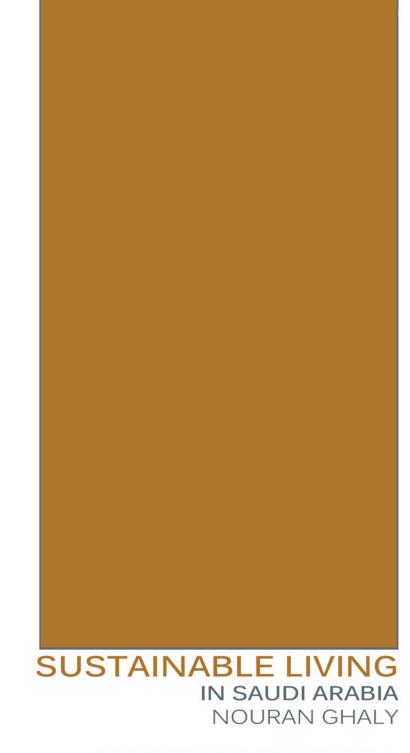


SUSTAINABLE LIVING
IN SAUDI ARABIA
NOURAN GHALY

SUPERVISED BY: WLADIK FUCHS UNIVERSITY OF DETROIT MERCY



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# **ABSTRACT**

This thesis attempts to investigate ways of using sustainable architecture for a desert climate like Saudi Arabia to achieve better levels of energy efficiency by incorporating traditional values and considerations that were applied to the built environment in the past. My research uses precedents throughout history to compare and benefit from the lifestyles of similar conditions in order to explore what is lacking today. By doing this the goal is not only to reach a sustainable lifestyle in terms of energy consumption alone, but also social sustainability and cultural sustainability. All three categories of sustainability can be enabled or hindered through the communities surrounding built environment. In the case of expat housing in Saudi Arabia, these categories for sustainable living are hindered due to the culture-less built environment that gate a community in instead of allowing it to grow.

# THESIS STATEMENT

This thesis will lead to a focus on a gated compound for expats in Saudi Arabia and how they can avoid living an inefficient culture-less lifestyle through the opportunities given by their built environment.

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**Work Cited** 

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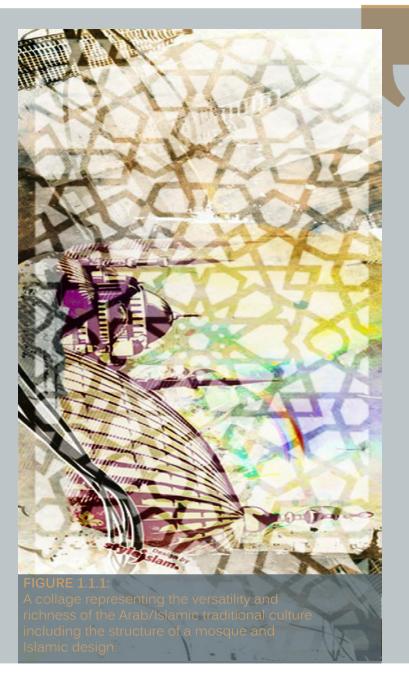
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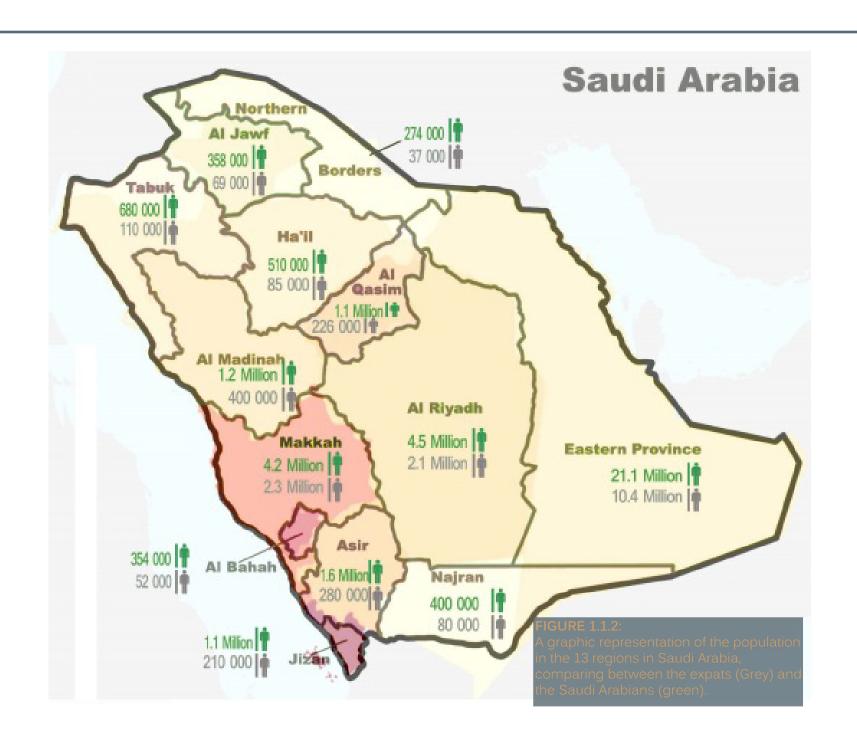


# BACKGROUND KNOWLEDGE SAUDI ARABIAN LIFESTYLE

# **01.1-LIFE IN SAUDI ARABIA** - PERSONAL BACKGROUND



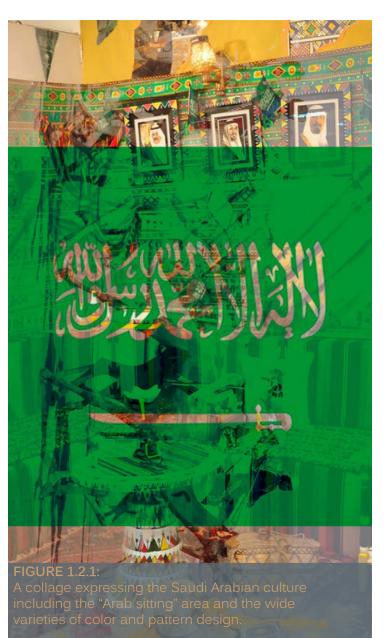
Being born and raised as a foreigner in a country like Saudi Arabia does not only give someone the ability to compare lifestyles, it also opens up their eyes to the faults and triumphs of a society and a built environment that is not typical for the rest of the world. Saudi Arabian people take culture as a leading aspect of their society. For example, as a foreigner living my whole life in Saudi Arabia, I have interacted on a personal level with not more than 5 Saudis. This, however has nothing to do with prejudice or racism, this is because foreign citizens in Saudi Arabia live in gated communities or rental apartment buildings their entire lives given the fact that they are not entitled to owning a house in Saudi Arabia. Whether the intention of this was to segregate Saudi Arabians from foreigners in order to preserve their culture, that has still been the result over the past years. In the nature of this society, it results in foreigners from all over the world intermingling in these gated "compounds" with little to no idea what a typical Saudi Arabian life looks like.

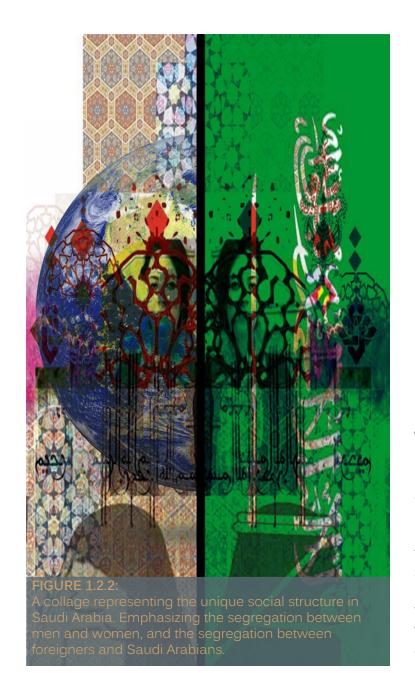


# 01.2-CULTURAL BACKGROUND

As a result of this social separation, expats living in Saudi Arabia experience a dual lifestyle. For example, expat women live an open and free lifestyle within the gated communities they reside in. They can wear, act, and socialize as they please. However once the women leave the gated communities, they are required to abide by the Saudi Arabian social regulations, such as wearing a veil and robe, and being separated from the men in public places like malls and restaurants.

This dual lifestyle portrays a mutual understanding and respect for cultural norms, yet deepens the divide between the Saudi Arabia citizens and the expats in the country.





What strikes most people about the culture in Saudi Arabia is that religion, culture and the law all go hand in hand. For example, since in a conservative Islamic culture men and women being mixed in public places and events is not permitted, therefore all social events and places follow this rule and split men and women from sitting together. Another example is women being covered up in the religion of Islam, therefore it is against the law and the culture for women to be seen in public without the "Abaya", a black robe, and a scarf.

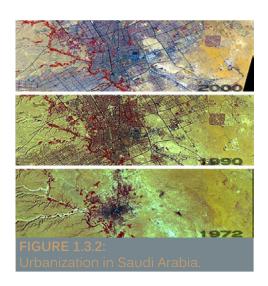
# 01.3-OIL INDUSTRY - ECONOMIC BOOM

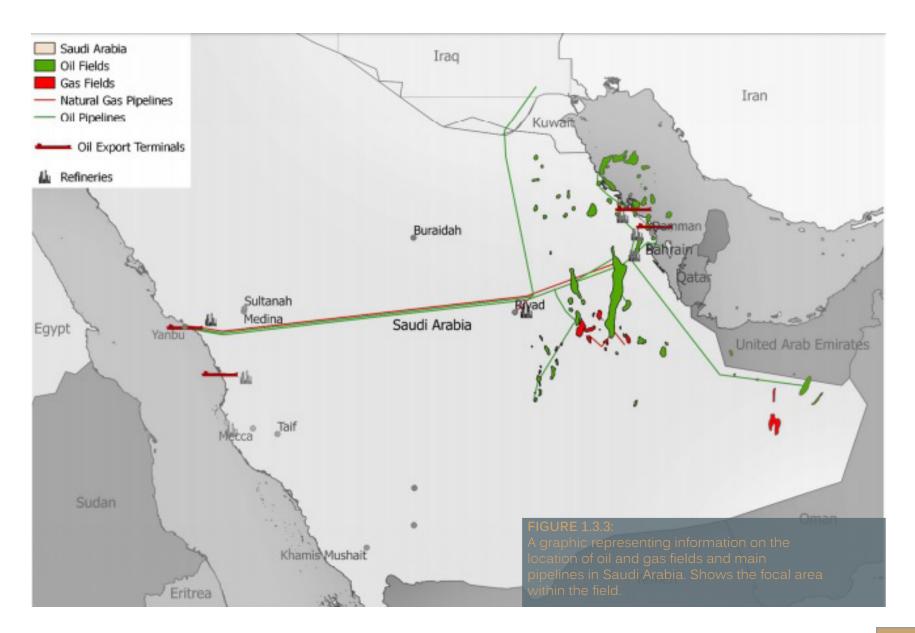
The oil industry started in the Dammam area in 1938 and Saudi Arabia had the greatest source of crude oil in the world. Ever since, the Oil industry became Saudi Arabia's economic foundation. <sup>1</sup>

With this economic boom, came a rapid urbanization with 92% of the population living in urban cities.

Once this rapid urbanization took off; the lack of sustainable design became the reason behind inefficient energy consumption for both residential and commercial uses.<sup>2</sup>

With oil and gas exports declining, it has been evident that Saudi Arabia's economy will collapse within the next decade if the focus does not shift from the oil industry to sustainability





# 01.4 - HOUSING AS AN ORGANISM

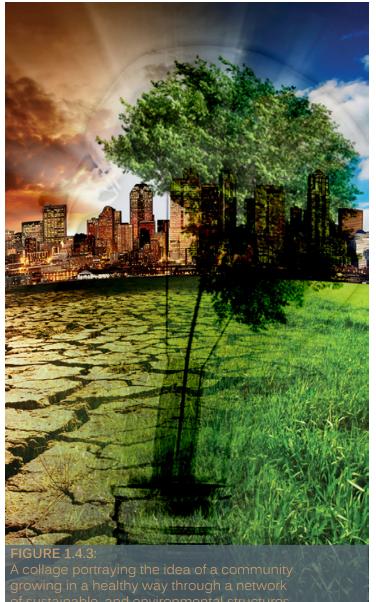


FIGURE 1.4.1:
A collage representing the idea of an adaptable skin, much like the skin of an animal being used as an organism in relation to the skin of our homes.

Doris Kim Sung is a Biology major who became an architect. One of her most fascinating achievements is using the skin of a building as an organism that can adapt to the climate the way our bodies do. Sung makes an interesting claim that buildings are becoming dumber over the years and decides to change this observation. Sung explains what thermobimetals are and describes them as envelopes that can self-shade, self-ventilate and self-operate.<sup>4</sup>

Using thermobimetals in windows, walls and other building components, she has allowed for buildings to be more adaptable and interchangeable based on the weather. Thermobimetals curl up during the heat and release during the cool weather, much like we learned about Bedouins in Saudi Arabia; who used goat skin to make up their tents. They used goat skin because it contracts in when water makes contact and in hot weather it is hot on the outside but remains cool on the inside. During cold climates, when there is fire inside the tent, the heat is preserved inside, and the cool weather is blocked outside.<sup>4</sup>





A collage portraying the idea of a community growing in a healthy way through a network of sustainable, and environmental structures

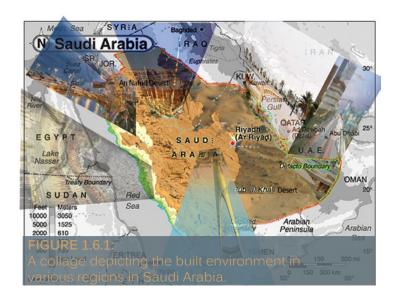
# 01.5 - CLIMATE AND WATER

The climate in Saudi Arabia is considered extreme desert heat up to 120 DF during the day and drastic drops in temperature by night with low rainfall. <sup>5</sup>

Saudi tends to create landscapes that they cannot irrigate with their water supply. Which is why the Saudi Arabian people are slowly starting to realize that a comprehensive water plan is required.<sup>6</sup>

Excessive floods occur in many instances in Saudi Arabia because of poor or no run off planning. Another issue that arises due to poor run-off systems is weakening structures, which is a common construction issue that arises during and after the structure has been built.

# 01.5-THE PROBLEM





It was evident that there were many obvious reasons as to why Saudi Arabia has little to no sustainable development in comparison to its rapid urbanization. These barriers include lack of awareness, lack of training, lack of incentives from the government such as subsidies or bank loans.<sup>7</sup>

However, researching through the historical and current living conditions of Saudi Arabia, it was clear that there was a significant leap throughout the past 80 years. Abruptly, the country grew more and more urbanized. Today, the residential sector in Saudi Arabia consumes over 50% of the country's energy, compared to the U.S.' housing sector which takes up to 25%. Of course, it has been realized that with a desert climate like Saudi Arabia, water consumption and energy usage would be higher than most countries. However, there were solutions and techniques that had been used in the past in order to survive the same climate, yet use zero energy.





PAST SETTLEMENTS REGIONAL TRADITION

# **02.1-BEDOUINS - "DESERT DWELLERS"**

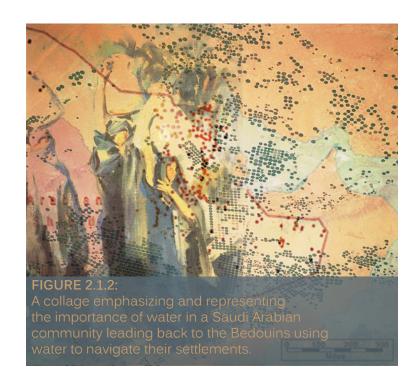
Bedouins, "desert dwellers" survived in an extreme desert climates in the past. They had many techniques that have only been proven

arpet and common material of their tents

to be true recently by science. They traveled at night, using stars and landmarks for navigation. The Bedouins usually settled on top of a dune to remain cool during the day under the shade to catch cool winds, and to avoid flash floods. They usually covered their heads and faces from sun and sand storms "Ghutras" 9. Their loose black and white clothing has been speculated and researched. White clothing reflects the sun, loose black clothing absorbs body heat and the sun heat blows away before it reaches the skin. Bedouins would use henna under their eyes to avoid the glare of the sun. They were dependent on water for cooling, hydrating and navigation purposes. Given that they traveled on camels, oases of water were seen the way we see petrol stations today. Bedouins already used the technique of drinking a hot drink or hot soup, triggering a sweat response in low humidity climates, to help them cool down, a theory scientists only verified recently 10.

The Bedouins today consist of 10% of the Middle Eastern population, and they still herd camels, sheep and sometimes cattle 10. Their migrating patterns depends on the seasons; during the winter they move further into the desert and in the summers they set up near water sources. However, not much has changed for the past thousands of years. As they are on the move they live in "the house of hair" which consists of a simple structure of wooden sticks and rope to make the structure, and stretched goat skin for the walls and roof. They used goat skin because it contracts when water makes contact and in hot weather it keeps the heat on the outside but remains cool on the inside. Whereas in cold climates, when there is fire inside the tent, the heat is preserved inside, and the cool weather is blocked outside. Before pulling up the structure of the tent, the woven goat skin is stretched on the ground, with one of the long sides facing windward, and then the structure is pulled up from under the skin. The low profile of the roof and the ropes are designed to maximize wind resistance. The interior space of the tent is divided into three spaces; the men's living space is closest to Mekkah, the women and guest's living space is larger and only open to women and the male leader of the family, and finally, the last living space is the kitchen. 11

Today's Bedouins have started to be led to the direction of modernization, with many Middle Eastern countries aiding their Bedouin tribes; starting with refrigerators and TV's, and they've even started to use canvas tents among the traditional goat-skin tents.<sup>11</sup>



# 02.2-SKETCH PROBLEM







FIGURE 2.2.1: A series of images outlining the three main sectors of the Saudi Arabian lifestyle with sustainability. A study of allowing sustainability to grow within the Saudi culture and fitting in with the societal norms

SUSTAINABILITY SOCIETY CULTURE

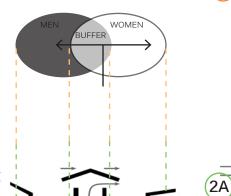
Since the heat in Saudi Arabia reaches unbearable measures, the country as a whole leads a lifestyle which revolves around cars. Obesity rates have reached 35% due to the carcentric lifestyle that Saudi lives by. Saudi Arabia wants to start focus on sustainability, not only for the environmental health but also for the people's biological health and safety. HOK, an American worldwide urban planning firm, found that with a new sustainable urban development that introduces public transportation, Saudi Arabia could save 50% of energy consumptions and carbon emissions.<sup>12</sup>

In attempt to discover more about the barriers that Saudi Arabia faces in order to reach a more energy-efficient and sustainable lifestyle, it was appropriate to tackle a micro-sketch problem.

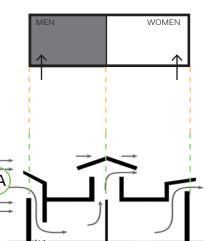
This sketch problem was initially an attempt to design a bus stop that would comfortably fit for the Saudi Arabian people and environment. The three main pillars that needed consideration were sustainability, society, and culture. The goal was to integrate sustainability while intriguing the culture and also respecting the social norms,

# RESEARCH THROUGH DESIGN

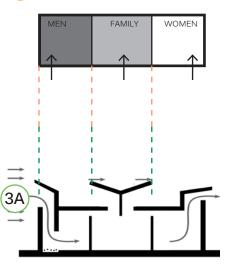
SHARED ENTRANCE

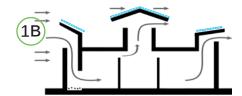




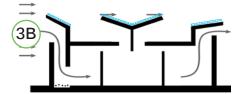


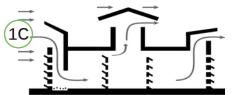


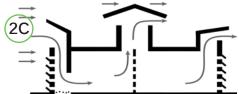


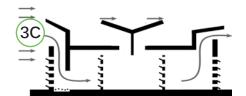












# WIND CATCHER

Natural ventilation can be achieved through the technique of wind towers. The wind direction comes in on one side and goes through the building, taking out warm air and allowing fresh, cool air to enter the space.

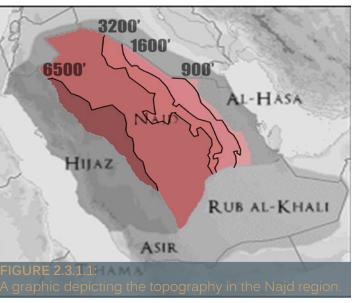
**SOLAR PANELS** 

By installing solar panels on the roof of the structure, the solar energy could be used to support the power needed for the HVAC required for heating and cooling, when needed.

C BREATHABLE SKIN

Glass louvers, controlled by a weather satellite, would be installed on the surfaces throughout the structure in the direction of the wind current, Allowing vision for incoming traffic and night flushing to take out the hot air during the night. The glass louvers contain photo-voltaic cells to power light. 16

# 02.3.1-OTTOMAN PERIOD - NAJD REGION



# Geography:

The Najd region is the central plateau of Saudi Arabia. This plateau sloped eastward from Hijaz.<sup>13</sup> Climate:

As it is a desert climate, rain is rare and therefore water sources are valuable.<sup>13</sup>

With the dry, hot climate in the morning, and cool nights, the people of the Najd region built their settlements accordingly.

# City Planning:

Clustered dwellings with narrow streets were designed in order to increase shade in the settlements.<sup>14</sup>



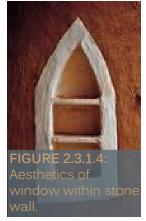








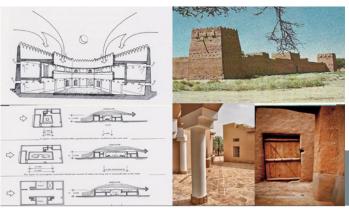






# Construction:

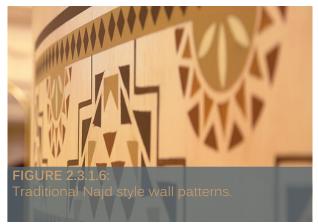
Adobe is a construction method used by mixing mud, water and straw, filling the mixture into wooden molds in order to create building blocks or a portion of a structure.15



# **Design Characteristics:**

Inward design orientation<sup>15</sup> Minimal window use on facade Stone columns and floor<sup>15</sup> Center courtyard for natural ventilation Wooden doors and roofs<sup>14</sup>

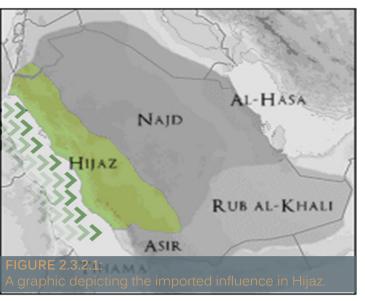
FIGURE 2.3.1.5: Inward housing orientation allowing for attriums for natural ventilation.







# 02.3.2-OTTOMAN PERIOD - HIJAZ REGION



# Geography:

Due to the geographic location of the Hijaz region, they were the most developed area in the country thanks to imported materials, engineers, and techniques.<sup>14</sup> As a result, main settlements were built along the Red Sea shore. <sup>16</sup>

# External Influence:

These external influences were mainly from Egypt. Wider streets were designed due to taller buildings to provide maximum shade, and allow free air flow. Streets take north-south direction at right angles to the sun to maximize shade.<sup>16</sup>





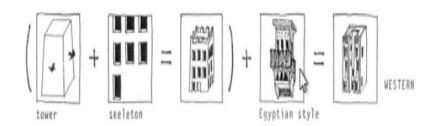


# Materials Used:

Coral building blocks taken from reefs of red sea. <sup>16</sup>Timber from Africa and Indonesia. Wood imported from India. <sup>14</sup>



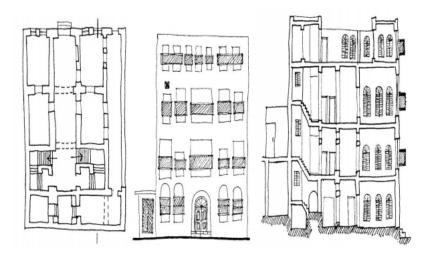




# Construction:

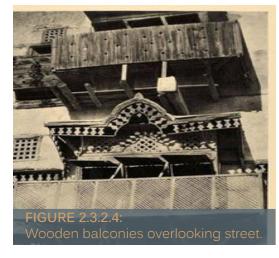
Coral stone and gypsum were used as for bonding and sealant.

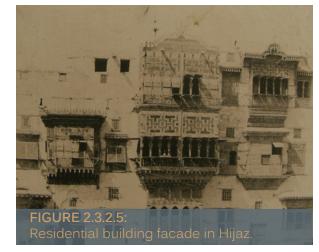
Gypsum was also used for waterproofing.<sup>16</sup>



# Design Characteristics:

- -A light and airy exterior facade allowing crossventilation.<sup>16</sup>
- -Wooden elements extruding from the facade
- -Projected screen windows. 16
- -5-6 Story buildings due to imported techniques
- -Vertical shafts.14
- -Decorative doors with stucco plaster on the entrance.<sup>16</sup>







# 02.3.3-OTTOMAN PERIOD - ASIR REGION



# Geography:

The Asir region, set in the south of Saudi Arabia, is known for its high plateau, plentiful rainfall and vast agriculture. <sup>17</sup>

The region is characterized by its mountain ridges, cliffs, and rocky grounds. Their settlements depended on seasonal rivers.<sup>14</sup> Climate:

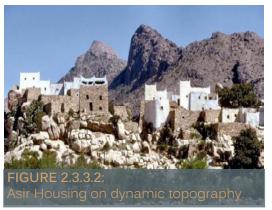
The Asir region is much milder than the rest of Saudi Arabia's desert climate.<sup>14</sup>

Due to relatively high rainfall in this region, dwellings were built on higher ground. Altitude falls dramatically between the two main cities; Abha, and Tihama.

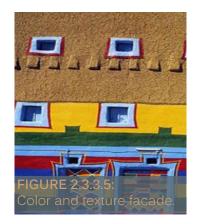














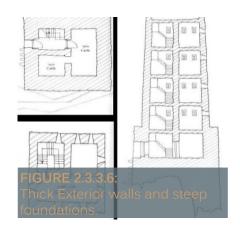


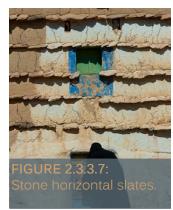
# Construction:

**Cob method**: horizontal bands of mud layers 30-45 cm, accumulated until required height is achieved for a tower house. Vertical drains of lime plaster, and hollow wooden jets lead the rain water off the roof of the houses.<sup>17</sup>

# Design Characteristics:

Both mud and stone houses lean inwards. Each layer of building blocks are clearly distinguished due to an inward recession at every layer.<sup>17</sup> Slates are inserted in the walls to avoid the rain making contact with the exterior walls.<sup>14</sup> Corners of the tower house raise higher than the height of the structure. Lime wash surround windows and band across houses for protection from rain and decoration.<sup>17</sup>







# 02.3.4-OTTOMAN PERIOD - ARABIAN GULF REGION



# Geography:

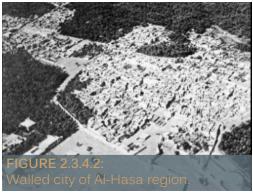
Hasa and Quatif were two oases that defined the locations of the settlements in the region.<sup>14</sup> Due to the location of the region there are noticeable influences from the Najd region.<sup>14</sup> Land Use:

The allocation of farmland and settlement patterns of rural areas were distinguished by water distribution. This distribution was distinguished by status and hierarchy of needs. Settlements in cities such as Quatif and Hufuf, were surrounded by a built wall as protection from sand and dust and also protection against invaders. Palm trees were sometimes used as a wall to these cities.<sup>18</sup>

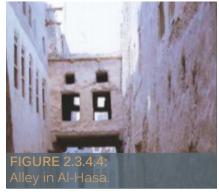


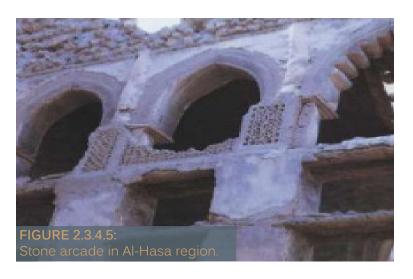








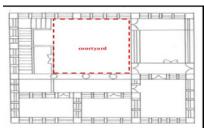




# Construction:

Thick mud walls with load bearing stone within them.<sup>14</sup>

Palm and mangrove trees used for doors and roofs. 18



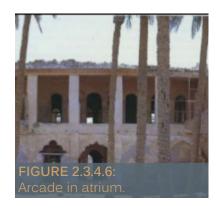


# Design Characteristics:

Wind towers were a distinctive feature, catching the northern wind.<sup>14</sup>

2 Story structures.14

Plans were spatially revolving around a central courtyard, much like the Najd style home. <sup>18</sup> Arcades were used frequently to allow loggia areas. <sup>14</sup>







# :::....

# 02.4 - BUILDING BASED ON ENVIRONMENT

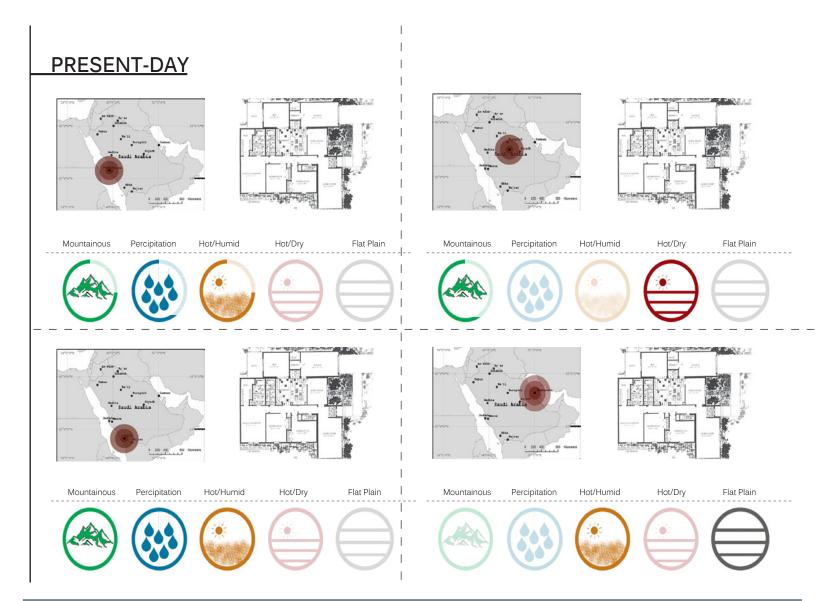
# THE OTTOMAN PERIOD



## FIGURE 2.4.1:

A graphic depiction highlighting the relationship between the environmental conditions of each of the four main regions in Saudi Arabia during the Ottoman period, with the resulting design solutions for housing.

# A COMPARISON THROUGH TIME



**FIGURE 2.4.2**:

A graphic depiction highlighting the lack of consideration in today's housing design in Saudi Arabia for the region's surrounding environmental conditions, resulting in a generic design throughout the country as a whole.





# PRESENT-DAY GATED COMPOUNDS (\*\*) EXPATS IN SAUDI ARABIA

## 03.1-PRESENT-DAY HOUSING - DAMMAM AREA



#### Geographical Context:

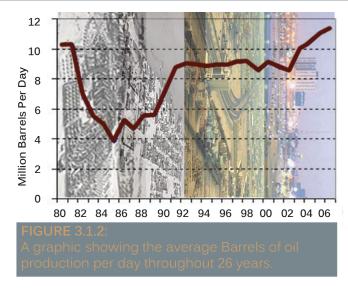
The DMA (Dammam Metropolitan Area) in Saudi Arabia borders the Persian Gulf, and is the largest **port** of the Arabian Gulf. Within the eastern province, more than half of the land area contains the desert region of Rub Al-Khali, also known as the **empty quarter**.<sup>19</sup>

#### Climate:

Winter weather in the DMA is classified as mild to warm. Temperature drops to **52 degrees** fahrenheit. Sparse rainfall, in small amounts in December..<sup>19</sup> **Dust storms** are common in the summer from the deserts in the Arabian Peninsula. Summers reach a high temperature of **112 degrees** Fahrenheit in august..<sup>19</sup>

#### Resulting Issues:

Due to **poor drainage**, leakage of underground water networks, and sewage pipes,the rising water table has created **structural weaknesses** for building foundations and underground infrastructures..<sup>19</sup>



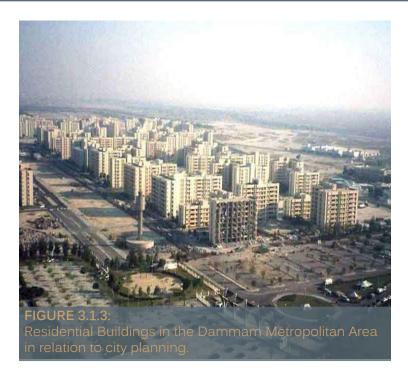
#### Economy:

The Dammam Metro Area is the third largest conurbation in Saudi Arabia. It is formed by the adjacent cities; Dammam, Khobar, and Dhahran..<sup>19</sup>

The economy in the Dammam Metropolitan Area is based on the exploration, extraction and processing of **petroleum**, and the export of petroleum. <sup>19</sup>

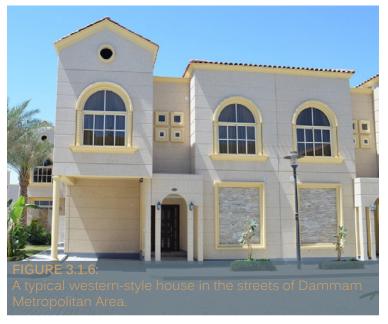
#### **Urbanization:**

The urban population growth boomed from 0.365 Million in habitants in 1974 to 4.14 Million in 2012, due to the rapid expansion of the economy, a speculative real estate market, limited urban planning to impose urban regulations. <sup>20</sup>











## **03.2-GATED COMPOUND - EXPAT HOUSING**

#### HOUSING IN COMPOUNDS

After the discovery of oil in the 1930's, foreign employees created a surging demand for housing.

Residents in these communities experience a western-style open environment with the facilities needed such as: kindergartens, markets, parks and swimming pools.

These communities allow for people from a diverse backgrounds and cultures to live sideby-side.

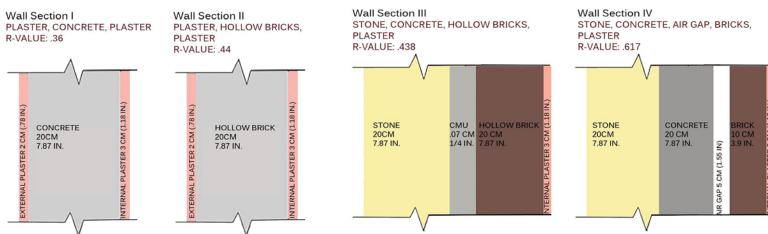
The social, cultural and religious expectations of Saudi Arabia are stripped away once someone enters the **gate** of the community.

#### CONSTRUCTION METHODS/ FAULTS

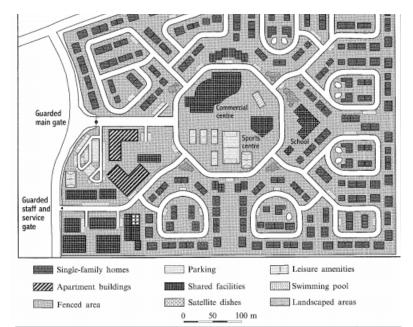
- Exterior walls: 15mm stucco + 200 mm cmu hollow block+ 15mm stucco
- Roofs: tiles + 10 mm mortar + 4 mm membrane+ 100mm lwc + 200 mm hourdi slab + 15 mm cement plaster
- -Thermal load of building envelope results in more than 70% of total thermal load of a single family house.
- -Most **energy consumption** is used on HVAC systems in order to reach thermal comfort in the home.
- -70% Of residential homes lack thermal insulation.

**Local/common materials:** limestone, concrete, cement for binding.

Common insulation (if used): polyurethane, polystyrene, fiberglass, mineral fiber.



A graphic comparison of a spectrum of insulated walls in Saudi Arabia. Wall Section I being the most common construction technique today, while Wall section IV is rarely used yet more efficient.



#### FIGURE 3.1.2:

A typical set of uniform houses aligned with a grid form resulting in an expat community in Saudi Arabia.



#### FIGURE 3.2.4:

A construction phase of an expat housing community in the Dammam Metropolitan Area, Saudi Arabia.



#### FIGURE 3.2.3

entical housing along the streets of Al-Khobar in the ammam Metropolitan Area, Saudi Arabia.





#### IGURE 3.2.5:

pical housing entrances in an expat compound (left), and ypical gate into an expat compound (right).





# CASE STUDY TAPPLYING TRADITIONAL INTELLECT



### 04 - KAUST - CAMPUS DESIGN

# THE WORLD'S LARGEST **LEED**PLATINUM PROJECT

A contemporary, sustainable project that is deeply rooted in **Saudi Arabia Culture.**<sup>21</sup> Using modern day technology, and useful aspects of traditional Saudi architecture to represent a sustainable, efficient project that is rich with culture and traditions.<sup>21</sup>

#### **COMPACT CITY PLANNING**

Narrow roads Maximizes shade, Minimizes heat/walking distance



#### THE TRADITIONAL SUQ

Market space Usually shaded with sky openings for daylight



#### **OVERHANGING BEDOUIN TENTS**

Monumental Roof System Spanning throughout the campus



#### **WIND TOWERS**

Solar Chimney Ventilation
Utilizing Red Sea winds to provide comfort
Natural Ventilation



#### THE TRADITIONAL MASHRABIYA

Wooden Shading devices Hijaz Inspiration Natural light in interior spaces; avoids heat













a natural airflow in the space.

FIGURE 4.2:
An interior courtyard covered with perforated material which avoids the heat but allows natural light to enter the space.





# PHENOMENOLOGICAL ANALYSIS A SUBJECTIVE REFLECTION



### 05 - PHENOMENOLOGICAL ANALYSIS

I. Introduction The outer layer of our homes is an aspect of our living environment that people usually take for granted. With today's HVAC systems, plumbing advancements, and water transportation, we think less about the role that this architectural feature plays in our lives. Because of the forgetfulness of this crucial layer, we tend to stop refining this important feature. However, in the absence of our architectural "skin," we become more aware of its purpose and value. I strongly believe that the distance that has grown between us and the understanding of the skin of our homes has led us away from a fuller and richer understanding of our shelters. Through my research of the various kinds of shelters used throughout history, I am hoping to illuminate the gap that has formed between us and our second skin in order to develop smarter, more beneficial skins to live within.

My Masters thesis focuses on sustainable housing in the booming urban cities of Saudi Arabia, which have led to excessive energy use throughout the country. In the face of this rapid growth of urban cities, sustainable development is required. Using my historical studies as precedents and phenomenological analysis, I hope to deepen our understanding of the relationship between us and our architectural skin.

#### II. The Relevance of the Skin and the Home

The idea of thinking of the built structure

of a home as a "skin" triggers the thought of the similarities and differences with the actual skin encompassing our bodies. Just like my hypothesis about our forgetfulness of the layer of our home, we have a similar experience with the skin of our bodies. For example, we're not usually conscious of our relationship with our skin. In fact, we rarely think of its functions and abilities. This raises the question, when do we become conscious of our body's skin? Situations like injury, unusual appearance like a scar, and discomfort like a rash. Making connections between these bodily situations and the skin of our homes suggests that we become conscious of the layer of our homes when a defect occurs, an unusual change in its appearance, or if it fails to perform one of its key functions, resulting in discomfort. A defect may occur in the skin of our home when you discover cracks in the wall due to structural problems, an unusual change arise in a situation where the facade is discolored due to weathering, and failing to perform one of its key functions could be when a window is cracked and lets in cold air.

At this point I will depart on a slight digression for the purpose of comparing traditional Bedouin tents to contemporary homes. I wonder what aspects of the Bedouin tents allow their inhabitants to have a more intimate relationship with it. A reason that comes to mind is the process of building and re-building the tent regularly. This process makes the Bedouins more aware of the value, technicalities, and significances of the skin of their homes. If our

bodily skin was like a glove that we put on and take off on occasion, I imagine we would be much more conscious of it, knowing the inconveniences we would face without it like fear of contamination, insufficient protection and lack of feeling whole.

Much like our home, our skin provides us with climate protection and an outer layer that appears to the outside world. We take care of our skin to enhance its aesthetic appeal, just like we care for our home's outer layer. The facade of our home is what is presented to the world, so we pay attention to its aesthetics more than we think of the inner condition of the facade. Through

the weather we understand our skin's reactions, such as sweating, redness, and goose-bumps. Our skin reacts in these ways in order to allow our bodies to adapt to the environment. However, we don't seem to comprehend the built structure of our homes in the same way. This leads me to ask why don't we consider our built homes as extended organisms? What factors played a part in creating this barrier? Was there a time when the built home was experienced in this way? If there was, how would it have changed our lived experience within our homes if we lived similarly today?





## 05 - PHENOMENOLOGICAL ANALYSIS

#### III. Phenomenological Analysis of the Bedouin Home

In May of 2009, I went on a camping trip in Saudi Arabia to experience a few days in the life of a nomad. Of course, I knew it would only be a temporary experience, but the experience brought me closer to understanding the immense differences between our everyday modern life and the life of a Bedouin.

Given these characteristics of the lived experience of the Bedouins, it is only natural that my temporary experience was filled with comparison and analysis. On my first day, my focus was mostly on the inconveniences that I encountered, such as uncomfortable weather, no access to technology, and an unsettling feeling due to the thin separation between me and the outside environment. Of course by the second day, my fascination grew and I began to live the experience. I watched the tent being taken down, and helped build it again from the beginning. Building the back of the tent perpendicular to the wind direction kept it stable, and protected the space inside from frequent sand storms. Once I did this, I felt safer in the tent having understood its strength and durability.

Once I felt safer, I became more aware of my body in relation to the tent and noticed how the Bedouins' bodies were amplified examples of this relationship. For example, when I first arrived at the camp I noticed the comfortable way the Bedouins interacted with the tent. I watched them lean against certain corners of

the tent that they knew were strong enough to bear their weight. I was much more cautious due to the doubt I had towards the structure's integrity. The comfort in their body language told me that they trusted the tent and experienced it as a reliable refuge due to their many years of experience and interaction with the structure. This led me back to the comparison between our bodily skin and the skin of our homes. Much like we are more confident, comfortable, and at times aggressive with our own skin than we would be while interacting with a foreign skin, the Bedouins had the same relationship with their tents, in contrast to my relationship with this foreign space. Their intimate relationship with the tent allowed them to act in such ways, and because we have a more intimate relationship with our bodily skins than foreign skins, we don't hesitate to scratch an itch aggressively, or peel off a dry scab. Whereas if someone were to ask us to have that kind of interaction with their skin, we would be much more cautious and gentle with the foreign skin.

By bracketing the contrast of bodily relations that I had with the tent, my focus shifts to the social and cultural dimensions of the skin of the Bedouin home. Living in a shelter with little to no solid barriers between interior spaces, such as living areas and sleeping areas, I noticed the amplified respect for spatial boundaries that is not as apparent in our homes today. The men and women's living areas were separated socially, but not physically. Before a man enters the women's space his body and eyes are turned

away from the space and he verbally draws attention to himself in order to request entry or ask to see someone in particular. The women act with the same consideration and respect for privacy before entering the men's space.

Based on my newly discovered experience, the understanding of my relationship to the skin of a home has shifted, and I go back to wondering what has changed over time to build a barrier between us and our relation to the skin of our contemporary homes? Has today's technology changed our understanding, experience, and expectations of the space we live in? And finally, could the process of phenomenological analysis of traditional Bedouin

conditions bring us closer to help apply and benefit from this understanding in today's world?

#### VI. Phenomenological Analysis of Contemporary Homes

In order to analyze an experience I was born into, like living in my house in Saudi Arabia, I must consider the obstacle that comes with this analysis. Analyzing the Bedouin experience, it was easier to notice the obvious differences between their lived experiences and my contemporary lifestyle because it was so different. Being born and raised in the same environment for most of my life, I must face the problem of taking certain aspects of my





## 05 - PHENOMENOLOGICAL ANALYSIS

experience for granted. For example, without defamiliarizing myself with my past experiences, I wouldn't notice the significance of certain nuances like temperature changes or social "norms." Therefore, in an attempt to rid myself of this factor, I will bracket my experience and perception of the lifestyle I have lived in Saudi Arabia for most of my life. Using my advantage of being a foreigner to the Bedouin lifestyle, I can approach the contemporary lifestyle as a Bedouin who is experiencing something new for the first time. I will use imaginative variation in order to emulate being a stranger in a new world.

Starting with the bodily experience within the built homes of Saudi Arabia, there is a prominent experience that comes to mind. The change in temperature coming in and going out of the envelope of the structure puts the body into a temporary shock before it begins to adapt to the weather. For example, entering a home, goose-bumps cover my arms instantly due to the intense shift in temperature between the outside, humid, desert heat and the dry, cool air provided by the HVAC systems. Leaving the home, however, provides temporary relief in my muscles and skin due to the sudden warmth, and fog covers my glasses instantly. After a few minutes my body starts to sweat, adapting to the outside temperature. This contrast reveals that in today's living conditions the home is experienced as an independent entity, removed from all environmental conditions surrounding it.

This insight is fleshed out as I analyze the

perceptual aspect of my experience. Waking up in today's living structures is an extreme contrast to waking up in a Bedouin home. Waking up, I have no sense of time or orientation to the outside environment due to shades covering the windows in every bedroom. The entry of light into the space is almost always by design, the openings of the windows, the angle of the blinds, and the height placement of the shades are all intentional openings to the outdoors which could easily be avoided by controlling the interior shading devices.

#### V. Conclusion

Ashraf Salama (2007) states, "Sustainability or sustainable design is simply a rephrasing of some of the forgotten values of traditional architecture and urbanism." After experiencing and comparing traditional and contemporary lifestyles within their respective skins, I learned the social, motile, and perceptive values that come with the understanding of the skin we live in, both bodily and architecturally. I believe that if we experience the skin of our homes the way the Bedouins traditionally do, we would live much richer lives both socially and individually. Our relationship with the environment, each other, and with our homes would become much more meaningful and whole than it is today.

For most residential architecture in Saudi Arabia, there are two misconceptions that are evident. The first is that a modern style home that gives the impression that since it is modern then it is a cutting edge and sophisticated home,

although it only takes on the aesthetic aspect of modern day architecture and not the functions it has to offer such as solar power. Second is the traditional style homes that appear to be taking the lifestyle of traditional homes, but also only utilizes the aesthetics of this style and not the valuable concept of building the home, such as consideration of the environment. Traditional homes considered sunlight, wind-direction, and natural ventilation; all of which are not taken into consideration when building a "traditional style" home today.

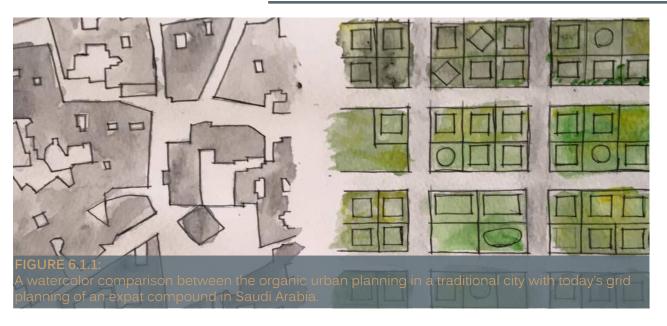
I hope to bridge the gap between the misconceptions of the traditional lifestyle and relationship with the skin of their home and the technological luxuries and standards we have today in order to harmonize the two. This gives the opportunity, for the first time in Saudi Arabia, to create a rich, wholesome social understanding and lifestyle like their past communities had. In an attempt to achieve this relationship and understanding that the Bedouins have with their homes, I plan on designing a residential community in Saudi Arabia that brings back the values of the traditional home, which will maintain relevance to today's contemporary standards.





# RESEARCH THROUGH DESIGN A CYCLICAL PROCESS

## 06.1 - INTRODUCTORY THOUGHTS



Through the process of historic investigation throughout Arabian history, one reoccurring thought continues to resurface; crucial methods, values, and elements have been forgotten (Figure 6.1.1). These sophisticated ways of living progressed over centuries of trial and error and allowed a culture to prosper and survive with the harsh environment they faced.

Gated compounds built for expats were intended to be built with minimal time and initial cost. However, since this was due to an economic boom in the 1930's, how

different would these compounds look if they were designed with intent, care and coherence with their geographical and cultural location?

If the people in these gated communities were given a chance to live in a built environment that was discovered, learned and taught by the people that lived in these regions for centuries, what would that change? What kind of conversation would that instigate for the future of these housing communities especially that these techniques of building reach for a much more sustainable lifestyle?

Growing up in an expat gated compound, I realize there are two concepts that continue to go against each other. First, the segregation between the Saudi community and culture give the expats no connection to the people they share land with. This created the notion of alienation between the Saudi way of life, and the expats who live in a built environment that does not speak the language of the culture it is set in. What I remember most about my experience in this particular compound was that my house and my friends' houses were identical, regardless of their orientation to the sun or wind direction. Another memory of my house were the thin walls. I remember this because on a hot summer day I could put my cheek against the wall and feel how hot it is outside. Looking back at these memories today, I realize the compound was somewhat like a virtual simulation, a world within a world, or a society within an unknown kingdom.

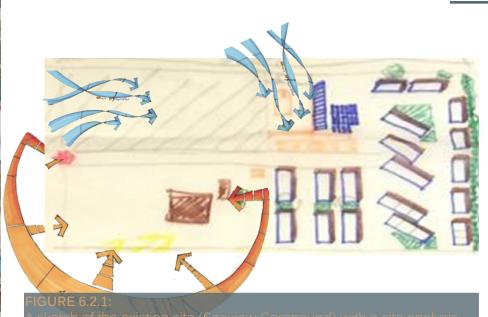
The second concept is the fact that the expats are a diverse group of people, given a clean slate to impose their own culture onto. None of the laws and regulations that are enforced outside the gates are quite as strict inside. Freedom is granted to both men and women regarding clothing, social dynamics, even driving.

With these contradicting concepts, this research begins to find the balance between segregation and merging of cultures, values and methods using the built environment, and the opportunities it could provide using the language it speaks.





## 06.2 - SITE ANALYSIS



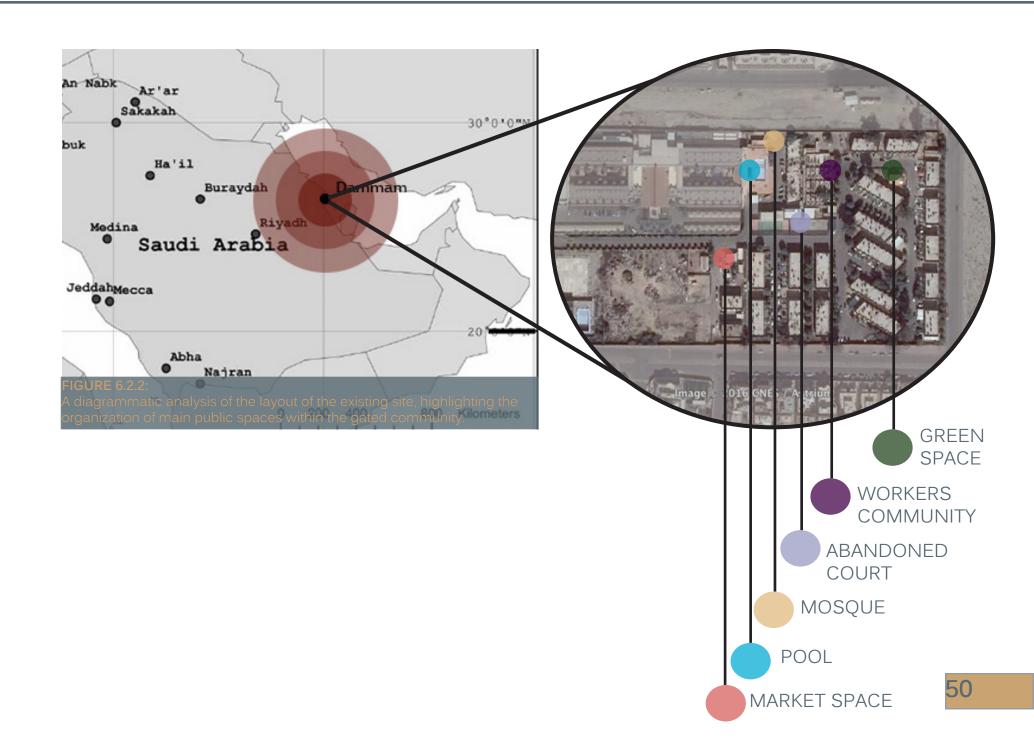
Seaview Compound is located in the Eastern Province in Saudi Arabia. It is in the city of Al-Khobar. The compound was built 50 years ago. Seaview Compound is designed for low income housing and provides a cabin area for the labor workers of the compound such as security, mechanics, electricians and helpers.

Much like the rest of the Eastern
Province, this area has extreme desert climates
in the summertime, and very little rain. The
prevalent winds come in from the West and
North-West. However, the Built Environment
shows no consideration to these climatic
factors whatsoever. The compound could very
believably be set in Detroit, Michigan.

Not only does the built environment show no correspondence to the climatic environment, it also shows no coherence with the cultural values of it's setting. For example, the mosque, being the most sacred space in a Saudi Arabian community is a cabin hidden behind the swimming area, rarely noticed yet has deep religious and social values for the Muslim community.

The market is a small store at the side of the main entrance road, making no engagement to the community and has very poor accessibility for most of the houses (Figure 6.2.2). Whereas in the traditional Islamic and Arabian cities, the "Suq" was celebrated, always in the center plaza for better access and surrounds the main public space. Finally, the park is in the back corner of the compound, usually forgotten and, unlike traditional Arabian towns, plays no role as a public space acting as a hub for the community.

As a result the community becomes culture-less and has no sense of the society it is part of.



# 06.3 - THE FABRIC



FIGURE 6.3.1:
A sketch defamiliarizing the grid of the existing site within the boundaries of the compound

In an attempt to defamiliarize the grid, it was fitting to juxtapose a map of a traditional town in the Al-Khobar area onto the outline of the site with respect to sun orientation (Figure 6.3.3). By doing this it greatly differentiated the shift in proportion between the buildings, the streets and the hierarchy within the town. This exercise shatters all connections between the site and the generic grid that was imposed on it originally, allowing the site to speak the language it wants to, and break free from the machine-like prison into its organic form.

Before creating an alien form and imposing it on the site, it was necessary to discover a fabric that was already there and let it dictate its own language.

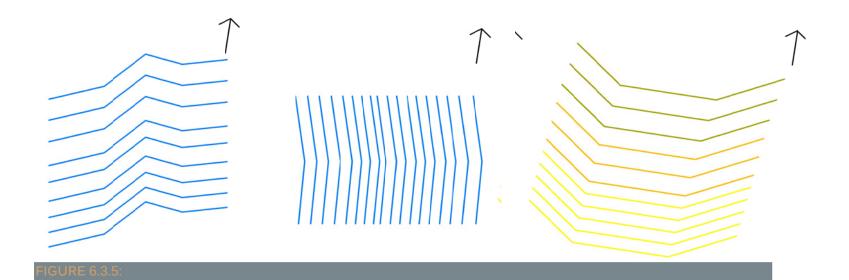
This fabric was discovered through environmental aspects such as wind and sun directions (Figure 6.3.5). Being the two key factors to work with the extreme environment of the site. In an attempt to funnel the winds effectively, and maximize shade, the fabric of the site was discovered and overlayed onto the site in order to take following steps of creating a fitting built environment.



**IGURE 6.3.2:**sketch defamiliarizing the grid of the site and allowing the rganic fabric to break out of the boundaries.







# 06.4 - THE ELEMENTS

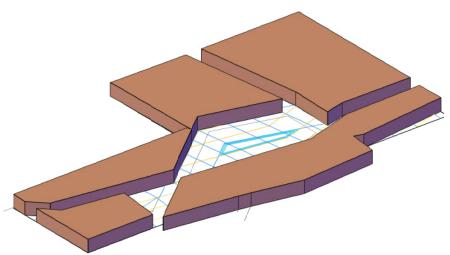


FIGURE 6.4.1:
A massing model showing six sectors of the community that have been formed after laying out the primary streets and public center.

The architectural elements of the site were dictated by the fabric of the site. Initially the central public area, including the mosque and the "Suq" were set within the fabric and determined the primary circulatory streets. Once the primary streets were determined, there were five main blocks. At this stage the site appeared as a giant atrium, which led to exploring the opportunities of atriums within an atrium.

In providing the opportunity of a series of atriums within the site, this allows for semi-public courtyards, green spaces, and ponds to act as gathering spaces and build a tightly knitted community within the larger community. (*Figure 6.4.6*)

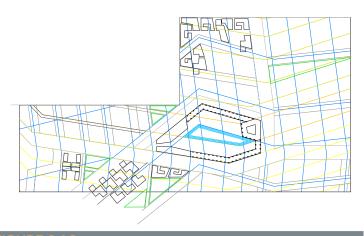
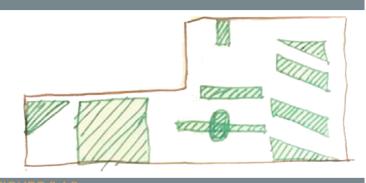
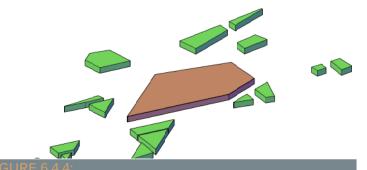


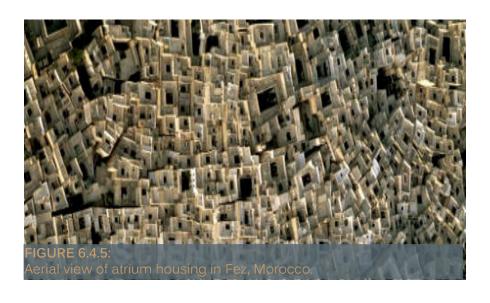
FIGURE 6.4.2:
An early designing process of the sit

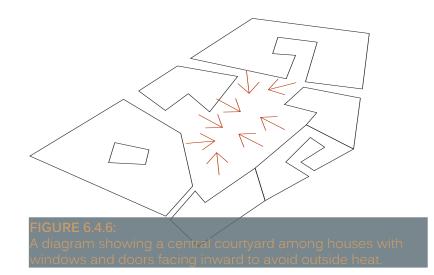


-1GURE 6.4.3: Existing abandoned green spaces in the site.



ynamic green spaces within the larger community as ell as within the semi-communities in each sector







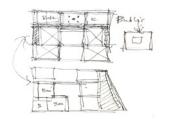


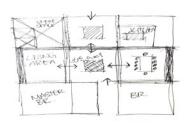


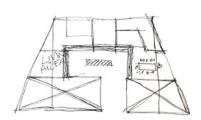
-IGURE 6.4.8: A series of sketch ideas for shared atrium houses forming a Shared courtvard between the homes.

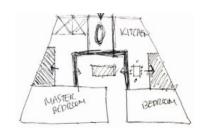


## 06.4.1 - THE ELEMENTS- STUDIO MASKAN



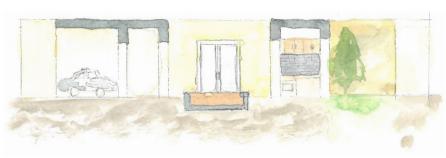








FLOOR PLAN A - GROUND FLOOR



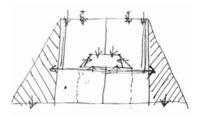
**SECTION A** 

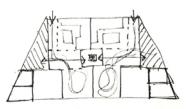
The word "Maskan" is an Arabic word meaning "Residence". A Maskan in a traditional town like Al-Hasa, which was located in the same area as this compound, had organic shapes to accommodate to the intricate city planning. Each Maskan had common features respecting the culture of the Arab people.

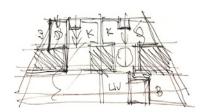
There are significant features in each *Maskan* regarding the environment which greatly resembles Al-Hasa region in the Ottoman period mentioned in *2.3.4*. For example, 30-50 cm walls to achieve maximum insulation, elevated, narrow windows facing the outer layer of the home, wider windows and doorways facing the atrium, and lastly wind towers. <sup>22</sup>

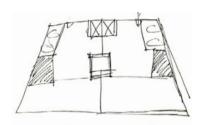
Atriums were a key feature in a typical Al-Hasa *Maskan*. Atriums were beneficial in keeping natural ventilation flowing throughout the space especially when a fountain, pond, or green space is in the center of the atrium. <sup>22</sup>

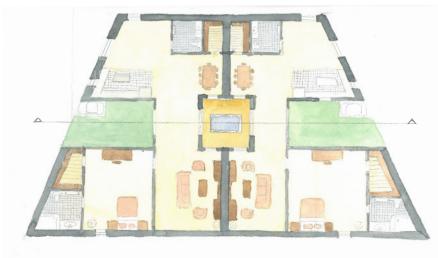
### 06.4.2 - THE ELEMENTS- JOINT MASKAN



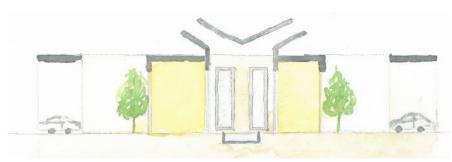








FLOOR PLAN B - GROUND FLOOR



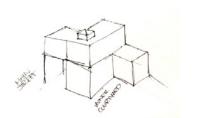
**SECTION B** 

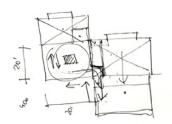
The tradition of having a courtyard or atrium in the center of a *Maskan* originated in the Middle East, and leads back to the first Islamic house built by the Prophet Mohammad. The courtyard was an essential feature in the Arabic-Islamic home. At the time, it allowed for a praying area while providing protection from the sun. <sup>22</sup> Usually, the walls would line up to face the *Qibla*, which was in the direction of the Holy city of Mekkah. <sup>22</sup>

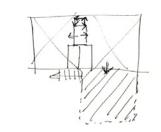
The courtyard layout of a home allows for two main islamic social and ethical requirements to be achieved which inspired the design of the *Joint Maskan*. <sup>22</sup>

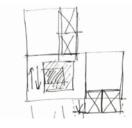
- A) **Privacy:** The layout ensures visual and acoustical privacy from the outside community, however, it allows members of the household to be in contact with nature through the courtyard. <sup>22</sup>
- B) Interdependence: The organizational consequences of the grouping of houses provides a level of interdependence between neighbors which is compatible with Islamic values as they relate to neighborly relations. <sup>22</sup>

# 06.4.3 - THE ELEMENTS- FAMILY MASKAN



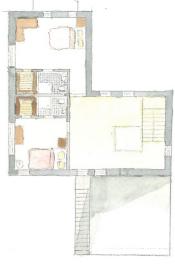












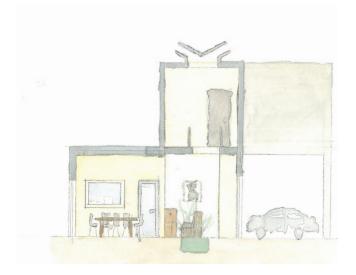


C.1 - FIRST FLOOR

C.2 - FIRST FLOOR

C.3 - FIRST FLOOR

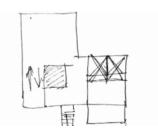


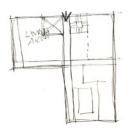


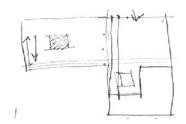
FLOOR PLAN C - GROUND FLOOR

**SECTION C** 









Until this day, a grand entrance is common in the Arab world, regardless of the size of the space. In this case a large entrance leading to the atrium which leads into the courtyard results in a successful path for wind circulation. <sup>22</sup>

In a traditional Arab-Islamic home, this entryway was called a "Driba", providing a private lane allowing further removal from the public street, yet enough privacy for temporary visitors from interrupting the privacy of the rest of the household, namely the women of the family. <sup>22</sup>

Providing semi-public space and private spaces within a family home was based on a social and Islamic concept that veiled the bedroom, kitchen and dining room from the more public areas of the home such as the entry-way and the living room where guests would normally stay.

In order to achieve this balance between private and public spaces within the family home, this *Maskan* provides a layout that achieves a comfortable circulation between the two criterias. The kitchen, for example is set at the opposite end of the house from the entrance, providing a limited

visual and acoustical access from the areas that temporary guests would usually dwell.

A common feature in tradition Arab-Islamic homes was for the ground floor to be the only floor of the house. <sup>22</sup> However, In order to accommodate to today's preference and technological advances, there can be a balance between the vernacular traditional concepts of a home and the adaptation of today's advances to achieve a morphing of the two ages. It is not necessary to abandon traditional values in design in order to create a relevant *Maskan* that accommodates to today's society, Neither is it necessary to only abide by the traditional values of the past regardless of today's changes and needs.

For example, in the traditional Arab-Islamic city, there was no need to plan for wider streets of take into account for parking spaces for the residents' cars. Which is why the Family Maskan focuses on a balanced design in attempt to maintain the convenient traditional values yet provide careful consideration to todays' needs that have changed through time.

# 06.5 - INTERTWINING



vatercolor comparison between the proposed Suq and the existing marke Seaview Compound.

In attempt to intertwine both the elements and the fabric appropriately, several categories must be taken into consideration;

- A) Environment: In order for the mechanism of the fabric to work and achieve natural wind circulation throughout the community and appropriate maximized shade throughout the streets, the elements need to abide by the guidelines that the fabric has layed out. (Figure 6.5.2)
- B) Society/Culture: The elements need to abide by the guidelines in a wholistic way in order to create a network of communities within the larger community. In doing so

successfully, the elements result in a series of atriums building micro-communities within the compound. These microcommunities allow for a shared neighborly interdependence regarding the use of the space as well as shared celebrations. Most importantly, the micro-communities prosper within the atriums, or center courtyards they share. Not only do these spaces provide a sustainable relationship between the environment and the elements, but they also act as a canvas through which the occupants can impose their unique traditions and cultures upon. This way, the Arab-Islamic culture is only used as a tool to reach a sustainable, vernacular design in relation to the environment, yet allows the society that occupies the communities to have enough control on their cultural practices and societal needs.

By intertwining the fabric and elements, and considering the balance between both environmental and societal/cultural needs, a healthy community is achieved that surrounds the main courtyard of the compound (Figure 6.5.1). This main center courtyard also balances the traditional use of a community center and today's preferences for a community center. The Suq and the mosque being the center of a community is a priority that benefits the social aspect of a community, however, how the community chooses to use the space is left in their control.



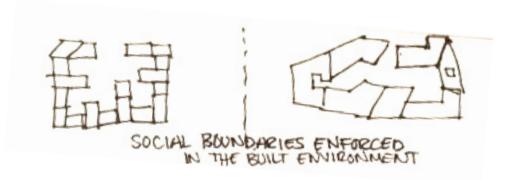
FIGURE 652

watercolor Site Plan of the proposed design

# 06.6 - ONGOING ANALYSIS - POST RESEARCH

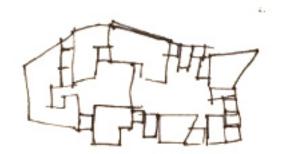


watercolor comparison between the experience upon entering the existing compound design (left), and the proposed experienc son entering the community facing the public central courtyard.



#### FIGURE 6.6.2

A sketch expressing the social segregation of two social classes within one community.



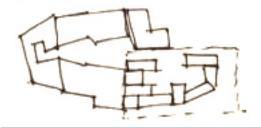
#### IGURE 6.6.3:

A sketch expressing a complete integration of both social classes into one sector.

#### SOCIAL SEGREGATION

Re-analyzing the proposed site, it is apparent that although the existing grid has been successfully defamiliarized, the social barriers within the community have not (Figure 6.6.2). For example, the block that has been designed for the working class is quite clearly segregated from the rest of the community. In attempt to break this barrier a series of solutions arise along with their advantages and disadvantages.

A clear solution would be to completely integrate the working class's cabins into the other sectors (Figure 6.6.3). However, the issue that arises from this solution is that it forces the two classes of people to live in a socially awkward and unrealistic environment. So how would the two classes break down the barriers, yet live comfortably in control of when and how to integrate themselves amongst one another?

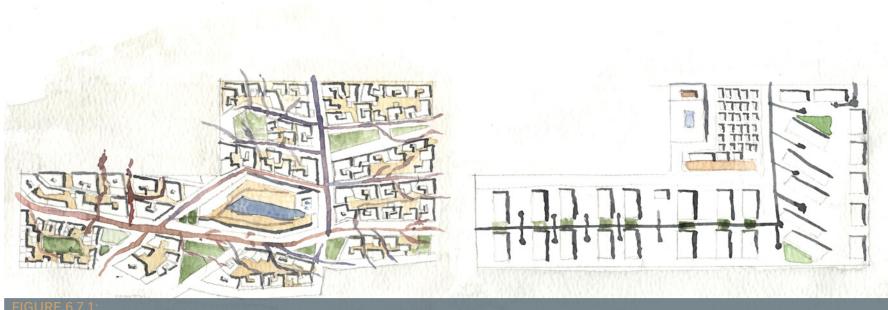


IGURE 6.6.4:

A sketch expressing a partial integration of both social classes into one sector.

Finally, a solution that finds balance between the two extreme living situations would be to create a two whole communities into one sector, without forcing them to break away from their comfort as a community, yet bringing their borders closer, allowing privacy and integration at the same time (*Figure 6.64*). In this case the built environment allows both social classes to coordinate and control their own living situations in an effective way.

### 06.7 - DESIGN LANGUAGE



watercolor comparison between the proposed natural flow of wind throughout a site, and a gridded site that minimizes airflow in a ommunity.

Studying a compound that was built as a robotic plan to segregate a diverse community, and defamiliarizing this plan in order to plant a community resembling an organism that speaks its native language allows for a major shift in the stigma (figure\*\*). This stigma is an accepted and unquestioned design approach that has been proven to fail. The proof is evident in the growing energy use in the residential sector of fifty percent in Saudi Arabia. It is also evident in the societal nature of alienated foreigners living in culture-less communities.

By shifting this stigma, several potential design problems arise, such as; the merging of

social classes, the balance of control left for the community to impose their own cultural onto the cultural they live in, and the boundaries between the expat communities and the outside society.

Nevertheless, in order to allow the built environment and living experience of these communities to progress, this thesis attempted to resolve these design problems in a cyclical process moving back and forth between the design and the problems that may arise. Surely, through this approach, if this thesis were to continue there would be no conclusion or final product to the design.

Finally, it is important to understand that the resulting design research is not to be considered as an idealistic design solution for expat communities in Saudi Arabia, instead it is a tool to research through design as an ongoing process of sustainable design in Saudi Arabia. It acts as a reminder that the answer to progressing the built environment is not always found by looking into the future, sometimes, and in this case especially, the answers have already been found in the past, yet they are often simply forgotten.

Salama (2007) states, "Sustainability or sustainable design is simply a rephrasing of some of the forgotten values of traditional architecture and urbanism" <sup>23</sup>. This concept is precisely the approach this thesis takes and which could be applied to this site and any other site around the world, which is what makes this research endless. It is an ongoing approach that can should be revisited, refined, and redesigned constantly.



FIGURE 6.7.2:

A watercolor depicting the street-scape between the houses and the view of the community from the main entrance.

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