanism and smart growth guidelines as well as highest international standards to attain a healthy urban environment ranging from soft-mobility and green open spaces network to environmental architectural measures.

Aligned with the guidelines of the Saudi Vision 2030 and with the ambition to enhance the role of Al-Dariyah as a heritage, cultural and entertainment center the Al-Riyadh Development Authority (ADA) allocated an area of 90ha East of Wadi Hanifa for the development of Al-Dariyah Cultural and Entertainment Triangle. Being at proximity to Al-Turaif UNESCO World Heritage site and the Al-Burjeri quarter, the urban and architectural development must be rooted in the cultural heritage of the area however be part of the future and must be ecologically sensitive.

The project master plan (Figure 3) concept aimed at:

- Enhancing the cultural, commercial and tourist activities;
- Creating of a new core with additional land uses in the fields of arts, culture, media, entertainment, education, sports that complement but not compete with the existing sites of Al-Turaif and Al Bujeri;
- Respecting the historic context
- Being inspired from surrounding environment and connects with Wadi Hanifa;
- Adopting highest international standards for transportation respecting green and smart technologies;

The general master plan morphology was inspired from the geomorphology of the surrounding landscape having the desert as a whole and the wadi as the unique definition of the core (figure 4). Looking at Wadi Shiab in specific, the rifts resulting from an eroded topography is one of the design motifs. Al-Turaif historic urban morphology also influenced the urban form of the project.





Fig. 3 Al-Diriyah Triangle birdeye view  
Reference: Dar Al-Omran

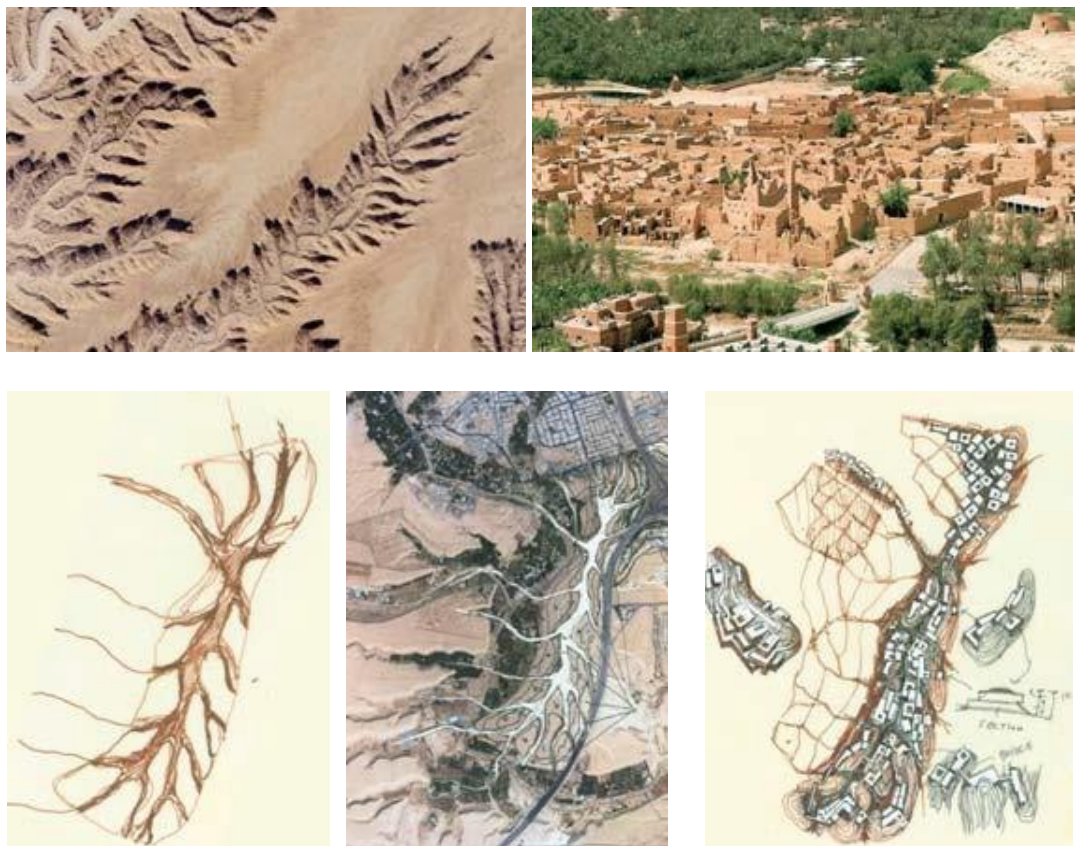


Fig. 4 Morphing the Al-Diriyah master plan  
Reference: Dar Al-Omran



Taking into consideration the General Entertainment Authority's Benchmark Findings, the land-use master plan resulted in seven different districts: (1) Cultural Heart; (2) Ecology and Nature, (3) Education, (4) Media and Entertainment, (5) Arts and Creativity, (6) Hospitality and (7) Administration.

### The Increments of the Site Evolution

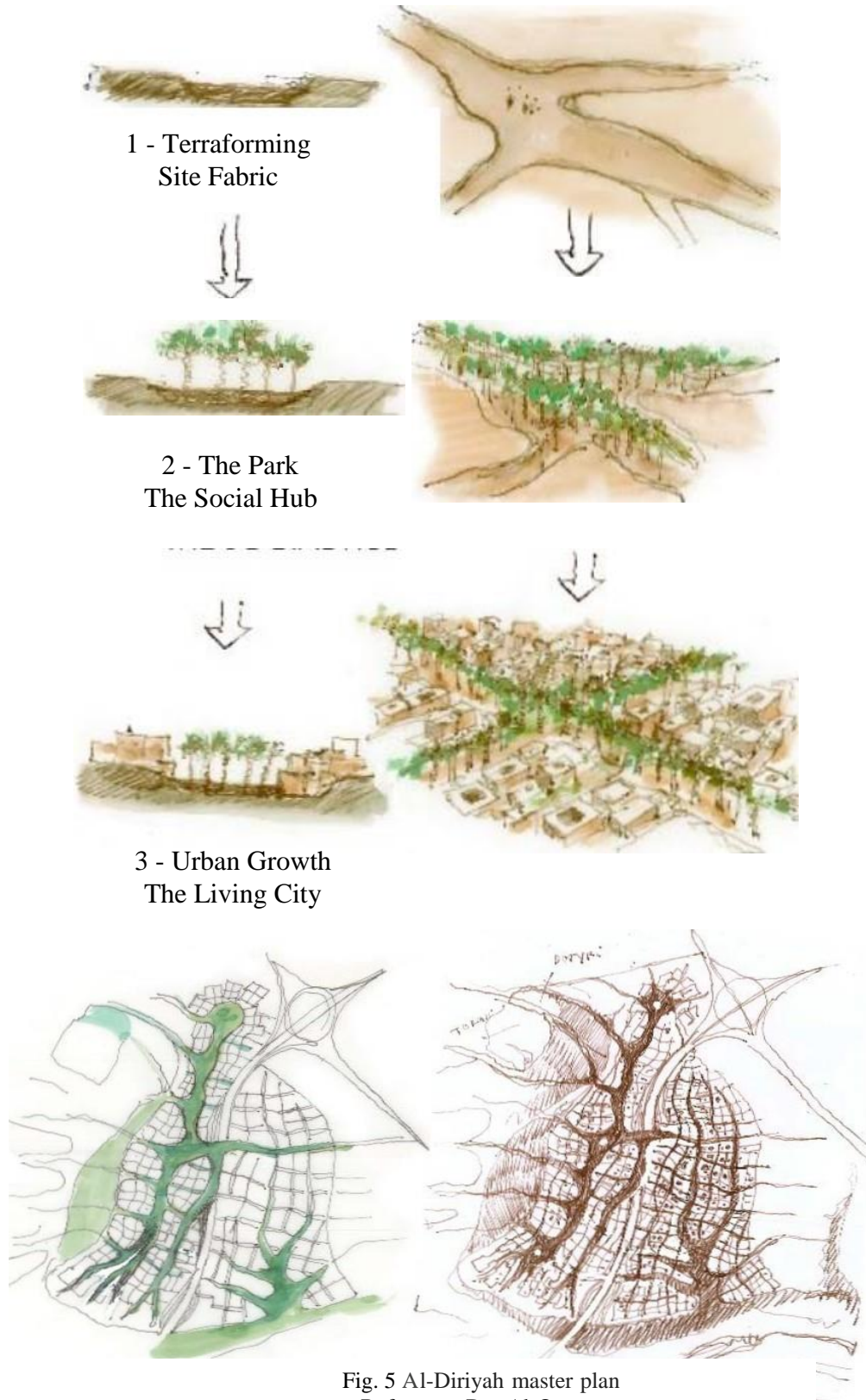


Fig. 5 Al-Diriyah master plan  
Reference: Dar Al-Omran

The main feature of the proposed development is the Wadi Park running from north to south connecting all developments and featuring hard and softscape vibrant public space. Imperial evidence from traditional habits of Najdi people showed that most Agriculture took place in the canyons of Diriyah (Shiabs's). Air descending to the canyon, drops velocity when passing through the palm groves and plummeting below the level of fast ground winds, gradually loses carried dust, and acquiring suitable levels of humidity from the evaporation occurring in the irrigation canals. By looking at the aerial photography of the Riyadh canyon networks (Wadi Hanifa), we can clearly distinguish that agriculture is nearly exclusively taking place in the wadis. Hence the Wadi Park design combined the use of culturally rooted tradition of Palm Orchards and the concept of green infrastructure to create a public recreational core of the project (Figure 6). The design approach opted to transform the land area by extending the existing wadis as (Green fingers) forming a quasi-natural network of connections tying the whole site together. These areas will allow for pedestrian and cycling circulation. Moreover, these green fingers will create an isolated micro-climate that will allow for indigenous fauna and flora to flourish and expand. A second advantage of the green fingers is controlled microclimate the utilizes passive energy and net-zero systems to provide for cooled spaces externally, a system of Evaporate cooling towers (figure 7), cooling pads and studied solar shades will result in a marginally cooler microclimate compared to Riyadh city, this effect augmented by the already lower temperature in Diriyah will allow for daily routines to be carried on the outside.



Fig. 6 The Wadi Park  
Reference: Dar Al Omran

The goal is to revive the old social habits by creating the old urban fabric and spaces, all while minimize energy consumption from transportation and air conditioning of houses. The main spine included multi-functional open space and car-free plazas for all age groups that is pedestrian thereby offers ample opportunities.

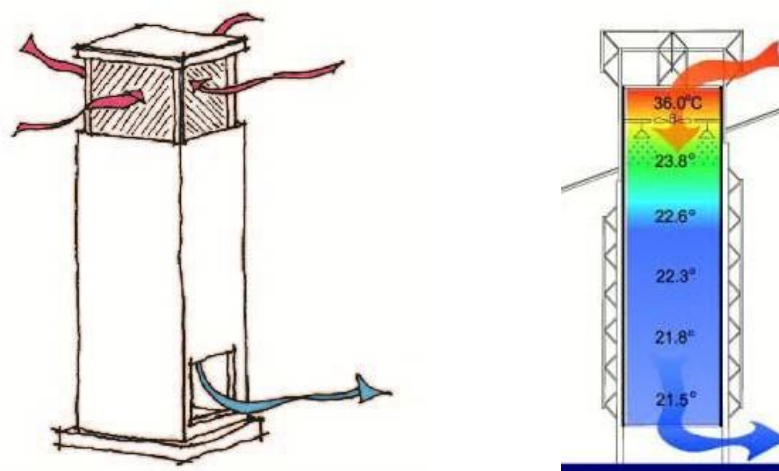


Fig. 7 Passive energy - evaporative cooling towers  
Reference: www.bgu.ac.il



Al-Diriyah contains many natural aquifers, basins and water sources compared to the rest of the region, this is a major reason for the emergence of Al-Diriyah settlement. The conceptualized public spaces incorporate water bodies; however, project planners aimed to reduce evaporation levels by strategic placement of these water features inside the wadis, sheltered space where evaporation rate is reduced by geomorphology, use large trees to shade these features and enclosing fountains by shrubs. The water bodies are isolated from ground soil and limited in artificial basins that limit water seepage and the water used in fountains and water bodies is a recycled treated grey water from household use: a “second” use of water ensures economic efficiency and environmental consideration.

The concept paid attention to ways of enhancing the livable climate by applying environmental design measures such as use of canyons and green fingers to create more hospitable and clean microclimates. Particulate Matter typically will penetrate beyond berms and canyons, however, by providing dense foliage, the designer aimed to reduce the amounts of Ultrafine particles within the canyon area. Many scientific studies Mo, L., et al. (2015), Janhäll, S. (2015), Stapleton, et al. (2016), Chen, L. et al. (2017) has proven that plants are efficient filtration systems capturing Airborne Fine Particulate Matter (PM2.5). To enhance the buffering earth berms were also used as environmental and cultural solution. The earth berms (figure 8) shall have a dual effect: for the exterior, the berm wall provides a changing pattern of closure and openings while characterizing the internal areas with wadi style elevations (Figure 8).

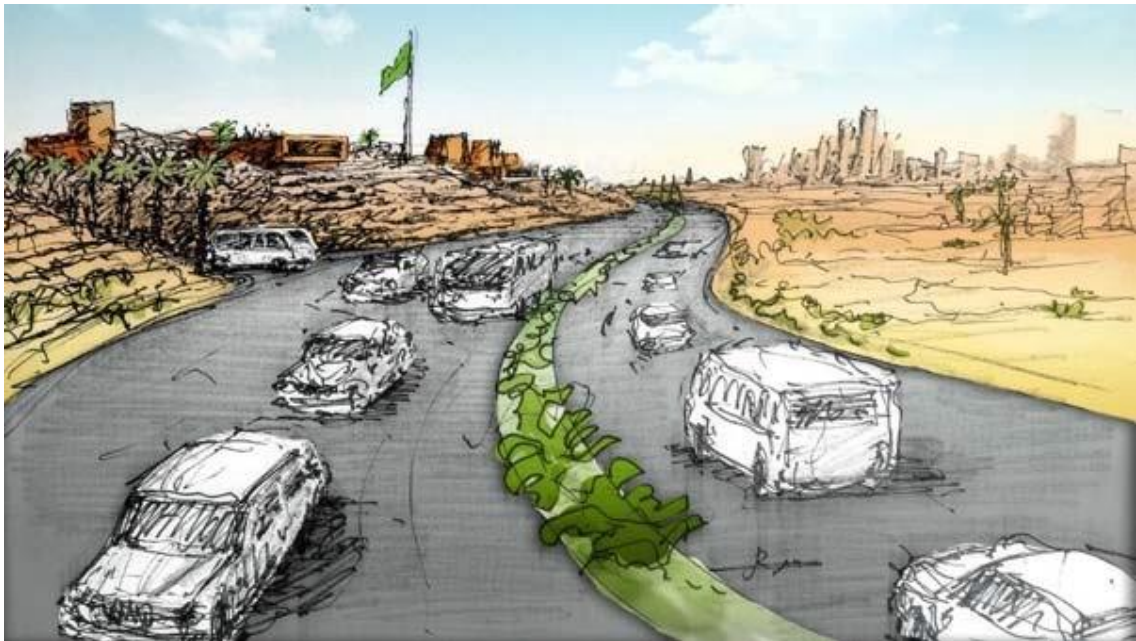


Fig. 8 Earth berms used to buffer from traffic  
Reference: Dar Al Omran

The adopted landuse strategy opted to bring the residents closure to the natural landscape by locating functions such as housing in the wadi to benefit from the scenic view of these green spaces. This landuse allocation capitalize on the old Najdi concept of placing housing in the center of palm groves to gain environmental benefit of a more hospitable climate with moderated temperatures and the acceptable levels of humidity. Additionally, the proposed building morphology takes reference in the traditional building style. To the fringes, the building morphology gets bigger in volume allowing for large-scale developments; however, as we approach the wadi edge the buildings open-up onto the activity spine allowing interaction between the wadi and the developments. The proposed architectural character combines both heritage architecture as well as a modern evolution of the heritage patterns (Figure 9).







Fig. 9 Master Plan and previous page Buildings morphology  
Reference: Dar Al Omran; Addariyah Art Center by Schiattarella (previous page middle right)  
– ReferenceE: <http://www.archilovers.com/projects/183095/addiriyah-art-center.html>

Smart technology, IoT and green concepts were also introduced both on the urban and architecture levels. Smart mobility such as limiting personal cars, investing in public transport on many levels have been established early on, light rails, metro stations and smart pods are integral parts of the master plan



circulation with a main objective in reducing energy dispensed on transportation (Figure10). On the architectural aspects, the vision of implementing mud construction for 80% of the site has also green and passive energy backgrounds; buildings oriented within the canyons relieve less thermal energy and capitalize of the heat sink natural earth can provide. Also mud construction typically has thick walls which acts as heat sinks that regulate the buildings internal temperature during the day and night.



Fig. 10 Modes of Transport and Green Infrastructure  
Reference: Dar Al Omran

Socially, the project tackled the economic aspect since the dominant function is commercial, cultural and recreational. There have been many programs that involve NGO's and collaborative programs that allow for low-income households and family businesses to have presence in the project, including non-profit crafts shops. Food truck plazas that are available on daily rent; and subsidies for potential shop tenants with low-income. Moreover, plans to limit the areas rented by major anchors and brands and allow for smaller businesses to have present are being investigated.

#### 4. CONCLUSIONS

In conclusion, the Al- Diriyah Triangle project illustrates possibility of designing a livable urban environment, providing a healthy urban environment and contributing to strengthening the cultural roots in the Saudi heritage while looking at the futuristic evolution through a reinterpretation of typologies, uses of building material, and hierarchy of proposed public space and green networks and infrastructure.

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