UPL 682- URBAN PLANNING RESEARCH WORKSHOP II
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BY:

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To our family..
ACKNOWLEDGMENT
“Verily, with every difficulty there is relief.”
Quran, Surat Al Sharh 94:6
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EXECUTIVE SUMMARY

We had several meetings and visits to Abu Dhabi, meeting with the Urban Planning Council, to set the core of the project to redevelop the site into an Emirati Fareej Housing development, which is located strategically in Abu Dhabi’s Al Mamora area, adjacent to E25 and Al Salam highway, as our proposal.

ADUPC wanted to engage with the MUP program for the interest in creating a new contemporary Emirati neighborhood, to address the problem of large plot sizes. These plots are granted under the grant program in Abu Dhabi.

Based on our site analysis as an MUP Studio I class, we responded to the site’s challenges and opportunities through proposing a contemporary Emirati neighborhood, but drawing on the traditional urban form of the fareej.

After conducting the site analysis, our Studio II group is moved onto planning and working on developing the site. The project includes several housing typologies with the heights ranging from G+2-G+7 for all of Emirati housing, apartment towers, and NON-EMIRATI rental villas.

The project has an earlier Emirati lifestyle through walkable sikkas and connected meydans to promote the cultural and social lifestyle of the Emiratis. The project reinforces open green spaces and community centers centralized in the fareej to connect and provide every need on a daily basis that could be achieved by walking instead of using a car.

The project decreases the massive impact on water and energy and its high demand in Abu Dhabi with adapting to new water usage sources such as gray water recycling by proposing wetlands for the site to rely on. To understand this sustainable approach, studies on the world and Abu Dhabi specifically was conducted to reach what adaptation and awareness must be done to achieve this. In order to have a framework for the master plan, the proposal was based on having more than one element to address. First of all having a mixed use
fareej neighborhood based on the UPC manuals and standards to begin with. Second, to create walkable spaces and linear sikkas that are shaded and safe. The most dominant factor in the project falls under privacy, where every block in the project should respect the Emirati culture and privacy as a family in the community.

Another factor is to unify the surrounding buildings with various building heights to the proposed project, still making the project and the neighboring developments harmonious.

The transportation and mobility plan encourages the project to be a focal area where it can be reached from several entry points, making it centralized and targeting congestion issues in the area. A proposed solution will also be introducing shuttle buses that serve the project, to access the station within walking distance, leaving car–dependency a less thought choice.
Figure 8: (right) Project location: UAE, Abu Dhabi, the site
The Urban Planning Council plays a fundamental role in ensuring that private and public development projects across the Emirate are aligned with the Strategic Framework and associated plans and policies and in doing so will continue to advance the Government’s vision.

The proposed project site is located next to villas, government, business and commercial areas in the heart of Abu Dhabi.

The Abu Dhabi Urban Planning Council’s primary purpose is to deliver upon the vision of His Highness Sheikh Khalifa bin Zayed Al Nahyan, President of the UAE, Ruler of Abu Dhabi for the continued fulfillment of the grand design envisaged by the late Sheikh Zayed bin Sultan Al Nahyan and the ongoing evolution of Abu Dhabi as a global capital city.

The privacy of the residential areas adjacent to E25 shall be carefully addressed.
The annual average cloud cover is less than 20% which increases the challenging solar exposure conditions in the area.

**VEGETATION**

The vegetation cover in the Abu Dhabi Emirate is scattered due to its harsh climate and limiting soils. The high fluctuation in temperatures, coupled with the aridity of Abu Dhabi coast, partially explains both the widespread occurrence of carbonates and evaporates, and the current restricted character of the vegetation in the region.

The most dominant vegetation type is the Mangrove. The natural vegetation has been considerably damaged and nearly destroyed in some places because of the misuse and the lack of proper management. However, it is predicted that all the coastal lagoons along the coast of the UAE will eventually be filled naturally or by man driven reclamation.

The project has great value because of its proximity to the mangroves. This is a major landmark in Abu Dhabi that cant be left unnoticed. For this reason, we incorporated the natural alignment of the mangrove trees and replicated it in our parks, open spaces and wetland, to unify the parallel locations.
PROJECT BACKGROUND

SITE ANALYSIS

Through observing the site, the group was able to identify all challenges, and opportunities to work with what is existing, and have the best outcome proposed possible with the following:

A. The road that leads to the street

B. The view facing Al Salam highway from standing in the middle of the site.

C. The view standing in the middle facing West of the site towards the military camp.

D. The view while facing East of the site towards Al Bahar towers situated in front the site’s border. This view shows a challenge of facing a tall tower how to maintain privacy throughout the site.

E. The view facing Delma Street on the West and its surrounding developments.

F. Standing on the West end of the site facing the busy street of E25 with commercial buildings on the right.

G. The view that shows the South of the site with empty land and high rise buildings that will need to be considered while planning the site.

H. South of the site looking East, are more commercial developments and offices.

I. The view shows a small area of local vegetation that surrounds the site and looking towards the well-known mangroves in Abu Dhabi.
Figure 10: Site analysis diagram that shows the surrounding area.
First of all, the project resulted from the collaboration between the American University of Sharjah - AUS and the Urban Planning Council of Abu Dhabi - ADUPC as an initiative to cooperate in exploring ideas about urban development in the Abu Dhabi Emirate. The MUP Studio team met with Mr Talal Al Ansari, from the urban planning department, back in October 2016 to discuss the proposal to showcase a contemporary Emirati mixed-use neighborhood with community facilities that catered the needs of the residents daily lives, and the proximity to the area catchments. Moreover, it led to stating the following issues, challenges, and opportunities.

The main challenge is to design for a multi-generation population accommodating their growth and density.

To incorporate the existing school and military base, located at the top central location, into the site or being considerate of the surrounding land use we propose. There are small residential units that are placed on the east side of the site, that will have to be part of our house typology transformations.
Another challenge is how to work with the existing surrounding commercial buildings and retail across on “E25”.

The site needs to be less car dependent and have a walkable and safe environment.

Emiraties prefer to always live in villas, however, we seek to encourage living into spacious apartments instead that also maintain their living standards and demands.

Another concern is to address mobility network that can grow as more traffic is increased with the population is increased.
The site is located to a busy commercial area at “E25” which provides a short walk to facilities as well. The people surrounding the site make the site vibrant and secure with constant movement.

The land has a high value because of its proximity to the mangroves and the Sheikhs Palace, with beautiful scenery that is hardly missed.
The entry and exit points from the site are very flexible with AlSalam highway bordering to the North, Delma Street to the West with the famous Delma Park, and Al Muroor Street.

The site is surrounded by other neighborhoods such as the one behind Delma street to the West, which creates a safe neighborhood to live in.
The manual talks about the vision of an Emirati neighborhood in Abu Dhabi. It shows how a neighborhood can be planned successfully with respect to context and climate. It is made up of a range of elements with a fine network of weaving paths and pedestrian-friendly streets throughout to enhance connectivity and encourage walking and cycling. Throughout, the community facilities are thoughtfully located to meet the needs of the residents. This combination works to create a dynamic, vibrant and cohesive atmosphere.

The neighborhood illustrated in figure 11 is a group of homes large enough to accommodate an extended Emirate family clustered around a courtyard or park.

This concept is based on:
- The traditional organization of Emirati settlements which reflects the high importance of family relationships
- Families to share the central courtyard
- Privacy is ensured by the cul-de-sac entrance that keeps out through traffic.

The benefits of courtyard housing are several:
- Privacy
- Optimum use of land
- Separation of the private family space from the semi-private guest space
- Internal rooms overlook the family courtyard
- Responsive to Abu Dhabi’s climate
- Provides a shaded atmosphere that is protected from the elements
- Flexible lay-out
Figure 11: ADUPC Neighborhood Manual- Diagrams of a neighborhood
VISION,
PROJECT GENERALITIES AND
DESIGN PRINCIPLES
The United Arab Emirates value their rich cultural backgrounds that they have had for years and would like to pass it down to further generations. Family and the social connections is what makes an Emirati neighborhood welcoming and long lasting. Through similar houses from their childhood and traditional grounds, the fareej will be welcoming for those who seek to live in a family community that is familiar to their personal day to day lifestyles. The project will reflect the past in a modern life pattern.

To attract the people to spend their time walking and socializing in the meydans and on their way to the mosque or back from the kiosks, the spaces are interconnected to the sikkas, cul-de-sacs and pathways, to maintain a healthy and vibrant sense of travel with the most sustainable and compact way. The healthier lifestyles come from green spaces that change behaviors and attitudes into relaxing and promoting the people’s wellbeing.

The project aims to respect each family to have their own right to their privacy. This is achieved through villa heights that are similar levels in the area and creating fareej’s that are compacted and easy to move around as well as safe at all times. The sense of the community allows any outsider into the fareej to not be left unnoticed.
Figure 12: Vision
The general concept illustrated in figure 13 is the outcome of how the concept was developed through three phases following the organic grid rather than a rigid system shown in figure 14. Phase 1 shows how the site is divided into four clusters. Phase 2 shows how the site depends on a green way link to ease connectivity in the site. Phase 3 shows land use planning based on the density and use in the forming of an organic rather than rigid system.

The project was planned to have a central low density residential area to create more connectivity and bring in the traditional essence of the “souk” where everyone can access their daily groceries and activities for the ease of connectivity.

The other high density residential area is facing the busy E25 District, which is more interactive with offices, retail, hotels, and apartment buildings. The main focal element on the site is the system of green ways links all the site together.

The site is accessed from surrounding areas easily. The extended bridge that connects the site to the mangrove creates for more accessibility. The hotels and offices are divided to be segregated from the residential areas, however will have a hierarchy of heights to respect the privacy of houses. These are placed as shown in the figure as investment areas due to the value of land location. Both are projected by the highway and have a visual connection towards the mangroves, and easy access to the service road.
Figure 14: (top) the standard rigid grid is shifted to an organic grid that serves our concept more.
PUBLIC REALM OF THE EMIRATI NEIGHBORHOOD:
The public realm of the UAE neighborhoods should reflect the traditional urbanism of the Emirati fareej.

To bring the Emirati identity and culture into the site, the public realm sets these characteristics in the site. The public realm of the fareej has numerous leisure of space alternatives from sikkas to barahat and mayadeen.

The essential necessities in the site are based on shading and ventilation because of the weather conditions throughout the year.

We tend to overcome the issues by using local palm trees all around the site that provides shade and cooling effects and the provision of loading zones. A focus on livability will require constant monitoring and attention to detail.

Public realm spaces should reflect local culture and design traditions to help define physical identity, including the use of water features, which is the wetland we have proposed, mosques, shade-ways, and open markets in the maydan for souks.
Figure 15: Illustration of a proposed sikka for the project

Figure 16: An illustration of the maydan in the project

Figure 17: Illustration of a proposed baraha for the project
The Emiratis cherish their rich culture and traditions. Privacy is mandatory when it comes to how they build their homes. Religion also plays an important role in gender segregation and how the houses are divided in respect to the neighbor’s plot as well. This is why the housing typologies in the fareej are various to serve each individual’s needs and design.

While considering the climate in Abu Dhabi, the housing typologies are formed into a fareej with courtyards, sikkas, and barahaat that work all together in forming today every Emirati’s vision.

Based on the analysis of existing housing typologies in Abu Dhabi and the region, we came to several housing typology proposals. To offer new living opportunities in a strategic location, three typologies were granted to both Emirati and Non-Emirati to unify the area and provide all elements of comfort.

**COURTYARD HOUSING TYPOLOGY** or Emiratis come in a traditional setting of space where the house is within a private open space that accommodates the family similar to figure 18. The current standard plot of an Emirati villa is 30 meters by 30 meters. We have proposed a different plot size drifting from the standard for efficient space of 23 meters by 30 meters as seen in figure 19.

Our proposal shows the controlled central spaces - courtyards- and the villa is built around it. First if all, the main reason behind this is that we wanted to create a more family setting and a friendly environment. This means that families will be closer to each other and have a longterm proximity for the future.

Also, this environment is more private and creates an unexposed area to the neighbors when privacy is required.

The multi generation use of houses will require adequate use of space and layout. The inward-looking family courtyard houses have either 1 or 2 courtyards that offer great light and venti-
lation, which makes it very pleasant for the family, shown in figure 20.
Also, privacy, which is an important factor in the Emirati’s ideal home setting, is seen in this house typology where the heights of the houses don’t exceed G+2 to not invade anyone else’s property.

Figure 19: Current Emirati housing size and our proposed housing size.

Figure 18: Emirati Housing Typology.

Figure 20: Proposed Housing Typology for Emirati villas.
APARTMENT TYPOLOGY comes in two types. One apartment is open for all nationalities, and the other is only for Emiratis that are just married or a small family. These apartments are located in mid-rise towers of G+2-7 facing the busy -E25- towers. There are various apartment sizes that also have separate entrances and secluded privacy, hence more access to retail and a shared safe building. This allows many families to live closer to each other that prefer walkable access to their neighbors. We recommend this for smaller families that seek higher level views with all amenities of a residential villa.

NON-EMIRATI HOUSING TYPOLOGY as seen in figure 22 shows how plot sizes vary and some with courtyards too. Inspired by traditional Emirati settlements such as Bastakiya Dubai, this is proposed to have shared walls of two or three of their four walls with their neighbors, aiming for a more compact type of typology.

We aim to have traditional elements implemented as well. There is the wind catcher - mashrabiya that will help work as an addition to the identity, as well as help with creating a better living environment.
Figure 22: Multi level extrusion of proposed non Emirati Housing Typology.

Figure 23: Multi level extrusion of proposed apartment typology (right).
DESIGN PRINCIPLES

CONNECTION WITH EXISTING DEVELOPMENT

TOWER PROXIMITY:
The surrounding buildings adjacent to the site are commercial, retail, and a few residential. In order to allow the site to be harmonious with the project, we have proposed the same elements to also be incorporated into the project. The towers that have retail are serving both the site and the surrounding buildings to have a more harmonious environment and interactive at once.

GREEN BRIDGE:
A new approach towards connectivity. The bridge is proposed to have an interactive link between the site and the mangroves, a beautiful landmark in Abu Dhabi, with activities along the way to create a livable site for all residents.
LAND USES

The project is divided into several land uses that cover the site based on the elements we want to achieve. The main area that the site covers is residential to have a fareej of villas for both Emirati and Non Emirati residents. Also a multi use tower of both residential apartments and retail unified into one space.

Another important use in the site is open space/recreational green ways that bring life to the site and encourages walkability, which is our main aim into this site.

These spaces are significant as they bring all social activities into one focused area, what we call a maydan, and more smaller areas for social gatherings, known as the baraha, and these are all connected to each other by narrow and shaded pathways called sikkak.

Parks have a comfortable walking distance from residential areas that make it accessible at all times.
DESIGN PRINCIPLES

MOBILITY

STREET NETWORK:
The street network on the site is based on __________________ streets that connect the site to the outside surrounding area, within the site, and between neighborhoods. This connectivity is to ease vehicle flow and pedestrian and cyclist movement throughout the site.

For the ease of pedestrian circulation, we have ground floor entry paths at some buildings at the edge of the block that have a pathway in their ground floor. The reason behind this is to make pedestrian movement flow easily and be enjoyable from one block to the other with a width of 6 to 8 meters.

WALKABLE DISTANCES TO OPEN SPACE:
To allow more people to enjoy and walk instead of drive on the site, we have designed the site to have connectivity where all services are at a short walking distance of 400 meters accessibility illustrated in figure 28. Every fareej can reach the services and have a safer environment where

SHUTTLE BUS:
A more convenient way to travel around the site is to implement the shuttle bus network for people to basically car pool, rather than drive individual cars, to be less car oriented on the site. The shuttle buses have a defined line of bus stops and a network that connects the site to the outer site as well.
Figure 27: The entry and exit points to and from the site.

Figure 28: A diagram showing the ideal walking distance of 400m from the fareej to the open public space.

Figure 29: The proposed bus network for the internal bus route (yellow) and external routes (green).
DESIGN PRINCIPLES

SUSTAINABILITY

CONSERVING WATER AND ENERGY THROUGH TECHNOLOGIES:
Abu Dhabi uses a lot of its resources and has a great dependency on water and energy due to its hot climate and population growth. To ensure that these resources will still be available for future generations, water should be conserved through gray water systems for landscape irrigation and individuals' demands. A wetland will be constructed so it will serve the site's water daily needs similar to figure 31. The approach to sustainability will create an awareness for people on the site, whether for educational practices from the school, or to help with household daily requirements.

Solar Energy helps to conserve the energy consumption in the city. This is why we have proposed a solar paneled-parking system to work both as shade and to be used for energy required on the site. This will decrease the energy consumption and save/store energy for the site seen in figure 30.
Figure 30: Solar paneled parking as a sustainable energy solution for the project

Figure 31: Constructive wetland as a sustainable water solution for the project

Figure 32: Local food production located in the park North-East of the site
THE EMIRATI NEIGHBORHOOD
THE EMIRATI NEIGHBORHOOD

HISTORIC NEIGHBORHOODS

This section is prepared as part of the first stage requirements. Its main purpose is to have a look on the history of the Emirati Neighborhoods and understand the bases those neighborhoods were built on.

Furthermore, it includes the definition and a background of the Emirate Neighborhoods as per described in UPC Manuals.

Good planning is a practice that spans past, present, and future. Learning from the past, interrogating present urban developments, and critically drawing on diverse resources and community vision to plan for future generations must be conscientiously observed before any development.

It is only after a thorough research that one could start planning a place, ensuring a traditional and ordinary pathway that everyone enjoys; mixed with the practicality the future has to offer. Hence, three distinct Emirati historic neighborhoods have been selected in order to satisfy the past studies and analyses: Heart of Sharjah in Sharjah, Jazirat Al Hamra in Ras Al Khaimah, and Bastakiya in Dubai.

Looking at the three locations, their similarities are what come to mind. First, the Heart of Sharjah’s house structures closely resembles Al Bastakiya’s. They both focus on courtyard houses, as the communities were designed for predominant and prosperous individuals. However, Jazirat Al Hamra is a much quieter, aged neighborhood, with Arabish housing built out of Palm fonds with flat roofs. These houses were mostly considered as Emirati summer houses, as they provided natural ventilation. While studying these figure-ground relationships, several typologies are found to be repeated.
Figure 33: Historical neighborhood diagrams represent the three different areas that we chose to study.
In the Heart of Sharjah, the housing typologies predominantly use figure grounds that usually have one side of the wall open, either towards the outside or a wider doorway. The final image demonstrates three sides of the house having walls, while one side is open to a larger area.

In Jazirat Al Hamra, even though there were slight typologies of completely bare walls, the prominent ones ended up having four-side structures, with one true courtyard. Although it was a temporary Arabish house, they still ended up having a courtyard.

Back in Bastakiya, patterns identical to Sharjah can be spotted, having central courtyards surrounded by heavy structure.
Figure 34: Historical sikka typology studies that we studied for the project.

Figure 35: Historical baraha typology studies that we studied for the project.
THE EMIRATI NEIGHBORHOOD

SIKKAK

The smallest elements of public space, Sikkak are narrow streets that link neighborhoods together. More specifically, they link each home both to neighbors and to community facilities. Shaded by the buildings they run along, Sikkak provide cool, safe, walkable routes to destinations, allowing for more practical routes for people to take into consideration when commuting around the city.

BARAHAAT

Barahaat are spaces between homes that are located in a small number of key positions throughout the Fareej. There are usually a small number of Barahaat to create focal points for residents to come and interact with one another, ensure maximum use and provide a focus for a larger number of people. This allows the community to interact better with each other and build long-term chemistry along the way.

The heart of Sharjah’s predominant locations consisted of large, open blocks with several houses surrounding them. While in Jazirat Al Hamra, a narrow and longer stretch of openings could be observed. Bastakiya, being similar to Sharjah, has larger openings as well, but are connected by thinner pathways.

These pathways are known as Sikkak.

1 Neighborhood Planning Manual, UPC
During conducting the site analysis stage, it was observed that the study area has variety of urban forms; from villas to high rise tower apartments as shown in figure 36. Most of the residential communities which consist of central open. At the same time, none of the surrounding blocks/typology seem adequate for the residential neighborhood to be developed on the site.
Figure 36: Existing built form analysis
The proposed urban form follows an organic pattern which reflects the traditional Fareej housing typologies. Voids seen between the structures provide a multitude of public, semi public, and intimate social spaces.
Figure 37: Proposed figure ground plan.
URBAN DESIGN

EXISTING BLOCK TYPOLOGY

The study area has five types of urban form as shown in figure 38.

**TYPE A:**
It contains residential villa communities located west of the site and it has the “vip” housing com-
munity with the closed compound of villas with an open space used for parking.

**TYPE B:**
It is high-rise towers community with a grid and open space. The street pattern is a grid shape without an open space.

**TYPE C:**
It has apartments with G+3-7 heights. Shown as clustered “U-shaped” middle spaces used for resident parking.

**TYPE D:**
This type of urban form is a gated-community where there is a fence surrounding the residential villas.

**TYPE E:**
This area has villa apartments with G+3 height. It is clustered as “U-shaped”, similar to type C, with parking as well.
Figure 38: Block Typologies in the vicinity of the site.
The project adopts an urban form radically different from the form existing in the surrounding areas. This approach is taken in order to achieve the Studio team’s vision of a tightly-knitted organic pattern form. This type of typology follows more of the Arab settlements we have seen previously, rather than being a western grid pattern. The resulting street layout in figure 40 offers a safer pedestrian environment and reduces vehicular traffic through the project. Additionally, it provides shaded spaces along the streets that may also encourage walking.

Figure 39: Proposed block typology
Figure 40: Proposed block typology
The residential plots shown in figure 41 are proposed to be for both villa and apartment form. It shows the sold void relationships. The housing block typology shows how individual units cluster together to form larger blocks which share a party wall leading to lower heat gain and exposure. The plan shows how these clusters create enclosed public spaces which encourage communal gatherings within the neighborhoods.
Figure 41: Proposed Housing Typology plan.
URBAN DESIGN

EXISTING BUILDING HEIGHTS

Building heights in the study area have been controlled. The study shows a variety of building heights from G+2 villas to G+M+26 high rise towers, which mostly are South.

The main challenge with the high towers is to maintain the privacy throughout the site for the residents. The study of the heights was ensured that the surrounding developments are unified with the site’s new heights and location of the land use carefully. The primary development controls should include building height, floor space ratio, building depth, building separation and setbacks. When applied together, the primary development controls create a building development.
Figure 42: Existing building heights
URBAN DESIGN

PROPOSED BUILDING HEIGHTS

The heights of the buildings are harmonious based on the surrounding. To the west of the site, the residential apartment buildings face “E25”, which are based on G+7-12. To have a hierarchy of heights that look and feel safe and unified, these buildings have a leveled height form to keep the privacy of the residents a priority.

The residential villas in the fareej are all G+1. The lifestyle of the Emiratis require the heights to be set not too high to not interfere with other people’s lives.
Figure 43: Proposed block typology
URBAN DESIGN

CONSIDERATIONS FOR OUTDOOR SPACES
WIND ANALYSIS

The wind blows on Abu Dhabi comes from different direction:
Northwest: cool wind blows most of the year (the most favorable)
East: strong wind blows rarely (has to be avoided)
Southwest: carries dust most of the time (has to be avoided)

CONSIDERATIONS FOR OUTDOOR SPACES
BUILDINGS AND CLIMATE

Climate varies around the globe and indigenous architecture used to respond to local climate through the use of natural heating and cooling methods that were not reliant on mechanical systems, as well as natural and local materials.

By understanding climatic conditions that are specific to a project’s location, design & planning teams are able to develop climate responsive building/Urban designs. The result is a neighborhood that utilizes less energy and provides a high quality and comfortable environment for the occupants.
CONSIDERATIONS FOR OUTDOOR SPACES
BIO-CLIMATIC DESIGN

A bio-climatic approach for design is based upon integrating the micro-climatic factors surrounding a building or a space to minimize the energy consumption on various levels and enhance the comfort conditions of an individual within such space (Center for Renewable Energy Sources and Savings, 2010).

Achieving a bio-climatic approach for the design of outdoor spaces primarily depends on a deep understanding of all the parameters of the surrounding natural environment. Two factors need to be considered regarding a green design initiative are (Gaitani et al., 2005):

The natural factor such as the micro-climate of the space. The man-made factor which is the urban setting surrounding the space. Both of these two factors are responsible for achieving a passive design.

The objectives of Bio-Climatic design are:
Providing natural passive design elements that enhance the micro-climate and minimize the heat gain through shading, natural ventilation and other factors.

Minimizing pollution and CO2 absorption. The implications of Bio-Climatic design objectives revolve around three main concepts; vegetation, water features and materials.

Manipulation of such concepts where as follows: Providing a dense green buffer zone along the periphery of the site to act as a wind shelter and enhance the micro-climate.

Locating plants along streets to enhance the cooling effect through shading providing greenery in all open spaces in and around the site with various densities applying a central water source in the park to increase the cooling sensation during hot summer days. Choosing carefully hardscape and construction materials to match the micro-climate.
Figure 44: Sun direction analysis illustration
Figure 45: Wind direction analysis illustration

Streets are oriented towards the northwestern direction for maximum breeze circulation.
To sum up, several strategies need to be taken into considerations when designing the future developments, to reduce the noise caused by the existing heavy vehicular network and adjacent developments. These strategies can include, buff-ering, planting and landscaping along the major source of noises to minimize its undesirable impact. The site is surrounded by highways, primary road network and mixed-use developments. This generates various levels of noise that have an impact on proposed future developments within the site boundary.

The proposed site will have noise buffers throughout the site such as landscaping of palm trees in areas of high noise levels.

**URBAN DESIGN**

**NOISE ANALYSIS**

The site is surrounded by major vehicular network and variety of mixed-use developments and public facilities. Each generates different level of noise, which has an impact on the future development. Figure 1.4, illustrates the levels of noise with percentages in relation to the source of the noise. It highlights the scale of the noise from (0 to 100), which is estimates as follows:

- 20%-40%: low noise, generated by the governmental and educational developments, south the site;

- 40%-60%: mid noise, generated by the mixed-use developments, south-west the site;

- 60%-80%: high noise, generated by the high vehicular network, through Delma Road, west the site;

- 80%-100%: high noise generated by the high vehicular network, through Al-Salam Road, north the site.
Figure 46: Noise analysis around the site
URBAN DESIGN

SITE AXIS SPATIAL ANALYSIS

The site has a strategic location in Abu Dhabi. Being bordered by four landmarks: WTC Towers, Al-Reem island, AlBahar Towers, and IPIC Towers, it creates an axial alignment across the entire site. Its purpose is to maintain the visual connection to each of these landmarks, as shown in figure 47.

Figure 47 : (Right) Site axis spatial analysis showing WTC, IPIC, AlBahar Towers, and AlReem island
Four major landmarks create an axial alignment across the entire site. Its purpose is to maintain the visual connection to each of these landmarks, as illustrated in the adjacent diagram.
Figure 48: Master plan and vignettes of the surrounding.

URBAN DESIGN
MASTER PLAN
The project begins with the first phase as a start. Each typology we proposed was introduced in the first phase with one area of low, middle, and high density developments. The second phase was based completed on either of two terms. The project had to complete three years, or it is occupied up to 90%. The last phase is either after seven years of completion, or both of the previous phases reach up to 95% occupancy.
Figure 49: Project phasing

**Phase 1**
Project Start

**Phase 2**
3 Years or once phase 1 reaches
90% occupancy

**Phase 3**
7 Years or once phase 1 & 2 reach
95% occupancy
The integral size of the site area consists of 80 hectares. The population density has been decided at 150 people per hectare. The reason for this selection was to ensure the optimal people per hectare ratio based on sustainable neighborhoods principles, which is usually between 130-250 people per hectare.

Taking an average estimation, 150 was the finest choice, offering a balanced density in the vicinity to stand out from the surrounding neighborhoods. Being built long ago, their measurements varied in terms of density, mostly resulting in higher density ratios that in turn deteriorate some parts of the district. Thus, creating a highly efficient and effective setup for a sustainable neighborhood is the main goal. The total projected amount is 12,000. Getting this number equals out to the initial population density, as a result of a peerless design to support the number.

Breaking down the population, the number of citizens (Emiratis) is 8,400 that are about 70% of the total population; this is because the main aim of the project is to permanently dwell citizens in households, as a result of sojourning in their own country. On the other hand, non-citizens (expatriates) make up 30% of the area, which are 3,600. The reasons behind it are that firstly, non-citizens have a wider variety of locations to dwell in, and secondly, creating an interlaced community within the area where there are variety of nationalities with different housing types (low-income, Mid-income, and high-income types).

Dividing the populations to families, the citizens make up 1,135 units, while non-citizens are 800 units. These units were erected from dividing individual populations with specific persons per household ratio for each. Taking 7.4 for citizens, and 4.5 for non-citizens. Based on Abu Dhabi statistics center, 27.3% of the population consists of students. Hence, the project is expected to have 3,276 stu
-dents. This information is crucial in investigating the existing schools or building educational facilities for a sustainable neighborhood, as residents demand dedicated facilities close by to the vicinity for their siblings.

The key concentration of the project is to propose Emirati housing development by following sustainable neighborhood principles. This offers a mixed-income housing development that includes diverse types of housing units i.e. single and multi-family housing units, town houses and apartments for both citizens and non-citizens with different income levels. To better plan for such a neighborhood, having the knowledge about the income level of expected residents is essential. The expected monthly income per Emirati household is AED. 22,000 while this amount is AED. 12,000 for expatriates.
LAND USE

DEMOGRAPHY

Site Area:
(800,000 sq.m + 10,000 = 80 ha)

Density: Based on Sustainable Neighborhoods
150 people per hectare

Total Project’s Population:
(80 x 150 = 12,000 people)

No of citizens:
(70% of total population = 8,400 persons)

No of non-citizens:
(30% of total population = 3,600 persons)

No of units for citizens:
(8,400 ÷ 7.4 persons per household = 1,135)

No of units for non-citizens:
(3,600 ÷ 4.5 persons per household = 800)

No of students:
(12,000 x 27.3% = 3,276)

Expected monthly income per household:
AED. 22,000 for citizens
AED. 12,000 for non-citizens

80 Hectare Site Area

150 Persons/Hectare

12,000 Persons Population

8,400 Citizens

3,600 Non-Citizens

1,135 Units for Citizens

800 Units for Non-Citizens

3,276 Students

17,000 AED/Monthly Average

Figure 50: Demography and sustainable analysis in Abu Dhabi for the project.
Figure 51: Demography of percentage distribution of employed population by work sector and gender.
LAND USE

EXISTING LAND USE

The site is located in a rich vitality area with many facilities, offices, hospitals, malls, schools and residential area which provides housing for higher and middle-income earners. The residential area serves both Emirati nationals in private villas or VIP communities and NON-EMIRATI nationals in apartments, district hotels and high-rise towers Figure 52.

The study area is divided approximately into Thirty four percent (34%) of residential, twenty five percent (25%) of mixed use residential-commercial, three percent (3%) of mixed-use offices commercial, three percent (3%) of educational, seven percent (7%) of governmental, four percent (4%) of healthcare and hospitals, two percent (2%) of industrial and eight percent (8%) of institutional. The rest of the study area fourteen percent (14%) considered as recreation and divided into open spaces and stadiums with percentage of ten percent (10%) and four percent (4%) respectively.

The study area has a good balance of land use in proximity of the site. Moreover, proposed location will be served by offices, retails and community facility.
Figure 52: Existing land use plan
To ensure that appropriate community facilities are designed and provided for all, the UPC have set some standards through “Abu Dhabi Community Facility Planning Standards” document. Referring to this document, the number of these facilities as well as the gross floor area for each can be determined. For instance, the minimum number of residents served by each neighborhood center is 6,000 therefore; this proposal with total population of 12,000 needs maximum two neighborhood centers. Every neighborhood center requires a community center with minimum GFA of 750 sq.m. Hence, this proposal needs two community centers. Similarly, it needs two early learning centers (nurseries) and two police stations.

For development proposals with a population of 12,000 – 29,999 residents, one medium clinic can be provided. As for parking lots, considering the real-life situation for car ownership in the UAE as well as sustainability guidelines, dedicating two car parks per family, requires 3,710 parking lots within the project that would take up 92,750 sq.m area.

Abu Dhabi’s total population consists of 2,784,490 where 1,831,741 of them are males and 952,749 of them are females. In fact, males are double the number of females that is sensible due to the large number of men-power in construction fields. 20% of Abu Dhabi’s population comprised of citizens while the remaining 80% is expatriates. This information would help us to project the estimated population for our proposal.

According to the Household Expenditure and Income Survey (HEIS) in 2007, the annual average household consumption expenditure in 2007 for national households was AED. 29,904 annually on average, compared to AED 25,228 spent by non-national household and AED 12,026 by collective households.
Figure 53: Projected land use area showing the percentages that will occupy the site.
LAND USE

PROPOSED LAND USE

The proposed land use in the project is divided into four categories: residential, commercial, open green spaces, and community facilities, as shown in figure 54. These uses are all connected to meet the residents needs and to make their life comfortable as possible.

RESIDENTIAL:
There are three different densities in the project. The low density residential villas for both Emirati and non Emirati are located at the North in the project, situated right near Al Salam highway and neighboring the Sheikh palace, taking the most land space for the residents with high incomes who afford this luxurious lifestyle offered in the project.

The other type of area is set in the mid-south for the medium density residential villas created for the local couples that have their more compact quiet neighborhood all to themselves, yet have a walkable distance to the low and high density neighborhoods. The last area towards the West is the high density apartment buildings that face “E25” offered for anyone to live in.

COMMERCIAL/RETAIL:
The retail that is locating in the ground floor of the apartment buildings are imitating what is being seen in E25. They offer daily needs such as groceries, and small shops for both the residents and employees on the other side to visit.

COMMUNITY FACILITIES:
Based on the study of what is needed in the site we have added mosques, nurseries, kiosks that are movable, and fixed shops to serve each fareej.

PARKS/OPEN SPACE:
There are three different park systems:
• Connecting to the bridge seen North-East in the project.
• The park on the North-West that links to the other side to Delma Park.
• The wetland that is situated in the center of the site behind the school to be both educational and functional.
Figure 54: Proposed land use plan
Figure 55: Extrusion of proposed land use plan

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Governmental
- Educational
- Military
- Religious
- Parks/Open Spaces
- Community Facilities
LAND USE

EXISTING COMMUNITY FACILITIES ANALYSIS
SUSTAINABLE FACILITIES CATCHMENT AREAS

The plan, figure 56 illustrates the possible facilities’ catchment areas for a sustainable town. It splits the town into home place (local), neighborhood, district and city level. It reflects the degree of permeability for both walking and cycling by showing the distance of each facility from home.

Following the two guiding concepts of the UPC manuals and the principles of a sustainable neighborhood, the accessibility criteria reflect them jointly. Both concepts have been merged, updated and adjusted in a way that the sustainable neighborhood principles are considered and adapted to the local UAE neighborhood facilities principles.

According to the diagram, within the local distance which is not more than 600 meters, there should be facilities such as Barahas, nurseries, shops, daily mosques, bus stops, local parks, community centers, tram or light rail stops, primary schools and clinics. As shown, the implementation of the concept on the site demonstrates both the existing and missing facilities.

It is evident that practically all the mentioned facilities are missing in the 600-meter proximity. This indicates the necessity for providing the essential facilities within the local distance all over the site.

Similarly, within the neighborhood distance which is not more than 2000 meters, facilities such as playing fields, Friday mosques, Maydans, secondary schools, district centers, leisure centers and major natural green spaces should be accommodated. Studying the surrounding areas of the site reveals the missing facilities such as playing fields, Friday mosques, Maydans and leisure centers. Noticeably, there are some educational institutions from primary schools to university level within the neighborhood distance.

In district level that is not exceeding more than 8000 meters, a technical college, general hospital and an Eid mosque should be provided. A general hospital is the only missing facility amongst all. Within the city level, which is not more than 15000 meters, a city hall and major theater should be accommodated.
Figure 56: Existing catchment for the site’s surrounding facilities.
LAND USE

PROPOSED COMMUNITY FACILITIES ANALYSIS
SUSTAINABLE FACILITIES CATCHMENT AREAS

Based on the sustainability distance of location of facilities from a neighborhood, and the ADUPC manuals, the proposed catchments as shown in figure 57 is shown for two different uses.

The blue catchment area signifies the walking distance from the mosque to the neighborhood that is around it within reasonable walking distance. As shown, the project has four mosques that are enough to occupy the residents living in the project. There are other mosques from the surrounding areas, one is walking across Delma Street to the adjacent neighborhood.

The orange catchment area is showing the nurseries we have estimated for the project. For safety issues, children are taken to school by the car rather than walking, so the distance of the schools are walkable, however are located with considering people will prefer to drive to this facility specifically.

Figure 57: (Right) The community facility catchment areas from neighborhoods illustrate the walking distance on the site.
MOBILITY
11
MOBILITY

EXISTING VEHICULAR NETWORK

Transit, vehicular circulation and pedestrian movement are best integrated to support a more cohesive urban form and block structure.

VEHICULAR NETWORK ANALYSIS:
Figure 58 illustrates street figure ground around the site. It highlights three different types of road network, including primary roads with heavy traffic vehicular network; secondary roads with medium traffic vehicular network; and lastly local roads with low traffic vehicular network. This explains how the development is highly dependent on cars and vehicles.

The site is surrounded by two primary roads, which are considered important links to the island of Abu Dhabi; to the North is Al-Salam Highway; and to the South is Al-Muroor Road. Whereas, Delma Street and Shakhboot Bin Sultan Street are considered secondary roads, that link the site with major roads and generate medium traffic vehicular network around the proposed development. Local roads are distributed around the urban blocks and provide access points to the different land uses and developments around the site as seen in Figure 59. The site is accessible through three existing access points. One from Al-Salam Roads and the other two access points are through Delma Street.

Potential vehicular network shown in Figure 59 will connect the various existing neighborhoods around the site with the proposed development. Potential continuation of the existing road network is projected to connect the site with the surrounding developments. Moreover, strategic connection points through the primary, secondary and local roads are proposed to access the proposed development.

The site is located in adjacent to Block E-25, which is one of the most important mixed-used developments around the site; it consists of residential, retail, offices and community facility land uses. Therefore, four potential access points are proposed to connect E-25 to the proposed develop-
Figure 58: Existing vehicular network plan around the site
ment, refer to site images in Figure 59. The main purpose is to offer and serve the future population and provide variety of services. In addition, anticipated access points are located directly through Al-Salam Road; one is to connect existing school with the future development and the other is opposite to the Mangroves zone. Other potential points are distributed to the east of the site to provide access from the variety of governmental entity.

In conclusion, the proposed vehicular network aims to connect the site with the various neighborhoods and centers of the surrounding developments, through an effective and efficient hierarchy of roads. It seeks smooth vehicular flows and prevents traffic congestions, due to the existing heavy vehicular traffic network, which is generated by the existing facilities; and the projected traffic network due to the projected population.

PUBLIC NETWORK TRANSPORTATION ANALYSIS:
Figure 59, demonstrates the network for multi-model transportation network through the island of Abu Dhabi, according to Abu Dhabi 2030 Plan. There are two modes of public transportation; which are planned to be located around the site; Metro, Light Rail Transit (LRT) in addition to the existing bus network. The Metro corridor is planned to run through Al-Muroor Road south to the site, along with two stations. One of the Metro stations is planned to be located in adjacent to the Jazira Stadium, which is considered one of the landmarks within the study area. Whereas, LRT corridors is planned to run through Airport Road, in parallel to Al-Muroor Road. Existing efficient bus network runs through the major roads of Abu Dhabi, including Al-Muroor and Airport Road. The stops are strategically spaced to ensure maximum catchment of the city and minimize walking times. The city-wide bus network provides interconnected and permeable routes throughout. Thus, the proposed public transportation network plan follows three themes:
• Public transport provision at key community facilities
• Fully integrated transit system with multiple interchange opportunities between modes
• Public transport stop/station provision within 400m for the vast majority of the resident and employee population.
Figure 59: Existing and proposed mobility network
Figure 60: Proposed mobility plan
The project’s main aim is to have connectivity all around the site. The site will have access to all of cars, pedestrian paths, bicycle paths, a shuttle bus lane, and a bridge that connects the site to the other end of the mangrove. There are main entry roads that enter the site that were planned to manage traffic flow from both sides. The need for main roads is to also have the site connected with its surroundings, not isolated on its own. The other secondary or arterial roads are connecting the ferjan together leading to cul-de-sac where residents park and walk within their fareej freely.

This proposal transforms the existing grid of high speed arterials into a better circulation network of pacified arterials, connector streets and internal loop roads. This hierarchy creates clear and effective vehicular circulation patterns that have fewer negative impacts on other modes of transportation.

The site is allowing more people to feel connected and welcomed to move around less likely to use cars, eager to make it more vibrant while walking near their neighbors. The pedestrian and bicycle networks are shaded to encourage the pleasant travel.

Figure 61: (Right) The proposed mobility plan showing the entry and exits to and from the site
Abu Dhabi is currently very car oriented, which is why the parking demand is relatively high and a lot of land space is required. On the site there are existing car parking among the open space which will later be incorporated into the site.

The site has proximity to offices, retail and commercial areas, entertainment venues, community and institutional activities, which offer the opportunity to reduce on-site parking standards for the project.
Figure 62: Existing parking spaces surrounding the site

Key
- Red: Project Boundary
- Blue: Parking Lots
The parking proposal is based on residential, public, and community facility parking.

**RESIDENTIAL PARKING:**
To maintain parking spaces, each household has 2 car spaces that are placed in cul-de-sacs form. The resident parks near his villa and walk to their door. This approach allows the neighborhoods to have a safer and defined area. People from other neighborhoods will be encouraged to walk to near neighborhoods, which promotes better health for the community.

**PUBLIC PARKING:**
These are parking spaces that are distributed around the neighborhoods’ sidewalk. They are used by the neighbor’s visitors, emergency stops, and easy access to the fareej. The community facility users also park in these parkings to encourage people to walk more rather than drive to these places.

Figure 63: (Right) Proposed parking
MOBILITY

STREET CROSS SECTIONS

Figure 64: Street cross sections

SECTION AA

SECTION BB
MOBILITY

KEY SITE ENTRY POINTS

Figure 65: (Right) Perspective views of different entries to the site
Figure 66: Mobility views
The site is surrounded by mixed-use developments, governmental, educational and other public facilities, which will foster pedestrian movements into and around the site. Potential pedestrian movement is highlighted in the diagram, to connect the site with all of the above amenities.
Figure 67: Existing pedestrian movement analysis
The site is pedestrian friendly allowing people to navigate within walkable distances to public facilities and centers. The residential areas all have inter-connective paths that never have closed ends, to allow more safety and movement on the site.

The two bridges are initially proposed to link both the site to the mangroves as shown in figure 68 in the East, and the bridge on the West connecting the site’s park to Delma Park.

Due to the shading and ease of located paths, the site makes both vehicle and pedestrian paths more encouraging to be in.
Figure 68: Proposed pedestrian movement plan
The plan shows how the green belts are linked from one direction to the other forming “organic” nodes.
In order to cool down the intensive long-term hot temperatures in Abu Dhabi, shading all around is essential to maximize comfort and productivity of the community.

The inspiration of traditional days where families walked the sikkas to their houses, or a father and son eagerly go to the masjid and meet with the neighbors at the barahaat, is all what makes this project alive once again.
The sikkak (plural for sikka) are narrow pathways that work as a transition from one end to the other. The breeze passes through these shaded walkable paths. In our project, because of the organic form of the plots, sikkas are too, various in shape and size. To have a different approach, some sikkas are wider than others to have trees for shading instead of the usual fabric covering seen traditionally. As seen in the image, sikkas here have more active residents to accommodate building functions, such as service access and above-ground utility placement.

A sikka’s potential reuse is determined by its width, location, neighboring uses, and potential for shade structures. Designing for human comfort must be emphasized and prioritized. Narrower sikkas imply informal coverings such as umbrellas or fabric on metal structures. Wider sikkas imply more formal measures that can support lighting. Alternatives include the use of partial tree canopies, which create shaded spaces for active or passive recreation.
Figure 70: Illustration of the residents in the sikka
Located between homes are open shaded spaces that bring families together near their doorsteps. The barahaat (plural for baraha) have local Emirati Palm trees, that work as shade and a native identity for the fareej. Each baraha serves as a planned and useful purpose. The baraha of a school has a playground for children to play in, and a baraha of a masjid has an outdoor majlis for men to meet after Saalat Al Jum’a – the Friday prayer.
Figure 71: Illustration of the residents in the baraha
The mayadeen (plural for maydan) are the focal points in the site, where a vibrant activity takes place. The souq or market is a display of kiosks that are often changing, while some are permanent shops that bring daily requirements to the ferjan. This way the mayadeen are never neglected and are socially invaded with residents and even guests, throughout the day. Supermarkets, cafes, laundry, hair dressers are what is proposed to be all at a walking distance from the homes.
Figure 72: Illustration of the residents in the maydan
The street is designed to serve all modes of transport. The lanes are for vehicles, while the sidewalk is for pedestrian and bicycle paths. Lighting is essential around the paths to have all means of comfort and joy. The street is designed to be 21,18,15 meters for bus, for cars, pedestrian paths, and bicycle paths.
Figure 73: Illustration of the public realm
PUBLIC REALM

SELECTED PROJECT VIEWS

Figure 74: Illustration of the public realm
Figure 75: Illustration of the public realm
Abu Dhabi being the capital and located by the sea, has been of great importance for its rich identity and culture, therefore its future is carefully visioned in Abu Dhabi’s Plan 2030. According to Plan Abu Dhabi 2030, the water and energy is of great importance for the country to develop and serve the people with their basic demands.

It is already known that water is threatened for its high consumption and its dependency on limited sources at the current time.

As a desert city, Abu Dhabi faces a significant resource imperative related to water. While desalination represents an obvious solution to future water needs given Abu Dhabi’s proximity to the Gulf, it is expensive both in terms of energy and dollars, as well as its potential cost to the environment due to the production of brine concentrate that must be disposed of. Only 4% of the water in use today is reclaimed from wastewater streams, a logical source of future irrigation. As Abu Dhabi moves forward in its planning, a water balance model must be established and managed rigorously.” (33)

In order to overcome these challenges placed ahead, it is important to understand the current conditions, the proposed sustainable conditions, and then recommend solutions for water and energy for the future of Abu Dhabi.
SUSTAINABILITY

CURRENT WATER CONDITIONS

First of all, FEDWA states that there are two main water sources in Abu Dhabi where the people’s water demand comes from: ground water and desalinated water. The water allocation in Abu Dhabi Figure 76 is rigid where only 51% of ground water is used for agriculture and irrigation uses, 37% from desalinated water is used for industrial and domestic, and 12% of recycled water goes to landscaping and irrigation. With that being said, there is a big gap that cant be left unnoticed with recycled water. The total unused recycled water is up to 45%, whereas wasted recycled water is 55% Figure 77.

Moreover, a detailed view to what people are currently consuming from water is shown in Figure 78 to understand in depth where Abu Dhabi stands today compared to the world with water consumption per capita. The world water consumption differs from one region to another with a maximum of 300 liters per day per person and an average of 250 liters per day. Today, Abu Dhabi consumes twice as much, side by side to the world, with a maximum of 695 liters

As known, water consumption is a global concern and is estimated to rise more due to population growth etc. Abu Dhabi is heading to a water crisis in the near future if actions aren’t implemented.

In addition to where Abu Dhabi stands today with the consumption, Figure 79 explains the high demand is on desalinated water. To get a more accurate over look, Abu Dhabi is compared to other two regions: Al Ain and Al Gharbia, which also rely on desalinated water. The obvious result ends with Abu Dhabi estimated being twice as much as the other two regions together. This gradual rise from 2011-2015 emphasis how Abu Dhabi itself should consider sustainable water approaches. (ADWEC)
Figure 76: Water Allocation in Abu Dhabi

Figure 77: Average Water Consumption per Capita

Figure 78: Desalinated Water Consumption

Figure 79: Sustainable Water Comparison
SUSTAINABILITY

SUSTAINABLE WATER CONDITIONS

Now that the existing conditions are stated, the following step to see what are the sustainable conditions or proposed factors to water consumption in the world is necessary. Abu Dhabi is at 695 liters per person, where as an average of 100 liters per person Figure 80 is where water stands in countries like Australia, London, and Africa. This number sets an average to what people actually need and how much water should be consumed for drinking, washing, and showering.

For our project, the proposed population living on the site will be 12,000 people. With a current water consumption of 695 liters a day, the total amount will be 8,340,000 liters per day, on the contrary to being 1,200,000 based on the sustainable world consumption of 100 liters only. (kevingstephensdesign.com)

The consumption of water in a household averagely around the world falls under several categories to clarify how we use water. Figure 81 demonstrates 5 people, are using 1325 liters per day for the following: Toilet 26.7%, shower 16.8%, faucet 15.7%, clothes water 21.7%, leaks 13.7%, and others 5.3%.

According to ADWEC, we can save about 30% of water consumption in Abu Dhabi by just using gray water instead of potable water for household usages. Figure 82 visualizes how this minor replacement can make a difference from 695 liters per day to 530 liters per day.
SUSTAINABILITY

SUSTAINABLE WATER SOLUTIONS

There are several initiatives that can be approached to water efficiency. In order to develop our project we can refer to these solutions. First of all, gray water recycling which has several benefits to how it can replace potable water for household uses. Because the groundwater in Abu Dhabi is high in salinity, gray water reduces the need of using potable water, which is currently the direction. It also reduces the amount of wastewater that enters the sewage, which aids in the vision of Plan Abu Dhabi 2030, for a better ecosystem and conservation. It helps as well is irrigation as it increases plant growth. [Figure 1-8]

The benefits of the wetland are various. First, it helps to cool down the environment, an urban heat island. Also they store water and buffer communities from bad impacts of floods. It will support diverse wildlife in the community as well. In addition, it is a great design in itself that serves as landscape and a recreational element. It will provide open space that will enhance the residential/community value.
Figure 80: Sustainable Water Comparison

Figure 81: Average Water Usage per Household
Figure 82: Average Electricity Consumption per Person
In the region of Abu Dhabi, Al Ain, and Al Gharbiya, the electricity demand all together shown in Figure 83 demonstrates how Abu Dhabi has a high demand from 2010 – 2014. Abu Dhabi alone consumes 32,575,456 megawatts per hour per year. It is a huge gap, more than double the consumption of Al Ain 10,390,745 Mwh/Y and Al Gharbiya 9,874,836 Mwh/Y (ADWEC). To know why the electricity consumption in 2010 was 24,850,010 and in just four years it had a big rise, we should see how other people in the world are consuming energy. (ADWEC)

Furthermore, ADWEC explains the average electricity consumption per person in Abu Dhabi is 20.39 Megawatts (Mwh/Y), whereas the global average is 2.89 Megawatts (Mwh/Y, which is shocking to be seven times higher. Figure 84

The United Arab Emirate’s demand has been increasing in comparison with other developed countries. In comparison to other countries in the world: Kuwait, Qatar, United States, Australia, and the United kingdom Figure 85 the UAE is considered to be neutral in its consumption. There are means that can decrease usage similar to the United Kingdom for a better sustainable project.
Figure 83: Energy Demand By Region

Figure 84: Average Electricity Consumption per Person

Figure 85: Electricity World Comparison
SUSTAINABILITY

SUSTAINABLE ENERGY SOLUTIONS

As seen in Abu Dhabi’s Masdar City, there are energy efficient systems for a sustainable living. One of the known approach is solar energy replacement. We recommend having solar energy because it can help decrease the energy consumption when it is installed as panels in the house, or used as a special land use underground.

Specifically, we recommend solar energy paneled roof car parking, which is required throughout the community for residential and commercial uses as shown in Figure 30. The panels are both functional and unique, they will store the energy and work as car shading, which will then conserve the energy on the site.

Last, is the conversion of waste to energy that can be implemented in the project to collect waste, such as providing waste bins throughout the project for specific type, and later transformed to energy that will be used according to demand.

This project located on a strategic and central location in Abu Dhabi, will attract many residents with promoting sustainable, efficient low energy designs.
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