POLITECNICO DI TORINO

Department of Architecture and Design

Msc. in **ARCHITECTURE AND CONSTRUCTION CITY**

Modularity for Crisis

Sustainable and Agile Typology Strategies for Transitional Needs

Master's Thesis

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“A Beirut,
Dal Mio Cuore, Pace a Beirut”
- Fairuz

FOREWORD

The resilient and strong city of Beirut has experienced a lot, weathering many difficulties that might have brought other cities to their knees. The people of Beirut have, however, consistently managed to rise above the rubble and restore their cherished city. The explosion at the Beirut Port on August 4, 2020, was one more difficulty this city had to deal with, leaving many people homeless. But despite the turmoil and destruction, the citizens of Beirut once again demonstrated their fortitude and commitment to reestablishing their city.

As an architect, I have always been fascinated by how cities change and develop as a result of their environment, especially my country. The Beirut Port explosion offered a chance to examine the urban morphology of the city and comprehend the underlying factors that led to its settlement. Additionally, it allowed me to investigate the architectural requirements of a city following a disaster, notably the residential demand. The system created in my thesis can be used by any city dealing with comparable issues. The system consists of a temporary building whose purpose can change based on the demands of the city. This strategy intends to offer a framework for cities to rebuild and recover after a hazard by controlling urban voids and investigating the underlying reasons of settlement patterns.

This thesis is dedicated to the people of Beirut, who have shown incredible resilience and strength in the face of adversity. Their unwavering determination to rebuild their city and pave the way for a better future for future generations is highly exceptionable. Moreover, it is my earnest desire that this work will not only have significant pertinence to Beirut but will also provide practical solutions to cities encountering similar challenges, which will eventually bolster our urban centers' resilience and flexibility in the face of challenges.

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Introduction

In the wake of a hazard, cities face significant challenges, particularly in meeting the urgent residential needs of affected communities. This thesis aims to address these challenges by focusing on the architectural needs and demands that arise in a city after a hazard event, with the case study of Beirut's Port explosion serving as a primary focal point. By studying Beirut's urban morphology and using it as a foundation, this research endeavors to develop a comprehensive and adaptable system applicable to cities facing similar post-hazard scenarios. Beirut's Port explosion on August 4, 2020, resulted in widespread devastation, impacting the city's urban fabric and displacing numerous residents from their homes. This tragic event serves as a catalyst for understanding the complex dynamics of post-hazard urban settlements and the pressing need for innovative architectural responses. By examining the underlying causes behind the settlement and closely analyzing the urban voids that emerge, we can gain valuable insights into the unique challenges faced by affected communities. The core objective of this thesis is to develop a temporary architectural structure that can effectively address the residential demands arising after a hazard event. This structure will be designed to be adaptable and flexible, capable of fulfilling diverse functions depending on the specific needs of the affected city. By understanding the nuances of Beirut's urban morphology and leveraging the lessons learned from the Port explosion, we aim to create a replicable system that can be applied to other cities worldwide, empowering them to face their own emerging challenges.

This thesis aims to offer a thorough framework for post-hazard residential solutions using a combination of research approaches, including site analysis, case studies, and architectural design. Our objective is to develop a comprehensive strategy that not only meets immediate housing needs but also promotes long-term community rehabilitation and resilience through the integration of resilience, sustainability, and cultural identity principles. This project aims to contribute to the continuing discussion on post-hazard recovery and the significance of architectural interventions in influencing the built environment by engaging with the various aspects of urban void management, architectural adaptation, and community involvement. The ultimate objective is to offer realistic and creative solutions that support the safety, well-being, and cultural identity of affected communities, enabling them to recover and prosper in the face of adversity.

1. Beirut Urban Development

1.1 Introduction

The cosmopolitan capital of Lebanon, Beirut, has a rich history of urban development that has resurfaced in a distinctive fusion of traditional and contemporary elements. Beirut's location as a significant port on the Mediterranean coast has fueled the city's urban development and economic significance. From Phoenician, Roman, and Ottoman domination to modern urbanization, Beirut has been impacted by several political and social influences throughout the ages. Modern skyscrapers coexist with older structures in Beirut's urban environment today, reflecting the diverse architectural history of the city. With a diversified population that includes Arabs, Armenians, Europeans, and others, Beirut's demographic composition has also contributed to the city's urban growth. The city is separated into several diverse areas, each with their own specialties, from the posh stores and eateries of Downtown to the busy streets of Hamra. With wide suburbs and congested urban cores coexisting side by side, Beirut's urban patterns are equally diverse. This section will delve deeper into each of these factors and look at how they have shaped Beirut's urban growth throughout time.

1.1.1 Background information on Beirut and its history

For thousands of years, and because of its location on the Mediterranean coast, Beirut has been an important center of culture, going back as far as the Bronze Age. In the third millennium BCE, the Phoenicians residing in Lebanon founded Berytus, the most ancient city, which quickly became an important hub for commerce and trade in the eastern Mediterranean. Many civilizations took over Berytus over the years, from Assyrians to Persians, Greeks and Romans, all of which have left their cultural and architectural mark on the city. During the Roman age, Berytus became a center of scholarship and studies, hosting especially a law school, which drew many students from all over the Mediterranean. It took several years and several generations to reconstruct the city after a significant earthquake in 551 CE entirely destroyed it. As was previously noted, Beirut was occupied by a variety of civilizations, particularly during the Arab conquest of the Levant by Muslim troops in the seventh century. Beirut became a center of Islamic knowledge as the Islamic civilization swiftly disseminated its culture and knowledge. Al-Omari Mosque and the Cathedral of Saint John the Baptist are two well-known structures that were built in the city by the Crusaders, who took control of it five centuries later. Beirut was put under the Ottoman administration, throughout a considerable portion of the history, regardless of its brief interaction with French occupation during the 19th century. The French Mandate has had the most impact on Beirut, beginning in the 20th century till 1943, which marks the year when the country took its independence. Known as “Switzerland of the Middle East”, Beirut has since then been under constant modernization and development, which led to it being an important cultural and business center in the Middle East region. Just as it had its times of triumphs, Beirut faced also times of unrest and unease, particularly when challenged with the civil war from 1975 till 1990.

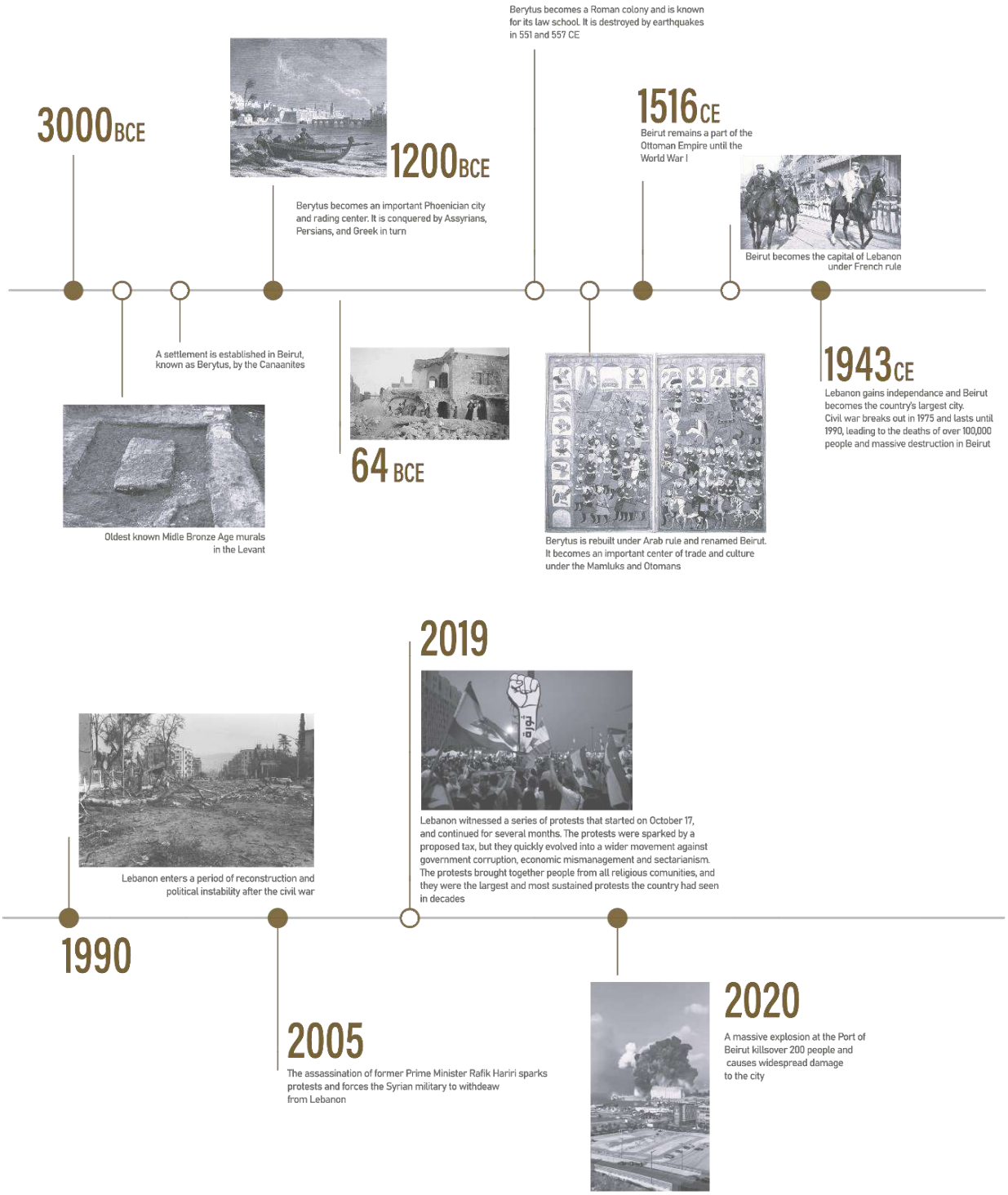


Figure 1. Historical timeline portraying the main events in Lebanon.

Just like every country after a war, Beirut was met with rebuilding and political unease. In 2005, with the murder of the former Prime Minister Rafik Hariri, Syrian troops were forced to leave the country after

protests and marches erupted in the heart of the country. Beirut witnessed many conflicts between parties, most importantly the conflict between Israel and Hezbollah in the 2000s. Using military strength, Hezbollah was able to take control of many areas in Beirut, with constant domination from 2008 till now. The neighboring country Syria experienced a civil war in 2010, which had its consequences reach Lebanon with a toll of refugees coming to Beirut and impact the national economy and politics. The government's management of the economy and political corruption worsened over the years, leading to the most recent and worldwide known protests in 2019, leading to the resignation of the prime minister. Since then, Beirut has been facing non-stop challenges, on many levels, all of which present significant and indirect causes for the tragic Beirut Port explosion in 2020.

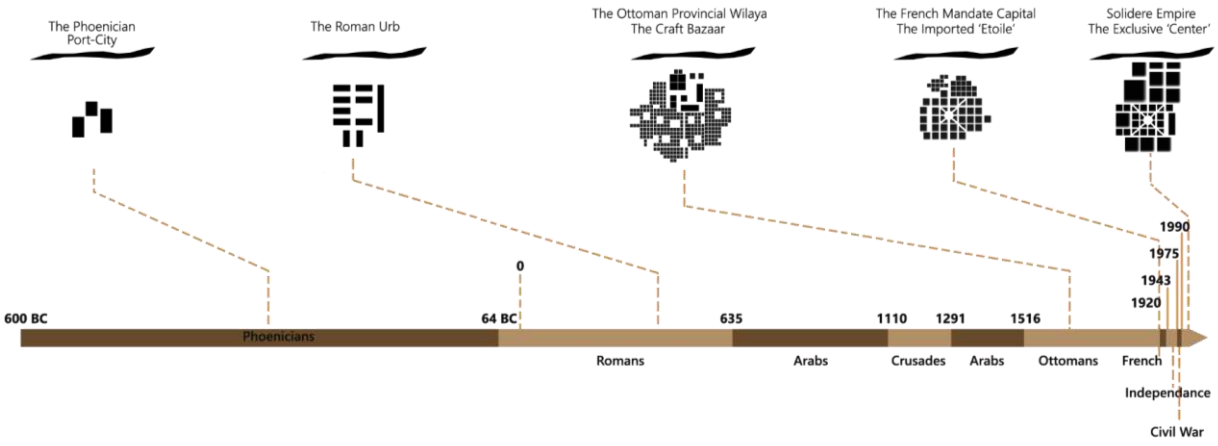


Figure 2. Timeline of Subsequent Foreign Influences and Beirut's Associated Roles.

1.1.2 Purpose and scope of the analysis

Beirut city is facing new architectural requirements, which emerged following the tragic disaster that happened in August 2020, an explosion which left the city in total despair. The analysis's goal is to focus mainly on all the difficulties that the city faced after the explosion, with a meticulous care to the residential demand which proved to be the most urgent aspect to look into. Due to the high residential building damage, the occupants were faced with the need to relocate and look for new refugees. The main goal of the study is to be able to reach and incorporate efficient strategies when faced with urgent local needs in future events. The settlement and examination of urban voids is a crucial element in the analysis, since many strategies could be found while searching in the depth of them. This necessitates also looking at how the city has been shaped and how its layout has been carried out, all of which has led to the rise of urban voids. Looking into many factors, such as Beirut's history to its urban morphology and zoning of its various districts, lead to the creation of a better management plan in the future which will improve the resilience of the city.

The analysis will look at the difficulties the city has encountered in the wake of the catastrophe as well as possible chances for Beirut's rehabilitation and rejuvenation. As already mentioned, in order to identify assets that may be used in the recovery process, it is necessary to examine Beirut's morphology, geography, social, economic, and cultural qualities. For instance, the research can show chances for supporting sustainable development methods or strengthening the city's cultural legacy. A variety of research

techniques, such as site visits, questionnaires, interviews, maps, and visuals, will be used in the study. This will aid in creating a thorough awareness of the difficulties and possibilities the city is facing in the wake of the tragedy, as well as the requirements and goals of regional stakeholders. By using the lessons discovered from the case study of Beirut, the investigation seeks to create cutting-edge, long-lasting remedies that might be used by other cities dealing with comparable issues. The analyses' ultimate objective is to support the creation of a more resilient and sustainable approach to urban design and catastrophe recovery, thus assisting in preserving the city's long-term viability.

1.2 Physical Geography (Climate and Topography)

It is important to assess Beirut's climate and geography in order to comprehend the unique opportunities and problems that the city's physical environment presents. These elements may have an influence on the city's architectural requirements, especially in the wake of a catastrophe like the Port explosion. For instance, Beirut's geography is distinguished by its location between the Mediterranean Sea and the Mount Lebanon range, which includes high hills and valleys. The accessibility and appropriateness of particular places for building or temporary dwellings may be impacted by this topography. Since Beirut is at proximity to a fault line, seismic activity could be very recurrent, which implies the urgent need to take this into account when new structures and new infrastructure are developed. On February 5th of this year, a disastrous earthquake hit Southern Turkey and Northern Syria with a magnitude of 7.8. Due to the fact that they are both neighboring countries to Lebanon, the earthquake was felt in parts of the country, shaking some residential buildings in the Bekaa region. This recent tectonic activity highlights the importance of being ready for any seismic recurrence in the area, especially due to the unfortunate location of Lebanon. Moreover, it brings into attention the need for safety regulations, particularly for buildings which were built before the Civil war, as well as essential emergency preparations in any future seismic event.

Figure 3. Civilians look for survivors amid the earthquake wreckage in Antakya, Turkey, on Feb 7, 2023.

The design and sustainability of temporary structures used in disaster recovery operations can also be impacted by Beirut's Mediterranean environment, which has scorching summers and moderate winters. For instance, employing specific materials or building techniques for temporary homes or shelters may be

challenging during the summer due to the high heat and humidity. Any new structures or infrastructure must also take the danger of floods or other weather-related risks into account while being designed.

The study can create more efficient plans for handling the difficulties faced by the city in the wake of any natural disaster by taking into account the unique challenges and opportunities given by Beirut's physical topography. This might entail choosing locations for temporary housing or rebuilding, creating more resilient infrastructure to resist earthquakes or flooding, or using sustainable design principles that take into consideration the city's particular climate and geography.

1.2.1 Description of Beirut's climate and its location on the Mediterranean coast

Due to its location on the coast of the Mediterranean Sea, Beirut is known for its Mediterranean weather, with moderate winters and dry summers. Across the many seasons, Beirut faces diverse weather conditions:

- During summer, Beirut experiences hot and dry months, from June till September, with the temperature in the 28 to 32°C range. The air reaches a great amount of humidity, which makes the heat feel more suffocating. These months present the driest times of the year, with little to no rain.
- During the following months, Beirut faces pleasant and temperate weather, with the temperature ranging from 24 to 28 °C. October presents minor rainfalls which typically lead to a decrease in the humidity.
- Throughout winter, from December to February, Beirut 's weather becomes chilly and wet, with the highest temperature reaching 19°C. Rainfall reaches its maximum especially during January. The presence of snow in Beirut is uncommon, nonetheless, it falls in the nearby mountains surrounding the capital.
- From March to May, Beirut's atmosphere is pleasant and sunny, with the temperature ranging from 20 to 24°C. During May, the humidity starts to rise again, preparing for the hot summer months.

It is safe to say that the climate in Beirut is very pleasant, with a reasonable temperature range throughout all the months. The highest peaks that might make an individual feel unpleasant exist during the harsh winters and the dry summers, making the heat feel more oppressive.

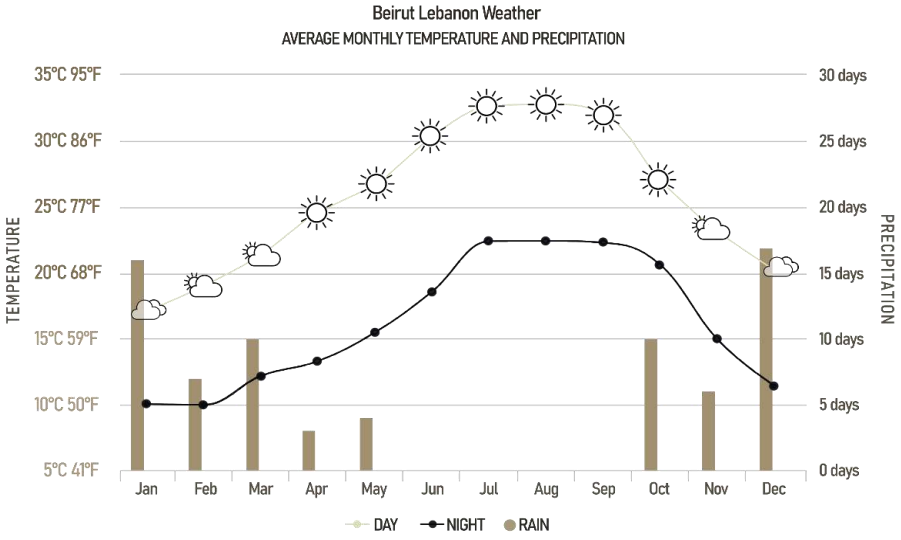


Figure 4. The average monthly temperature and precipitation in Beirut, Lebanon.

Intense flooding in Beirut was triggered by heavy rains in the winter of 2023. The floods damaged several homes and rendered numerous roads inaccessible, trapping drivers in their cars. Despite spending tens of billions of dollars on infrastructure since the conclusion of the civil war in 1990, Beirut and its surrounding areas were particularly heavily struck by the recent downpour. The country also experiences annual floods because of a poor sewage system. Due to its old drainage infrastructure and poor urban design, Beirut has historically endured catastrophic floods. In January 2020, houses and businesses experienced severe damage due to heavy rains in the capital which caused flooding, resulting in road closures as well. The neighborhoods in this period experience flooding each year during the months of winter, and this could be easily explained by the presence of an outdated and aging infrastructure. In order to alleviate the effects of any natural catastrophe which could have major effects on society, one should tackle and try to solve the problem at its roots.

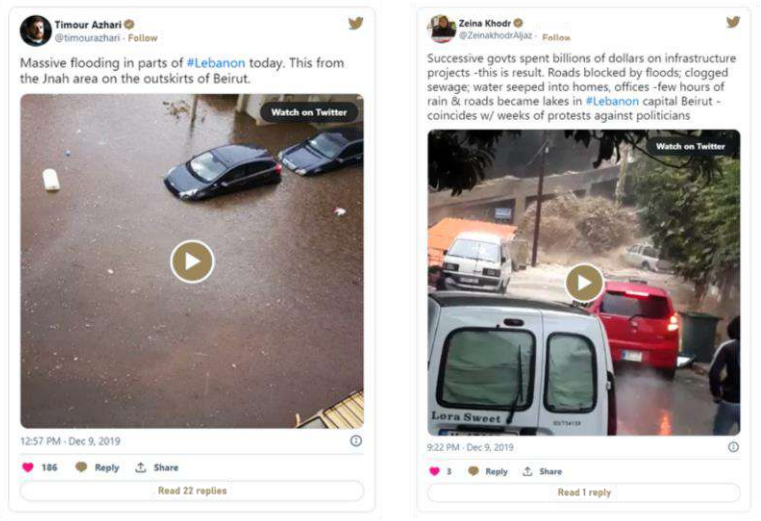


Figure 5. Lebanese citizens using social media to complain about the flooding situations happening in Beirut.

The city of Beirut is situated on a peninsula that faces the Mediterranean Sea and is encircled by mountains to the east and northeast as well as the sea to the west. As we go north, Beirut's topography becomes more varied and changes, ranging from sloping lowlands to rising hills. The Lebanese Mountains are directly in front of us as we go inland from Beirut's shoreline, which may be thought of as being quite flat and low-lying. Due to their capacity to hold precipitation from the sea, these mountains have a big impact on Beirut's climate, creating a humid habitat for a variety of plant and animal species.

Figure 6. Detailed terrain section showing Beirut's topography.

There are several distinctive neighborhoods in Beirut, each with its unique geography. Modern high-rise structures may be seen in the relatively level downtown region, which also has large streets. Yet, the landscape grows steeper and more congested as you leave the city center, with older, more traditional buildings and narrower streets. Broadly speaking, Beirut's terrain is a blend of coastal lowlands, hilly neighborhoods, and towering mountains, resulting in a varied panorama that is exclusive to this area.

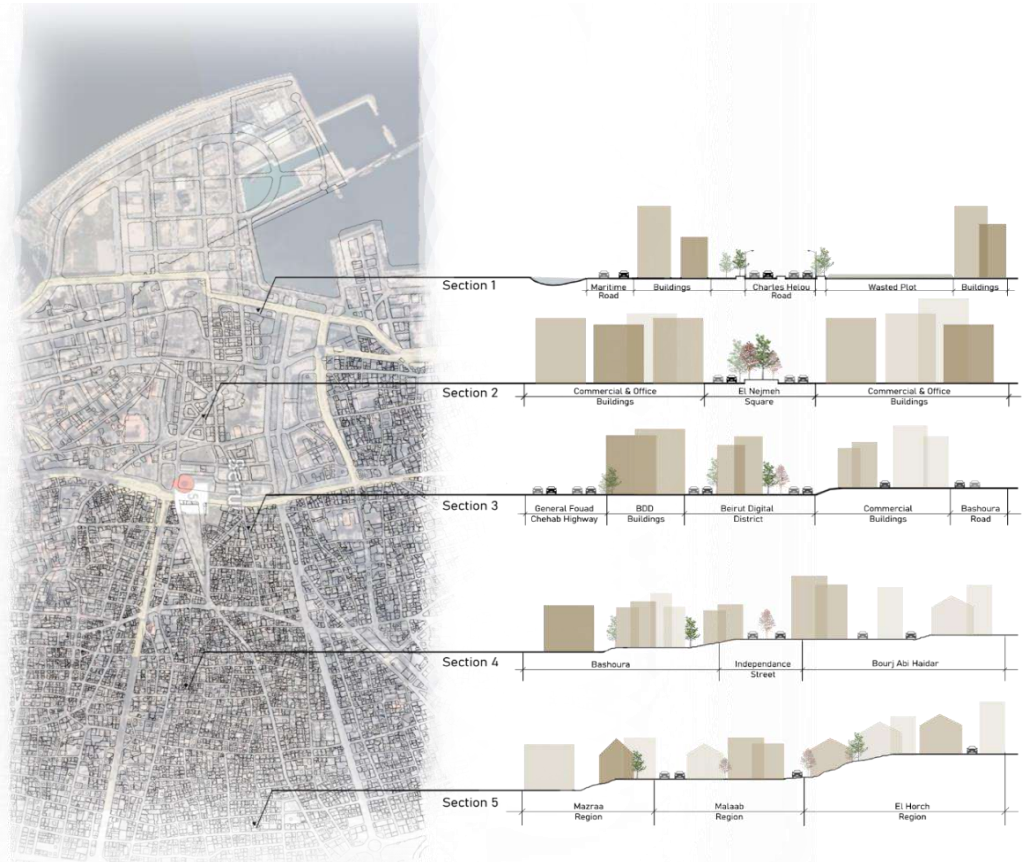


Figure 7. Different sections representing diverse topographies and profiles in Beirut.

1.3 Demographic features

To determine the unique requirements and vulnerabilities of Beirut's people after a disaster, it is essential to understand the demographic characteristics of the city. Beirut is a metropolis which hosts more than two million inhabitants of many ethnicities and religions. Understanding how these groups are distributed around the city and how they can access services, infrastructure and resources is important to look into. For example, the city could host, in one particular part, groups with low-income inhabitants which are more likely to be excluded while having the least access to services like healthcare. Studying the demographics can help us understand the social and cultural dynamics of a city, which is important to take into consideration when designing a system for a society, targeting the needs of the vulnerable population. The preparation of successful policies, initiatives, and interventions to help the city's people in the event of misfortune depends on a detailed understanding of the city's requirements and vulnerabilities, which can only be provided by demographic analysis.

1.3.1 Description of the population

In 2021, it is expected that Beirut, the country's capital and largest city, would have a population of more than 2.1 million. It is important to note that a big portion of Syrian and Palestinian refugees that reside in the city are not counted in the census. Therefore, the actual population may be higher. The city has long been a hub for commerce and trade, luring tourists from all across the country and the region. Beirut's population is heterogeneous, consisting of a range of racial and religious groupings. Islam and Christianity are the two main religions in the country. Maronite Catholics, Greek Orthodox, and Armenian Orthodox Christians make up the Christian community.

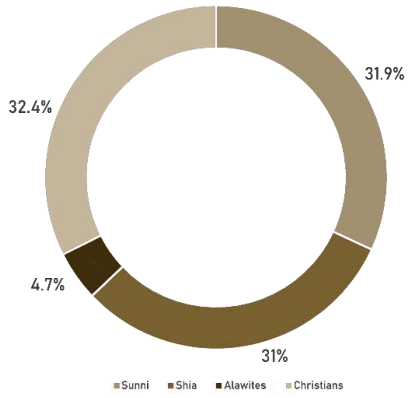


Figure 8. Percentage of religions between the Lebanese population

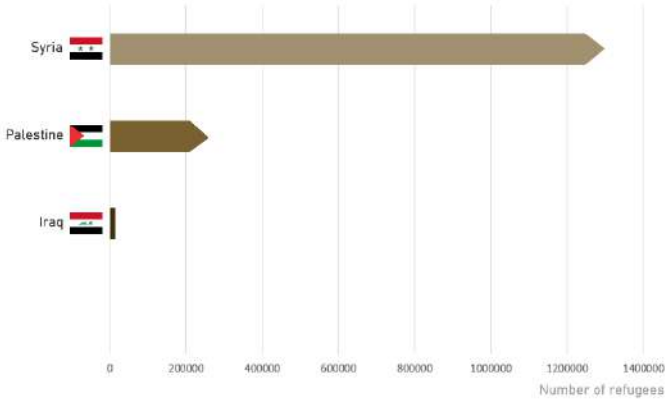


Figure 9. Number of refugees in Beirut from Syria, Palestine and Iraq till 2021

Many Syrian refugees have been staying in Beirut ever since the Syrian crisis began in 2011. Over a million Syrians are anticipated to be formally registered in Lebanon by 2021, with the majority of them staying in the Bourj el-Barajneh and Shatila areas of Beirut. The city was already experiencing difficulties due to inadequate economic and political leadership, and the flood of Syrian migrants has made matters worse. The nation is straining to supply the fundamental essentials that these refugees need, including food, housing, and medical attention. Many migrants find themselves living in crowded apartments with terrible

living conditions as a result of unemployment. Poor living circumstances are typical in these areas, which leads to a large number of refugees living in temporary tents.

Due to the Syrian refugees in Beirut, there has been some serious friction between the Lebanese citizens and the refugees. Regrettably, the refugees are blamed for a variety of issues in the nation and get a lot of abuse. But, not all of the news is dreadful; some organizations and NGOs are stepping up and supporting the refugee groups. They are connecting people with a ton of crucial resources including legal counsel, medical assistance, educational opportunities, and career training.

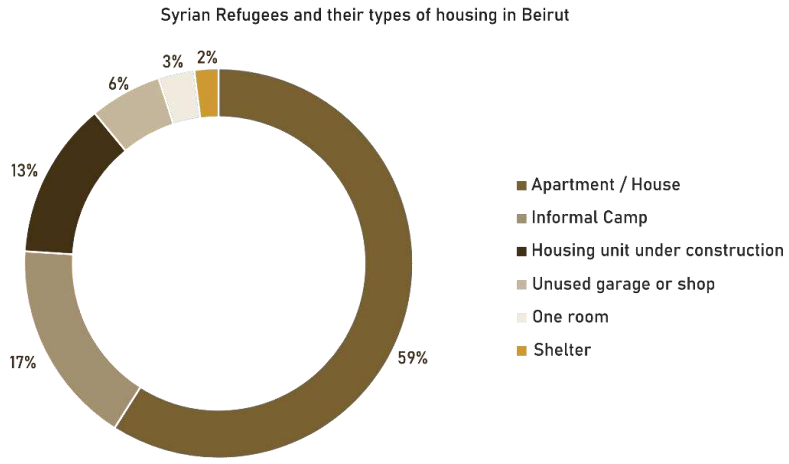


Figure 10. The different types of housing of the Syrian refugees in Beirut

The population of Beirut is more or less evenly distributed, with approximately as many men than females. It is estimated by the World Bank that starting 2019, Beirut will have around 1.06 million female inhabitants and 1.04 million male residents.

Beirut consists of many different neighborhoods, presenting different cultures and populations. Across the capital, we can find many stereotypes of the main characteristics of the regions:

- Located in the West of Beirut, Hamra is a vibrant and diverse area, well-known for its important cultural institutions. This neighborhood groups more than 60,000 people of many nationalities. Lebanese represent the majority of the inhabitants, while the rest are Syrians, and Palestinians.
- Located in East of Beirut, Achrafieh district is a residential and business neighborhood, well-known for its restaurants and stores. This district groups approximately 100,000 residents, with Lebanese Christians forming the majority group, while the minority is formed by Armenians, Syrians and other ethnicities.
- Located in the Northeastern part of the capital, Bourj Hammoud is dominated mainly by Armenians, well-known for its rich cultural heritage and artisanal workshops. It is estimated to host around 15,000 people, with the majority being Armenians.
- Since the 1948 Arab-Israeli conflict, Sabra and Shatila are Palestinian camps that have formed in the Southern suburbs of Beirut. These camps group more than 30,000 individuals, most of them living in dreadful conditions.

- In the Southeast part of Beirut is located a working-class neighborhood, Tariq el-Jdideh, well-known for the open markets and multicultural population. Lebanese Muslims make up the majority of the 70,000 residents, with other ethnicities present as well, like Syrians and Palestinians.

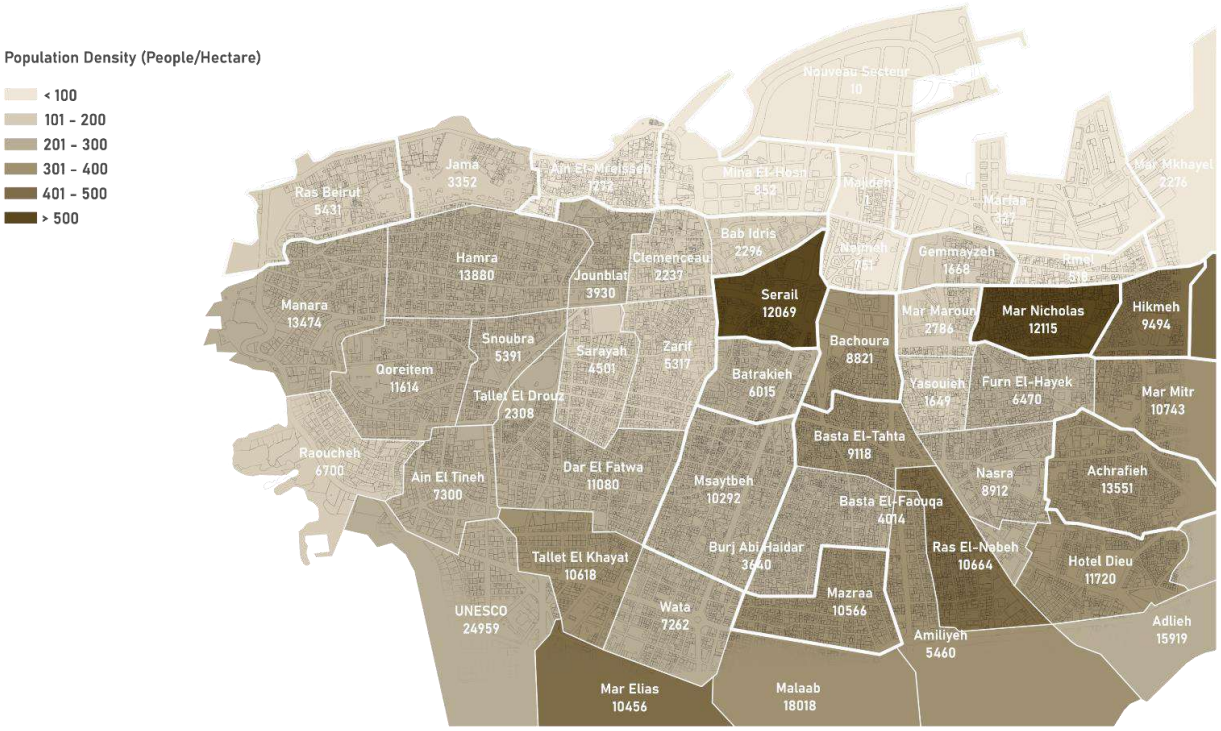


Figure 11. The distribution of the population in Beirut's distinct neighborhoods.

1.3.2 Socioeconomic Status

Like many other cities in the world, Beirut presents a diverse socioeconomic environment. In order to make sense of the socioeconomic status of Beirut, many patterns and factors should be taken into consideration:

- Economic inequality: Beirut, just like any other part in Lebanon, presents high levels of income differences between individuals. Just a small minority of Beirut's residents are extraordinarily wealthy; the majority are either middle-class or destitute. Several factors that have transpired throughout time, including the slow growth of the economy and political issues, have contributed to the widening gap between the rich and the poor.

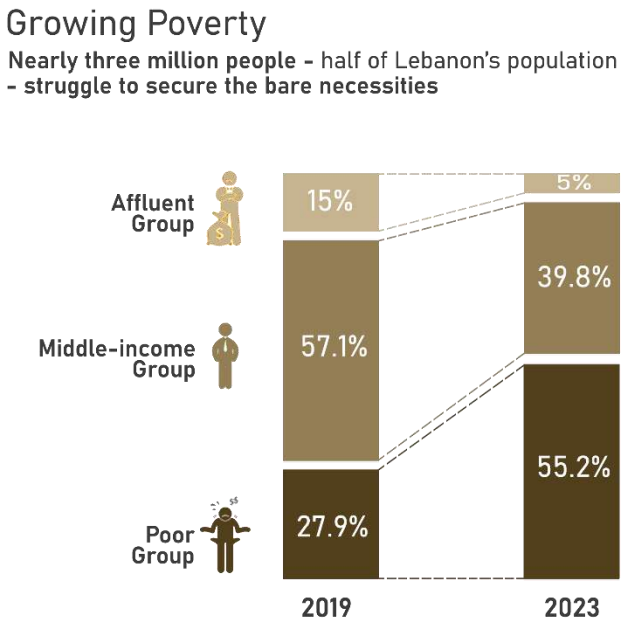


Figure 12. Diagram showing the growing percentage of the poor and middle-income classes in Beirut, screening a growing poverty from 2019 to 2023.

- Expense of living: Due to Beirut's relatively high cost of living, those with lesser incomes may find it challenging to purchase essentials. Particularly with regard to housing, many individuals are compelled to live in cramped or unsanitary conditions.
- Education: The literacy rate in Beirut is comparatively high, and the city is home to several reputable institutions and colleges. Nonetheless, socioeconomic status may affect educational quality, and many pupils lack access to high-quality instruction.
- Employment: It might be difficult for many people to obtain secure employment in Beirut due to the fierce competition on the labor market. Youth unemployment is particularly high, and those who do find jobs frequently make poor earnings.
- Services accessibility: Beirut has a strong infrastructure and a wide range of public services, including transportation and healthcare. Nevertheless, depending on where you live in the city, the quality of these services might vary, and many residents in lower-income neighborhoods do not have access to the same level of services as those who live in affluent regions.

The socioeconomic status in Beirut presents complications and has many dimensions, with diverse factors influencing the capital's economic situation. The never-absent political unrest, the COVID-19 pandemic as well as many other circumstances led to the greatest economic crisis ever experienced by Beirut. With inflation skyrocketing, and the local currency (LBP) severely devalued, many people are facing extreme poverty as well as a high level of unemployment. Even if living in Beirut presents a certain challenge, one could always grab many chances which are available to those who know how to make use of them.

The following are some important causes of the economic crisis in Beirut:

- Political instability: Lebanon has been struggling with political instability for many years, making it challenging to take into action economic reforms and solve the roots of the economic crisis.
- Corruption: As already mentioned, the country's existing economic challenges are due to the long-lasting history of corruption. Many public officials have been accused of stealing money and taking part in many corrupt activities. As a result, Lebanese citizens have lost all faith in the government.
- Financial crisis: Due to a financial crisis in 2019, people had difficulty accessing their money, which resulted in both a depreciation of the local currency and a high level of inflation. The systemic shortage of capital and liquidity throughout this financial crisis was its defining feature.
  To put it in concrete words:

Figure 13. Image representing the devaluation of the value of the local currency as shown in simple purchases, such as in the supermarket.

- COVID-19 pandemic: Like any other country in the world, the COVID-19 pandemic has had a considerable negative impact on the country's economy. With the sudden pandemic came a sudden decrease in tourism, which plays a role in the economic activity of Lebanon. Also, an increase in healthcare expenses due to its high demand added to the stress which the country was already facing.

Ordinary residents' lives in Beirut have been significantly impacted by the country's economic disorder. The local currency's value has dropped significantly, making it challenging for residents to buy basic necessities like food and shelter. In addition, a lot of individuals have experienced job losses or income reductions, which has aided in the widespread poverty and food insecurity. Political chaos, protests, and social tensions have all been brought on by the crisis and have made things worse.

The socioeconomic circumstances of people living in different neighborhoods in Beirut differs drastically. Each neighborhood has its unique economic, social and cultural features. Beirut presents important regional variations:

- Wealthy neighborhoods: Many areas in Beirut, like Ashrafieh, Verdun and the Downtown, are considered to be wealthy neighborhoods. Just by visiting them, one can know why this is true. Luxury houses, five-stars hotels and restaurants, as well as high-end stores with luxury brands occupy these areas. Only the rich and highly educated people have access to these neighborhoods and can afford living in them. The average family income in these areas of Beirut is the highest, ranging from $1,667 to $4,000 per month.
- Middle-class neighborhoods: Beirut is characterized by an important number of middle-class neighborhoods, such as Mar Mikhael, Hamra and Gemmayzeh, all of which have mainly access to the same services as the wealthier community, but at a much cheaper rate. In general, although not being wealthy, the residents of these areas are well-educated and have proper employment, with the average family income of these households ranging from $1,000 to $1,500.
- Working-class neighborhoods: Other parts of Beirut include the working-class families, such as Bourj Hammoud, Nabaa and Sabra. Observing these areas, one can pay attention to the constant busyness of the people who live there. The residents are less wealthy, lack proper education which makes it more difficult for them to get steady jobs. Their typical monthly household income ranges from $500 to $1,000.
- Refugee camps: Beirut is home to many refugee camps, which were erected in the capital by people fleeing their countries during wars, mainly from Syria and Palestine. These camps present dreadful conditions, are overly crowded, and lack many necessities such as healthcare and education. The residents face difficult conditions every day, from poverty and social isolation, to the struggle to make ends meet due to their very low income, with a monthly average of only $161.

In general, there are several elements that affect the socioeconomic standing of people in different parts of Beirut, and these variances can be significant. On people's quality of life, access to resources, and chances for social and economic mobility, these inequalities may have a considerable load on the population.

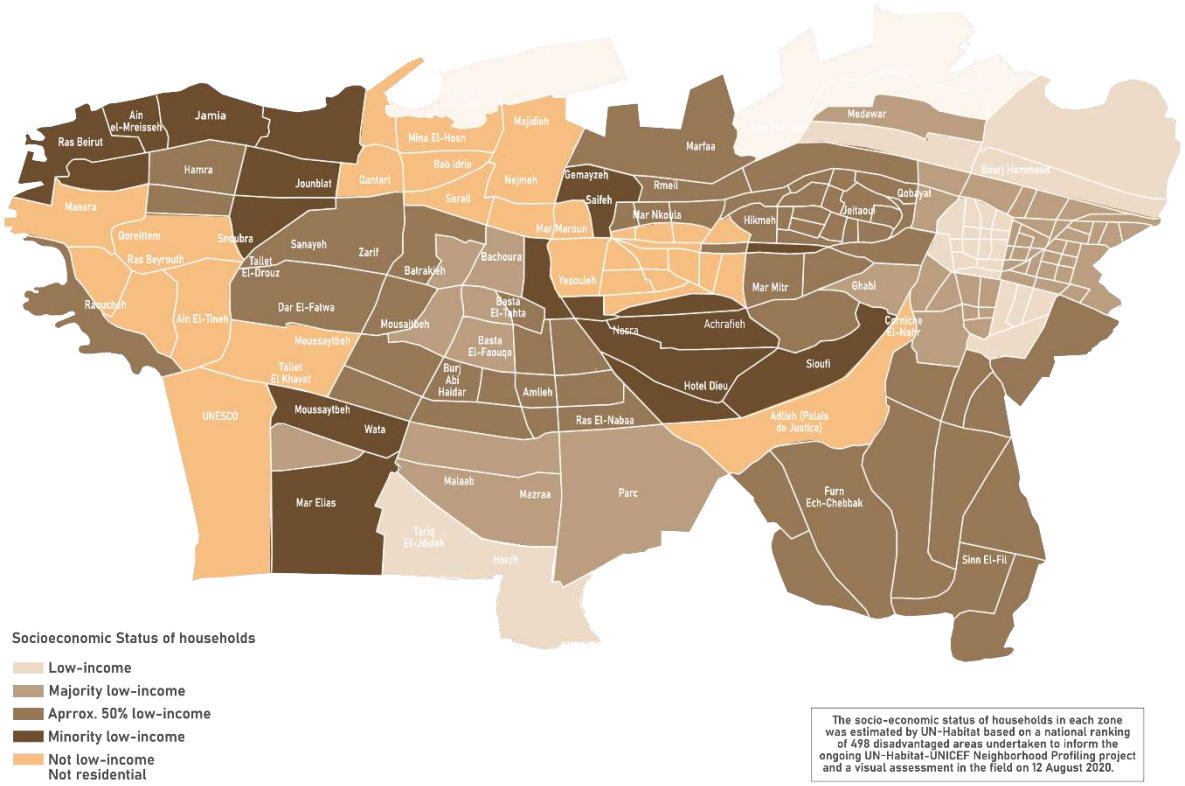


Figure 14. The distribution of the socio-economic status of households in many divided areas in Beirut. (Source: OCHA,HDX,UN HABITAT,Govt.ofLebanon,UNHCR,LRC,UNICEF,ESR, May 2020)

1.4 Districts and Neighborhoods

The city of Beirut presents a vibrant atmosphere, with a distinguished mix of modernity, cultural diversity and historical significance. A series of districts and neighborhoods, each characterized with its unique personality, make up the city of Beirut. The capital is able to provide the visitors with everything that might interest them, from the booming business of the neighborhood of Downtown Beirut to the trendy restaurants and cafes in Mar Mikhael. Beirut surely knows how to capture someone's attention and imagination, since there is a place in the city for everything; whether someone is interested in the city's rich history or wants to enjoy its exciting nightlife. The following section will delve into some of Beirut's most distinguished neighborhoods while looking into their unique characteristics.

In order to establish an efficient method and design for dealing with the difficulties that occur after a hazard, one should have a better understanding of the layout of a city, as well as its urban shape and the population distribution in the different neighborhoods. Automatically, this study will highlight the areas which are more vulnerable than others, by studying their size, their density, their population as well as their building types. For example, a hazard could easily have the most impact on areas with informal settlements or older structures, being the most vulnerable. Moreover, it is important to understand the demographics of an area in order to have a better design strategy when implementing new structures. For example, areas that host small families may require single-unit temporary housing needs, while areas hosting bigger proportions of families need bigger temporary housing solutions. Additionally, looking into

the neighborhoods can also give an insight into the social dynamics which affect the effectiveness of any new system; areas which host strong communities have a better accessibility and a strong network, are better at mobilizing resources and respond to emergencies. However, areas which present communities with strong social inequality and shattering might need more external help to ensure everyone's safety and access to resources.

A crucial first step in creating a complete strategy for handling the encounters that happen following a risk is thoroughly understanding the Beirut neighborhoods. It enables a more nuanced comprehension of the urban morphology and population distribution of the city, which may guide the creation of focused and efficient solutions to assist the resilience and recovery of the city and its inhabitants.

Figure 15. Administrative boundaries in Beirut as defined by Electricité du Liban

Many administrative sectors that separate the city of Beirut into its several neighborhoods and districts are identified by a set of physical borders. Each of these industries has a unique set of traits that distinguish it apart from the others. For example, certain regions are well-known for their buzzing business districts and exciting nightlife, while others are distinguished by their tranquil residential zones and attractive parks. These administrative divisions play a crucial role in the management and structure of Beirut. They are in charge of managing different facets of the city's infrastructure, including public services, utilities, and transportation. The city's sectorization has been essential in ensuring that each neighborhood is properly maintained and serviced.

An essential tool that may provide visitors to Beirut a comprehensive overview of the various parts of the city is a map of the administrative borders. They may use it to get around the city and learn how it is laid out. Visitors may better appreciate the distinctive personality and attraction of each neighborhood and make the most of their time in Beirut by learning the various administrative sectors.

1.4.1 Assessment of the main districts

The most appreciated features of Beirut are its unique districts and neighborhoods. According to Beirut's citizens, the city is composed of a series of well-liked and well-known neighborhoods, such as the Beirut Central District (BCD), Ashrafieh District, Hamra District, and Gemmayzeh District. Visitors as well as residents are drawn to these areas for the attractions and the features that they offer.

Figure 16. Beirut's most prominent and popular districts: Beirut Central District, Hamra District, Ashrafieh District and Gemmayzeh.

1.4.1.1. Beirut Central District

The following research focuses on the interest in Solidere's 25-year master plan to reconstruct Beirut's BCD, the city's war-devastated central quarter. This research aims to investigate and draw attention to unsolved urban and typological tensions that are present in the new form of the city. It explores the urban conflict that arises from the outset of the project as a result of the removal of the site's damaged existing fabric and the consequent impact of this "tabula rasa" approach on issues like scale, social and economic exclusion, and security by analyzing the proposed urban plan and programmatic structure.

The philosophy of Aldo Rossi, as outlined in Architecture of the City, focuses on comprehending cities by their form, which is made up of man-made items referred to as urban artifacts. These relics are enduring cultural events that represent the character and typology of the city. Rossi underlines how important architecture is to preserving the city's history and determining its future. While much of his analysis is based on his own encounters with old Italian and European cities, it is still useful for comprehending cities that are undergoing ongoing growth.

Regarding Beirut's historic center, which was destroyed by sixteen years of war and rebuilt by Solidere, an ongoing joint-stock company project, an analysis of the new character of the city center based on Rossi's theory of urban artifacts is warranted given the city's rich history and pre-conflict layers. This approach

enables one to challenge both Solidere's claims of preservation through their master plan for the city's rebuilding from an architectural and typological position as well as Rossi's theory on the significance of permanence and communal memory for the continuation of identity. Within Solidere's master plan, this research focuses on the rehabilitation of Beirut's dead center, in particular the Beirut Souks project. It uses Rossi's criteria as a tool to assess the quality of the rebuilt typologies.

Figure 17. Historical Souk Structure and Functions in Beirut.

i. Past Foundations and Goals

Lasting for 16 years, the Lebanese civil war had severe consequences on the country, causing an important number of deaths and destruction. Beirut, the capital, was impacted the most since the fierce battle between the religious militias controlling either side split Beirut in half. As a result, the city was destroyed, people were killed and homes were severely damaged.

Beirut was severely damaged, yet it was nonetheless able to cope with losing its core after the war. Residents of the city were adamant to rebuild and recover, and a fresh master plan was established to direct the restoration activities. The duty of carrying out this plan and reconstructing the city's historic center quarter was allocated to Solidere, a firm established by the Lebanese government.

Figure 18. Christian bride and Muslim groom walking through bombed Beirut, 1983.

Figure 19. Beirut being bombed by Israeli missiles, 1982.

Expropriating 296 acres of property from the central district, which had previously belonged to almost 250,000 Lebanese owners and renters, was part of Solidere's efforts. To give itself a total of 1.8 million square meters of land to work with, the business additionally recovered 159 acres of waste from the sea north of the site. The Etoile and Serail neighborhoods and the Souks were the focus of Solidere's initial

concept, two of the city's most recognizable historic landmarks. Almost 800 existing buildings in the central district were assessed by Solidere as part of this phase, and 291 of them were kept in a conservation area surrounding the Etoile. However, to create room for future building, the majority of the center's surviving portions were leveled. A contemporary, thriving metropolis that will once more operate as a center for culture, entertainment, education, and economic activity was the aim. Although Solidere's initiatives have drawn debate and criticism from some, they have also been recognized as reshaping Beirut and aiding in the healing of the civil war's wounds.

ii. Context Preservation via Form and Function

The ambitious New Beirut Souks project aims to rebuild a region that was totally destroyed during the Lebanese civil war, leaving many Beirutis with severe emotional scars. With the exception of the pre-existing structures in the conservation area, the initial stage of Solidere's proposal comprised expropriating property and leveling the majority of the center's remaining regions. The new souks were created by famous architect Rafael Moneo, who was chosen after an international competition. His strategy included new store spaces that would appeal to current customers while also maintaining the traditional feel of the ancient souk. Moneo used cutting-edge building methods to reimagine the shape and function of the historic souks while reconstructing its spatial and urban patterns. The overall effect is a stunning fusion of history and modernity that casts doubt on the widely held belief that cities are constructed through time in a progressive manner. An important feature that differentiates Beirut and aids in maintaining its status as a "meeting point" is also the preservation of historical relics discovered during the area's flattening. Ultimately, the New Beirut Souks project is a significant step in revitalizing the city's historic district while also paying tribute to its illustrious history.

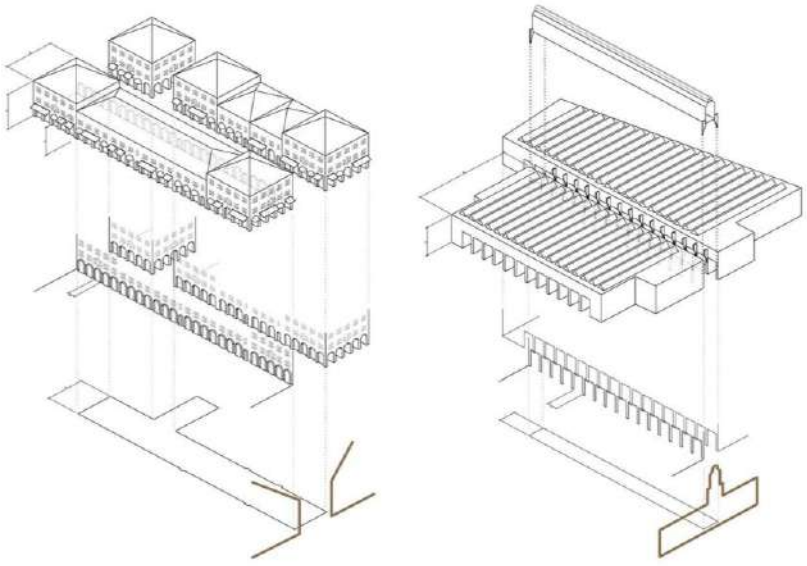


Figure 20. Exploded axonometric with typological change from the Old Souks to Moneo's New Souks as Urban Mall. (Source: Moneo, 2018)

iii. The destruction of history, memory and individuality

The legitimacy and efficacy of Solidere's master plan to revitalize the Souks' historic character and reconnect them to the city's past have been questioned. Rossi's theory of the city may be used to evaluate

the characteristics of the city and the standard of its urban artifacts. The city, in Rossi's view, is made up of urban artifacts that are assessed based on four important criteria: originality, location, memory, and design. Rossi's theory of type and typology places a strong emphasis on traditions and ways of life, while the rebuilding of the Souks places more emphasis on form and function. It is stated that the Souks' loss of identity and character is caused by the alteration in the scale and structure of the land, which has led to the expropriation of current tenants and store owners and the destruction of the social structure and history of the city. There is no significant means to maintain or continue the site's identity due to the lack of uniqueness and communal memory. The crucial cultural activities and ways of life that form the Souks' identity are ignored, despite the fact that renovation of the Souks may give the impression that it is restoring their historic character. While beginning urban development projects, it is crucial to take into account the preservation of cultural assets and the social fabric of the city to make sure that the site's identity and character are not compromised.

By comparing the new open-air mall development built by Solidere to the traditional typology and structure of Beirut's Souks, it emphasizes the urban confinement and exclusivity existing in the city's structure. This is due to Solidere's inability to strike a balance between their desire to bring international capital into the city center and the need to redefine the center's role on a socio-political national level. It is examined in the context of historical and political events before and after the Lebanese civil war.

iv. Trade Economies in Transition and the Privatization of Public Property

Parts of Beirut were destroyed during the 16-year Lebanese civil war, while other neighborhoods saw unintended densification as a result of the city's high development rate. During this time, Beirut lost its reputation as a contemporary global metropolis and sought to reestablish contact with the outside world when the war ended in 1991. The Central District's rebuilding was seen as an essential step, although Solidere's idea failed to preserve the connection to the city's original Lebanese identity and character. Real estate that is privately owned, managed, and promoted and that is marketed using land stock values has changed the economic structure of the BCD region. This strategy was also used to rebuild the Souks, which are now leased by foreign businesses and regional distributors rather than being owned by families or individuals. The Souks now serve a new clientele, changing the area's personality such that it resembles a mall more so than a traditional market. This change emphasizes how the Solidere project has affected the social structure, identity, and character of the city. Due to this, the new Beirut Souks have a more mall-like appearance, and analysis of the Souks' typological elements has shown even more evidence of this relationship.

v. Heritage and Typology

The typical central-hall house, which was a popular home type throughout the 19th century, is frequently associated with Lebanon's idea of heritage. Yet, the history of this kind of dwelling is complicated and calls for more investigation. The central-hall home was created in reaction to Beirut's growth as a thriving commercial port city by fusing many architectural styles, including Ottoman nine-square grids, Levantine arched windows, and imported French and Italian materials. It not only represented the new bourgeois way of life but also the complex interplay between the private and public domains in Arab-Ottoman society. The house, which developed from the open courtyard house, served as a representation of the social structure of an Arab civilization built on nuclear families. The central-hall home, however, lost its relevance as a residential urban form throughout the French Mandate period and was supplanted by contemporary French governmental tasks. The central-original hall's structural importance was lost during

the post-war renovation when it was reduced to a simple façade to satisfy general office demands and corporate requirements.

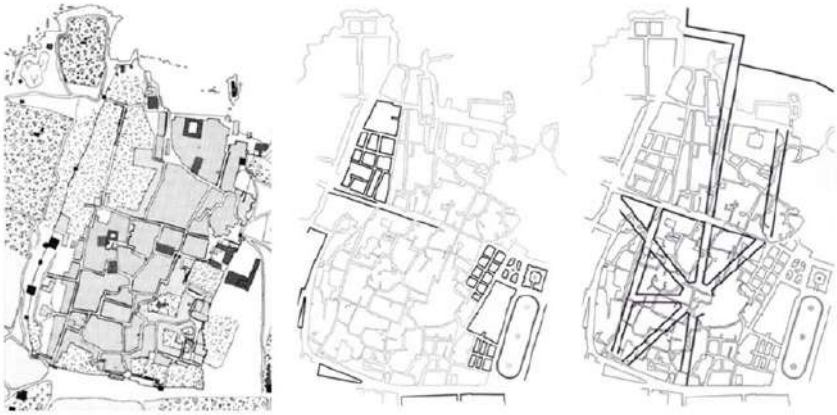
Figure 21. Destroyed central-hall house in Gemmayzeh on the left, and a destroyed central-hall that housed a series of restaurants and a bakery in Mar Mikhael on the right.

The urban environment was completely rebuilt as a result of Solidere's vision for the city center, which also eliminated the interconnected home and commercial typologies, diversified functional open spaces, and scalar textures of secondary and tertiary street networks. The concept, which included a thorough zoning plan, established a totally new city without adhering to the historical urban fabric of the area. Instead of reflecting the state emblem, the masterplan attempted to represent the financial capital of the new joint-stock real estate firm.

The continuation of scalar connections between the person and society, or between architecture and the urban, was no longer the basis for the construction of the city. Instead, it was built using a number of deliberate architectural and urban gestures and compositions. The resultant city instead put corporate interests first rather than the complex interactions between the many urban components.

Figure 22. First phase of the SOLIDERE plan to the redevelopment of Beirut DownTown. (Source: Khalid S. Al-Hagla, 2008)

The central-hall home, which represented the bond between families and distinct trade organizations, served as the foundation for the customary process of forming the city of Beirut. The central-hall served as several scales of this historical typology's spatial structure, which was reproduced across the city up to the American Civil War. Solidere's masterplan, however, marked a significant divergence from this method. Solidere's suggested architecture has nothing to do with the neighboring metropolis and made heavy use of facades as "history" containers and symbols. This method fell short in its understanding of the significance of architectural space in forging a city's character and political economy.



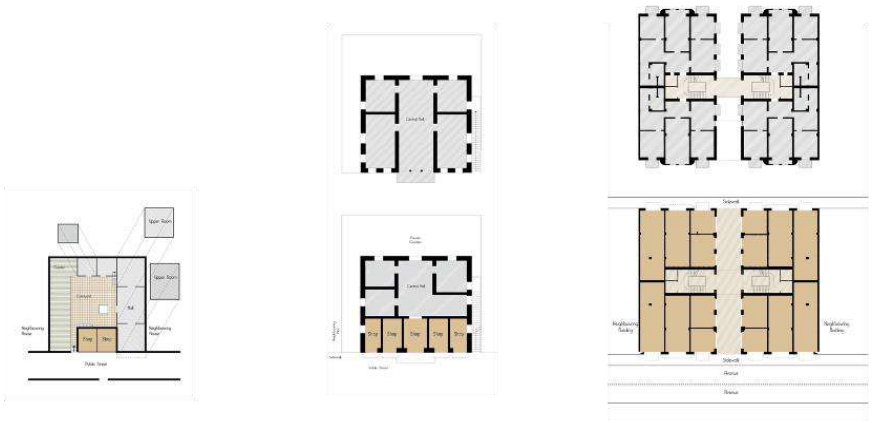


Figure 23. City and Dominating Type Transformation: from the Arabian Courtyard city to the French Boulevards.

As was previously said, the central-hall house, which served as Beirut's traditional residential structure, is no longer functional or appropriate for the demands and circumstances of the modern world. Even when these homes' interiors have been kept, their purposes have changed significantly, making it impossible for them to meet modern household demands or the realities of the city's new economic reality. Hence, boutique hotels, pricey shops, restaurants, and cafés have been built where central-hall kinds have been retained. These structures can only be used as businesses today, where their historic nature raises the value of their retail or entertainment offerings. It raises concerns about the central-continuous hall's relevance as a historically developed typology and its capacity to sustain the city's future opportunities because the survival of historic buildings is sometimes contingent on its real estate or retail value. The issue with historical typologies is more complex than just Solidere's legacy. Buildings designated as "heritage" have recently received similar treatment throughout the city and the Lebanese territory, showing a pervasive problem with historic typologies.

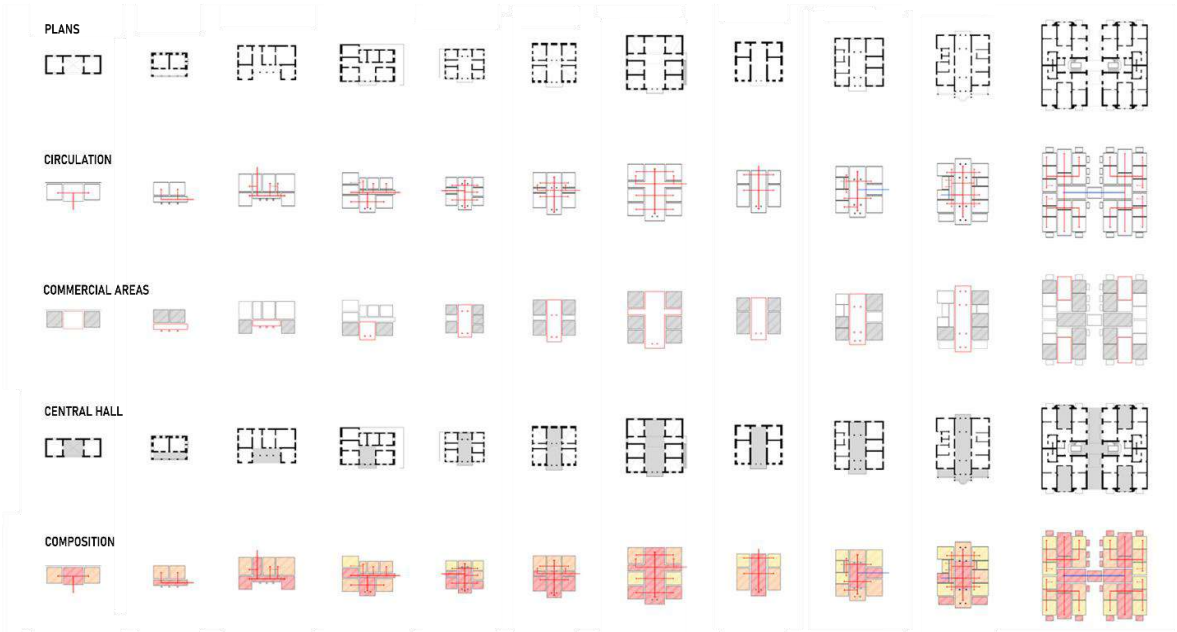


Figure 24. Porous and Directed Organizations of the Central-Hall Type.

vi. Collective Memory and People's Perspective

It is crucial to take into account a city's memory from its residents' point of view as well as from a strictly historical one. Sadly, numerous parties, including architects, businesspeople, sociologists, and politicians, have misused the idea of communal memory in recent years to their own ends, both in support of and against the restoration of Beirut's Central District. Without engaging the people who really remember the city, these groups have modified the concept of communal memory to meet their own claims. At the American University of Beirut, Professor Robert Saliba gave his students a task in 1990 that required interviewing about 80 people to create mental maps of the city. Age-related grouping of the participants allowed for a better understanding of their perspectives on the city's rebuilding and memories, soon before the city was completely open to the public after the civil war.

It is significant that the youngest cohort of respondents in Professor Saliba's study who were in reality his students at the American University of Beirut performing the research, saw the city center as a "tabula rasa". As they were all under 25, none of them had any firsthand contact with the city prior to the start of the Lebanese civil war in 1975. The media and personal reports from their parents had a big impact on how they mentally pictured the city. This group pictured a vacant area in the city center with the Place des Martyrs and al-Masarif Street (Banks' Street) as the only two significant monuments. The latter was represented more accurately since it stood on the western edge of the Beirut Central District and was mostly intact during the conflict, whereas the former was portrayed as a circle despite having a rectangular shape. This group advocated a full revamp of the region, disregarding its pre-war status, when asked about their opinions on the restoration of the city center.

The individuals who belonged to the groups of people between the ages of 25 and 45 were able to give out more detailed maps and representations of the city. In this same group, the younger people who ranged from 25 to 35 had already established their jobs and companies outside of the city center, and had a constant worry about its redevelopment since it will lead to more competition. Nonetheless, the older people between the ages of 36 and 45 expressed their wishes in preserving the appearance of the city as it was before the war. Saliba, belonging to this age group during the study, named them the “romantics” because of the mental image of the city that they constructed in their mind, becoming an important element of their mental environment.

The eldest group, aged 45 and more, were able to give out the most detailed mental maps of Beirut, out of all the age groups. Intriguingly, a comparison was present between them and the youngest group; the eldest group was in favor of constructing a new city center since it would provide more job opportunities for their children.

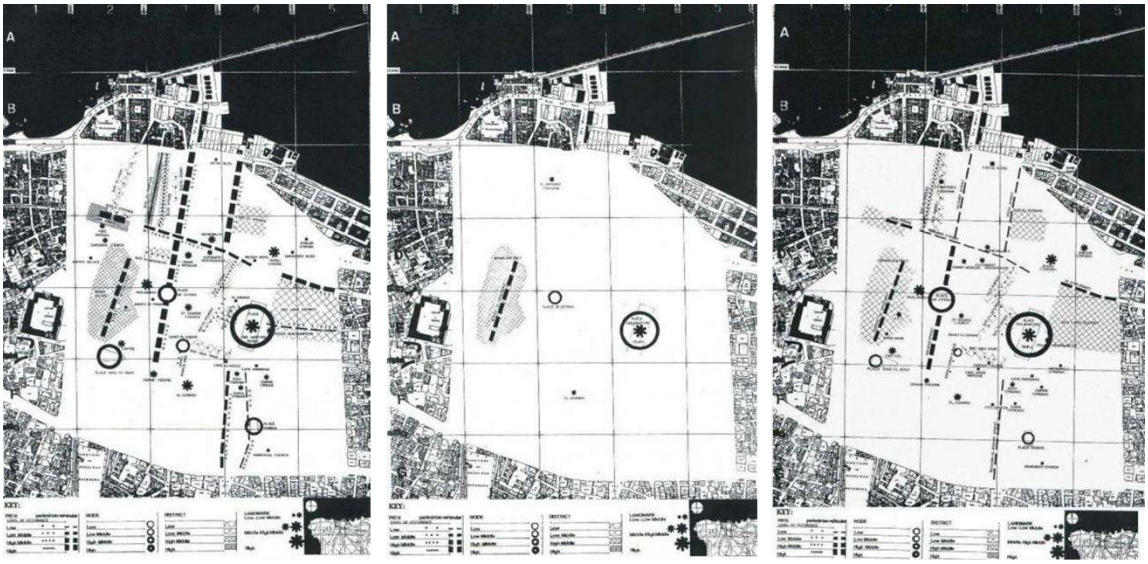


Figure 25. Mental picture of Beirut before the conflict by the groups under 25 years of age, between 25 and 45 years of age, and over 45 years of age respectively. (Source: Robert Saliba, 2001.)

This study conducted by Saliba helps us understand that people's opinions on the reconstruction and rebuilding of the city center are so different, and it would be impossible to generalize about the concept of "memory of the city" just as planners and architects do while overestimating its capability of reconstruction. The last map of the activity serves a basis for all the collective memory of the group regarding the city.

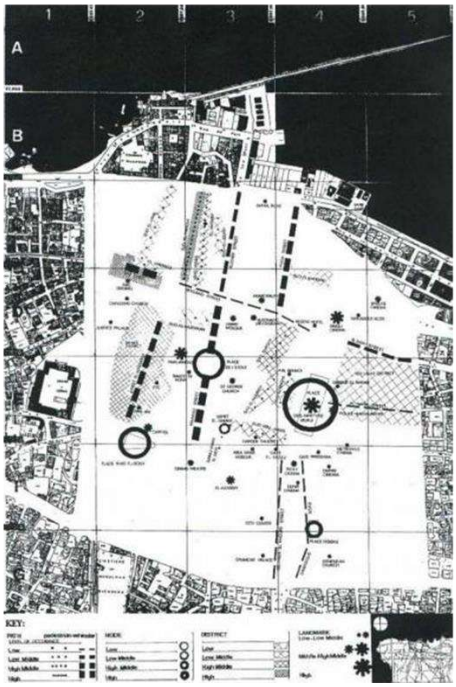


Figure 26. Combination of the mental pictures that the various age groups offered. (Source: Robert Saliba, 2001.)

1.4.1.2. Ashrafieh District

Ashrafieh is a district of unrivaled beauty and charm tucked away in the heart of busy Beirut. This historic area is a real jewel in the crown of Lebanon because of its rich history and lively culture. Ashrafieh reflects the soul of the city unlike any other neighborhood, from its meandering alleyways and distinctive architecture to its bustling markets and exciting nightlife. Ashrafieh is a melting pot of cultures and ideas, where old meets modern and tradition meets innovation, with a varied population of inhabitants and tourists from all walks of life. It suggests that humans lived on the Achrafieh highlands for a very long period. The region contained a burial ground where historical artifacts were discovered and now can be found at the National Museum of Beirut.

i. Ashrafieh's Architectural Heritage

Beirut saw a substantial expansion in the middle of the 19th century as a result of an increase in trade and immigration. Its expansion was also aided by the migration of refugees from intercommunal strife in Syria's interior and Mount Lebanon. A large number of wealthy Greek Orthodox merchant families moved to the eastern semi-rural districts as the ancient city's population grew more and more congested. They built opulent villas with spacious gardens and post-facing views here. The Butros, Gebeily, Trad, Tueni, and Sursock families, among others, are notable for having made their fortunes via the silk trade, currency exchange, and taxation. As a result, during the 1860s and 1870s, they became the city's largest property owners and tax payers. Many opulent homes were built on the hill's slopes at this time, and the hill came to represent Ashrafieh. The Grand Duke of Russia, Nicholas, was lodged at one of these villas—Nicolas Sursock's palace—during his visit to Beirut in 1872. Other notable villas include Elias Sursock's palace, which hosted General Gouraud during the French Mandate before being demolished in the 1960s, the Fadlallah Butros Palace, which was finished around 1863, the palace of Moussa Sursock, which was finished around 1870, and the Taswinat al-Tueni, a palace constructed by Georges Tueni in the early 1860s. Eventually, Nicolas Ibrahim Sursock bequeathed the Municipality of Beirut the final substantial home built in 1912 as a land donation or waqf when he passed away. The Sursock Museum is its current name. These extravagant homes still serve as symbols of Ashrafieh's rich architectural history today; one such house built for Abdullah Butros was sold in 2018 for $22 million.

Figure 27. Achrafieh's late Ottoman palatial homes.

ii. A Changing Landscape

Several of the city's historic structures from the late Ottoman and French Mandate eras are located in Ashrafieh. Regrettably, the Civil War destroyed much of this legacy, and many buildings had to be rebuilt in the years that followed. The region also had multiple development booms, during which time tower blocks largely displaced the region's constructed history. For a variety of causes, such as inheritance, evicting tenants on "old rents," or due to neglect, historical structures have been demolished. At the moment, the region is home to Sama Beirut and SkyGate, two of Beirut's largest structures. Despite campaigning by civil society organizations, only a small portion of Achrafieh's remaining historic structures have any kind of governmental protection. An important historical turning point for activists who have pushed for legislative action since the conclusion of the conflict was reached in 2017 when the Lebanese government enacted a measure to safeguard heritage sites all around the city. The legislation has not yet been approved, though.

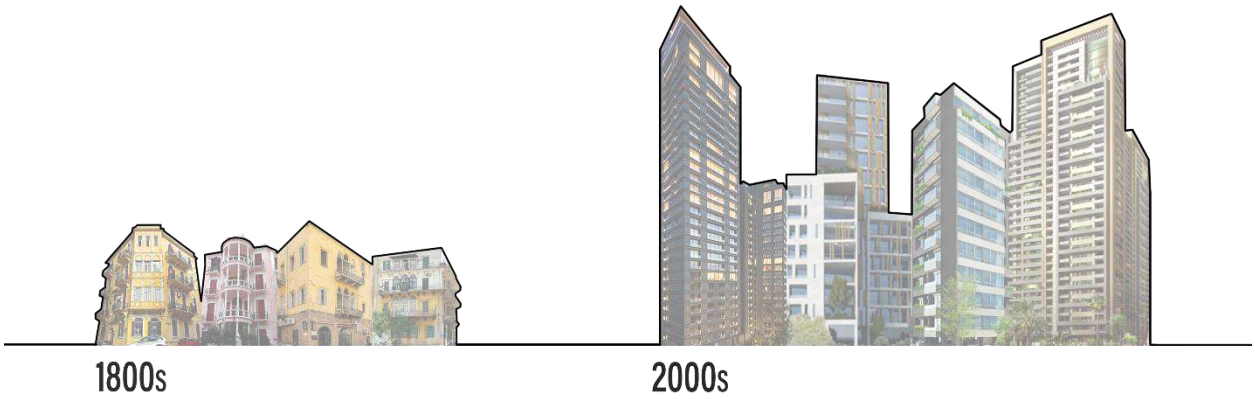


Figure 28. Diagram illustrating the changing landscape in Ashrafieh, from traditional architecture to tower blocks.

iii. A Blend of Styles

The historical and cultural influences of Ashrafieh may be seen in the architecture. Beirut saw a period of urban expansion between the late Ottoman and French Mandate eras that witnessed the erection of numerous public and private structures in a variety of architectural styles. These designs frequently combined elements of Lebanese, French, and Ottoman architectural traditions. The most dominant type of architecture that the Ashrafieh hosts is the neo-classicism, which was vibrant mostly during the late 19th and early 20th centuries. This style of architecture is notable through its grandeur, symmetry, and simplicity. At Ashrafieh, large entrances with columns, pediments, and cornices are typical of neoclassical architecture. These structures often have symmetrical façades with balconies and windows that are uniformly spaced apart. Art Deco is another type of architecture in Ashrafieh. The geometric outlines, streamlined forms, and vivid colors that defined this style when it first appeared in the 1920s. At Ashrafieh, ornamental embellishments on Art Deco buildings include stylized floral designs, sunbursts, and chevrons. These structures frequently incorporate polished stone, glass, and metal, as well as curved or stepped designs. The typical Lebanese homes of Ashrafieh, which have stone walls, arched windows, and interior courtyards, have Ottoman influences in their construction. These homes frequently feature flat roofs and symmetrical architecture. The Ottoman-inspired elements can also be found in the ornate details such as the wrought iron balconies, wooden shutters and intricate tile work.

Generally, Ashrafieh's architecture is varied and represents the region's extensive history and numerous cultural influences. The region is distinctive and intriguing to explore thanks to the buildings' mixture of styles, materials, and ornamental accents.

1.4.1.3. Hamra District

Many sites and attractions are proof of Hamra's rich culture, history and education. One of the most-known attractions in Hamra is the AUB (American University of Beirut), which not only offers the most prestigious academic learning to students, but also displays an astonishing collection of artifacts dating back to prehistoric times, especially to the Ottoman Empire. The American University offers undergraduate and graduate studies in many areas, and its architecture is proof of Beirut's mix of construction styles. The most recent building in the university was designed by the famous architect Zaha Hadid, who made sure to incorporate a mix of modern and traditional Lebanese styles. Ras Beirut Cultural Center, another important site in Hamra, serves as a central point for cultural activities and events. The center's public library and archives are accessible to everyone, offering a wide range of cultural materials. Furthermore, Hamra is known for the Makhoul Street Market, which is an outdoor market, always jammed, offering a variety of goods and traditional Lebanese foods. Another landmark in Hamra is the Hamra Urban Gardens, which is a community garden project that promotes sustainability and urban agriculture.

From his modest music store, Hamra resident Michel Eid has observed the rise and fall of Lebanon via the shifting fortunes of the famed Hamra Street for more than 60 years. Hamra Street was the epicenter of Beirut's opulence in the 1960s and 1970s, housing the best movie theaters in Lebanon, cafes frequented by intellectuals and artists, and stores carrying high-end foreign brands. The Boulevard has seen a renaissance in the last ten years, thriving with lively pubs, eateries, and foreign brand retailers. But right now, many of its shops are shut, the street is filled with homeless Lebanese and Syrian refugees who are begging on the streets, and rubbish is piled up on its corners. The street has been devastated by the economic collapse, much like the rest of Lebanon. At the age of 88, Eid recalls the turbulent years of the Lebanese Civil War, which lasted from 1975 to 1990. At that period, Hamra saw militia clashes, killings in coffee shops, and even Israeli forces walking down the street at one point. Nothing, in Eid's opinion, was as terrible as the current predicament.

Figure 29. In the first picture, taken on September 24, 1982, Israeli soldiers are shown following a shooting incident that took place on the main shopping street in Hamra. The second picture, taken on January 14, 2022, shows a woman passing by the same corner on Hamra street in Beirut, Lebanon.

i. Bedrock

The coronavirus pandemic and the enormous explosion at Beirut's port in 2020 further exacerbated the devastating economic crisis that has befallen Lebanon since October 2019, culminating in what the World Bank has called one of the worst financial crises in the history of the world since the mid-1800s. Due to exorbitant rents and other monthly expenses, several stores in Lebanon have closed as a result of the economic downturn. The effects may be seen on Hamra Street, once known as Beirut's Champ Elysees and home to a thriving, international center of business, culture, and nightlife. Considering that many streetlights are out of service owing to energy disruptions, it feels desolate before midnight today.

The crisis has had a significant impact on daily life in Lebanon. After losing many of its pre-war symbols and having a significant refurbishment in the early 2000s, the once-thriving Hamra Street has been severely damaged. While it saw a recovery in the last 15 years as a result of the introduction of worldwide chains like Starbucks and Nike, the current financial crisis has forced many firms to close once more. Notwithstanding the difficulties, there are encouraging indicators. Bars and clubs lure youthful crowds with live performances of vintage Arabic music from the previous century, and a new generation of young people from all sects have carried the progressive spirit of the Arab Spring to the street. While the road to recovery will be long and difficult, the resilience and determination of the Lebanese people offer a glimmer of hope for the future.

ii. Contrasting the Past

During the day, Hamra is still a busy street, with many people visiting its hospitals for care or to enroll at the prestigious American University of Beirut, one of the best universities in the Middle East. Elie Rbeiz, a resident of Hamra, claims that the city has changed since its earlier days. Since 1962, Rbeiz, a 70-year-old Hamra hairstylist for the affluent, has seen his business suffer from the recession. But he is still optimistic that Hamra will make a full recovery. His store was damaged during the Civil War, but he restored it and opened it again. “I didn't give up back then, and I won't give up now”, he declared.

Not everyone, though, shares that optimism. Naim Saleh, who has been operating a newspaper, magazine, and book stand on Hamra Street for the past 52 years, thinks that the present economic woes have increased hardship and poverty. His business was devastated, and now only a select few can afford to read foreign publications. Saleh said, "See how many beggars there are on the streets. I saw a teenage beggar chasing after some Iraqi visitors. That feels curse-like. Eid is confident that Hamra Street will prosper once more since the Gulf visitors who formerly fueled its economy will not do so and would instead travel to Europe. He considers Hamra Street to be the oxygen he breathes, and he has no plans to leave.

1.4.1.4. Gemmayzeh

Gemmayzeh, a district in the center of Beirut, is renowned for its lively streets, grand architecture, and hip clubs and eateries. During time, this region has witnessed tremendous transformation, with the emergence of new structures and companies coexisting with venerable buildings that have stood for many years. Notwithstanding the changes, Gemmayzeh has managed to keep its own personality and allure. Examining the several factors that influence the neighborhood is crucial if one is to fully comprehend the essence of Gemmayzeh. This entails looking at its design, urban profile, and mobility patterns.

One important aspect of Gemmayzeh's distinctive nature is its layout. The area is distinguished by a mixture of Ottoman-era tiny, twisting lanes and later-added broader boulevards built during the French Mandate era. The layout of the neighborhood is significantly influenced by both the built and unbuilt parcels inside. While some places are more heavily populated with structures than others, others offer more open spaces. One might learn more about how Gemmayzeh has changed through time by examining these diverse components.

The urban profile of Gemmayzeh is a further significant factor. This comprises the distinctive architectural details and design components of the area. Old stone houses and contemporary apartment complexes coexist in Gemmayzeh, resulting in a rich and eclectic combination of architectural forms. Balconies, arches, and other ornamental features are used to enhance the neighborhood's aesthetic appeal. Knowing these architectural details might help us better understand Gemmayzeh's distinctive personality and the forces that have influenced its evolution.

Ultimately, Gemmayzeh's movement patterns have a significant impact on the way it is overall. The traffic, pedestrian, and public transit movements are all included in this. Together with a significant number of pedestrians who patronize the district's numerous stores, cafés, and bars, the neighborhood is home to a variety of automobiles, taxis, and buses. One may learn more about the rhythms of life in Gemmayzeh and the elements that contribute to it being such a dynamic and alive location by looking at these movement patterns.

In general, Gemmayzeh is a neighborhood with a long and complicated history that has been influenced by a wide range of political, economic, and cultural elements. We may better understand the distinctive qualities of this intriguing place by looking at its layout, urban profile, and mobility patterns. These subjects will be discussed in the section that follows in order to provide a thorough description of Gemmayzeh and the elements that have influenced its evolution throughout time.

i. District’s Layout

The layout of Gemmayzeh is a key component in determining the neighborhood's personality. The streets of Gemmayzeh are a reflection of the region's rich history and many cultural influences, ranging from tiny, twisting lanes from the Ottoman era to bigger boulevards that were constructed during the French Mandate period. Understanding the pattern of the neighborhood, which includes both constructed and unbuilt plots, is essential to understanding how the community has changed through time. The key to understanding Gemmayzeh's layout is to look at the numerous components that make up the urban fabric of the area. Building placement, roadway width and direction, the presence of open areas, and mobility patterns all fall under this category. The developed plots in the neighborhood range from old stone homes to contemporary high-rise buildings, and the positioning of these buildings has a big impact on the neighborhood's overall character. Similar to this, the neighborhood's undeveloped plots are crucial for both preserving the neighborhood's general balance between constructed and open spaces and for providing room for public amenities like parks and plazas.

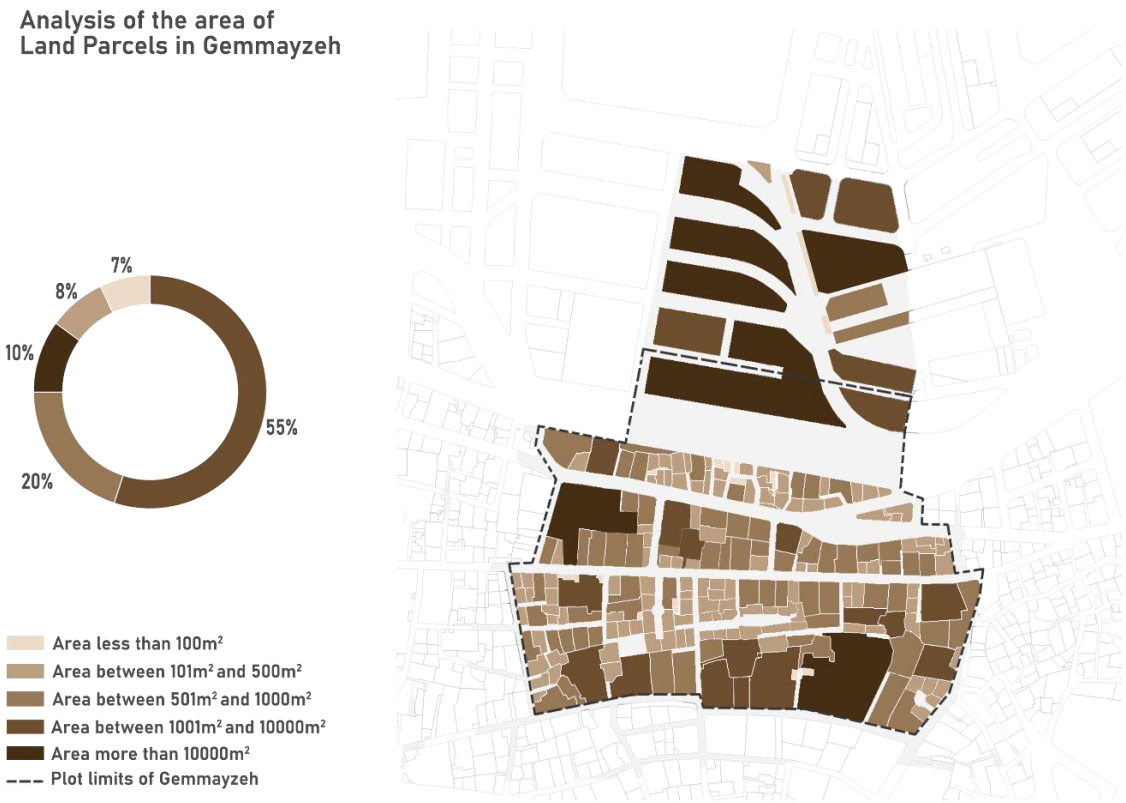


Figure 30. Breakdown of Gemmayzeh's land plots' sizes and areas.

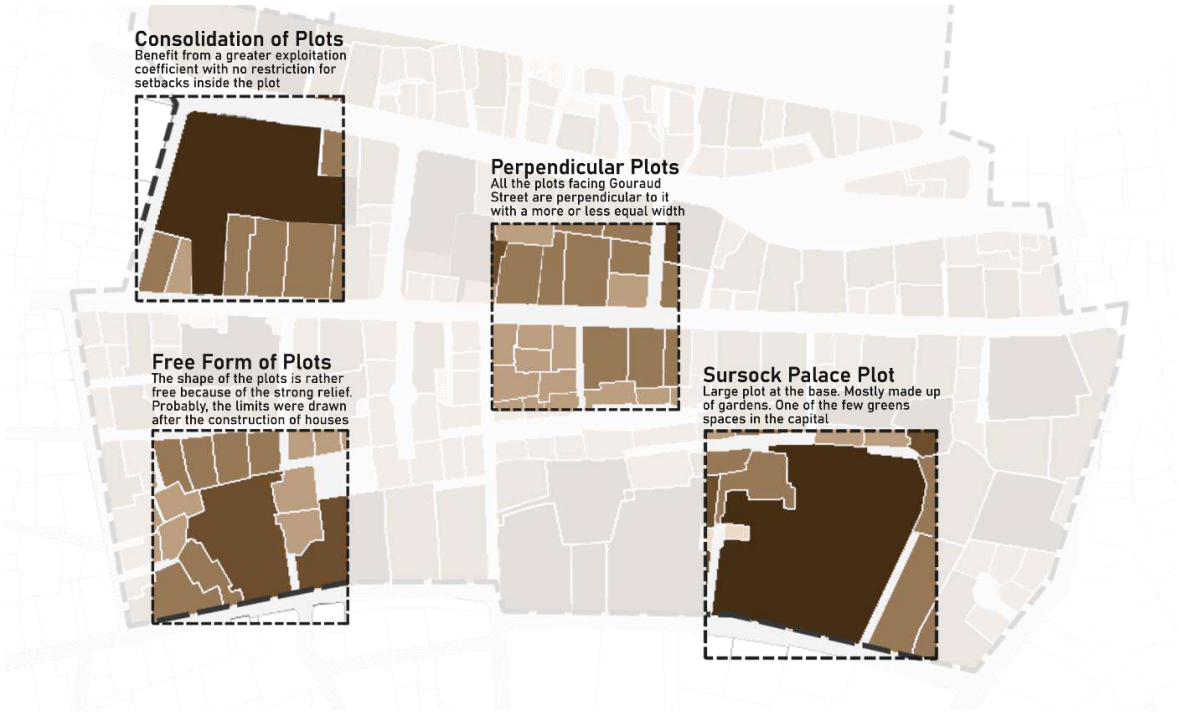


Figure 31. Main specificities in the form and usage of the land plots in Gemmayzeh.

Being one of the oldest districts in Beirut, Gemmayzeh has been through many changes and growth over the years, which led to it presenting a number of built and unbuilt properties. The built properties' entire area consists of 68,000 m^2, or 42% of the whole area of the land plots in Gemmayzeh. Whereas, the unbuilt properties represent 68,000 m^2, equivalent to 58% of the whole land. These lands mainly consist of parking spaces, green areas (both public and private), as well as vacant lands with no use. Locals and visitors, in need for a break from all the bustling of the city, make use of these green spaces which are referred to as Gemmayzeh's "lungs". More precisely, these spaces are responsible for improving the social cohesiveness and the livability of the area, building a sense of community and belonging. In order to lead Gemmayzeh to being a more sustainable and developed neighborhood, one should look more into these unbuilt plots, which offer an immense chance for the promotion of sustainable urban design. These areas offer a potential in order to improve the overall quality of life in Gemmayzeh while addressing important issues like air pollution and traffic congestion.

To put it in simpler words; Gemmayzeh's built and unbuilt plots are proof of the area's extensive history and growth. The built plots show the area's architecture's richness and liveliness, while the unbuilt plots offer a chance for sustainable development and the maintenance of important open spaces. We can understand that it is crucial to balance between the development and the preservation in order to guarantee Gemmayzeh's long-term viability.

Figure 32. Map showing the relationship between the built and unbuilt spaces in Gemmayzeh.

Figure 33. Map showing the various usage of the unbuilt and unused plots, from public and private green spaces to parking.

ii. Urban profile characteristics

Gouraud Street is a well-known and worth looking-into street in Gemmayzeh, with its bright structures and charm. It offers a vibrant atmosphere to residents, visitors and tourists, especially at night. This street is named after a Frenchman, Henri Gouraud, who put his touch and influence on Lebanon's history under the French Mandate.

Figure 34. Profile of the buildings facing Gouraud Street.

The urban profile of the city can be illustrated by the series of buildings that overlook Gouraud Street, with a mix of architectural styles, reflecting the culture and history of the neighborhood. An important number of the erected buildings were constructed in the late 19th century, back when Lebanon was ruled by France. This explains the impact of the French colonization on the architectural style of the area, with arched windows, decorative moldings and elegant balconies, all of which are typical of the French colonial style of architecture. Over time, with changing demands and needs, these structures have undergone many changes; floors were added, some characteristics were hidden or changed according to preferences. This is a further reason as to why we can find a mix of traditional and modern architectural styles. These changes do not mean that the buildings lost their original charm and character; they are still a solid image of the city's architectural heritage. Any person interested in Beirut's urban setting and architecture should visit this location, since Gouraud Street's profile highlights the neighborhood's rich history and cultural variety.

iii. Streets and Movement pattern

Figure 35. Map showing the networks of roads in Gemmayzeh: the 3 main streets, the Charles Helou Avenue as well as secondary, tertiary and pedestrian streets.

One of the most important roads in Gemmayzeh is the Avenue Charles Helou, which is the main axis connecting the city center to the North. This broad street serves as the city's main transit center, sprinkled with stores, commercial buildings and homes. Gemmayzeh comprises additional one-way minor roads, such as the Gouraud Street, Pasteur Street as well as Sursock street. As mentioned before, Gouraud Street is one of the most sought-after streets in the area, since it serves as a hangout for young people with its variety of cafes and restaurants.

Figure 36. Map showing the vehicular traffic in Gemmayzeh, the vehicular spaces as well as the flow directions and the critical crossings between the main streets.

The Gemmayzeh area is divided by three main traffic lanes. While these wide roads present an enormous potential for pedestrians due to their width, they are rejecting them only on the sidewalks. The only pedestrian space remains the always frequented Saint Nicolas staircase. This staircase is another special aspect of Gemmayzeh, linking Gouraud Street to Sursock Street. The 118-step historical street was and remains a favorite go-to place for visitors and tourists, offering breathtaking architecture and enjoyable restaurants.

Figure 37. Saint Nicolas stairs in Gemmayzeh with graffiti of Said Akl on the left, new painted stairs with bright colors on the right.

Figure 38. Map showing the pedestrian sidewalks in Gemmayzeh and the critical crossings between vehicular flow and pedestrian flow.

Gemmayzeh, in addition to the main streets and pedestrian roads, includes a network of smaller lanes and hidden side streets, full of treasures. They present a perfect opportunity to learn about the area's undiscovered corners, home to historical cafes, restaurants, stores and art galleries. Despite Gemmayzeh's charms, these streets can be quite challenging, especially for drivers. People have difficulties finding parking spots, especially during the weekends when the streets are crowded, as well as during the busiest travel times during the days, when people are coming to and from their jobs.

Figure 39. Map showing the concentrated spaces of people in Gemmayzeh during the day and during the night.

During the day, Gemmayzeh is too crowded due to the businesses at Pasteur Street, supermarkets, cafes and offices. Gouraud Street has a traffic jam since it is a main street that leads to Achrafieh, Mark Mikhael and Nahr Beirut. The workers in this area during the day are from Lebanon, Bangladesh, Sri Lanka and Syria. During the night, Gemmayzeh is frequented the most by young people, tourists and foreigners who come from all regions of Lebanon to spend their evenings in nightclubs, cafes and restaurants. It is important to note that Gemmayzeh is mostly known for its active nightlife.

1.5 Transportation Infrastructure and modes of transportation

While developing any strategy for tackling difficulties such as hazards that could affect any population, taking a closer look at Beirut's transportation industry gives some insight into the opportunities and challenges that emerge in the wake of a tragedy. This analysis might provide ways for controlling the transportation-related effects of catastrophes and aiding the recovery process by looking at how transportation networks are set up, how citizens utilize them, and how they can be modified to meet changing demands. The transportation system proves to be of high importance when a city is affected by a disaster, such as the Beirut Port explosion, since it can directly affect how help and supplies are quickly delivered to the affected communities living in the city. Plus, it is important for individuals to have easy access to their homes and lieu of employment in case of a disaster, which aids in the resettlement process, in order to rebuild and recuperate. The forms of mobility present in Beirut, such as public transportation, private automobiles and walking, have an influence on the livability and accessibility of a region.

Due to careless governance and regulatory frameworks, a lack of a dependable and modern public transportation infrastructure, and a car-friendly culture dominated by huge, out-of-date, polluting vehicles, Lebanon's transportation industry is regarded as one of the least sustainable in the Middle East. This condition has resulted in a variety of issues with corresponding negative effects, primary among them being a poorly planned urban transportation system, high levels of daytime traffic congestion, and the associated financial, health, and environmental cost burdens. In short, Lebanon's transportation infrastructure has deteriorated into an unstable network of congested roads with no other means of transportation, intruding on urban areas to impede freedom of walking and cycling, and so adding to the decline in quality of life in Lebanon.

Initiated by the United Nations Human Settlements Program (UN-Habitat) in Lebanon in 2017, the National Urban Policy (NUP) program seeks to promote the control of the nation's quick urbanization, taking use of its benefits, and dealing with its difficulties. The publishing of a diagnostic report in 2018 marked a significant accomplishment for the program in Lebanon, which is a part of a regional initiative that also includes Jordan, Tunisia, and Sudan (UN-Habitat Lebanon, 2018). This was the end of the diagnostic phase of the five-part NUP process, which included the feasibility, formulation, diagnosis, implementation, monitoring, and assessment phases. Once the diagnostic report was published, key stakeholders were consulted, and it was determined that two sectors—transport and housing—were particularly crucial for the nation's sustainable urban growth.

This guide offers a list of policy orientations, suggestions, and priorities that are directed at policymakers, other pertinent stakeholders, and specialists in Lebanon's transportation industry in particular and urban planning in general. They seek to transform the sector toward a sustainable future by assisting in

enhancing mobility and the delivery of transportation services throughout the nation, with a focus on Lebanese cities, given that almost 88.5% of the country's population resides in urban areas.

1.5.1 Problems and Opportunities for the transportation sector in Beirut

With the past 20 years having experienced rapid and consistent population and economic growth, road transport activity in Lebanon has experienced a fast increase, until the start of the economic crisis in 2019 and the COVID-19 pandemic in 2020, when growth ceased. Nevertheless, the expansion of the necessary infrastructure and services did not keep up with the surge in travel activities. Since the end of the 15-year Lebanese Civil War in 1990, neither public transportation nor major measures to encourage and enable alternatives to motorized transportation have advanced by government authorities or the business sector. This has made the Lebanese transportation industry one of the most unsustainable in the Middle East due to the terrible traffic congestion conditions in urban centers and throughout the nation.

i. Heavy traffic congestion and high rates of vehicle ownership

Around 1.75 million vehicles, including automobiles, lorries, buses, and well over 100,000 motorcycles, are registered in Lebanon. Looking closely, there are about 1.5 million cars in the city that are designated for moving goods and people. But with only 5.5 million people in the country, that means there are approximately 270 cars for every 1,000 people, making Lebanon one of the Middle East's nations with the highest concentration of gearheads.

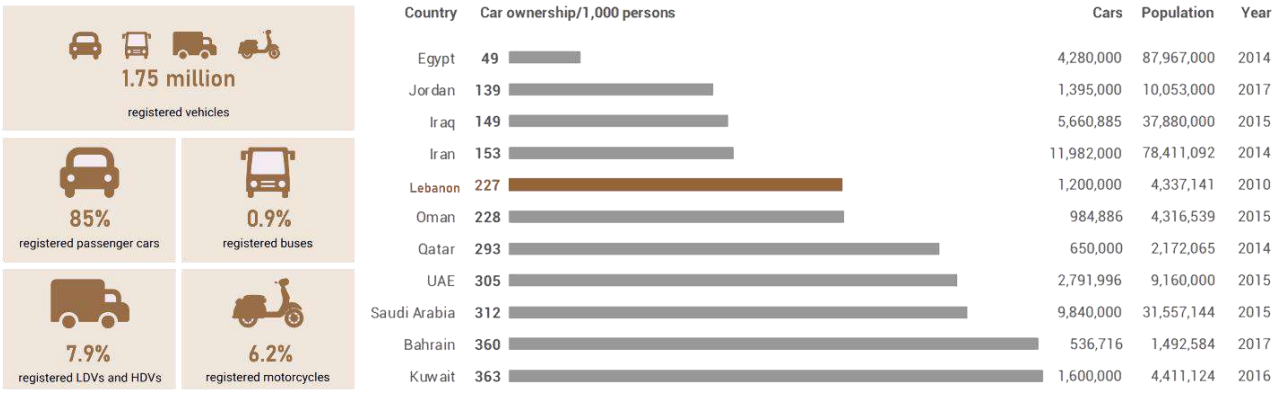


Figure 40. Rates of national automobile ownership per 1,000 people in Middle Eastern nations. (Source: Adapted from UITP (2019))

The use of motor vehicles heavily contributes to high rates of traffic congestion during extended periods of the day, extending beyond the traditional peak times during work commutes, when combined with high population density in urban areas. The underdeveloped and badly maintained road infrastructure slows down traffic because of potholes, the almost complete lack of lane markings and street lights, the absence of merging and breakdown lanes, the inadequacy of traffic signs and signals, and slick pavement during extreme weather. The lack of regard for non-motorized road users is one of the most detrimental effects of the unsustainable motorization trend; walking and cycling have become very unattractive, even dangerous, options.

ii. Implications on energy, environment and health

Since road transportation in Lebanon is primarily powered by fossil fuels—gasoline and diesel account for 97.9% of all fuels used in transportation and at least 40% of all oil consumed in the nation—an increase in demand for motorized mobility translates to an increase in energy consumption in the sector. Consumption levels increase in congested traffic because trips take longer to complete and because driving speeds are slower. Additionally, due to the inefficiency of their outmoded engine technologies, older vehicle models, which make up the majority of the Lebanese vehicle fleet with over 70% of cars being older than 10 years, are to blame for increased energy consumption. The road passenger transport in Lebanon is considered to have a very high energy demand, due to the factors mentioned previously, estimated to be around 15.06 GJ, higher than the global average. The consumption of the fuel releases into the atmosphere emissions which are pollutants, having an impact on human health. Additionally, the use of fuel releases greenhouse gases, such as the carbon dioxide (CO_2), which has a great impact on climate change and global warming. To put it in other words, the transportation industry in Lebanon is the second-largest producer of greenhouse gases in the nation.

Figure 41. The narrow streets of Bourj Hammoud in Beirut, one of the examples of dense urban areas with slow-moving traffic.

The dense urban areas in Beirut which present very narrow streets where slow-moving traffic is typically met, are the most places which encounter these issues. Plus, the suburban areas which are close to primary highways are facing these same difficulties. The slow-moving traffic leads to major problems coming from the mobility sector, such as many respiratory diseases, loss of productivity, as well as a misuse of available funds. Despite all of these problems, there is always hope to make the situation better, especially with the country's promise to reduce its emissions, as already agreed with the 2016 Paris Agreement. In reality, Lebanon pledged to decrease air pollution by 15% by 2030 compared to 2010 levels. To make that happen, they are going to offer incentives to people who trade in their old gas guzzlers for new vehicles that don't consume an important level of fuel. By 2040, authorities look forward to a number of 10% of people to own hybrid vehicles and 35% of people to drive green vehicles. With a target of a 15% increase in the number of people using public transportation, they also want to improve the buses so that more people will make use of them.

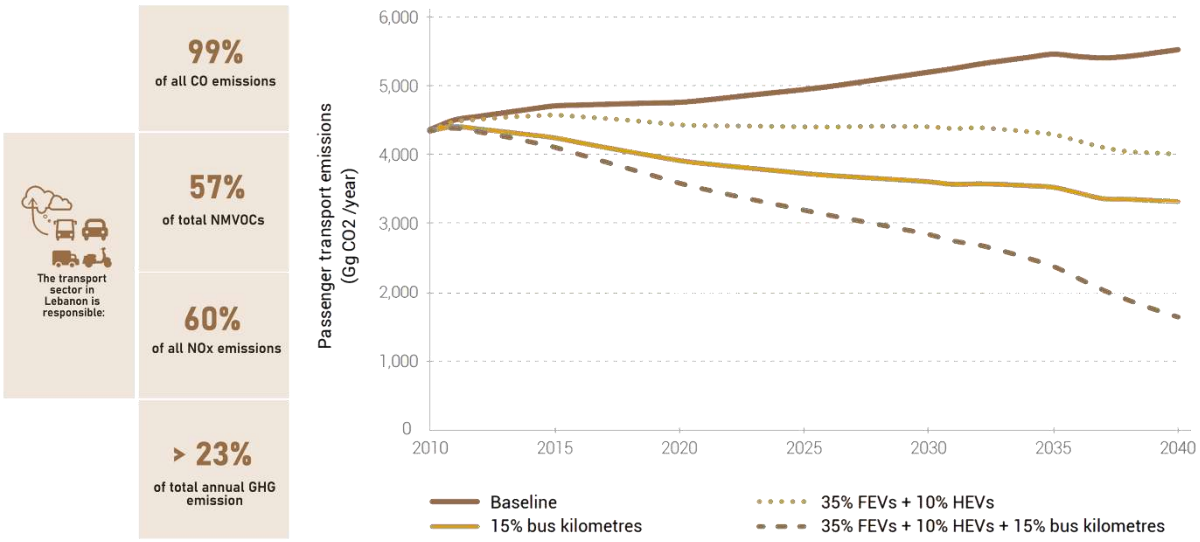


Figure 42. Graph showing the impact of various mitigation techniques on the reduction of the CO_2 in the transportation sector in Lebanon (Source: MoE, UNDP and GEF, 2016)

The baseline scenario (the upper, brown line in Figure 43) would see a continuous and rapid increase in CO_2 emissions, in line with the growing motorization trend, if no mitigation actions are taken, according to a study of the reduction potential in fuel use and CO_2 emissions of the prioritized passenger vehicles (FEVs and HEVs). It also showed that revitalizing public transportation alone (the third, orange line) is more advantageous but still insufficient to stop the expansion, and that just replacing the passenger fleet alone (the second, dotted orange line) is insufficient to stop the growth. However, combining the two mitigation measures (the lowest dashed brown line) has the potential to cut CO2 emissions by 71% in comparison to the reference conventional gasoline-powered cars. This reduction would be sufficient to buck the trend of rising emissions and bring them below their present levels.

1.5.2 Mobility limitations and potential in Beirut

The definition of mobility is to be able to move freely and with so much ease and comfort in-between locations, resources, services and opportunities, in order to meet one's social and economic needs. This is only made possible with the use of effective and easily accessible transportation options. Efficiency is the time and expense involved in using these solutions, which presents another indicator of success and triumph in this field. A person who is caught all day in severe traffic or lives in a city which is deprived of a good bus service cannot be said to have genuine mobility. On the other hand, the residents who enjoy urban areas and going to their places of work and social visits by walking and cycling, which are inexpensive and suitable non-motorized ways, can be said to make the most of mobility. In order to understand how the mobility in Lebanon is perceived, it is important to make sense of all the fundamentals of the mobility which are considered to be efficient and convenient.

i. Inadequate driving safety, bicycle and walking areas

Beirut, just like the majority of cities in Lebanon, has experienced very rapid urbanization, developing very fast in unrestrained ways, which led to it becoming unwelcoming to pedestrians and bicyclists. Henceforth,

Beirut is considered to be a city where it is hard to move from one place to another in any type of transport, particularly by cycling or walking. These challenges took place as a result of primary causes such as:

- The absence of zones attributed to pedestrians only, as well as a very limited number of areas that are car-free. The lack of land-use planning as well as zoning does not encourage cycling and walking in Lebanon.
- Lack of pedestrian elements in the city, such as walkways, crosswalks at intersections, tunnels, bridges, and other elements that could assist the pedestrians and ensure their safety.
- The lack of public spaces, public squares and parks which could encourage pedestrian activity such as cycling, walking and scootering. The Nijmeh Square which is located in Downtown Beirut, even though it is a public space, has been unreachable and unapproachable due to security reasons.
- In the area of Beirut, the lack of bicycle lanes is observable. Limited bike trails are made available in some regions, such as Tripoli and Byblos, which are separated from the main highway relying solely on roadway markings which do not comply with safety measures.
- In Lebanon, highways and roadways dominate the scenery of urban regions. These four-lane highways such as the Charles Helou, Fouad Chehab and George Haddad highway cut the city center in half, passing by many residential neighborhoods.
- Contrary to the European way of living, the priority in Lebanon is given to car drivers, who allow themselves to exercise power over the roads and not stopping for crossing pedestrians. Also, there is a bigger chance of accidents when car drivers do not keep a safe distance from bicycles.

The TRACS NGO conducted a poll after the government imposed the COVID-19 limits on the residents related to their mobility. As a result, 43.9% expressed their concern about maintaining the social distance, which resulted in their preference to walk or use a bicycle for traveling. Yet, these same participants, due to the lack of appropriate infrastructure to ensure their safety in Beirut, expressed their fear when walking or cycling. Because walkers have to share the road with vehicles, the pedestrian accident fatalities increased by 29% during the last recent years.

Traffic Accident Statistic	10-year Annual Average	Yearly Count	Year
Average annual number of crashes	4.365		
Average annual number of injured	5.854		
Average annual number of fatalities	547		
Average annual rate of fatalities (%)	12.5		
Maximum number of crashes in one year		4.907	2014
Maximum number of injuries in one year		6.697	2012
Maximum number of fatalities in one year		657	2014

Table 1. Table showing the Lebanese road traffic fatalities and injuries from 2010 to 2019. (Source: Internal Security Forces data)

The structure of the city, which gives favorable circumstances for non-motorized mobility, encourages walking in the heart of Beirut. Many NGOs started promoting this culture and implementing walking as a daily activity, such as the Achrafieh 2020 NGO which encourages morning walking groups, as well as the Achrafieh Stairs Initiative which planned activities and walking tours around the city. The Great Beirut Area

has been witnessing the implementation of many walking trail pilot projects, including the soft mobility project and the redevelopment of Jeanne d'Arc Street located in Ras Beirut launched by the Neighborhood Initiative of the American University of Beirut (AUB). Moreover, the Beirut Municipality expressed its intention in creating bike lanes in Beirut in order to encourage cycling (Figure 45).

The NGOs of TRACS and Bike du Liban are showing their efforts in launching a bike lane, connecting the northern coastal road to the northern metropolis of Tripoli, passing by many municipalities along the way, such as Jounieh, Byblos and Amchit respectively. Municipalities as well as professional cycling clubs have been organizing throughout the years many cycling events in order to encourage the use of bicycles. All of these initiatives have a possibility to transform cycling from a sport to a mode of transportation in Lebanon, resulting in a central bike culture in the country.

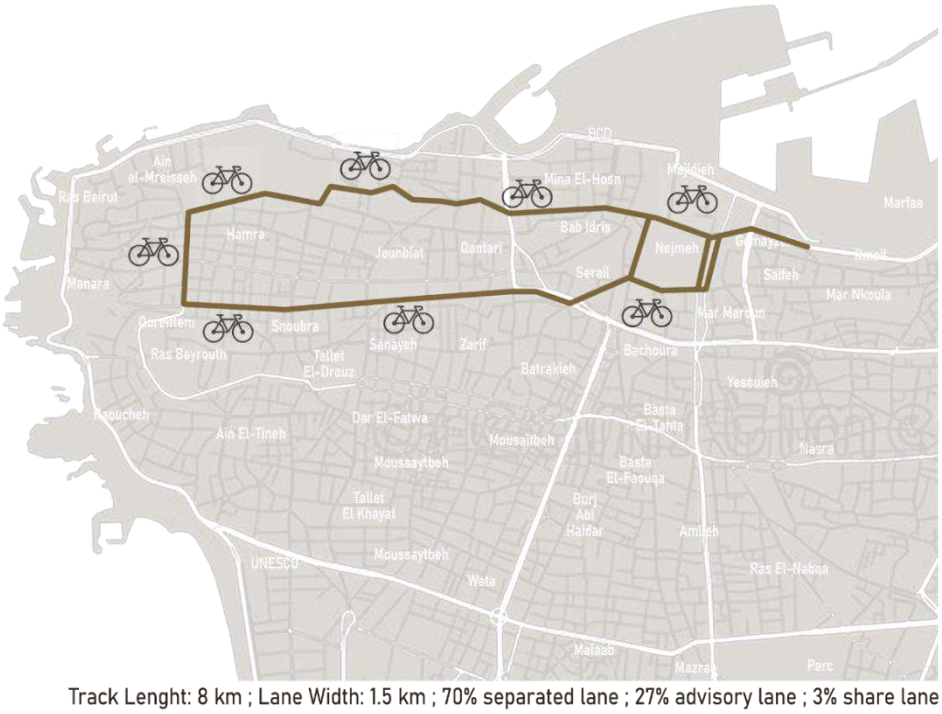


Figure 43. The first phase of the project of the Beirut Bicycle Network by the Beirut Municipality (Source: Municipality of Beirut, 2019)

ii. Lack of innovative mobility options and high mobility costs

It is estimated that driving in Lebanon would cost approximately between 43 cents per vehicle kilometer traveled for a small vehicle to 64 cents for a large SUV back in 2015. The average Lebanese commutes 33 kilometers each day, which results in paying approximately 21,000 Lebanese pounds, which is equivalent back in 2015 to $14 USD. To put it in another way, that is more than twice what a supervisor is required to pay an employee for travel expenses. This is a simplified example to show how much the cost of mobility could be a burden on Lebanese citizens. This situation has been worse since the devaluation of the Lebanese Pound since 2019, making the use of a car not practicable and anything related to it way more expensive. The cost of driving has increased drastically due to many factors such as fuel, pollution and climate change, time spent stuck in traffic and accident risk as well as the expense of commuting in congested areas.

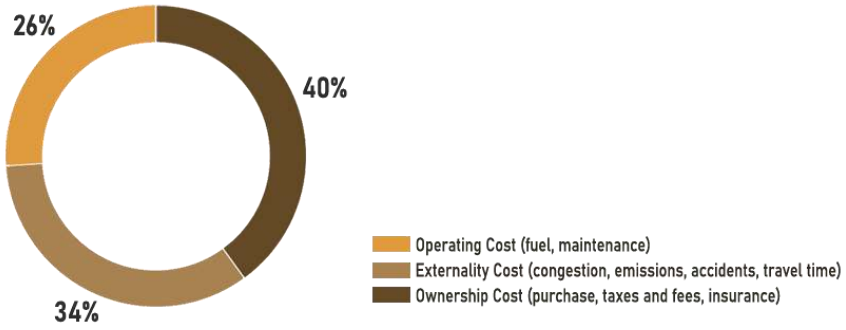


Figure 44. Subdivision of the costs of movement in Lebanon (Source: MoE, 2015)

Cities and their transportation sector should be planned and organized in the right way, which will lead directly to a significant reduction in the cost of the major expenses related to mobility. For that, it is crucial to reach measures in order to decrease the need for driving and commuting. As a result, the amount of fuel that is consumed could be reduced, the time lost in traffic could be limited and the amount of pollution could be kept to a minimum, all of which will lead to a safer environment for the citizens. For that, it is imperative to advance secure, new and practical means of transportation, especially since the transportation sector has an impact on Lebanon's tourism, agriculture and business.

1.6 Architecture and Urban Design

Beirut's urban landscape has witnessed its growth and development following a very long and rich past. On one hand, many civilizations and cultures which resided in the country helped shape its progress, while on the other hand, its location molded its importance as a commercial hub. The urban planning methods adopted in Beirut, the infrastructure networks as well as the numerous architectural styles have all undergone important changes with time. The history of the city's contemporary construction began in the early 1900s, which was a time of fast urbanization and development of Beirut. The city's distinguishing architecture results from the mix between the Lebanese traditions and the new ideas about the planning and construction which emerged after the French occupation came to an end. The new modern design philosophy accorded an importance to geometric shapes, clean lines and the use of innovative materials such as the reinforced concrete. The modern architecture can be illustrated by many examples, such as the UNESCO Palace, known as the Sursock Museum and the Bank of Beirut building. Even through the emergence of modern architecture, Beirut has kept its connection to its history. In the city's different architectural design, a mix of old and new coexist, going from traditional Ottoman-style homes to modern apartment buildings, which came to life in abundance during the post-war construction. This mix is not only translated in interior spaces but also in public ones, where modern sculptures and modern art installations co-occur next to historic sites like Marty's Square. City planning confronted many problems along the years; the absence of reasonable housing prices, many clashes and risks which are recurrent, and the inevitable need for long-lasting infrastructure. Despite all of these difficulties, some innovative planning techniques are proof of the city's constant progress, such as the creation of mixed-use zones, with the coexistence of residential housing, entertainment areas and commercial spaces. The planning also proposes the presence of green spaces which have proven to be vital in any city as well as pedestrian-friendly areas.

Ultimately, Beirut city shows its ongoing aspirations for the future as well as its mesmerizing cultural history by its continuous and challenging expansion and its planning, both of which can give us insight into the challenges and the opportunities it is facing. This knowledge could serve as a basis for the development and the growth of cities elsewhere.

1.6.1 Outline of Beirut's growth and urban morphology

After the 1840s, Beirut city played a role as a "magnet", which led to its rapid urbanization and its escalation into an urban hub. The second half of the 19th century marks the condensation of all the economic and cultural activities in the center Beirut, which proved to be moreover where the administrative and governmental actions take place, as well as the country's main port and only international airport. Furthermore, many immigrants contributed to the expansion of Beirut, such as rural Lebanese coming to the city in order to search for job opportunities or for better life conditions and several Christian refugees from Turkey and Ottoman regions.

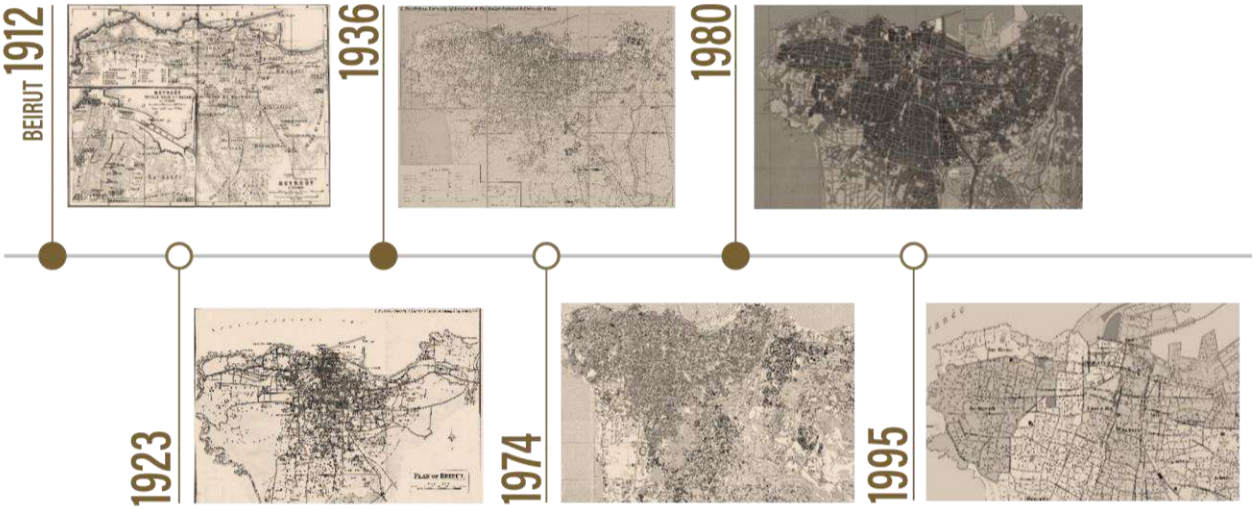


Figure 45. Historical maps of the urban expansion of Beirut, from 1912 till 1995.

The urban expansion of Beirut happened in five stages, each famed by a specific collaboration between the local, regional and international inspirations, all of which were translated and had an effect on the urban dynamics, specifically on the urban space, economy, demography and society.

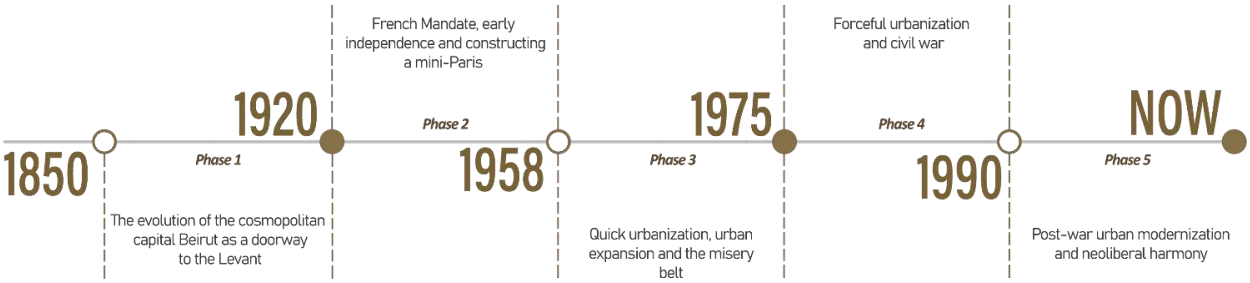


Figure 46. The urban expansion of Beirut followed five stages, from 1850 till now.

- *Chapter 1 (1850-1920) - The evolution of the cosmopolitan capital Beirut as a doorway to the Levant*:
  Beirut, around the half of the 19th century, was a distinctive coastal area where the Ottoman Levantine settled, which means that Beirut was part of the eastern Mediterranean under the Ottoman empire rule. Muslims predominated the Beirut scene, with a very small minority of Christians; out of 16.400 residents in 1846, around 9000 were Muslims. The old Beirut, similar to the morphology of the traditional Islamic city, was not divided into neighborhoods, but instead, those divisions were directly related to the workplace. During those years, the Ottoman Sultanate initiated a series of reform initiatives, the Tanzimat strategies, in order to protect the Empire from external danger and internal disintegration. These reforms benefited Beirut in which the first municipal government was established in 1868, and many infrastructure projects were carried out in order to improve the city's appearance and services. The strategy of Tanzimat aided in strengthening the Empire's ties with the international economy, especially the marine trade, including Beirut, which expanded between Levantine cities and Europe. Furthermore, the achievement of the road and the railway between Beirut and Damascus in 1894 improved the city's status as a regional trading hub. Historians claim that the development of the road between Beirut and Damascus was one of the most influential constructions on the growth of the city. For the first time in history, Beirut expanded outside the ancient city's walls, with an increase of fifteen times the city's original area, growing to the east, north and south. During this phase, the pattern of growth of the city followed a semi-circular form around the ancient existing town, with rural outlying areas developing into neighborhoods connected to the city center.

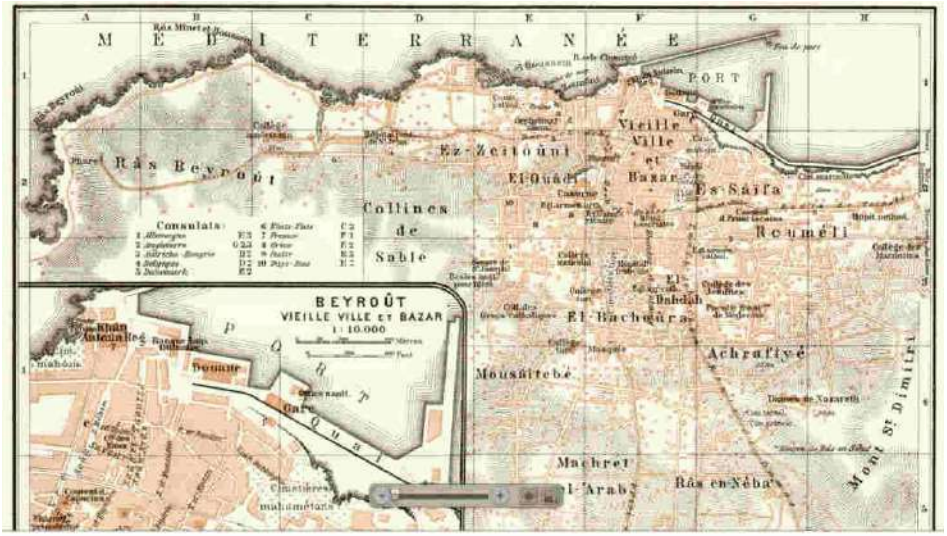


Figure 47. Old Beirut city map from 1911. (Source: Wagner & Debes)

- *Chapter 2 (1920-1958) – The French Mandate, early independence and constructing a mini-Paris:*
  Lebanon was under French authority after the fall of the Ottoman Empire in the first World War, enlarging Mount Lebanon after being a semi-autonomous region under Ottoman authority, to include Tyre, Sidon, Tripoli, Beirut, Bekaa, Jabal Amel and Akkar, forming what was known as the "Grand Lebanon". The French designated Beirut as the capital of Grand Lebanon with the formation of their headquarters in the city, in which they added their colonial touches while continuing its modernization. The expansion of Beirut followed three axes; the Damascus Road to the east, the Saida Road to the south and the Tripoli Road to the north. The demographic boom was accelerated by the settlements conceived by the Armenian and the Syrian refugees, after which the differences in class among neighborhoods became perceptible.

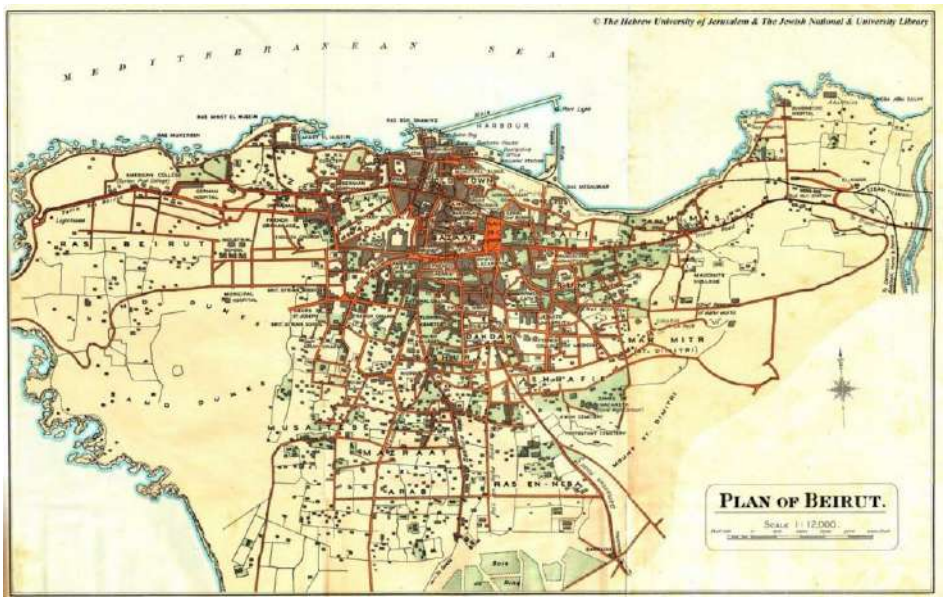


Figure 48. Old Beirut city map from 1923. (Source: Lebanese Arabic Institute)

- *Chapter 3 (1958-1975) – Quick urbanization, urban expansion and the misery belt:*
  In the Middle East, Beirut was the ultimate business hub from the late 1950s through the 1970s, accounting for two-thirds of all economic activity and the center of all financial activity. During that time, Beirut was home to more than half of Lebanon's population, solidifying its position as the hub for all things politically and economically significant. A total of 40% of Lebanon's rural residents left their homes in the early 1970s to live in Beirut. Once Haifa's port failed in 1948, the port of Beirut emerged as a major player for transit services and importing products from the West. In the 60s, a French planner Michel Ecochard was entrusted with the creation of a master plan which was never implemented due to the pressure from private developers. The extensive suburbanization came as a result of the rapidly expanding population in the center, with uncontrolled settlements rambling all around Beirut made of Palestinians, Syrians and Kurdish laborers, receiving the attribute of 'misery belt' for the city. This belt was the reason for many injustices, rebellion and radicalization among the population.

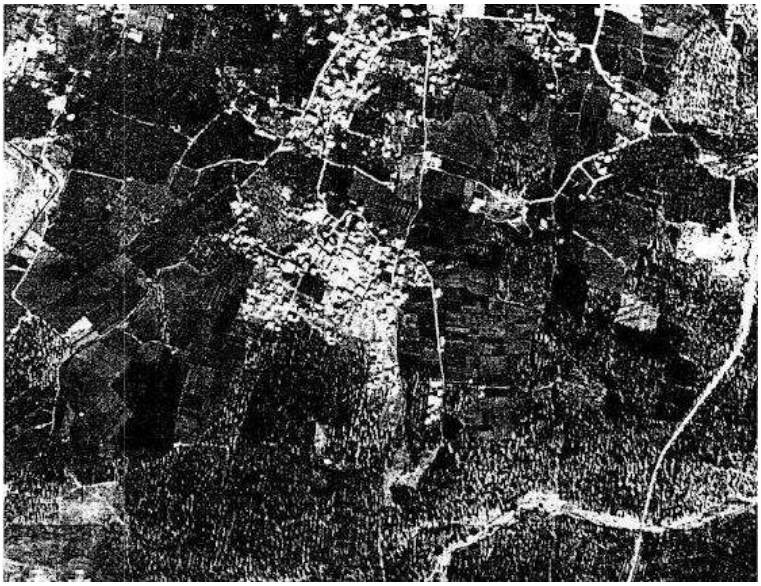


Figure 49. Aerial photograph of some neighborhoods in Beirut in 1963.

- *Chapter 4 (1975-1990) – Forceful urbanization and the civil war:*
  During April of the year 1975, the Lebanese civil war broke out between the Muslim-Leftist and the Christians, resulting in horrific atrocities and massive explosions. The attacks by the two sides were carried out in many parts of Beirut, resulting in a massive urban event, which forced the people and families to relocate from mixed-sectarian neighborhoods to exclusively religious ones. A new spatial order was required which would complement the new political and social orders; the militias took it under their responsibility to rearrange the urban space and territory. The areas were separated one from the other by the Green Line, the biggest physical barrier which was installed separating the east, occupied by Christians from the west dominated by Muslims in Beirut. This new form of urban morphology came as a result of the civil war, which was present until a peace agreement was established in 1990.

Figure 50. Aerial photograph of some neighborhoods in Beirut in 1978.

- *Chapter 5 (1990-now) – Post-war urban modernization and neoliberal harmony:*
  Beirut faced exhaustion after its many wars and invasions; the civil war, the Syrian armed control since 1986, and the Israeli invasion in 1982, which resulted in the death of more than 150,000 people and 800,000 displaced. After the civil war which ended following the National Reconciliation Accord, the militias were disarmed and the boundaries between the East and the West of Beirut were eliminated. Beirut became the symbol of Lebanon's will to reconstruct the capital, and reconstruction efforts were conducted in 1993. A privatized organization oversaw the restoration of Beirut's central area, focusing on the city center, ignoring its other neighborhoods, and maintaining the architecture of the 19th century. Over-gentrification of the city center failed to cross the physical divide brought about by the war-induced sectarian lines.

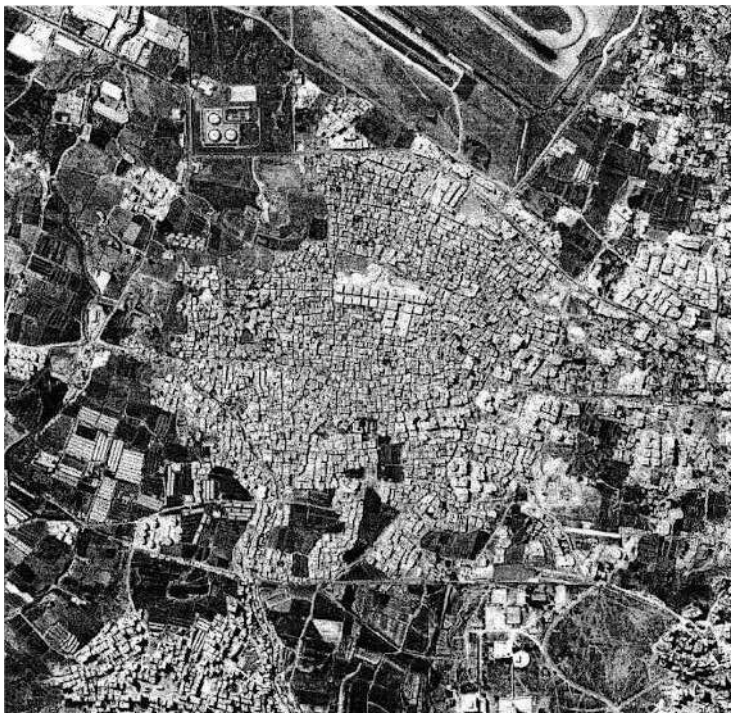
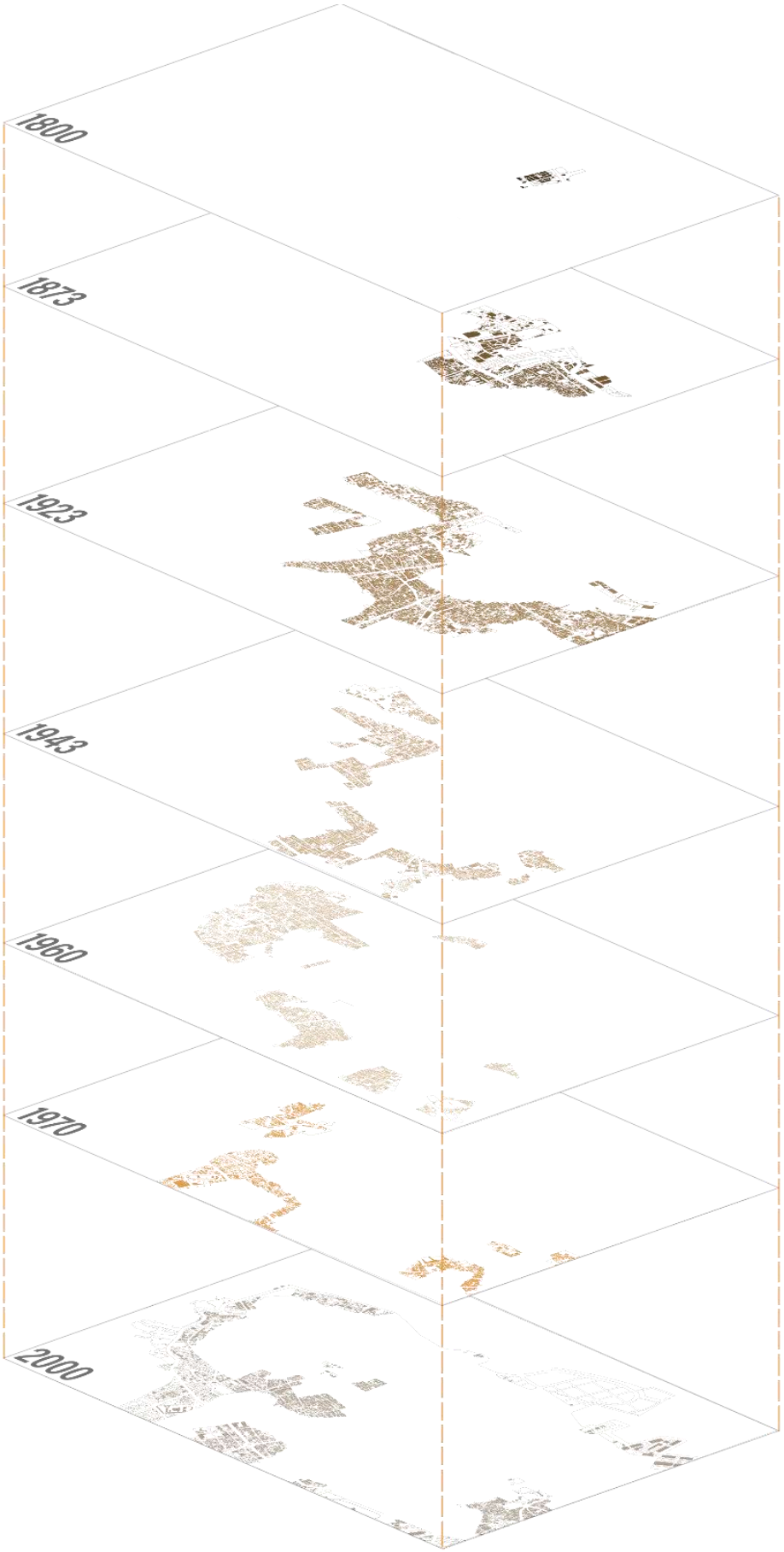


Figure 51. Aerial photograph of some neighborhoods in Beirut in 1995.

From a minor Ottoman town in the 1840s to a modern metropolis with more than 1.7 million residents, the evolution and urbanization of Beirut draws attention to the changing cultural, social and political landscapes which went through many difficulties such as sectarian differences. Till now, the absence of a strategic system for urban development has left the city without a functioning public transportation sector. If not addressed, these problems could widen the social gap and the already-existing social and religious divides.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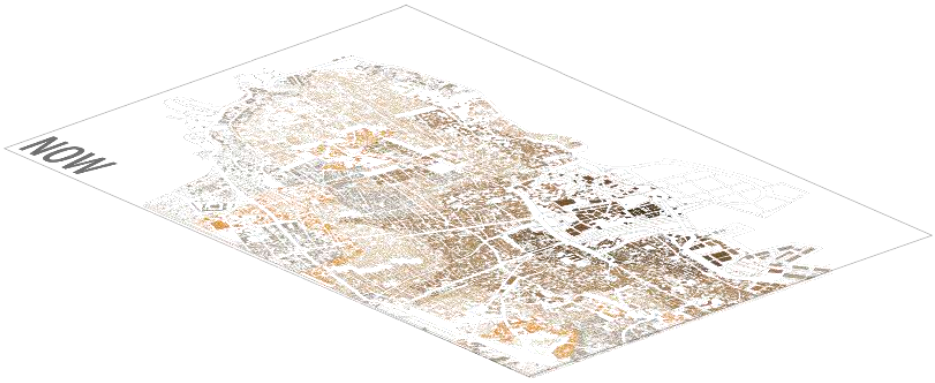


Figure 52. Exploded axonometric of the phases of urbanization of Beirut throughout the years.

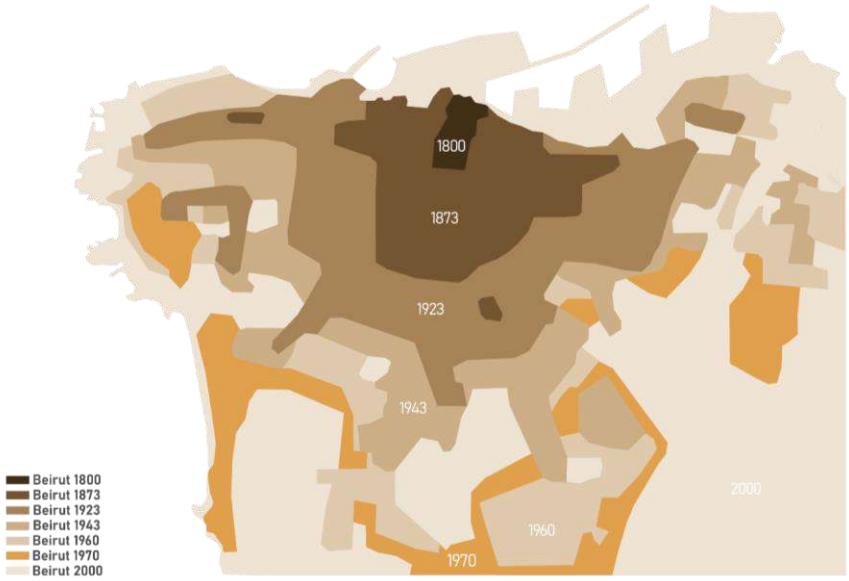
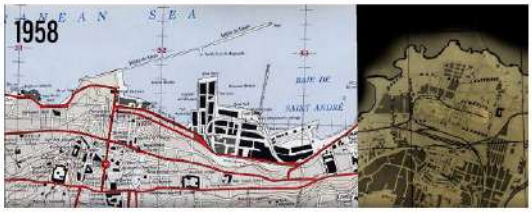


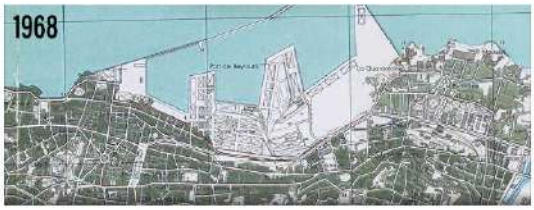
Figure 53. The phases of urbanization of Beirut throughout the years. (Source: Yassin, 2012)

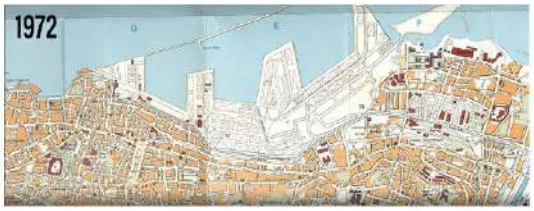
- **Beirut Port Development and Relation to the city**

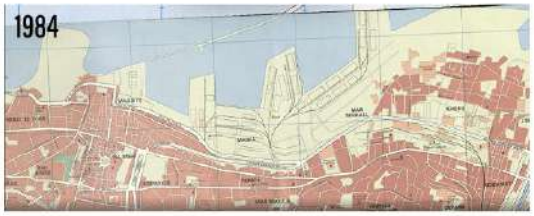
Beirut's port and the rest of the city are physically separated from one another, albeit this barrier is not complete. The port is encircled by water on three sides and is situated on a peninsula that juts into the Mediterranean Sea. The port has been able to grow into a separate entity with its own operations and facilities because of this physical separation. But there is also a close connection between the port and the rest of the city thanks to a variety of roads, train lines, and public transit. These connections allow for the movement of people and goods between the port and the rest of the city, and they have greatly influenced the way the city is organized both spatially and in terms of its urban design.

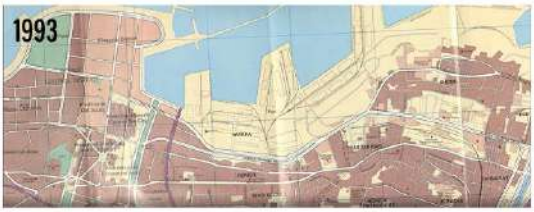
The urban fabric in the area has also been significantly impacted by the port, and the two are not wholly physically separate. The growth of the port has occasionally come at the expense of the nearby urban neighborhoods, frequently leading to the eviction of residents and the demolition of buildings. At the same time, the port has made a considerable impact on the city's urban shape and spatial organization, as well as its economic and social development.











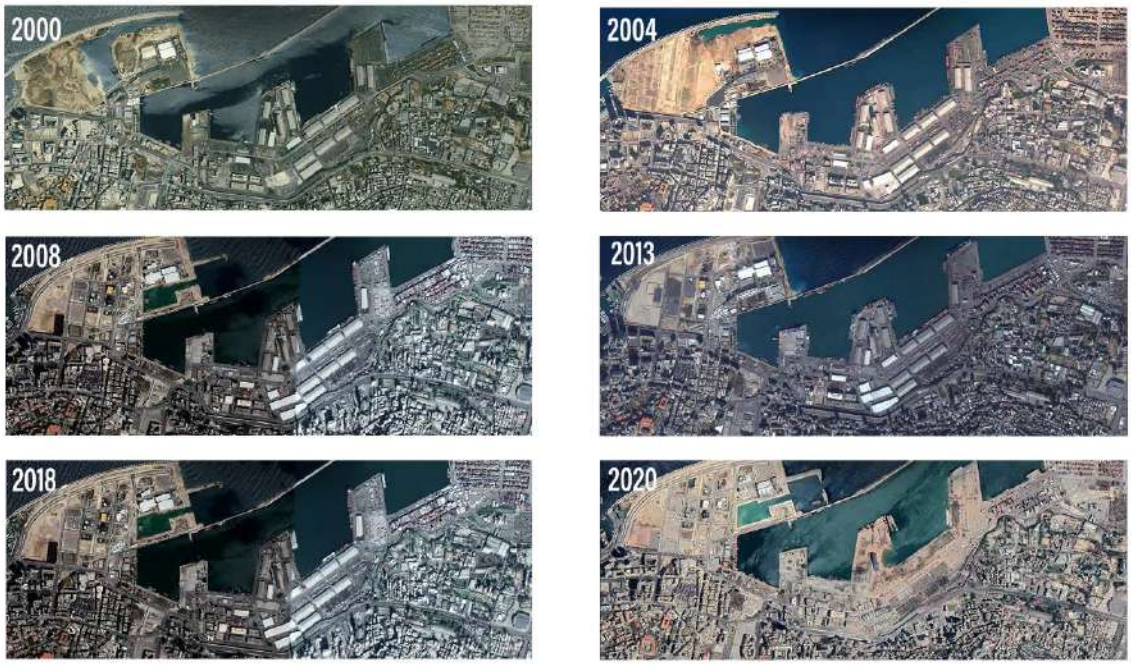


Figure 54. Successive maps showing the development of the Beirut Port and its expansion. (Source: Reddit online, rlebanon)

1.6.2 Birth of Beirut's Modern Architectural Identity

Many events throughout the years led to Beirut's development as a commercial port, such as its coastal resurgence during the 18th century, and Beirut becoming the capital of Vilayet Sidon in 1832 attracting international businessmen and diplomatic representation. But, the years between 1840 and 1864 marked the most significant events that formed a turning point in Beirut's history. To start, Beirut formed the main entry point for the Syrian/Arab interior after the construction of the Beirut-Damascus cross-mountain route. Furthermore, the population of Beirut faced a quick increase from 10,000 to 80,000 in less than three decades, due to the inflow of the population of Mount Lebanon and the Greek Orthodox from Aleppo and Damascus, from 1845 to 1880.

1.6.2.1 First stage of Modernization

By 1876, the first green suburbs were created in the periphery after Beirut expanded over its limited surroundings by 13 times. This new periphery became quickly urbanized, creating another suburban belt, holding only residential quarters. This was due to the migration of the bourgeoisie population outside of the walls of the small city. With this shift emerged three housing types, dominating the townscape; first, the aristocratic class houses, second, the low-slope farmhouses with their adjacent gardens, and third, the structures with red tile rooftops, an image of the bourgeois central hall house, characterized by its triple arch (Fig 49). This house came to be the modern Lebanese house, spreading from the capital Beirut to the mountain settlements.

Figure 55. View of the residential suburbs in 1895, showing three types of housing; the flat-roof farmhouse in the foreground, the central hall house in the middle ground, and the aristocratic house in the background.

At the time, the central hall house with three arch and red tiles roof was not only a sign of prosperity, but also a desire to copy the Occident, after many Lebanese traveled to France. But the question posing a debate is: "Was the modern Lebanese house a creation by the Lebanese, or was it a copied model made to fit the local conditions of Beirut?" The answer to this question came to be appalling; the central hall house that the Lebanese consider to be their identity, their national icon and their traditional building type is a mix and the integration of many hybrid elements. First, a big part of the materials is introduced from Europe, such as the roof tiles and the iron I-beams from France, the cast iron railings from England, the industrially saw timber from Romania as well as the marble tiles from Italy. Second, their most unique feature, the triple arch, is said to be imported from Venice. As for the plan of the central house itself, its spatial organization and planning still seem to be vague as to their origins.

The central hall house developed to showcase the wealth and the social classes of the residents, leading to the emergence of many typologies which are still existent in neighborhoods such as Ras Beirut and Achrafieh; the 'kasr' or palace, which is a house for the noble class, the 'hara' or the high vernacular elevation, which is a family home of the newly affluent bourgeoisie, and the 'bayt' or the low vernacular elevation, which is a farmhouse to the less fortunate families.

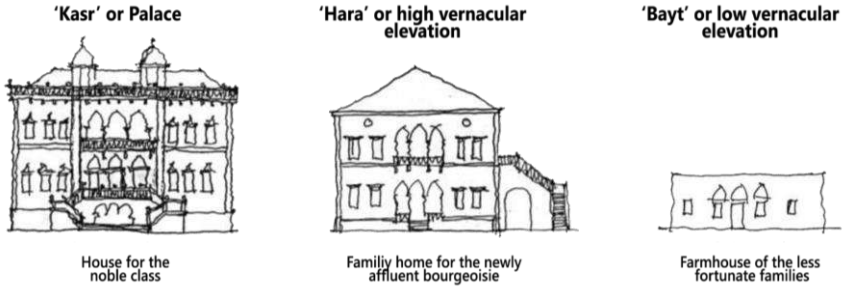
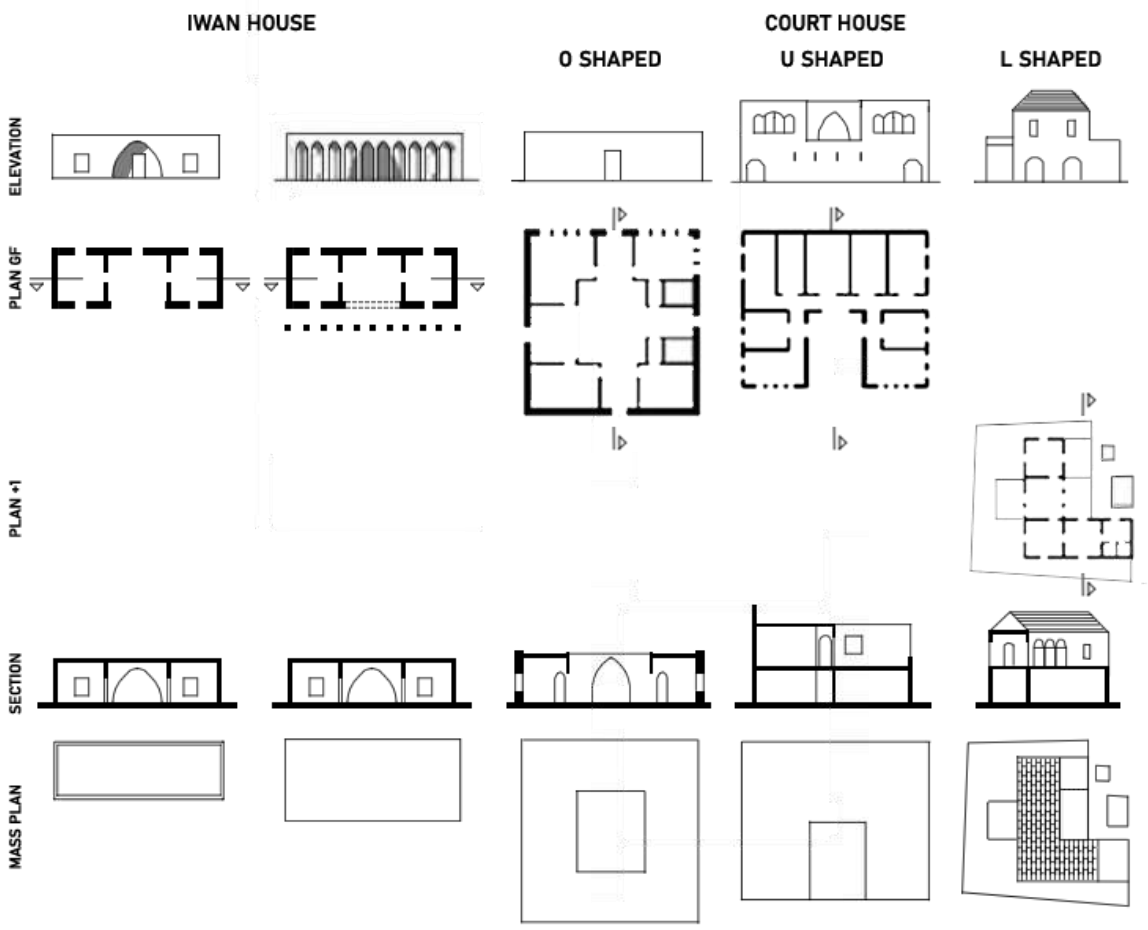


Figure 56. The three emergent typologies of the central hall house elevations.

Sharing the central hall is a common characteristic between these elevations, but they differ in all the other components. The mansions that belonged to the upper-class were characterized by ornate detailing, high and elevated entrance as well as an extravagant staircase. Conventional residences as well as dwellings belonging to the high bourgeois use ornamentation, copying the aristocratic mansions, with typically between 1 to 3 floors, through isolated entrance staircases. The flat roof houses as well as the farmhouses were constructed by craftsmen with standard building methods, thus lacking aesthetics. Their elevations were simple, contrary to the aristocratic mansions, with small and lacking decorative elements. New residential types emerged, such as houses with their ground floor occupied by commercial functions, rental apartments, and apartment buildings stretching vertically.



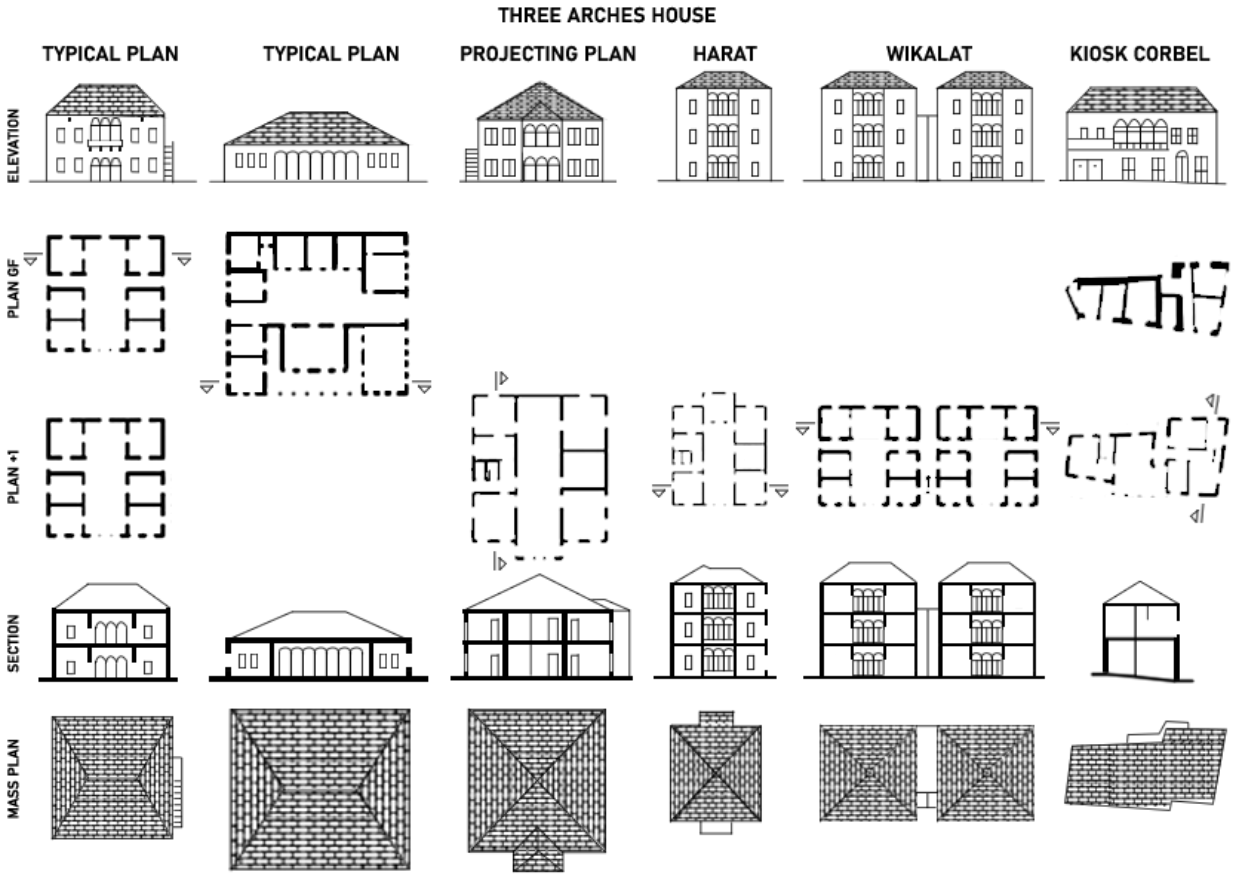


Figure 57. Central hall houses Lebanese traditional typologies.

A new vernacular model emerged after the first stage of early modernization, the central-hall house, which came to be the image of the traditional Lebanese house. This model showed enough flexibility to adapt to various locations, from the city to the suburbs, and to the needs and prosperity of the various social classes. This central hall house model, during the second phase of modernization, was challenged to a certain extent by the introduction of concrete and new materials, as well as the new techniques adopted by architects and engineers.

1.6.2.2 Second stage of Modernization

Cement was moderately introduced into construction processes during the first part of the 20th century, which marked the point where the construction sector faced the most important changes. Due to its high demand, its importation grew five times between the years 1923 and 1930, leading to the foundation of the first cement mill in the area. Furthermore, along this shift, the notion of reinforced concrete was officially introduced and taught in universities. This resulted in civil engineering becoming a distinct profession in the practice of construction. Malleability and susceptibility are characteristics of concrete which led to its adoption as the “new vernacular” by builders, since this material was more likely to serve as a form of imitation. Plus, concrete was observed to be a cost-effective replacement for stone dressing and engraving. The various intermediate shapes of the central bay throughout the course of less than a decade must be examined, beginning as a triple arcade and ending as a standard rectangular entrance, in order to understand the architectural styles of central hall constructions from the mid-1920s to the mid-1930s. This shows how much a small change can completely transform a structure. Two new facade styles

emerged after the implementation of the middle bay in the buildings: the bow window type, imported from Europe, and the veranda type, made by adding a concrete veranda, coupled with stylistic variations. The second stage of modernization illustrates a dualism; a mix between a traditional interior and an incredibly diverse exterior. The construction, although integrating an array of elevation styles such as Art Deco, Art Nouveau, and Neoclassicism, was able to maintain its centralized design and plan distribution as well as its symmetry. During this same period, the center of Beirut as well as its neighborhood was undergoing changes in order to build what is now known as la Place de l'Etoile. For future constructions in this location, street facade strategies were set, adapted to various stylistic treatments.

Figure 58. Street facades adapted to diverse styles and treatments in Place de l'Etoile.

An important structure was erected in 1930, showing the convergence of two trends: the downturn of eclecticism and the establishment of early modernism, the Hotel St. Georges by the architect Antoine Tabet. The convergence of these two architectural trends will end by the second half of the 30s, marking only the beginning of modernism, which proved to be the presiding architectural style in all types of buildings.

1.6.3 Overview of the mix between tradition and innovation

All around the world, urban heritage has been a major concern, and its conservation has been a priority in the construction sector. The perception of urban heritage has been altered, especially after the occurrence of many wars which left many countries destroyed, such as Beirut. The historical urban contexts, image perception and the morphology are afflicted by three aspects: the urban, the buildings, and the community aspects. After the war, Beirut's heritage perception and its image have been re-established by conducting many strategies and efforts. The following section is divided into three parts: reporting conservation strategies, briefly discussing Beirut's situation, and finally highlighting reconstruction approaches.
The goal of heritage conservation is to give history and maintain constructions to future generations. The phraseology employed is diverse and varied. For example, passive conservation is known as a technique which is used to preserve historic sites and ancient monuments. It is the act of preserving what is of value and influencing what needs to be adjusted or altered. Then again, restoration is the fact of re-establishing the original state of a structure, reconstruction refers to the act of completely reconstructing historical structures, adaptive reuse seeks to repurpose a building for a new and a more accessible use, while rehabilitation restores a structure to its primary usage which updates old and valuable structures with new features. In order to keep a building functional, maintenance seeks to retain building components.

As mentioned throughout this research, Beirut was occupied by several civilizations during its history, with many historical heritage left behind from each culture, such as Phoenicians, Byzantines, Romans, Hellenistics, Ottomans, Mamluks, French and many more. The Downtown of Beirut is an important cultural and historical point in the city, with monuments dating back to more than 5,000 years. Moreover, as shown in a previous section, Beirut's urban growth progressed through five stages, all of which began in the Downtown of the capital. This illustrates the area's importance and its contribution to the development of the country. The wars and conflicts which took place in the last century, such as the Arab-Israeli conflict, the civil war and the Israel-Hezbollah war, had a significant impact on Beirut's history and heritage. One of the most destructive conflicts, the civil war, greatly affected the city's urban heritage, damaging many buildings of great history. After the war, most of the historic structures in the city have been either partially or totally destroyed, resulting in the emergence of many policies for the preservation of Beirut, oriented mainly to reestablish the perception of a city valuing heritage. In an effort to revive memories of the city before the war, architects worked and renovated the downtown area. They divided the heritage buildings into three main groups: archeological, religious and repaired structures. The strategy of any building's conservation was based on many factors, such as photographic and architectural inspections, a study of its history, its original design, and their distinct circumstances.

A series of archeological sites, columns, pieces of old constructions and foundations were discovered during the renovation of Beirut, which were later preserved and exposed. The valuable heritage buildings which were partially destroyed have been restored and renovated in order to ameliorate their appearances and facades and reinstitute their original state. These various techniques have been used in order to preserve the perception of the ancient capital as it was before being damaged by the conflict.

Figure 59. A picture of one of Beirut's streets after the war on the left, and after undertaking conservation a few years later on the right. (Source: Solidere, 2010)

As for the totally destroyed structures in the Downtown, three main solutions have been identified in order to reconstruct and rebuild them. The first grouping consists of reconstructing buildings in their original

condition. The second grouping are the buildings that do not have any historical evidence of their image, while the third grouping comprises classic and modern design features, a mix between the traditional and the innovative. However, a few structures in Beirut have not been preserved in any form, still a display of the violent years. Many structures have been erected since the war, some entirely modern, while others were assembled in order to complete the urban fabric, like the Beirut Souks. These souks have a plan for heritage composition with new and innovative features and other structures which are totally contemporary, with parametric forms. A distinctive image perception is observed when this blending between conventional and modern is remarked, giving the city a new character.

1.6.4 Planning trends in Beirut

In order to simplify the difficult planning process, it is important to determine a framework that defines the urbanization trends while employing a categorization criterion. Two types of tendencies are distinguished: general trends, which are imported models found in many Middle Eastern nations, and particular trends, which are distinctive to a given setting. The comprehension of the connection between contemporary urban planning trends and traditional methods is an important notion to grasp, while taking into consideration a chronological perspective. Colonial, contemporary and post-modern planning are the identified three models of planning in Beirut, described in the following section.

- *Colonial Planning*:

The colonial planning is credited to two eras: the French Mandate (from 1920 to 1930), and the late Ottoman authority in Lebanon (from 1830 to 1910). Western patterns, which were first used in Istanbul and other provincial capitals of the Ottoman state, constituted Beirut's planning during the late Ottoman era. During the French Mandate period, the Beaux-Arts and the Haussmanian model were overlaying Beirut's medieval structure, causing the old city to vanish and a new early modern Beirut to be built occupying its place. Other areas faced with the colonial planning where a dual city model was applied, were met with the decision of preserving the old city and adding new sections next to the existing one, contrary to Beirut's colonial design process, which implicated superimposition instead of juxtaposition. This shift should be borne in mind when taking into consideration the identity of Beirut, completely erased of its medieval urban fabric. During the 80s, colonial planning was looked into, especially how it was affecting modern-day Beirut. In the 90s, the modernist method of planning came under criticism, sparking a shift in taking into consideration participation in planning and decentralization. In fact, the 1931 danger plan for Beirut was not fully executed, showing that the French and the local community were in negotiation. The Lebanese did not just accept Western planning methods, they actively negotiated their use to advance their own goals, which has been challenging to implement. As a result, Beirut experienced "planning disarray". Debate has been going around about the concentration of buildings from the colonial era in Beirut's center. Urban and architectural historical study has been carried out to incorporate the colonial past into Lebanon national heritage, but resistance to this integration exists. Planning studies in Beirut, prior to 1990, addressed the municipal and metropolitan scales, the city as a whole. After 1990 and for the first time, planning studies target the micro-scale (the neighborhood scale), in order to form practical responses to the continuous destruction of Beirut's colonial past.

- *Modern Planning*:

The second phase of Beirut's modern history introduced a different planning paradigm, known as the era of contemporary planning, from 1940 to 1975. Three significant occasions introduce this contemporary planning in Beirut. The first juncture is the Ecochard plan, named after the urban planner and architect Michel Ecochard and created in 1943. Based on the functional zoning of various activities, the design demonstrated a functionalist rationalist approach to planning. Even though this plan was never carried out, it still had an intellectual impact on the planning models that came after it. It is an unexpected revelation that Damascus has gained more from the Ecochard plan than Beirut has in terms of planning. In his plan, Ecochard opposed the concepts of liberal capitalism, prevalent in Lebanon and Syria during the French Mandate. The 1954 plan was Beirut's second juncture of modern planning, adopting a different strategy than the Ecochard plan. The plan came as a result of multiple pressures applied to planners by politicians, property owners and businesspeople, which led to it becoming the most detrimental design of the capital. The city had been divided into five concentric zones, presented with a decreasing density while moving further from the center. The Ecochard plan, contrary to the 1954 plan, addressed and stressed the issue of Beirut as part of its larger context. The third juncture is the Greater Beirut Plan enacted in 1964, with the assistance of Ecochard. In contrast to the 1954 plan, this plan focused on "Greater Beirut"rather than municipal Beirut. The 1964 plan introduced new laws that permitted collaborative public-private real estate corporations to conduct planning activities, creating a master plan for the region and marketing the new development.

- *Postmodern Planning*:

The count of wars that raged in Lebanon marks a trinity of introductions of new planning paradigms in the city — creating two plans; L'Atelier Parisien D'Urbanisme (APUR) in 1977 and the local engineering consulting business, Dar al-Handasah, introduced the other in 1983. The first rehabilitation plan for Beirut was created in 1977, adopting a collaborative public-private preservation strategy. This plan retained the majority of the city's existing urban fabric with the suggestion that local property owners would rebuild and restore the Central District's less severely damaged areas. The first plan to take into account Metropolitan Beirut was the one from 1983, the only one that has been designed for Beirut that takes the urban level into account. The proposed unadopted plan suggested placing sub-centers near the bustling hub of the city's commercial district. The 1900-2000 post-war period which brought the model of post-modern planning is the final era of Beirut's history. During the period under consideration, the planning of Beirut was affected by:

- The 1991 plan, which was Beirut's second reconstruction plan, generated a lot of controversy and garnered strong criticism, mainly for its suggestion to establish a single real estate firm in charge of overseeing the redevelopment of Beirut's downtown.
- The 1994 plan, Beirut's third rebuilding plan, was made in response to the opposition that developed against the 1991 plan. Dar al-Handasah initially conceptualized the 1994 strategy, which Solidere then presumptively adopted
- The 1989 Ta'if Accord, a political agreement putting an end to the Lebanese civil war, which has the most effect on how Beirut develops urbanly.

The restoration of Beirut's Central District by Solidere is an example of corporate planning, featuring a single real estate corporation being in charge of rehabilitation and redevelopment during the postwar era. Radical planning, including political negotiations and active participation from locals, was another trend that intended to rehabilitate illegal communities in Beirut's southwest suburbs. Moreover, community-

based participatory planning was established, growing to be a significant trend in planning in Beirut. International aid organizations that place a strong emphasis on environmental impact assessment studies have helped environmental planning become a significant trend. Yet, because of flaws in the current management structures, implementing planning policies in Lebanon continues to be a challenge.

- Beirut Urban Grain

Beirut's design is quite intricate. A battle over urbanization is involving the two primary players; the imported western design and the more Arabic style. Both have unique constitutions and ways of doing things. With an accumulation of structures inside boundaries established by the streets and locations, the Arabic design appears to be effective. Every structure is closely related to the main streets. Every structure faces the main thoroughfares. Another hierarchy of roadways is present within the block, but they are always surrounded by buildings. There is a vertical hierarchy in the Beirutian block as well. Over a ground floor that is open to the public, various activities are piled. Western culture operates very differently. The Haussmanian typology calls for axes from which we can observe a big portion of the situation. The main road axes are focused on the housing blocks. In contrast to the oriental block, which lives more independently, the Haussmannian block is a component of a larger territory. Numerous public spaces that are connected to the main streets are incorporated within the blocks. Every building has the exact same rise and facade design. The structure is mono-programmatic as well. The local model and this imported model will clash since the local model will generally oppose the separation of functions.

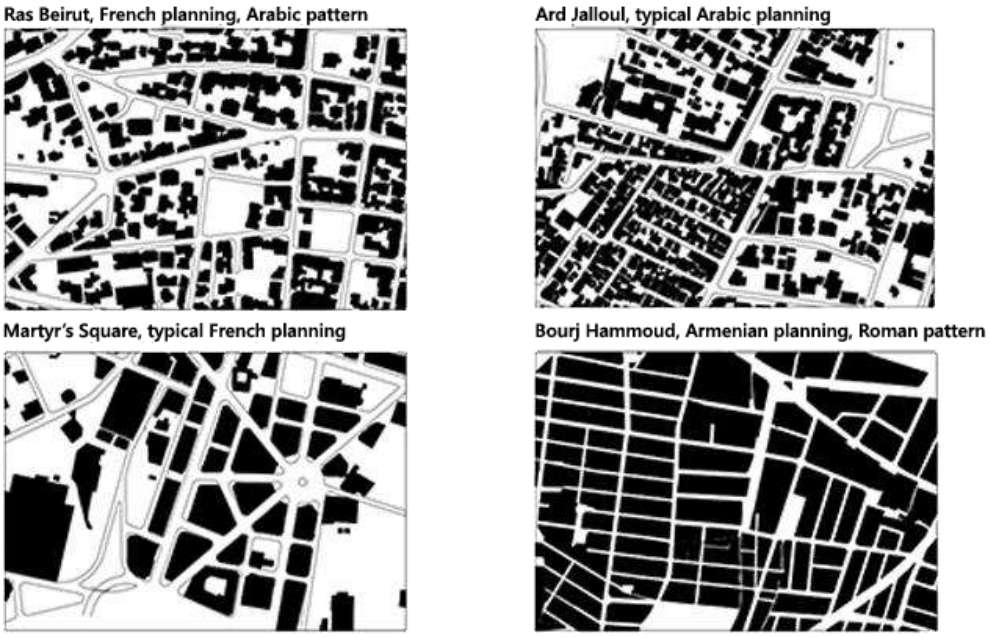


Figure 60. Urban form of Beirut neighborhoods following different planning patterns.

Even if the western design is well defined in every detail, it is clear that the Arabic layer has not accepted the importation. In Ras Beirut, this theoretical model does not appear to be as well established as it is in Martyrs Square. The contrary is also true, as is evident in the Armenian neighborhood of Bourj Hammoud. We discover a geometric grid that resembles the Roman design more.

1.7 Dynamics of Land Use

In order to create dynamic urban plans and land use policies, comprehending the dynamics of land use, land cover as well as the variables that underlie these changes is a typical problem that should be addressed. Moreover, it helps in monitoring and the foreseeing of changes in land use by planners, policymakers and environmentalists. The driving forces behind the dynamics of land use change have been the subject of numerous researches, which have found a number of characteristics, including land use regulations, sociodemographic trends, economic conditions, topography, infrastructure availability as well as biophysical elements. By transforming the new or evolving forms of urban agglomerations into the compact, dense, and centralized shape, the economic stagnation has degraded the socioeconomic position, delayed the pace of urban growth and retracted the population from spreading. For example, in more than 30 Sub-Saharan African countries, poor governance and ineffective law enforcement were shown to be the primary causes of considerable forest and habitat destruction. Similar to this, ineffective land use policies would result in less natural green spaces and more urban growth. According to reports, the key forces behind land use change in countries like Ethiopia are population growth and the resulting rise in demand for infrastructure and building supplies. In the Northwestern region of Ethiopia, for instance, these variables were responsible for the increase of urban development and cultivated lands and the decline of natural green zones.

The following section will delve into the examination of factors influencing the development of land use dynamics in Lebanon, identifying variables and separating them into two parts: internal and external influences affecting the nation. The main land use issues Lebanon is dealing with include excessive urban development, the deterioration of natural and farmed areas, a lack of suitable urban planning as well as a lack of land use legislation. The abandoning of the agriculture industry, a lack of ties to the land as well as pollution are thought to be the main causes of the degradation of green spaces, not urban growth, which is also thought to pose a threat to green areas. According to the United Nations Development Programme (UNDP), Lebanon's growing population and small amount of land have led to an increase in urban growth. High standards of living and high income levels have also raised demand for additional homes such as summer retreats, chalets, villas, and other additional elements that contribute to the growth of metropolitan areas. Another element contributing to increased chaotic urban sprawl is the high profits from ordeal estate development projects and the lax adherence to land use rules and planning requirements. Formerly built-up lots, unoccupied sites and natural regions like woods and agricultural zones are all being used for these developments. The UNDP emphasized that Lebanon's evolving land use lacked the necessary urban planning rules and law, with the dynamics of land usage not being properly watched.

1.7.1 Qualitative Assessment of the variables influencing the built-up land use

A shift in Lebanon's built-up land usage, between the years 1984 and 2019 is strongly noted. Five patterns in the development of built-up land use throughout five different time periods are observed; from 1984 to 1990, from 1990 to 2004, from 2004 to 2009, from 2009 to 2014, and from 2014 to 2019. These five phases' linear tendencies serve as indicators of their dynamics. For example, the first phase's urban development correlates with a period of downturn. Similar to the first phase, the last one exhibits a marked slowdown in urban development, which may signal the beginning of a stagnation phase. The accelerated rates of urban development corresponding to the second and fourth stages, are in some ways, compared to the

aforementioned phases. A specific increased urban development that corresponds to the third phase is also noted. The elements influencing the changes in these phases were then linked and identified using qualitative and quantitative types of study.

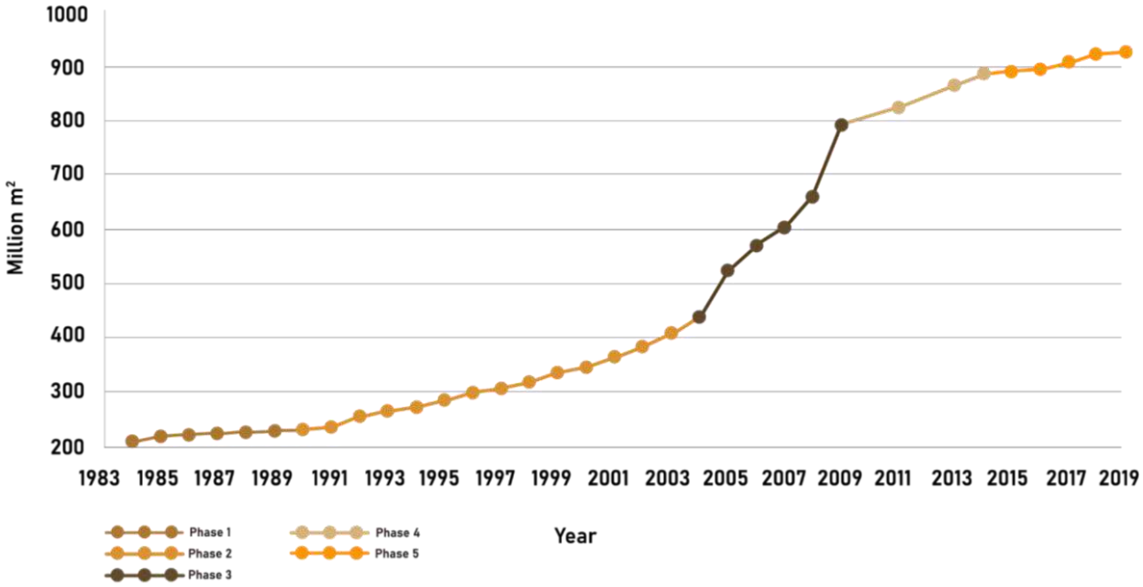


Figure 61. The linear stages of the development of the build-up land use in Beirut from 1984 till 2019. (Source: Walid Al-Shaar, May 2021)

In order to determine their significance and effects, the factors relating to each of the five phases of urban development are explored:

- *Stage 1 (1984-1990):*
  As shown in the graph, this phase indicates a relatively gradual increase in built-up land usage. The key factors underlying this pattern are the Lebanese-Israeli tensions, the presence of the Israeli army in south Lebanon, as well as the political and security vulnerabilities portrayed by the civil war, beginning in 1974 and concluded in 1990.
- *Stage 2 (1990-2004):*
  During these years, the rate of built-up development accelerated compared to the previous years. The contributing elements behind this rising tendency are several; the geopolitical and the calm of the internal security brought about by the civil war's end in 1990 is one of the primary drivers. The beginning of Syrian mentorship to secure internal security stability and the beginning of the post-war redevelopment process were timed to coincide with the conclusion of the 15 years conflict. Creating the corporation Solidere to manage construction and real estate rentals in Beirut's downtown is a significant portion of the rebuilding. Since 1990, the state has pushed the building and real estate industries through various incentives and laws. The plurality of Lebanese politicians has investment projects in the building sector, which explains the economic growth dynamo and a means of profit and money circulation. Significant economic developments also occurred during this time period, beginning with the peg of the Lira, the national currency of Lebanon, to the USD at 1500 to 1. Moreover, the September 11th attacks in the USA in 2001 had accelerated the influx of Saudi owners in Lebanese businesses, within the same environment of economic growth.

- *Stage 3 (2004-2009):*
  "Accelerated built-up evolution" best describes the pattern of urban growth throughout this stage. Together with the associated strong economic growth, the political and safety stability attained in the second phase has created a favorable investment environment and raised investors' confidence in the banking, construction, and real estate industries. Furthermore, Lebanon's construction and property industries have benefited from the influx of investments. Nonetheless, other reasons hastened urban development and enhanced overall national stability. A new construction law that was passed in 2004 allowed for a large rise in the pace of land exploitation as well as the authorization of higher projects, which attracted investors in real estate to trade in this industry and accelerated built-up development. It should be noted that the evolution of urban development was not adversely impacted by the instability of security conditions or the decline in governance indicators. On the other hand, and in spite of this instability, urban development is seen to be accelerating. The strongest justification for this may be found in the fact the effects of other supporting factors outweigh the force of these retarding ones by a wide range.
- *Stage 4 (2009-2014):*
  According to the United Nations Development Programme, the 2008 global financial crisis compelled and encouraged many Arab investors and Lebanese expats to direct part of their financial resources toward Lebanon's real estate market. On the other hand, the Lebanese real estate market began to exhibit signs of slowdown towards the beginning of 2010. A supply-demand imbalance exists when the amount of construction is excessive compared to the local demand. However, due to a number of new developments, this stalemate was postponed. The Syrian war, and in particular the influx of wealthy Syrian refugees - who make up the large bulk of the refugees - benefited the real estate industry. Refugees' arrival made up for the decreased local demand for housing, maintained high housing demand, increased rental prices by 40% in 2012 and improved the rental sector.
- *Stage 5 (2014-2019):*
  The time frame depicts a period of stagnation in the building and real estate sectors. By the year 2010, this industry has reached a standstill as a result of imbalance in supply and demand caused by excessive building without consideration for local need. The Arab Spring, the flood of Syrian refugees, which are considered the main factors, and the increase in real estate investments and bank savings, among other reasons, helped postpone this standstill. It is important to keep in mind that other variables, such as the decline in investment and monetary inflow into Lebanon, helped set the stage for the end of this delay.

So, it can be inferred from this qualitative analysis that the political and security stable conditions at the regional or local level have no bearing on urban growth and the real estate and construction industries. They are, nonetheless, very reliant on market forces. The general elements that have an impact on urban development and real estate are the following:

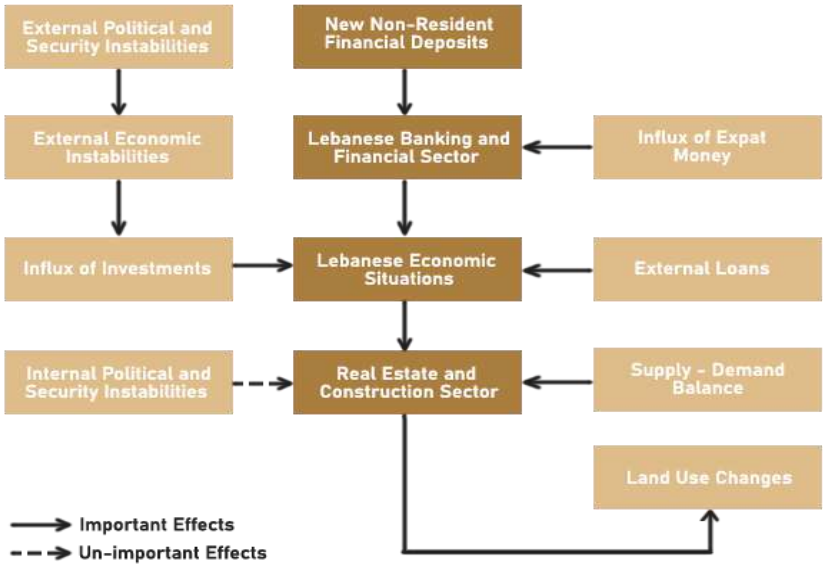


Figure 62. Factors having an impact on urban growth and real estate.

1.7.2 Linkages involving land use changes

Observably in Beirut, a trend of land use dynamics emerged in the neighborhoods. It is important to note that the overall area of green zones increased from 1984 to 2000, while the area of non-vegetated lands was reduced over the same time period. It is demonstrated that from the year 1996 to the year 2006, Beirut's built-up land use increased at a faster rate. It is critical to state that the significant slowdown in Beirut's urban development after 2006 can be attributed to the city's built-up saturation, which is 89.5% of its total area, the presence of non-constructible green spaces like the Beirut Park and the Hippodrome, and non-constructible bare soils lands like the public beaches.
Two sub-periods were created to represent the accelerated growth of built-up regions in Beirut. The first spans the years 1995 through 1999, and the second, from 1999 through 2006. In the first era, there was a rise in the amount of developed land, which is accompanied by a rise in the area of green spaces and a decline in the amount of bare soil. The evolution tendency of green areas, from expanding to decreasing, is one way that the second era differs from the first. The first era shows that green space preservation is not being sacrificed for urban expansion. On the other hand, the second phase demonstrates that a portion of the bare soil and green spaces are transfiguring into urban developments. Built-up land use in Beirut increased at a fairly sluggish rate between 2006 and 2019. For the whole time period, the total area of green zones remained constant.

All in all, a single land management policy cannot be applied to all zones in Lebanon equally due to the differences in land use trends, rather, individual land use policies ought to be adopted for each zone. Also, these policies should aim to strike a balance between the necessity for urban expansion on the one hand, and the protection of natural resources and favorable environmental circumstances on the other. The negative effects of these necessary urban development projects could be lessened in this way. These policies ought to include; the protection of natural zones, such as forested and watery areas, the subsidies of agriculture, the subsidization of urban densification rather than horizontal sprawl, the restriction of urban sprawl in rich soil green areas, and finally the direction of urban development towards specific bare soil lands and without any risk of adversely affecting the environment.

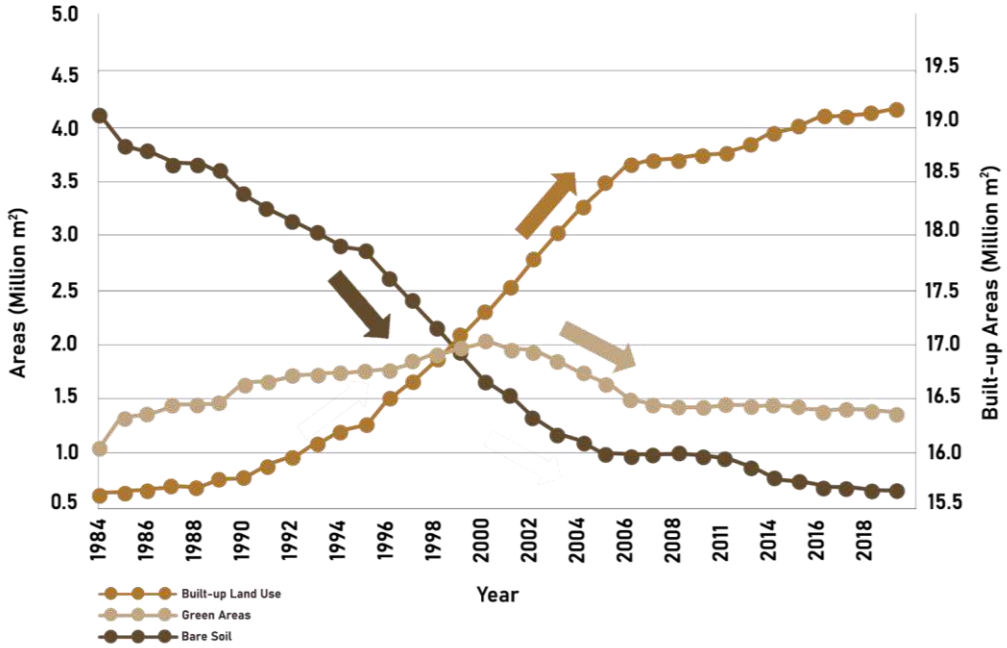


Figure 63. The dynamics of land use in Beirut, from 1984 till 2019. (Source: Walid Al-Shaar, May 2021)

2. Beirut Explosion

A significant amount of ammonium nitrate stored at the port of Beirut exploded on August 4, 2020, claiming the lives of at least 200 people, wounding over 7,000 others, causing approximately between 3.8 and 4.6 billions of dollars in material damage, and uprooting more than 300,000 people. The advent of COVID-19 exacerbated an already severe financial crisis that was already affecting Lebanon, and the explosion aided in exposing the fragility and inconsistent development plans of Beirut. In Lebanon and Beirut's history, this explosion was a turning point, with the majority of Beirut's wheat stockpiles' silos, as well as a sizable portion of the port's infrastructure, greatly destroyed. In addition to more than four important hospitals, several nearby residential communities were also devastated by the explosion, with almost all government buildings. All the neighborhoods that were surrounding the explosion were affected, such as Mar Mikhael, Medawar, Gemmayzeh, Burj Hammoud, Bashoura, Achrafieh, Karantina, and many more. More than 6,000 structures were burned, causing complete or partial destruction and forcing tens of thousands of people to flee as it moved to other parts of the city. In response to this terrible catastrophe, a large number of researchers, specialists, public organizations, as well as NGOs, have mobilized their efforts. Sectarian violence has emerged as a vital motivating agent in the struggle for urban reconstruction or preservation within the current volatile and unstable socio-political landscape brought about by the Fourth of August events, and despite local and international organizations offering relief and assistance for many, Beirut is impoverished by a series of poor management. Since the explosion, the aftermath of the Beirut Port blast has given many local and foreign professionals, academics, and opportunistic developers the chance to assess the connections between numerous crucial areas of city design, like the city's connection to its suburbs, coastline, and city center. Greater urbanization and city expansion have been the results of the tension between the need to preserve the legacy and the complexity of its urban development, with services and infrastructure systems becoming progressively inadequate over time.

Since the explosion, the effects of a lack of public spaces on the atmosphere in cities, urban division and disparity have gotten worse, having a combined and detrimental impact on the standard of city life.

2.1 Incident Situation

Massive catastrophes and innocent fatalities are brought on by chemical explosions. Ammonium nitrate (AN)-related chemical explosions, in particular, have been responsible for numerous disasters throughout history that have disrupted all elements of community functioning. After the nuclear attacks on Hiroshima and Nagasaki at the end of the second World War, the most recent AN explosion in Beirut was ranked as the third most deadly urban explosion in history. Over 220 people were killed and another 6,500 injured instantly in the Beirut explosion, which also caused a 140 m wide crater and an earthquake measuring 3.3 on the Richter scale. Around 300,000 people were left homeless. In addition to the human tragedy, this significant catastrophe devastated 9 hospitals in the city, causing access to healthcare to be restricted. The anticipated economic cost of the explosion exceeds $6.7 billion. As a result of the explosion and subsequent ignition, poisonous chemicals were also discharged, posing a serious hazard to Beirut's 2.4 million citizens, especially when combined with sea moisture and dust particles released by the destroyed and collapsed structures.

In the Mediterranean Sea is Lebanon, a nation with an upper middle class, and with its port's advantageous geographic location at the confluence of three continents, which serves as Lebanon's primary entrance point. The port, one of the biggest in the Middle East, serves as a key important hub for countries in the Eastern Mediterranean such as Syria and Jordan. In addition to a grain silo and a duty-free zone, it has terminals for general freight with 12 warehouses, containers, and passengers. The grain silo held 85% of the nation's grain, mostly supplied through vessels from Eastern Europe.

Tuesday, August 4, 2020, at 5:55 p.m. local time Beirut, an uncontrolled fire broke out at a fireworks warehouse at Hangar 12 of the Port. Nine firefighters from the Beirut fire department were sent to the scene, but the group was unable to put out the ferocious and strong fire. At 6:07 p.m, the warehouse caught fire, starting the initial explosion. After around 30 seconds, a major explosion happened in the Ammonium Nitrate warehouse near the grain silos.

Figure 64. At the Beirut harbor, a blast explosion at 5:55 p.m and at 6:08 p.m the orange and mushroom clouds.

The first flames released from the nearby burning warehouse served as fuel for the explosion, which released a significant amount of AN that was greater than 2.7 kilotons. A tremendous instantaneous blast caused by the devastating AN detonation was audible 125 miles distant in Cyprus near the Mediterranean sea. Buildings around the epicenter, as well as the grain silos, docked ships, and surrounding warehouses, were all destroyed, resulting in a 140 meter wide crater. The pressure that was created had a Richter scale equivalent of 3.3, and was accompanied by a supersonic shock wave that destroyed most of the urban neighborhoods near the port. In addition to the explosion severely damaging more than 50,000 residential

homes, 178 schools and 9 hospitals, it also completely destroyed the majority of Beirut Port and its concrete grain silos construction.

Figure 65. Satellite images of the Beirut port before and after the explosion. (Source: Jorge Fitz-Gibbon, August 2020)

The incident was derived and induced by many factors on many scales:

- Surrounding Urban Population: Large volumes of bulk container traffic, as well as some on-site storage, were brought on by the business' growth, particularly when there was abandoned cargo. Hangar 12, where the explosion took place, was only 0.4 kilometers away from the city limits. Lastly, due to nearby residences and businesses, the port's location and hangar were unsuitable for storing large amounts of hazardous chemicals.
- Poor Storage Techniques: Even though the ammonium nitrate in the seized container was a known hazard, it exposed the port and the general public without need. The cargo was mixed in with a number of other unsuitable items, such as fireworks and other combustible and dangerous items. Moreover, the AN was left to combine and leak from the bags, exposing a greater exposed quantity.
- Poor Emergency Response and Fire Protection: Poor hot work performed during door repairs is thought to be the root problem. The structure lacked an automatic sprinkler system. The explosion was started by the accelerant being ignited by fireworks. The dangers the firefighters were in were unknown to them, and in the wake of the original fire, neither the terminal nor the city were evacuated.

2.2 Revisiting the Past - Collective Memory, not Collective Amnesia

Built in 1968, the grain silos that took the brunt of the blast have come to represent the grievance of a city. The preservation and rehabilitation of the silos have been urged by the families of the deceased, activists, civil society organizations, and some prominent public personalities in order to rebuild the social fabric of the districts impacted by the explosion and to serve as a reminder of the injustice that has so far been suppressed. Victims now refer to the silos as the explosion's "Silent Witness".

Disfigurement and erasure of the scars left by crimes against the country's civilian populations have grown commonplace since the aftermath of the Lebanese civil war. There is little room for a post-war recovery process since some political parties persist in pushing inaccurate and partial historical narratives that widen

tribal and sectarian gaps. Its manufactured cultural memory hides internal conflict and discord. Reconstruction at the city's center erased the past, leaving each town to face its own problems and memories. Young people had little time to consider the effects of the conflict and the lessons learned in history books because they ended with the country's independence. The Lebanese were ignorant of the ominous potential for differences to resurface and spark yet another war because they lacked a shared memory and a concrete solution. As a result, every time a tragedy strikes the city, the same painful tale is repeated. Authorities are charged with destroying the silos to eliminate any physical reminder of the detonation that would hasten people's forgetting of the awful incident. The daily burning of the silos without a valid reason infuriates the Lebanese, with a portion of the silos falling just a few days prior to the explosion's second anniversary. The Lebanese have turned to preserving a communal space they wish to defend in opposition to what is viewed as the destruction of memory by the state in order to counter this and to emphasize Beirut as a center for the collective memory, instead of collective amnesia.

Figure 66. The grain silos and surrounding region in the port have sustained extensive damage, as seen from above.

To help the Lebanese people take control of their city, avoid a return of violence, and serve as a reminder of what happened so they may demand their right to justice, the location of the grain silos needs to be protected. In a nation that has been ravaged by an economic collapse, creating a collective narrative can help bring together disparate populations and possibly even aid in the creation of an inclusive economy. It might enable individuals to voice their demands and future plans. A national identity that supports finding common ground can be developed by ending the widespread official practice of forced or intentional amnesia, together with reforms and an open judicial system. The silos represent another turning point in the Lebanese memory and justice dream during the second year of grief. Seeing them fall apart would bind people together and distance them from a ruling class that is destroying history and reliving the anguish that people have experienced since August 4, 2020.

2.3 Humanitarian Impact

On the 4th of August in 2020, Lebanon had already reached a deadlock. The COVID-19 pandemic has only made things worse since it is currently experiencing its greatest economic crisis in recent memory. Last September, 33% of the nation's population reported living at or below the poverty line; today, that proportion is thought to be about 45%. Currently, the nation's unemployment rate is little above 30%. Moreover, it is home to the highest proportion of refugees in the world by population. The explosion of Beirut left more than 300,000 people to lose their homes and injured over 5,000 more. The continuous coronavirus pandemic and these injuries have put further strain on the nation's medical and healthcare facilities. While the entire extent of this event's effects are still unknown, the Beirut explosion is an illustration of how a crisis can exacerbate an already challenging humanitarian situation.

As a result of the explosion at the Port, many patients had to be evacuated, increasing demand for beds in other neighboring facilities, and one of the city's primary hospitals was destroyed along with many other healthcare facilities. Due to the coronavirus, several medical supplies were already in low supply. Back then, Beirut had the greatest number of COVID-19 confirmed cases in the nation. One medical official stated to the media the day after the incident that "there is an acute lack of everything we need to hospitalize the patients". In addition, the Port of Beirut handled 80% of Lebanon's imports of food and medicine. As a result, there will need to be backup plans in place to bring supplies into the country immediately and, more critically, to the capital, where they are most needed.

The order to cover in place is made more difficult by the fact that it is anticipated that up to 300,000 people will be unable to dwell in their houses in the immediate wake of the explosion. For those who are able to remain in their houses, there is also the worry that the explosion would make infrastructure necessities like electricity even more difficult to maintain. The housing shortage is even more perilous for Beirut's sizable immigrant and refugee population.

A year in which the Food and Agriculture Organization has already forecast rising levels of hunger owing to factors like the pandemic, food security remains an additional concern. The FAO worries that there may be a scarcity of flour in the country as a consequence of the explosion, which also damaged the largest grain silo in the nation. The cost of essential food staples has more than doubled between 2019 and 2020 as a result of the economic crisis, which may also mean that those in Lebanon who are the poorest and most economically susceptible will suffer the most.

The effects of the explosion's unseen mental health ramifications are still being felt till today. Many investigations have emphasized the widespread trauma endured by the explosion's survivors, which includes exhaustion and nightmares as well as a greater need for mental health counseling. Following the explosion, reports were highlighted concerning excessive sadness and higher rates of suicide and calls to help lines, which were not only linked to the explosion, but to the economic situation as well. The blast also brought back memories of the older Lebanese generations who suffered earlier trauma due to displacement, civil wars, and escalating violence and unrest during mass anti-government protests. Health workers and people on the front lines have been affected the most, since they were already overwhelmed by the rapid increase in COVID-19 cases, untrained to deal with repercussions of any disaster, and worked hard despite minimal funding. The Lebanese Red Cross and other volunteers who rushed to the explosion highlighted the devastation felt by the citizens while they were looking for their loved ones and trying to rescue them. Therapists worked closely with people who were the most affected by the trauma, reporting that they experienced severe distress symptoms.

The majority of Beirut's estimated 1.5 million-strong refugee community has also been retraumatized as a result of the explosion. Estimates indicate that the proportion of refugees living below the poverty line rose from 60% before the blast to 90%, with nearly 60% of Syrian refugees losing their employment during the lockdown, just a few months before the explosion took place. Since the explosion, pressure on the

refugee communities in Beirut has only grown as a result of growing anti-refugee attitudes and political and host community hostility.

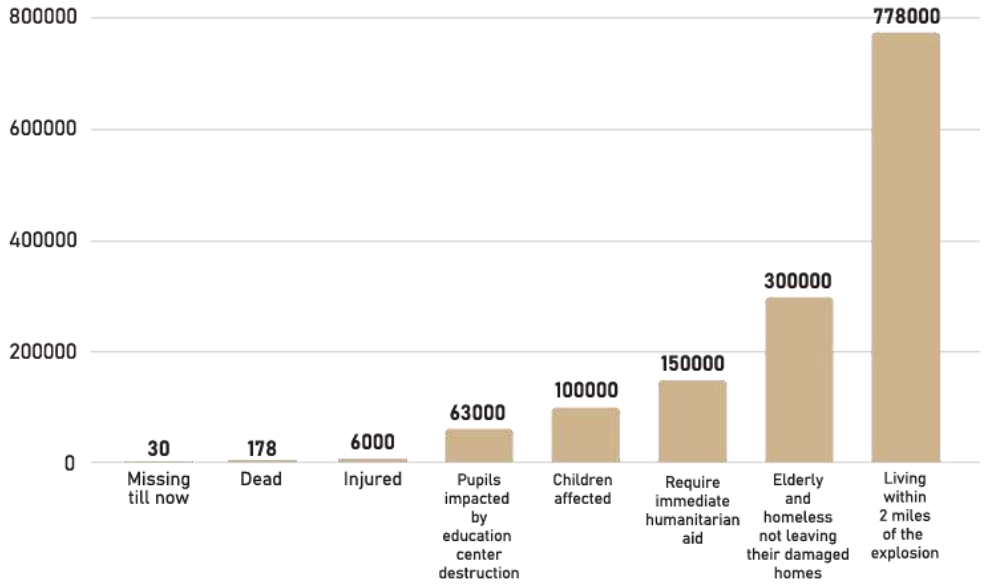


Figure 67. Number of the most afflicted people by the Beirut Port explosion. (Booz & Company, 2020)

2.4 Economic Impact

Since the port explosion, the firms' profitability has decreased significantly. Only 3% of the businesses claimed to have been profitable after the explosion, while 32% of them claimed to have been profitable in the time prior to the explosion. The majority of the businesses claimed to have lost money after the explosion occurred. This sharp decline in profitability for the majority of businesses cannot solely be attributed to the explosion. The surveys do, however, indicate that the explosion added to the pressure already created by the challenging economic conditions in the country, which are characterized, for example, by loss of purchasing power and declining demand for goods and services. 92% of all businesses mentioned that their projected profits for 2020 would be significantly lower than those for 2019, and none anticipated more profits. Businesses that demonstrated formal qualities, such as offering written employment contracts, being insured, being profitable before the explosion and not damaged during it were slightly more positive about predicted profitability.

	Much higher	Higher	About the same	Lower	Much lower	Total	Sample size
All enterprises	0	1	6	24	68	100	1,539
Ownership of premises							
Owned, no debt	-	1	8	30	61	100	275
Owned, have debt	-	-	9	18	74	100	34
Rented	0	1	6	23	69	100	1,214
Occupied for free	-	-	22	11	67	100	9
Damage status							
No damages	-	3	13	28	56	100	213
Minor, repair impossible	-	1	6	24	69	100	863
Major, cannot be repaired but replaced	0	1	4	23	71	100	409
Fully damaged	-	-	4	22	74	100	54
Financial condition prior to the explosion							
Profitable	-	2	9	28	61	100	496
Break even	-	0	7	27	65	100	603
Losing money	0	1	3	17	80	100	440
Insurance at the time of the explosion							
Yes	-	4	16	29	52	100	112
No	0	1	5	24	70	100	1,361
Type of employment contracts offered							
Written contract	-	3	14	25	58	100	64
Written & oral agreement	-	7	14	21	57	100	14
Oral agreement	-	2	9	30	59	100	291
None	0	1	5	22	71	100	317

Table 2. Evaluation of 2020 profitability in comparison to 2019. (Source: International Labor Organization, 2021)

Since the port explosion, the firms' monthly expenses and revenues have significantly decreased, along with their earnings. The fact that 32% of the businesses record no sales revenues and 15% report no expenses suggests that they have been economically inactive since the explosion. Both revenues and expenses have sharply decreased for the remaining businesses that contributed to function in varying capacities after the explosion.

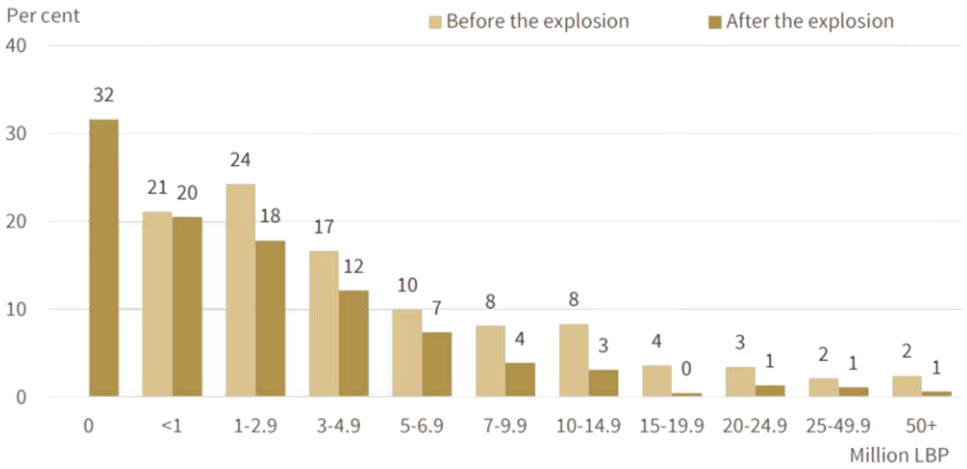


Figure 68. The total monthly income of the businesses expressed in million LBP, before and after the explosion. (Source: International Labor Organization, 2021)

Businesses may borrow money to cover losses if the economy performs poorly. Yet, only 4 more businesses in percentage had financial commitments than before since the explosion. This comparatively small increase in financial commitment is solely attributed to an increase in the amount of supplier debt owed by businesses. One-third of the examined businesses are overall indebted to their suppliers. The remaining businesses that have financial obligations owe money to banks, microlenders and issuers of bills of exchange. However, privately held and small businesses in Lebanon frequently borrow money from informal sources including family and friends. As a result, the increase in debt among the questioned firms may be greater than what the surveys' financial commitment show.
After the explosion, the size of the formal debt owed to creditors has not considerably changed. The percentage of businesses with debts between 10 and 30 million LBP has climbed by 2%, while the percentage with debts under 1 million LBP has decreased by the same percentage. As a result of the explosion and the challenging situation in Lebanon, including the COVID-19 lockdowns, businesses in the hospitality and tourism industry appear to have grown their stable forms of debt slightly more than businesses in other industries. Thirty-five percent of the hotel and tourism businesses now have official debt in excess of 10 million LBP, up from 32% percent before the explosion, while six percent have debt of less than one million LBP, down from 13% before the explosion.

2.5 Physical Extent and Urban nature of the Damage

The city of Beirut, shaken by the huge explosion resulting from the fire of about 2,750 tons of ammonium nitrate stockpiled at the port, led to extensive destruction as well as fatalities. The blast's effects could be felt for kilometers in all directions, severely damaging nearby structures, roads, and infrastructure. The explosion, which had a force comparable to several hundred tons of TNT, has been hailed as one of the most potent non-nuclear explosions in recorded history. The physical scope and character of the harm this terrible incident inflicted will be discussed in the section that follows.

Grain silos, warehouses, and other nearby structures were completely destroyed, with debris flunging up to two kilometers from the harbor, covering up the streets from nearby destroyed structures. In addition, ceilings, windows and walls collapsed. Moreover, cars and a cruise ship were turned upside down. This demonstrates the explosion's intensity and the extent of the destruction it caused. The ability of the explosion to destroy such massive infrastructures, given that everyone was taken off guard by it, is evidence of the great suffering and harm that mankind endured. The port, which handles 60% of Lebanon's imports, has long been a crucial component of the country's supply chain for goods. The enormous explosion destroyed the nearby dockside area and left behind a huge crater, throwing ships out of the water into the wharf. The extent of the damage brought on by the explosion is depicted in the following

figure. Mar Mikhael and Karantina, which were the neighborhoods closest to the Beirut harbor where the explosion took place, were completely devastated, whilst Saifi, Achrafieh and Downtown, further away, were partially or barely damaged.

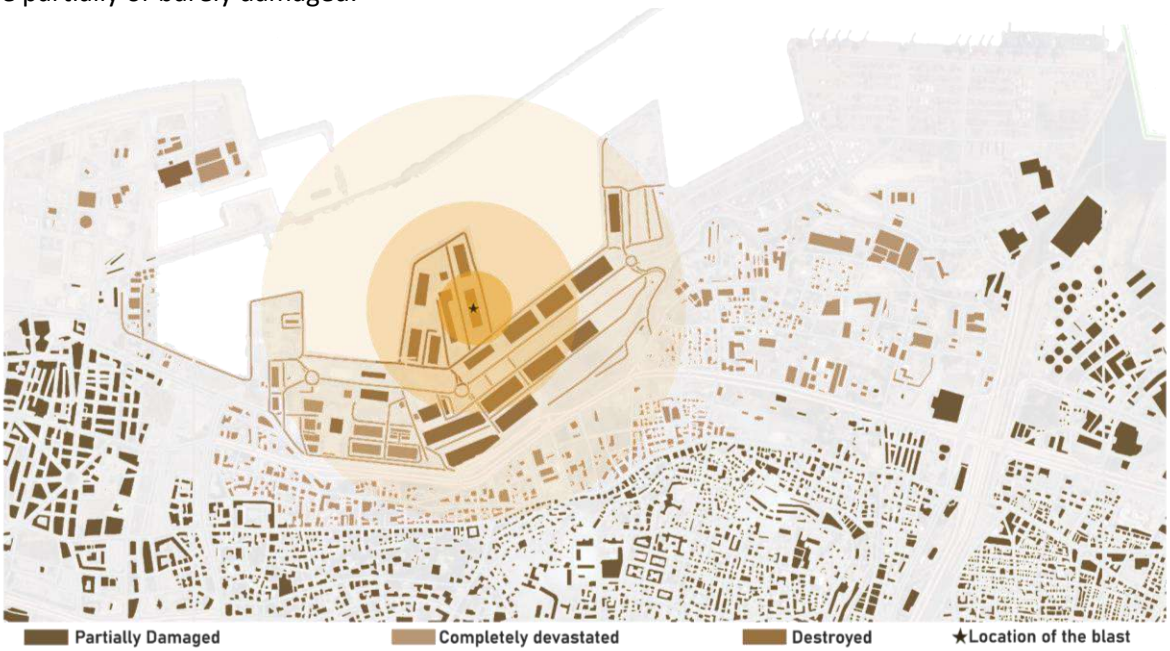


Figure 69. Map showing the severity of the damage in the neighborhoods of Beirut. (Source: UN Volunteers, September 2020)

According to statistics and within the blast radius, 52% of the housing was damaged. Of the 14,324 total surveyed dwelling units, 864 were demolished, which is equivalent to 6%. Moreover, of the 143 schools inside the bomb radius, 18 were severely damaged or destroyed, accounting for 55% of the damage. Museums, churches and theaters made up 43% of the damaged cultural heritage sites. Plus, 359 of the 3430 cultural heritage sites were destroyed, corresponding to 10%.

Damage Degree	Number	Percentage
Minor	2.236	33.81
Moderate	1.364	20.62
Major	2.981	45.08
Severe	31	0.47

Table 3. Survey showing the damage severity of 6.621 buildings. (Source: UN Volunteers, September 2020)

The numerous plans for the rehabilitation of Beirut's port that have started to pour in recent weeks may offer the first glimmer of hope in a situation similar to the post-civil war era, while people of Beirut and its suburbs are still devastated by the loss of their houses, shops, and neighborhoods. The most well-known proposal to date is that made to the Lebanese authorities by four German companies, among the many expressions of interest in this reconstruction process by various international actors, such as private companies and governments. This multibillion-dollar project aims to renovate and improve Beirut's port and the surrounding neighborhoods. With the help of the planned proposal, Beirut will once again serve as the entry point to the other Lebanese provinces by creating a high-end port. The primary port access

point will be moved from the city center to the eastern bank of the Beirut River, and the storage area will be moved from the city center to the industrial region close to the river, which is now occupied by the Burj Hammoud dump. The plan aims for the construction of numerous towers that face the water as well as significant tourist attractions. According to its supporters, the funds used for these facilities would be used to pay for other infrastructural projects, such as park trees, nurseries, schools, and athletic facilities. As part of its assistance for the Beirut Blast recovery efforts, the Beirut Urban Lab produced quick analyses of six districts, severely impacted by the explosion, such as Mar Mikhael, Geitawi, Karantina and Badawi. The six urban studies place the effects of the explosion in the context of the greater urban processes that have defined the neighborhood. It does so by providing a preliminary urban record and analysis of locales, which includes an overview of the history, insights into context urban trends, profiles of key stakeholders, and a look at socio-spatial conditions. Moreover, the historic sites in Beirut affected by the blast have been cataloged by the Beirut Urban Lab.

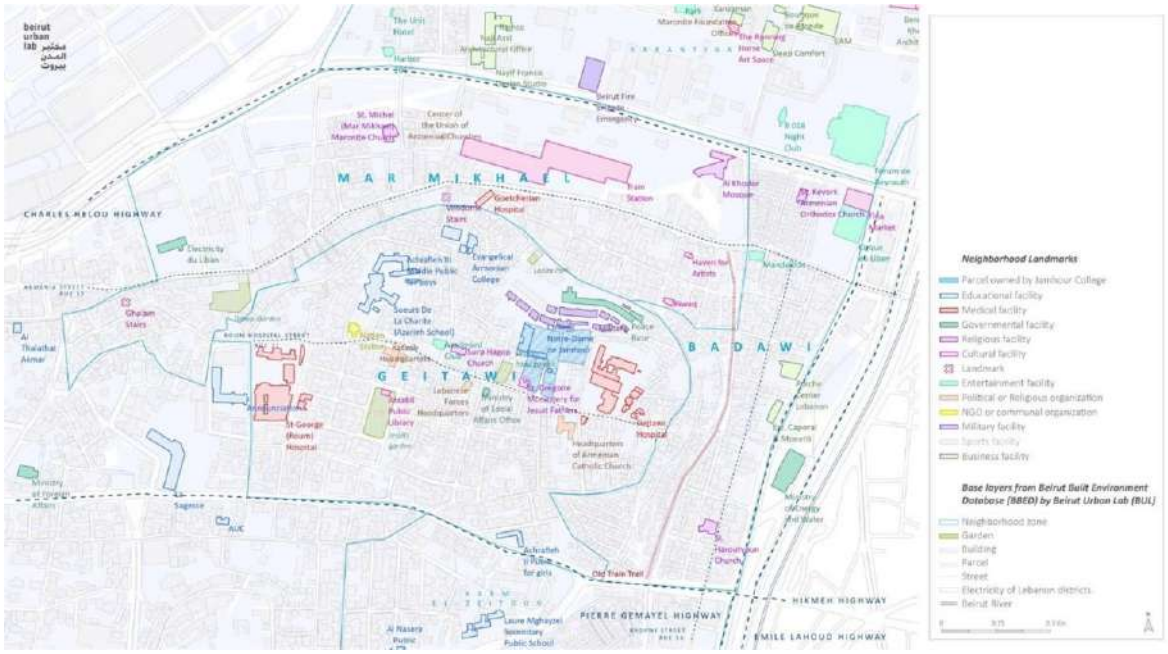


Figure 70. Map showing the landmarks affected in the neighborhoods of Mar Mikhael, Geitawi and Badawi. (Source: Beirut Urban Lab, 2020)

In addition to repairing and rebuilding destroyed buildings and infrastructure, institutions and governance systems will also need to be rebuilt as part of the reconstruction process. For instance, the research recommends that, in addition to the immediate repairs required to safeguard Lebanon's important imports, the port be completely rebuilt in accordance with modern standards, with superior site and dimensions, and operated by the most effective and transparent methods. Due to its insolvency and inadequate foreign exchange reserves, international aid and private investment will be crucial for Lebanon's long term rehabilitation and reconstruction. A viable reform program must be implemented for Lebanon to be able to access external and private sector financial sources as well as international development funds. The World Bank, United Nations, and European Union are completely devoted to collaborating with Lebanon and its people to reconstruct a better Lebanon that prioritizes the needs of its citizens.

2.6 Profiles of Blast-Affected Areas

According to preliminary assessments, the blast notably affected 21 neighborhoods in the governorates of Beirut and Mount Lebanon. In areas of pre-existing sensitivity where residents have less ability to self-recover or find other living arrangements, paired with areas of pre-existing vulnerability, preliminary evaluations have highlighted these most affected neighborhoods.
The existing neighborhoods and areas most impacted by the explosion are as follows:

- *Marfaa quarter:*
  The explosion's epicenter is at Marfaa sector, which is located in Marfaa quarter. It included Beirut's commercial port, Majidieh, Nejmeh, and Nouveau secteur, commonly known as centre ville in French or Downtown in English. The Marfaa quarter is not a significant residential neighborhood; rather, it is a center for business, commerce and government. Nonetheless, the boom at the time of the explosion injured local residents, and fatalities were noted. Nouveau secteur, a contemporary neighborhood within the district, was nearly fully rebuilt after the Lebanese Civil War. The Lebanese business Solidere took on the construction of Nouveau secteur, which serves as the administrative hub of the Lebanese capital and is home to the Grand Serail, the prime minister's office, and the Lebanese Parliament in Place de l'Etoile. Moreover, this sector is home to several diplomatic structures, including UN offices, monuments, places of worship and other tourist destinations like the Beirut Souks, a shopping district.

- *Medawar quarter: Presents the impacted neighborhoods of Karantina, Mar Mikhael, Rmeil and Jisr Hadid.*
  - *Mar Mikhael sector:*
    The neighborhood of Mar Mikhael contains both residential and commercial properties, and the cafes, restaurants, and art galleries draw tourists. It was near the explosion but not particularly inhabited, and there was some reported damage to homes and businesses. As a major business hub in Lebanon, Mar Mikhael's devastation has an impact on the nation's economy since it hosts the headquarters of Electricite du Liban and several other important companies. Due to the ongoing financial crisis, owners of stores run the risk of not being able to rebuild. This will have an impact on all of the individuals working in those industries.

- *Achrafieh quarter:*
  The neighborhoods of Hotel Dieu, Adlieh, Ghabi, Achrafieh, Mar Mitr and Corniche El Nahr are all included in the Achrafieh quarter. It is regarded as Beirut's Christian neighborhood, consisting of residential areas with good services, cafes, stores and restaurants. The Université Saint-Joseph de Beyrouth, one of the city's primary universities, is located there, along with a number of other schools, colleges, hospitals and medical facilities. The majority of Achrafieh's neighborhoods gained investment as a result. Although being one of the oldest neighborhoods in Beirut, the few classic structures from the civil war are frequently located adjacent to new developments and pricey apartments. In addition to Lebanon's financial problems, the blast's destruction is having an impact on the area's service delivery, and COVID-19 had already overburdened the city's health services.

- *Saifi quarter:*
    - *Gemmayzeh sector:*
      Like Mar Mikhael, Gemmayzeh is a bustling commercial and tourist destination with a few residential streets, bars, and eateries. Its damage will probably, just like Mar Mikhael, have an impact on Lebanon's economy. Owners of stores run the risk of not being able to resume operations as a result of the current financial crisis, endangering the lives of those who worked in the informal service sector there.

- *Bourj Hammoud quarter:*
  The Governance of Mount Lebanon's Metn neighborhood is where Bourj Hammoud is situated. Bourj Hammoud is, however, regarded by many as being a part of Beirut. It is frequently referred to as the Armenian neighborhood. Narrow streets and a web of twisted electric lines that spans the municipal buildings define Bourj Hammoud. The susceptible neighborhoods of Nabaa, Maraache and Adana are all located in this area, which is extremely densely populated. At least 10,000 Syrian refugees as well as thousands of migrant laborers are housed in Bourj Hammoud. The villages in these districts are notorious for having substandard housing. This quarter's service delivery was especially subpar even before the explosion, with inadequate waste management being one of the main causes.

2.6.1 Priority Shelter Sector

Buildings, both commercial and residential, reported a variety of damages. Up to 300,000 people are currently sleeping mostly at friends' and family members' homes after being uprooted from their homes. The risks that were present mainly consist of inaccessible and expensive building and repair material, and an increase in COVID-19 transmission because of communal housing. Within a 2-kilometer radius of the port, total destruction of infrastructure and buildings was also recorded. While residences 20 kilometers from the explosion reported only little damage, buildings up to 8 km away reported significant structural damage. No significant damage was reported by Palestinian refugee camps. Early inspections revealed that fixing broken windows and doors was urgently needed. To provide some protection and privacy, windows were momentarily covered with disposable materials like nylon and plastic.

Up to 300,000 people, according to the governor of Beirut, were unable to dwell in their houses as a result of the explosion. According to UNICEF's estimation, 100,000 children may live in families whose homes have been completely destroyed or have sustained significant damage. Despite continuous cleanup and removal efforts, debris was still being reported inside homes and on the streets. There are worries that unsafe structures could endanger first responders and residents, especially those who refuse to leave their badly damaged homes in less affluent areas. It would be extremely challenging for households to finance home repairs due to Lebanon's economic crisis, which has wiped off 70% of many Lebanese' savings. Due to the increased demand and potential market shortages, the cost of building and repair material such as wood, aluminum, and steel for windows and doors, in addition to glass, is anticipated to rise. Even those who locate the necessary equipment and have the means to pay for it must adhere to severe cash withdrawal restrictions set by Lebanese banks. They could consequently have to wait till their homes are once again habitable. The most disadvantaged households could experience protracted displacement or reside in dangerous situations without access to privacy or even essential utilities like water and electricity. The majority of displaced persons are either staying with friends and family or accepting free offers of housing from other locals, including vacation homes. Early needs evaluations found that almost all families had taken in extra residents as a result of the blast, with the majority housing 2 to 10 people. But, local communities were not able to continue receiving this support indefinitely. Some 5,000 injured persons

were being treated in hospitals; when they got released, they required housing or rental assistance. According to one source, on August 6th, about 100 persons, mostly laborers, were homeless and sleeping on the streets. Hotel chains, educational institutions, religious institutions and other public buildings have been welcoming the displaced. They, however, have not yet been effectively used and only provide a short-term fix. While some displaced persons reportedly moved to temporary shelters near their homes, others remained in the city but were evacuated from the blast location. Also, it was alleged that social isolation policies had made it harder for those who had been forcibly relocated to find housing.

Figure 71. In the Beirut district of Quarantine, a man slept outside in front of demolished apartments.

It is unclear that COVID-19 distancing measures were followed because immediate accommodation options had to be found. When multiple families share a home, the increased population will prevent social isolation and increase the likelihood of the virus spreading, putting older or vulnerable family members at greater danger. What kind of public health measures would be implemented if more individuals used temporary public shelters is unknown. There is a wide range in displacement's time frame. Some households anticipate being relocated for up to a month, while others anticipate being relocated for a longer, indefinite period. It could take up to a year for the Karantina district's affected residents to come back.

To be able to pay their rent and so avoid being evicted, vulnerable families have had to turn to a variety of unhealthy coping mechanisms:

- Families downgrading their shelter choice by relocating to informal settlements or non-residential shelters, where rents were typically lower.
- Downgrading shelter circumstances refers to families moving into shelters that are in worse shape, which generates more public health issues when there is restricted access to water and sanitary services.
- Dwelling in overcrowded settings, which involves families sharing a single shelter, is frequently done to save rent costs but may also provide a danger of COVID-19 transmission.
- Taking on more debt or expanding an already existing debt load, which causes more issues when families are unable to make payments on their debt because of a lack of income.

- Malnutrition and other health hazards, particularly for children, are increased in the medium and long-term when food consumption is reduced to pay rent.

2.6.2 Distinct vulnerable Groups

The most vulnerable population in Lebanon continues to be the refugees, who frequently complain about difficulties accessing basic services and earning a living. 1.5 million people are displaced from Syria, 180,000 people are displaced from Lebanon by Palestinians, and 27,700 people are displaced by Palestinians from Syria in Lebanon. These refugees are particularly exposed to economic shocks and the effects of the crisis because of the high rates of poverty and insecure employment among them. Although refugees are only officially allowed to work in the construction and agriculture industries, 95% of Syrians who are now employed do so in an unregulated environment with no social or legal protection. Compared to Lebanese, refugees have considerably greater rates of poverty, underage labor, child marriage, and other unhealthy coping techniques. In a study of Syrian refugees over the age of 15, 78% reported having no legal status. Their inability to obtain a regularized stay in Lebanon has a significant impact on every area of their lives, making it difficult for them to find homes, access jobs, and avoid arrest and detention. The biggest hindrance to regularizing their stay was having to find a Lebanese sponsor.

The second vulnerable population in Lebanon proves to be the migrant workers. In Lebanon, there are between 250,000 and 400,000 migrant domestic workers, the most of them are female from African and Asian nations. Their rights are restricted by the kafala system, and labor law offers little to no protection for them. As a result, they are vulnerable to additional exploitation and abuse and have no ability to bargain with or hold their employers responsible. Four migrants died in the explosion, according to the embassy, while at least 128 more people were hurt. The economic crisis, and more recently the health crisis, has put domestic employees at danger for a number of infractions, including losing their right to remain in the country and facing deportation. Before the explosion, many migrant laborers had been forced into unemployment, poverty, and homelessness as a result of the economic and COVID-19 difficulties. A significant danger of abuse and exploitation by employers and limited access to services like mental health care are shown by the numerous suicide attempts among migrant workers and other abuses. Since COVID-19, live-in female migrant domestic workers have had more limits placed on their mobility, no day off, and limited access to family and friends, all of which have a severe impact on their mental health.

Another vulnerable population in Lebanon are the internally displaced persons. Up to 300,000 individuals have been relocated and lost their houses. Those who are affected by catastrophes are particularly susceptible because of housing shortages and financial instability. Children, the elderly, those with disabilities, and who are ill are vulnerable population groups who are more likely to experience abuse, neglect, and homelessness. One thousand displaced people, predominantly Lebanese, were reported at authorized evacuation facilities in Karantina, where an estimated 70% of the population had fled. During the summer break, schools have been converted into shelters.

2.7 Response and Recovery

This section provides an insight on the main initiatives and contributions made available for Beirut as well as the relevance of the private institutions' contribution to the post-explosion management and reconstruction process. While the government's irresponsibility is well underlined, the Lebanese people took charge and stood together after the shock and agony caused by the explosion in Beirut. They all contributed to each other's survival and the delivery of the injured to the hospitals.

2.7.1 Role of international organizations and local authorities

The UN Office for the Coordination of Humanitarian Affairs (OCHA) listed access to medical treatment and medication, food security, shelter and rebuilding, financial aid, and psychological support as its top humanitarian priorities. In response, Russia and Iran constructed field hospitals in less than 48 hours to relieve the strain on the severely damaged Lebanese facilities. Similar activities were also carried out by other regional players with relations to and interests in Lebanon, including Iraq, Egypt, Jordan, Morocco, Turkey and Qatar. Through their organization USAID, the United States made a contribution as well and pledged USD 17 million for disaster relief. France and Italy, the two European nations with the greatest stake in Lebanon, have constantly provided finances as well as food and medical supplies. However instead of going to the government, most relief was sent to local organizations including NGOs, hospitals, and UN agencies. Politics is the root cause of this behavior. The Lebanese government's incapacity to handle money transparently is the first and most obvious cause. The second, more covert motive is the desire of regional and international players to become more involved in Lebanon's already intricate political games. Foreign actors, particularly France and the US, have publicly called on the government to implement constant reforms in order to be held responsible once more, thereby restoring international trust and gaining access to international funding. The current status quo, which has been challenged by the protests that began on October 17, 2019, is now also being contested by these foreign actors. Foreign stakeholders hope to participate in the restoration process through this mechanism, particularly in the reformation of the political and financial structures, which had already started to falter in the preceding months. The UN is already present in Lebanon and engaged in a number of initiatives. In order to focus partners' efforts in Beirut, the area was divided into operational sectors and assigned to various actors in accordance with the needs and the resources available. Activities included providing secure refuge for the displaced, repairing damaged structures, distributing food boxes, and providing inclusive medical and mental health treatment to the afflicted community. Medical and food supplies have been distributed to the several districts based on needs assessments, giving priority to the arrears that have suffered the most damage, where search and rescue operations have been ongoing for nearly a month. The Lebanese Red Cross (LRC) and the larger International Red Cross and Crescent (IRCC) network were among the first organizations to respond to the situation and dispatch personnel.
Because of the size of the affected area and the sheer quantity of displaced persons looking for shelter outside of Beirut, one of the key problems continues to be the difficulty in assessing and resolving the vulnerable conditions of many. Rural areas run the risk of further marginalization, and millions of people's living situations, including those of refugees and poor Lebanese, could get worse. The extent of the city's damage exceeds the reach of the humanitarian response, despite quick intervention and significant community involvement. It will take years to adequately repair the physical damage, and given Lebanon's severe economic problems, external aid will be crucial.

The August 4 explosion was absolutely exceptional, despite the fact that Lebanese residents and NGO employees have coped with their fair share of crises and harsh circumstances. In a matter of seconds, the geography and history of Beirut were irrevocably changed. After the explosion, they have been responding to its consequences. Several Beirut families were compelled to flee their houses or locate temporary shelter elsewhere since residential buildings had been physically destroyed. Several others had no choice but to stay in their destroyed homes. The initial objective of several organizations, including the American non-profit Anera, was to restore people's homes to at least their pre-loss condition, if not better. They follow the minimum requirements set by the UN's Shelter Working Group for all home repairs, including setting up dependable plumbing systems, private doorways, and electrical outlets in every room. This

indicates that many of the households' level of living will increase as a result of the repairs compared to before the explosion. From the days following the explosion, Anera has renovated 500 homes and 80 stores. The rehabilitation of damaged residential urban districts in Beirut was the responsibility of NGOs like Anera, Norwegian Refugee Council (NRC), ACTED, Development for People and Nature Association (DPNA) and others.

Alongside the official activities, thousands of residents helped with the search and rescue efforts by clearing glass and other debris from homes and streets, conducting assessments, and forming operational units all throughout the city. The creation of initiatives supporting the response, such as networks finding protection for the homeless and coordinated support for the operations of agencies and NGOs, was made possible by a strong sense of solidarity that had already been demonstrated during the *thawra,* the rebellion that was still raging across the streets of Lebanon.

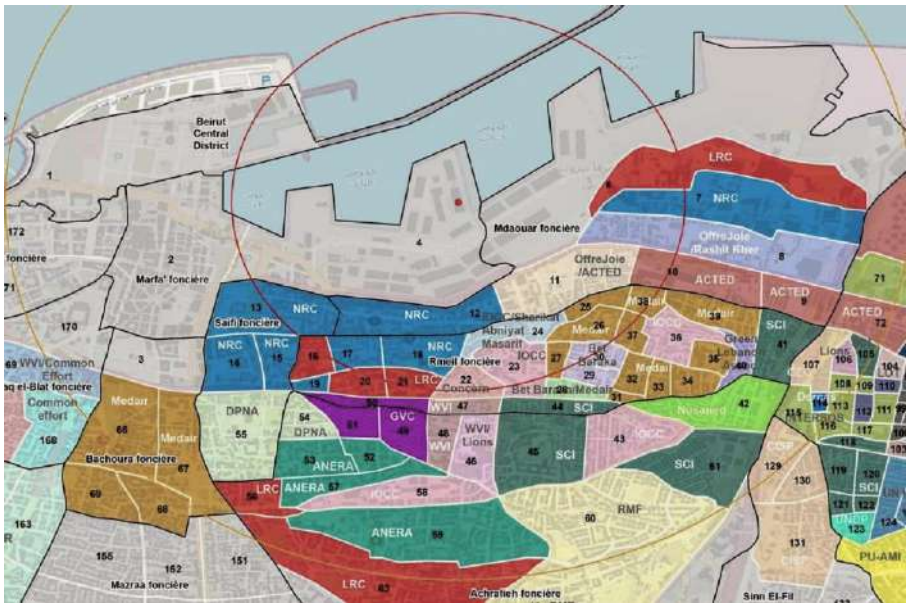


Figure 72. Part of Beirut home repair coordination map from the UN. Work areas for Anera indicated in teal green. (Source: Anera, 2021)

2.7.2 Plans and initiatives proposed

Fundamentally, urban transformation is the process of transitioning from one circumstance to another. It frequently involves bold decisions that mark the beginning of a new era in the history of a place. These choices can be made from above, but in order to reshape cities, they must also be accepted from below by those who will take the risks and pay the price while rewriting their city's history. Beirut has often been compared to the mythical phoenix, which is said to rise from the ashes of its own ashes. Several restoration proposals were made public in the months after the terrible explosion in Beirut. On the other hand, several of these 58 recommendations, while taking into account the interests of residents who lived close to the port, frequently mirrored outdated perceptions of the city.

A team from Gradplan Moscow created the rehabilitation plan for the Beirut Living port as part of the global competition run by the Phoenix Prize. The IDAR-Jerusalem Association established the award to explore strategies for turning risky environments into safe ones while also confronting limitations and barriers. Symbolic and pragmatic components are combined in the competitive notion. Seven district zones, including a memorial park, social housing, a multi-level container terminal, and a water treatment plant, were identified by the architects. As a result, the port becomes a multipurpose hub with responsibilities for both international trade and politics. Refined versions of the classic urban design elements include zoning, landscaping, traffic patterns and height restriction. The concept seeks to embrace modernism without sacrificing traditional values as well as assist the city in developing a comprehensive vision for the coastal region. The inclusion of the word "life" in Arabic script as a component structuring the plan of the memorial park was a significant symbolic choice made for the project. The restored ruins of the exploded silo will also serve as one of the emphases of the coastal landscape. In the cargo area of the port, advanced technologies are also planned.

The port space is divided into seven areas, each with a distinct function:

- *Area 1*: Mixed use (spaces with functional integration); clusters of green homes (rentable mid- and high-level apartments), offices and business spaces to rent in the city, healthcare facilities, hotels and community centers.
- *Area 2*: Cultural center with a stadium and music hall, serving as a center for recreation in a multicultural metropolis, educational center (zone focused on health, sports, and family activities), a multipurpose stadium with eateries and simple access for locals and tourists, piers for boats in marinas that offer daily excursions and fishing trips.
- *Area 3*: Waterfront park and memorial parks by the water that represent in Arabic "Life", a facility for teaching using a synthetic oyster farm and future shoreline farms to put into practice methods of preventing coastal erosion (in light of rising ocean levels), Memorial "Park of Lights is conveniently connected to cultural and port-related centers, Old Silo was converted to a monument.
- *Area 4*: The pier for passenger ships and the transportation HUB Customs checkpoint, logistics management focused on ports, accessible bus tours at shopping centers (for local, regional and worldwide trade).
- *Area 5*: New water treatment and Silo facilities, dewatering and solid waste treatment facilities, new, larger silo storage infrastructure, automatic handling silo equipment, stable operations.
- *Area 6*: Affordable rental apartments with green areas.
- *Area 7*: Multi-level container terminal and warehouses, a "layer-to-cell" system that used "cell-guides" to position containers one layer at a time, a "digital twin system" that stages the ship's discharge from deeper to shallower water close to port.

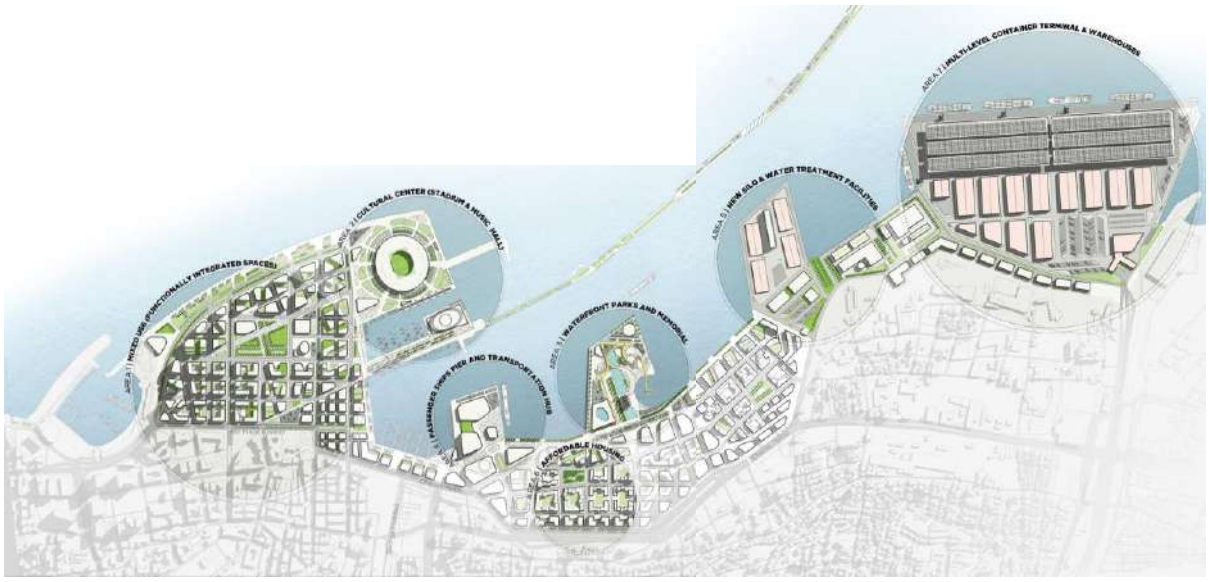


Figure 73. Proposal for the reconstruction of the Beirut port for the Phoenix Prize. (Source: iDAR, 2021)

2.8 Architectural Implications

The process of reconstructing a city is anything but easy, especially regarding the implications it has for the structure of buildings. There are myriad variables to factor in, such as having modern infrastructure, preserving dated buildings and accommodating the residential needs of any particular neighborhood. In particular, refurbishing Beirut can pose further issues due to its complicated past that often included destruction and regeneration over time. More recently, things have been even more chaotically compounded with political unrest, economic turbulence along with social anomalies adding to the mix of pre-existing problems which all affect urban design influencing Beirut's architecture significantly. To tackle these difficulties associated with transformation and reconstruction demands a team of architects along with diligent city planners who must take calculated steps while also considering this culturally diverse city's rich history when blueprinting solutions for its future existence.

2.8.1 Challenges of Rebuilding

Reconstructing a city poses an arduous challenge, especially after it has undergone a catastrophic event such as the bombing in Beirut. This involves both practical and architectural complexities, primarily identifying which areas need to be restored and deciding what structures would be most conducive for future development while considering the values of impartiality and community collaboration. To ensure that the process takes into account local interests and incorporates their views, community engagement is preeminent. The involvement of residents promotes a feeling of self-importance and ownership in rebuilt neighborhoods thereby increasing its likelihood of success by garnering support from vested stakeholders. One of the challenges during construction and restoration is placing environmental sustainability at the forefront. In order for buildings to be both aesthetically pleasing and eco-conscious, architects and builders must work in unison. It may entail incorporating green materials, for example using recycled products, or going as far as tapping into renewable energy sources like solar power or wind turbines. The significance of prioritizing such factors increases all the more especially in areas like Beirut prone to natural disasters such as earthquakes and floods.

Restoration of a city like Beirut also necessitates striking a balance between contemporary architecture and traditional values and cultural heritage. Roman, Byzantine, and Ottoman architectural styles are among many that make up the city's rich past. As a result, the restoration process must consider the city's cultural legacy and work to meld contemporary design with traditional principles. This can be accomplished by combining conventional architectural components and materials - like wood or stone - into contemporary constructions.

In order to effectively restore and enhance infrastructure, there needs to be a delicate balancing act between the cost involved in reconstruction and the need for speedy fixes. Governments and benefactors must judiciously consider the expense of rebuilding against the significance of expeditious maintenance as well as constructing fresh infrastructure. It is important to note that refurbishing incurs significant expenditure; whereas, some may opine that it should take precedence over all other concerns, others may argue that creating new structures to allure investors and foster additional job prospects are equally pressing.

To sum it up, a thorough strategy that takes into account the requirements of the community, environmental issues, cultural legacy, and economic factors is needed to restore a city. The restoration effort must be successful by addressing these issues and establishing a sustainable, inclusive, and culturally sensitive environment.

2.8.2 Role of design in creating disaster resilient communities

Communities that are resilient to disasters must incorporate design, by creating public places, infrastructure, and structures that can resist calamities caused by hurricanes, floods, wildfires, earthquakes and other catastrophes. What follows are ways in which design aids in building communities that are resilient to disasters:

- *Building design*: Creating disaster resilience requires thoughtful building design. Building materials that can endure natural disasters must be used during construction, according to building norms and standards that can be established. For instance, structures in seismically active regions can be built to survive earthquakes, and structures in hurricane-prone regions can be built to endure strong winds and storm surges.
- *Infrastructure design*: Roads, bridges, and water supply systems are examples of infrastructure that are essential to a community's ability to function. Disaster damage and disruption can be avoided or minimized by designing infrastructure that is resilient to natural disasters. For instance, it is possible to build water supply systems to continue operating during earthquakes and roads and bridges to endure floods and landslides.
- *Public space design*: Parks and community centers, for example, can be made to function as emergency shelters in the event of a disaster. These areas can be created with characteristics that increase their resistance to natural disasters, like reinforced walls and roofs and sufficient ventilation systems.
- *Community planning*: By identifying regions that are highly vulnerable to natural disasters and putting policies in place to reduce those risks, community planning can help build communities that are resilient to them. Communities can be planned, for instance, to lessen the effects of floods by adding vegetated areas that can soak up water and staying away from places that are prone to flooding.

Design is essential in developing communities that are resilient to disasters by ensuring that public spaces, infrastructure, and buildings are built to survive natural catastrophes and by putting community planning strategies into place to lower the risks associated with disasters.

2.9 Case studies - Successful rebuilding efforts

Depending on the prevailing forces steering a city's recovery after a battle, reconstruction typically takes diverse forms. Authorities' attitudes regarding the memory of the event and their propensity for conversation or new development have an impact on these drivers and the planning procedures that are linked with them. Some post-conflict locations have undergone oblivious reconstruction. A recovery that prioritizes new construction while purposefully erasing memories of the event is an example that may be found in Downtown Beirut's development after the Lebanese Civil War. Private redevelopment has adopted a fresh start approach to planning, supported by market-focused neoliberal policies. It is challenging for visitors to understand that the city center was ever a battlefield because of the renovation, which is consistent with the setting of 'political and psychological amnesia' in the aftermath of the civil war.

After World War II, Old Town Warsaw is another instance of recovery when restoration swept away the memories of the incident. The recovery was carried out by 'creative reconstruction', which pushed the Old Town back to around 1830 and erased the alterations that occurred after that period because they did not match the then-dominant realist socialist ideology. This was done to shield Polish architecture from 'western influences' and to restore it to its original state.

On the other hand, in other reconstruction cases, the incident is mentioned throughout the recovery process. One instance of monumentalism driving the preservation of conflict-related aspects is the unification of Berlin. The recovery efforts recognized the Berlin Wall's return to the city's landscape after the memory-erasing 'critical reconstruction' strategies failed to convey the tale of change in Berlin. Thus, the wall served as a vehicle to conjure vivid images of the city's memory and transformation.

There is no solace in the destruction caused by a natural disaster, but it is crucial to the idea that there may be opportunity in adversity. Federal, state, and municipal governments' millions of dollars for disaster relief might be converted into billions more in private investment. However, such tragedies need more time, patience, and innovation. All three cities - Tuscaloosa, Greensburg and San Francisco - learned how to transform a personal tragedy into an inspiring new vision. For municipal leaders coping with today's calamities, their lessons on leveraging funding and handling local sentiment - the desire to replace rather than remake - serve as a blueprint.

Tuscaloosa, 5:13 p.m. on April 27, 2011

Tuscaloosa, Alabama, was devastated by an EF4 tornado in 2011, leaving the city with the dilemma of how to recover. The city was able to set aside $10 million thanks to a healthy reserve fund to start cleaning up and rebuilding affordable housing units for low-income people. By establishing a mixed-use district, the Tuscaloosa Forward Generational Master Plan, which has gained support from the locals through open forums and online participation, city officials have also taken advantage of the opportunity to rejuvenate the neighborhood. Despite the tardy arrival of federal financing from the U.S. Department of Housing and Urban Development (HUD), the city has been able to draw in businesses and make infrastructure investments thanks to a revolving loan fund and the new zoning district.

Figure 74. Residential and commercial built more densely, according to the Tuscaloosa Forward master plan. (Source: Liz Farmer, 2013)

Greensburg, 9:45 p.m. on May 4, 2007
An EF5 tornado that struck Greensburg, Kansas in 2007 completely destroyed 95% of the community and made half of the population homeless. However, because of state and federal subsidies, congressional appropriations, property tax incentive programs, and local bonds, the town was able to recover and become a role model for sustainable and environmentally friendly growth. A local group raised $500,000 to assist a business incubator that houses 10 enterprises, and Greensburg currently has the most LEED-certified buildings per resident in the US. It also exclusively uses wind energy for electricity.

San Francisco, 5:04 p.m. on Oct. 17, 1989
The Embarcadero Freeway, a road that separated San Francisco from the waterfront, was damaged by the Loma Prieta earthquake. The federal government and Chinatown companies opposed Mayor Art Agnos' decision to demolish it and requested a replacement instead. In the end, he persuaded HUD to fund demolition rather than renovation, and today, the waterfront serves as an example of urban planning. Agnos counsels other disaster survivors to involve the community and professionals in the planning phase rather than just reconstruct everything exactly as it was. Making the choice to rebuild differently from the start is crucial since getting federal financing for reconstruction is a long and difficult process. Disaster-club leaders emphasize the necessity of remaining concentrated and truthful when making these decisions.

3. Experimental Project

3.1 Project Goals

The design of this project serves as a basis to demonstrate the role of architecture in the process of supporting wounded people, affected by a hazard. Beirut's population is the one in dispute, with thousands of people left stranded on the street, and pushed into a period of relocation. Some individuals take the chance of living in unsafe structures, while others choose to remain stranded on the streets, while waiting for someone to make their home habitable again. All those people have the sense of belonging, tying them to their place, wishing to return to their homes and communities as soon as possible.
The objective of my project is to facilitate the process of giving the homeless population refuge amid a disaster, which left them without shelter. Two phases were thought of while working on this project;

managing quickly the welcoming of displaced people is the first emergency phase. It demands an urgent fix that will give the populace a secure, safe and comfortable haven to wait for the city to be rebuilt and habitable again, while also allowing them to heal from the physical and mental wounds caused by the disaster. On the other hand, the second phase is distinguished by a prospective look toward the future. As a means of restoring the social fabric and serving as an incubator for a new, peaceful, integrated, and tolerant society, architecture must in it give the populace the tools necessary to emancipate themselves and prepare them for reintegration into the city. The first idea is typical of every emergency circumstance, such as a natural disaster, while the second idea is where we discover the uniqueness of the post-disaster context. The people are frequently brought together by their shared suffering and the need to rebuild after a city is completely destroyed by a catastrophic event. Although internal conflicts within the population may result from the effects of a catastrophe on the city and people's everyday lives under these situations, these issues are in no way comparable to those we face in a post-disaster setting.
After a disaster, especially one as devastating as the one in Beirut, the populace is traumatized and divided, with the experience of losing a loved one and a home. Disasters and sorrow can only exacerbate imbalances and convert them into resentments when people suddenly find themselves unstable, who had been living peacefully and stably just a few days earlier. It goes without saying that the first emergency phase is crucial, which includes acting quickly to ensure that everyone's survival and basic needs are met in a safe location where they have the means to wait, frequently for very long periods of time, for the possibility of returning home. It is worthless, though, if we don't deal with creating favorable conditions to make this return conceivable and, more importantly, guaranteed over time.
For all of that to be possible, architecture should intervene in a way in order for the people to be successfully reintegrated in their homes and in their cities, peacefully and self-sufficiently.

3.2 Design strategy

The design strategy aims to establish a process that develops through time. If we observe the city, we can perceive how the spaces experiment and change constantly, evolving on their own as a result of interactions between the city and its inhabitants and being continually tested and improved. This phenomenon is related to research on the beneficial effects on a city of quick, low-resource minor initiatives that later developed over time. Additionally, since the identity of places and spaces is continually shifting, a continuous building process is required. Regarding the selection of totalizing solutions that can be replicated in any setting, it is advised to use "urban acupuncture" interventions to develop manageable effects gradually rather than totalizing solutions that frequently prove useless. The greatest way to attempt to relate to the dynamism present in cities, populations, and the web of relationships between them is to design a process.

As a result, the project progresses through a procedure that is separated into different phases. In theory, the hosting of people needing an urgent shelter is permitted thanks to temporary self-sufficient emergency quarters, grafted into Beirut's devastated urban fabric. The unit then develops by creating a space for empowerment where the community comes together and takes responsibility through planning activities as the city is secured and rebuilt. Finally, as the settlement's habitants gradually return to their newly rebuilt homes, the temporary residential portion of the cell is demolished, restoring the urban void as a public space along with spaces that were created in accordance with the population's needs and have since become semi-permanent. A new strong, cohesive, integrated and free society is something that this binary system, which is made up of the public space and the sociocultural and educational activities that surround it, aspires to continue and expand. Therefore, the project acts like a spark that can start a chain reaction, creating resonances from the micro-projects that support the fabric of the metropolitan city, to rebalance the whole structure and to continue doing so over time because of its capacity to feed itself.

- *User Attributes*

  Choosing to house the inhabitants in the city as opposed to a field is the first step in planning. However, the choice of the groups to be transferred is not arbitrary; rather, it is based on particular hypotheses that establish its make-up and location. As was already mentioned, some residents have resumed residing in the city despite its destruction. Their residing in their homes is taking place on an informal basis, living in their homes and going back to their daily routines to manage their own and their city's rebirth. There is evidence of their attachment to their home, to the memory associated with their city, to their friends and neighbors, and the desire to be the masters of their own destiny. People of different religions and ethnic groups are united by a common past and a common will.

  It is crucial to structure a project plan on the preferences of the populace since this places citizen accountability at the core of the building process. The first indication that a process of city resurrection is working is that citizens are in control of and responsible for their own fate.

- *Site Attributes*

  The ideal locations for the establishment of temporary cells are determined concurrently with the process of choosing the citizens to be admitted into the new settlement. While taking into consideration where the citizens were residing before the disaster suggests that it would be useful to recreate the spatial relationship between the residents and the areas in which they reside. It also necessitates the selection of a location in consideration of the cadastral subdivision of the territory in order to avoid quick fixes. A strategy similar to that used in informal settlements was conceived, in which the project evolved on its own while being sewn back together from the grafting of fundamental modules. Private property, the preceding cadastral context and architectural setting, was never taken into consideration, demonstrating an obvious disconnect between the project and the reality in which it was to be inserted. The location of temporary communities must thus consider public spaces. It is specifically deliberated to choose, out of all the public areas in the city, those locations that were destroyed but had previously been home to common places where the community used to meet, hosting public structures of a special social significance. Because of the strong link between the locations that are associated with the city's memory and the people who live there, public spaces and structures are potent symbols that profoundly influence citizens' sense of self, sense of pride and morale. Additionally, they serve as a reminder of a shared past for the entire society, and as a result, they have a strong educational influence on younger generations. The actual act of building a new cell over the ruins of a location that is crucial to society's identity has a potent symbolic meaning that has the power to have a tremendous impact on the population that is now reliving that area in a different way. It brings back sad memories from the past that should never be forgotten while also evoking a shared memory that may be used to rebuild one's life and city. For this reason, the decision to link the intervention to a demolished and deeply ingrained part of a society's identity can significantly affect population cohesion. When working on cultural heritage, instead of dismissing the current changes as invalid and attempting to return to an irretrievable past, one should work to reconcile the city and its inhabitants while taking into account every aspect of their history, including the lessons that can be learned from every disaster. Because of this, the concept of preserving the memory of the destroyed Beirut - first safeguarding them through the overlap of the temporary cell, then bringing them back to the city as healed and publicly revitalized voids - does not want to constitute an insult to the identity associated with them, but rather the act of making them symbols of all phases of their past. Finally, due to their symbolic significance and connections to

the city's infrastructure, public spaces frequently occupy a strategic location and are thus helpful. These areas are not randomly placed. They had a significant impact on the public life of their local communities and were frequently planned in locations that attracted people and promoted social interactions inside the city. As a result, by placing the new settlements in the same locations, continuity with the activities previously carried out in the area could be established. Additionally, by utilizing the accessibility and visual significance, the process intended to turn the new centers into landmarks for the entire city could be sped up and stimulated.

- *The System*
  The local characteristics helpful to the project are presented under the presumption that the side of the temporary cells is defined by those urban voids that form visible wounds in the urban fabric. The locations picked should exhibit qualities appropriate for the expansion. Given that they serve as the urban voids that will serve as the foundation for adaptable spaces of empowerment in this case, the presence of vacant and amorphous public spaces, which are typically found around monuments and other public buildings, is crucial to meeting the project's needs. We can assume that, unlike the important center area, these weakly connoted locations will be occupied indefinitely to continue acting as catalysts for peaceful cohabitation in the society. In order to cover the project site practically and serve as a framework for the construction of temporary cells, the design approach calls for the overlap of a light reticular, modular and elevated structure. In order to reflect a balance between the demand for efficiency and speed as well as local characteristics, a formal grid is used. Its qualities of order and stability make it easy to overlap with every empty space, but its versatility and uniformity enable it to be altered in accordance with a variety of circumstances that are unique to a particular location. This design enables very quick and effective initial emergency intervention, with the potential to be installed with minimal foundation intrusion. If this system is easily adaptable to any situation that possesses the aforementioned characteristics, it will be developed in each different area in a specific way through a thorough examination of the context in which it is inserted and the unique requirements of the population that will reside there. The temporary emergency cell is established once the users and the project location have been located within their region of origin. The neighborhood is structured to cater the primary demands of the people. The program calls for building temporary housing for displaced people as well as health facilities, communal canteens, and labor areas that can assist not only the residents of the cell but also all of the citizens assigned nearby. Additionally, the settlement must be made almost entirely self-sufficient. In order to do this, places of agriculture and self-maintenance as well as tanks for water recovery and renewable energy sources are being developed. The spaces for empowerment are designed and put together while the process of restoring and rebuilding homes continues and the residential settlement starts to become unnecessary, starting from the same modular grid framework. The predetermined functions prioritize community involvement, education, culture and training as the core components of their initiatives. The inhabitants of the cell leave the temporary emergency community once a return to the property is feasible, enabling its demolition. Imagine if, after a long period of time, the city is rebuilt, its residents freely planning its development in a way that is impossible to predict. The new propulsion systems, which are built up of the binary apparatus created by the community park and the empowerment center that surrounds it, work in synergy to sustain their role as hubs of activity and catalysts for the entire neighborhood through time. The arrangement of these systems in Beirut's urban fabric creates a network that stimulates all parts of the city, ensuring the continuous peaceful cohabitation of all racial and ethnic groupings in the population.

3.3 Surrounding Site analysis

With being urban planners comes the awareness that every city has a distinctive urban morphology that influences its personality and functionality. However, when a catastrophe happens, such as the explosion in Beirut's port, the urban fabric of the city is damaged, and the needs of its citizens drastically shift. As a first step, it is crucial to adopt a holistic perspective in order to comprehend the needs of the city and create a system that can be used to any city suffering comparable difficulties. An important step is to analyze the surrounding area, in order to comprehend the context of a specific site or region. An urban planner can learn a lot about the needs and preferences of the neighborhood by mapping out the surrounding region, including the roads, buildings, public spaces, and other pertinent elements. The design of public spaces and community facilities, for instance, might be influenced by a thorough examination of the ethnic groups that make up the given neighborhood to assist in determining their cultural and social demands. Similar to this, a review of the current infrastructure, including utility and transportation networks, can assist in pinpointing locations in need of upkeep or repair and direct distribution of resources.

Figure 75. Satellite imagery of Beirut following the explosion. (Source: European Space Imaging, August 2020)

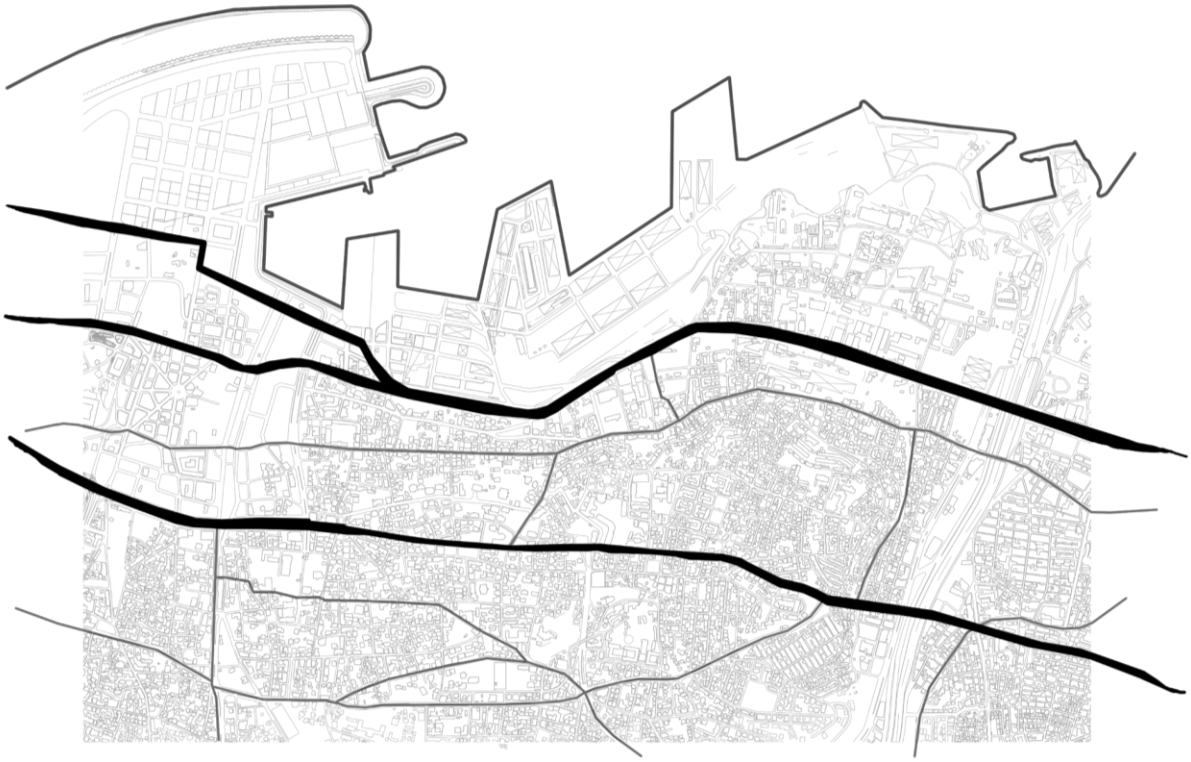


Figure 76. Main road axes and system in Beirut.

Figure 77. Areas of Government subdivision in Beirut.

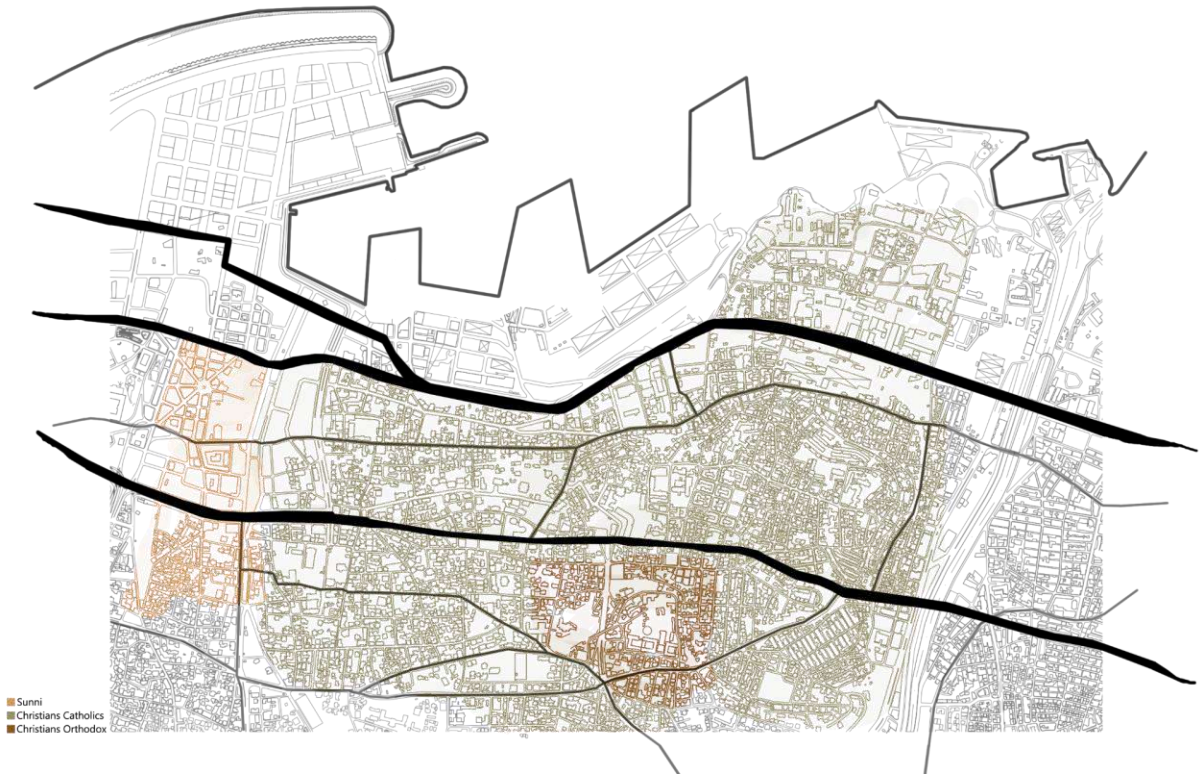


Figure 78. Ethnic distribution in Beirut.

Figure 79. Functional distribution of some areas in Beirut.

It is evident from the examination of the previous maps that every area of the city has been impacted by the disaster's destruction, regardless of its ethnic or functional makeup. The overlap of the maps makes it clear that the level of destruction in a specific area of the city directly relates to the immobility of roads, schools, hospitals, infrastructure, and any other sector taken into consideration. Another sort of map requires extra consideration in terms of the design technique proposed by this research work. In order to choose the location with the highest likelihood of areas suitable for inserting the temporary cell maps, it is important to take a look at the areas that were the most impacted by this explosion, by the use of a map showing the estimated impact of destruction. Such maps can aid in locating severely damaged places where individuals might require assistance.

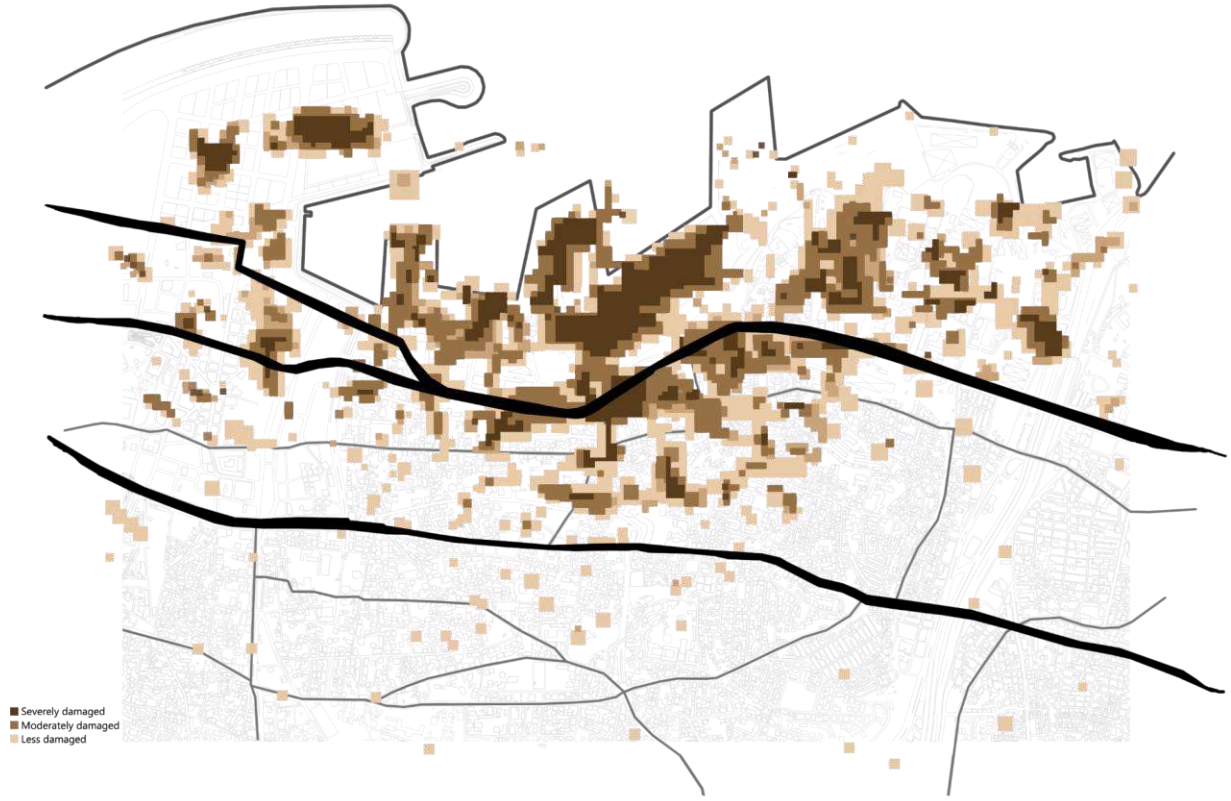


Figure 80. Map showing the degree of the damage in some neighborhoods in Beirut. (Source: NASA, 13 August 2020)

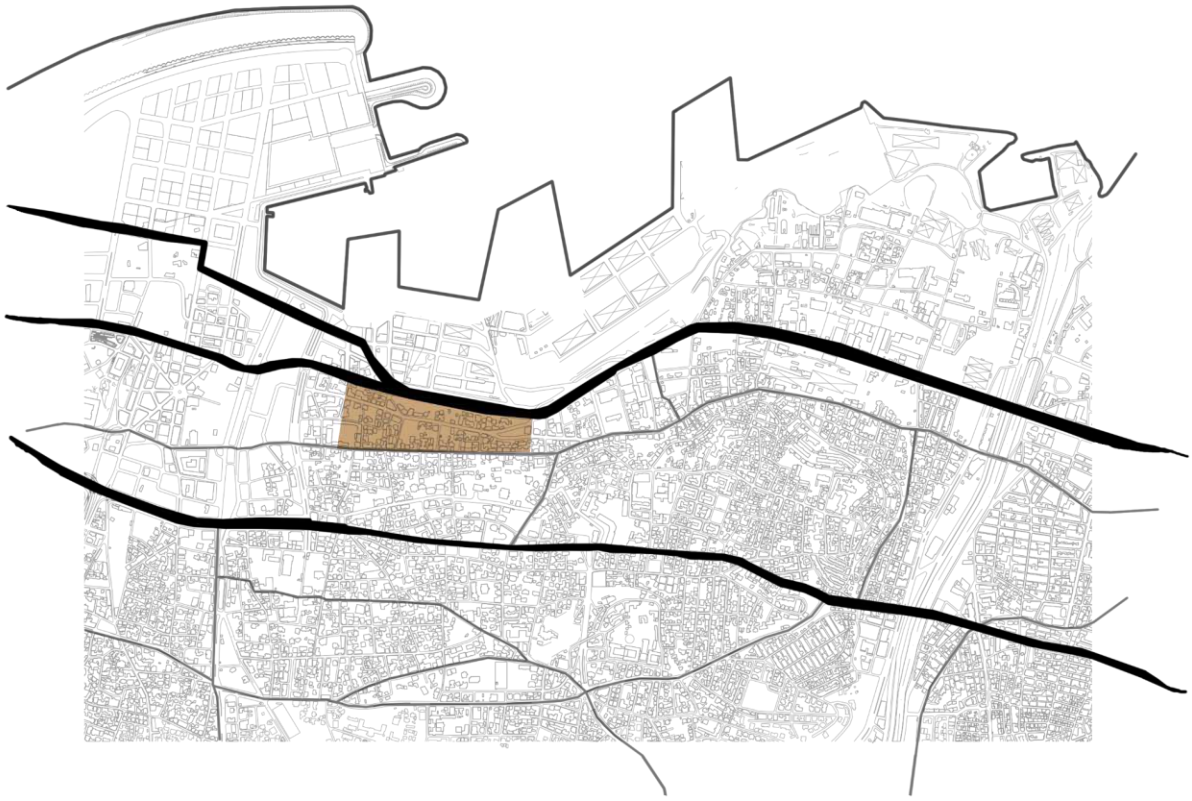


Figure 81. Selected area of interference: Gemmayzeh.

3.4 Area Selection: Gemmayzeh

After thorough research through all the neighborhoods in Beirut, and for a number of reasons, Gemmayzeh is an ideal neighborhood to conduct experimentation after the explosion. First of all, the area was severely affected by the bomb and is situated close to the harbor. Consequently, it offers a fantastic chance to research both the short- and long-term repercussions of the tragedy in a heavily populated urban area. Second, Gemmayzeh is a lively, varied community with a significant cultural and historical past. This makes it a crucial location for comprehending the sociocultural dynamics of the neighborhood and determining the needs and preferences of its residents during the healing process.
In order to select the areas in Gemmayzeh where it would be suitable to insert the temporary cells, maps that illustrate the in-between areas and negative spaces between buildings should be consulted first. Moreover, it is important to take a specific look into the damage and the impact of the explosion on this chosen area, as well as analyze its relationship to the port.

3.4.1 Relationship with the Port

Gemmayzeh's relationship with the port is characterized by an urban rupture. The Charles Helou highway, which incorporates on lower levels the Charles Helou station, is a clear physical separation between Gemmayzeh and the Beirut Port.

Figure 82. Aerial image of Beirut Port, Charles Helou highway and Gemmayzeh.

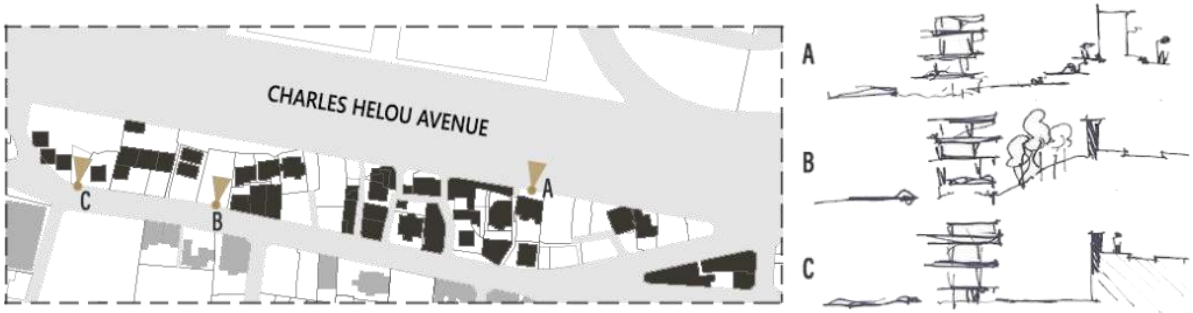


Figure 83. Sketched sections of the relation between Gemmayzeh and the Port.

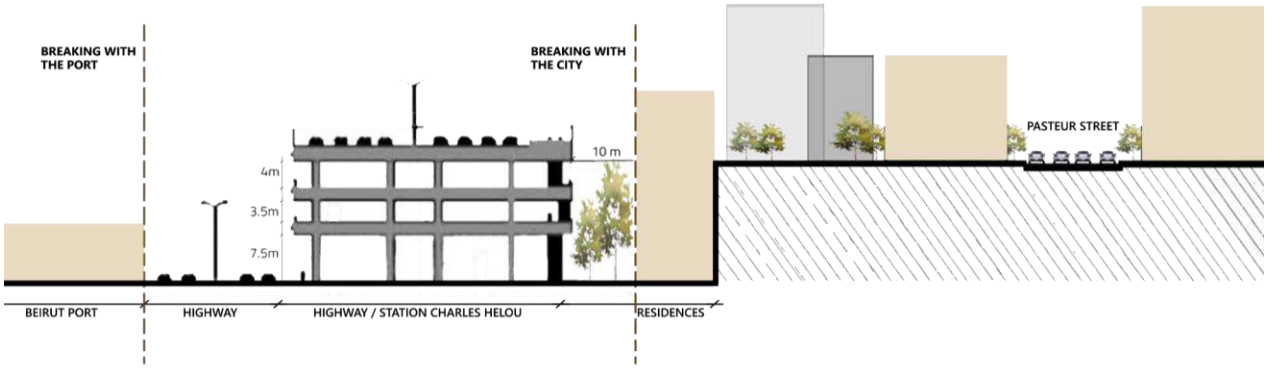


Figure 84. Transversal Section of the Charles Helou avenue.

3.4.2 Explosion impact

Based on studies on Gemmayzeh, such as the Gemmayzeh Urban Project carried out in 2005, the buildings could be classified in four different categories; the structures to be preserved in their integrity because of their authenticity and architectural significance, the portions of the structures to be conserved, such as facades or interiors, the structures with potential for classification, and the unclassified structures. After the explosion, all of these structures proved to have some damage of great importance, and required immediate restoration and reparations, with others facing the risk of collapse.

Figure 85. Descriptive map of the classified heritage buildings of interest in Gemmayzeh.

Figure 86. Map showing the degree of damage of the buildings in Gemmayzeh.

- **Habitat Diversity**

A single typology leads to a homogeneous population and does not meet all the needs of a city and a society. The various housing typologies make it possible to avoid ghettos and to mix the types of population while renewing them. This diversity, a source of social diversity, also ensures the durability of the facilities. Gemmayzeh is divided into three zones; the first one between Gouraud and Sursock Street is occupied by wealthy families who have been living in Gemmayzeh for a long time, the second one is the area of Gouraud Street, which is more frequented by young people and is the most active street in the area, and the third one is the area between Gouraud and Pasteur Street, which has a mix of buildings with diverse uses. The various styles and typologies led to various people inhabiting the area, with different characteristics.

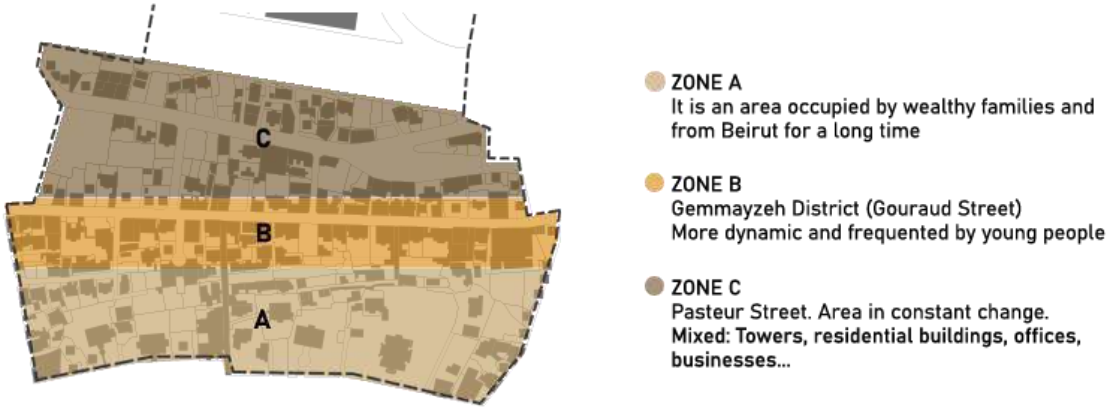


Figure 87. Map showing the habitat diversity in Gemmayzeh by three divided zones.

Figure 88. Urban profile sections on Gouraud street showing the diversities in the households.

Families between 3-5 people / accomodation	Number of accomodations	Number of floors	Number of inhabitants	Total Number
Before the 4th of August	112	5 floors	2240	3880 Inhabitants
	30	3 floors	360	
	11	10 floors	440	
	21	10 floors	840	

Table 4. Table showing the number of inhabitants in the concentrated area before the August 4 explosion.

- **Affected zones studied**

The area has been divided into several parts, each illustrating a particular character of the region (typology, morphology, style, etc.). This was done in order to grasp and give a concrete meaning to the damage, whether it was done at a physical scale or demographic one:

- *Zone 1*: Peripheral zone between different speeds.
- *Zone 2*: Multiplicity of characters, variety of languages.
- *Zone 3*: Series of new buildings breaking the scale of a district.
- *Zone 4*: A life around a staircase: Saint Nicolas.
- *Zone 5*: Alignment, corner treatment, typical traditional house.
- *Zone 6*: Old residences, different approaches.

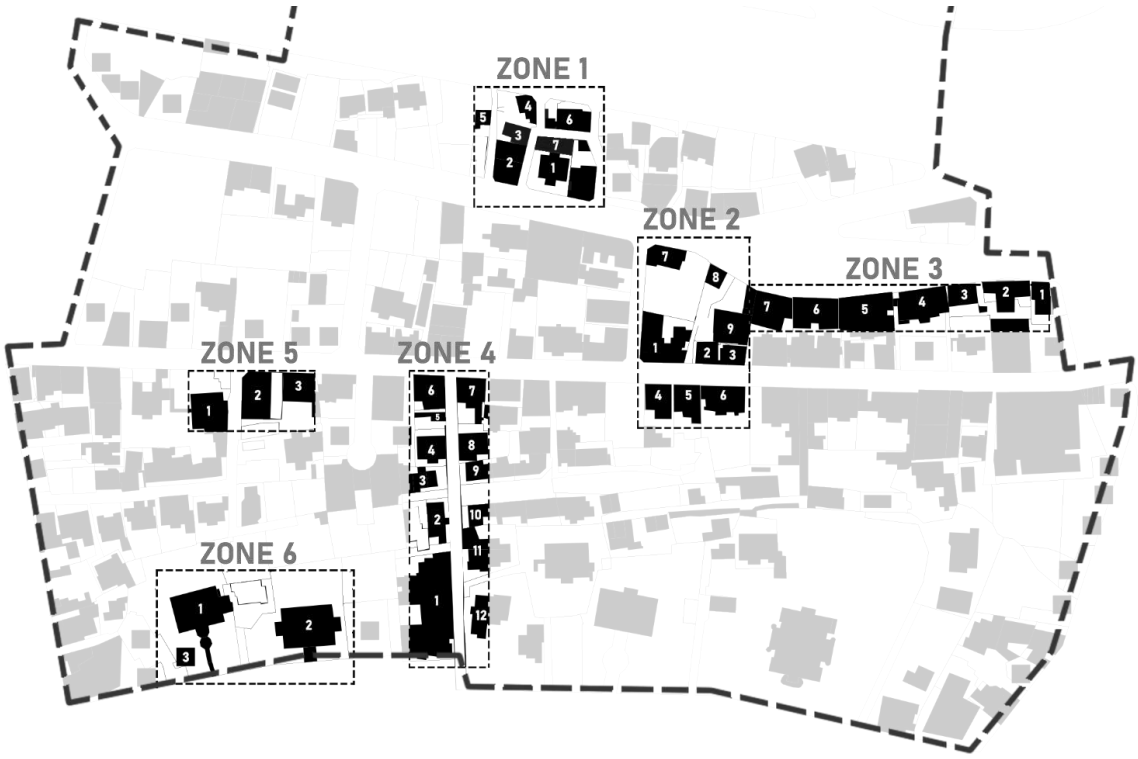


Figure 89. Chosen affected zones in Gemmayzeh to be studied.

		Footprint	Total Surface	Number of floors	Functions	App / Floor	Occupation	Era	Structure	Typology	Categorization	Degree of damage
Zone 1	Building 1	254 m2	980 m2	RDC + 3	Residential	1	Abandoned	Modern	Concrete	Traditional	Cat. A	
	Building 2	490 m2	1960 m2	RDC + 3	Residential	2	Abandoned	Modern	Concrete	Modern	Cat. B	
	Building 3	150 m2	300 m2	RDC + 1	Restaurant	-	Evacuated	Ottoman	Ramleh stone	Traditional	-	
	Building 4	110 m2	220 m2	RDC + 1	Restaurant	-	Evacuated	Ottoman	Ramleh stone	Traditional	-	
	Building 5	80 m2	160 m2	RDC + 1	Restaurant	-	Evacuated	Ottoman	Ramleh stone	Traditional	-	
	Building 6	210 m2	630 m2	RDC + 3	Restaurant	-	Evacuated	Modern	Concrete	Traditional	Cat. B	

		Footprint	Total Surface	Number of floors	Functions	App / Floor	Occupation	Era	Structure	Typology	Categorization	Degree of damage
Zone 2	Building 1	517 m2	2585 m2	RDC + 4	Offices	4	Evacuated	French Mandate	Ramleh stone	Traditional	Cat. A	
	Building 2	113 m2	226 m2	RDC + 2	Residential	1	Evacuated	French Mandate	Mixed	Traditional	Cat. C	
	Building 3	136 m2	272 m2	RDC + 2	Residential	1	Evacuated	Modern	Concrete	Modern	Cat. C	
	Building 4	285 m2	1140 m2	RDC + 3	Residential	1	Evacuated	French Mandate	Ramleh stone	Traditional	Cat. C	
	Building 5	252 m2	756 m2	RDC + 2	Red Cross	1	Occupied	French Mandate	Ramleh stone	Traditional	Cat. B	
	Building 6	360 m2	720 m2	RDC + 1	Residential	1	Evacuated	French Mandate	Ramleh stone	Traditional	Cat. B	
	Building 7	220 m2	660 m2	RDC + 3	Residential	1	Evacuated	Modern	Concrete	Modern	Cat. B	
	Building 8	214 m2	425 m2	RDC + 2	Residential	1	Evacuated	French Mandate	Ramleh stone	Traditional	Cat. A	
	Building 9	223 m2	446 m2	RDC + 2	Residential	1	Evacuated	French Mandate	Ramleh stone	Traditional	Cat. A	

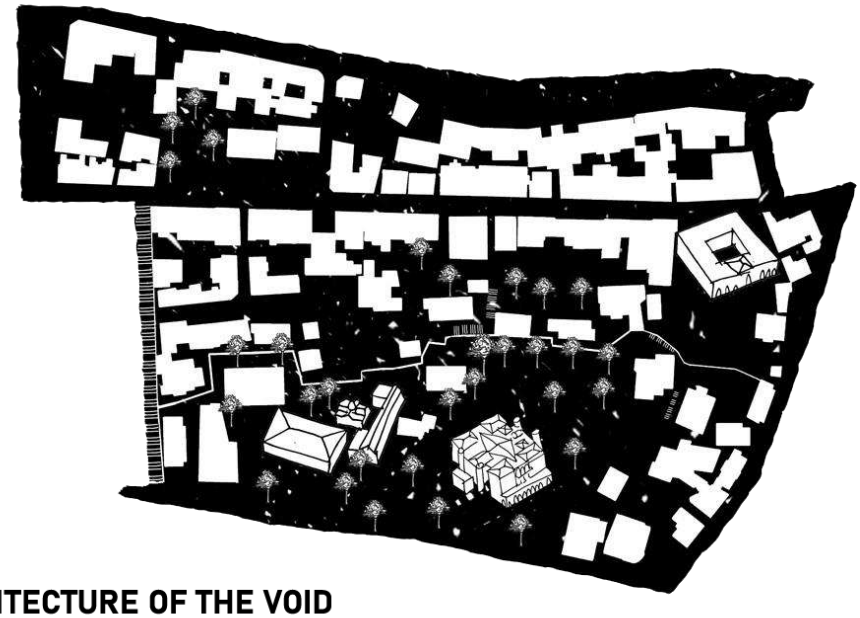
		Footprint	Total Surface	Number of floors	Functions	App / Floor	Occupation	Era	Structure	Typology	Categorization	Degree of damage
Zone 3	Building 1	235 m2	2820 m2	RDC + 11	Offices	2	Evacuated	Modern	Concrete	Modern	-	
	Building 2	425 m2	3400 m2	RDC + 7	Residential	4	Evacuated	Modern	Concrete	Modern	-	
	Building 3	340 m2	5100 m2	RDC + 14	Residential	1	Construction site	Contemporary	Concrete	Modern	-	
	Building 4	370 m2	4080 m2	RDC + 10	Offices	7	Evacuated	Modern	Concrete	Modern	-	
	Building 5	550 m2	3300 m2	RDC + 5	Offices	2	Evacuated	Modern	Concrete	Modern	-	
	Building 6	300 m2	2400 m2	RDC + 7	Residential	2	Evacuated	Modern	Concrete	Modern	-	
	Building 7	320 m2	2560 m2	RDC + 7	Residential	2	Evacuated	Modern	Concrete	Modern	-	

		Footprint	Total Surface	Number of floors	Functions	App / Floor	Occupation	Era	Structure	Typology	Categorization	Degree of damage
Zone 4	Building 1	980 m2	6860 m2	RDC + 6	Residential	5	Occupied	Modern	Concrete	Modern	-	
	Building 2	205 m2	1025 m2	RDC + 4	Residential	2	Occupied	Modern	Concrete	Modern	-	
	Building 3	100 m2	200 m2	RDC + 1	Residential	1	Abandoned	Ottoman	Natural Stone	Traditional	-	
	Building 5	112 m2	224 m2	RDC + 1	Residential	1	Occupied	Ottoman	Natural Stone	Traditional	-	
	Building 6	245 m2	735 m2	RDC + 2	Residential	1	Evacuated	Ottoman	Natural Stone	Traditional	Cat. B	
	Building 7	215 m2	645 m2	RDC + 2	Residential	1	Occupied	French Mandate	Natural Stone	Traditional	Cat. B	
	Building 8	238 m2	476 m2	RDC + 1	Residential	1	Evacuated	French Mandate	Natural Stone	Traditional	Cat. B	
	Building 9	400 m2	2000 m2	RDC + 4	Residential	6	Occupied	Modern	Concrete	Modern	-	
	Building 10	200 m2	1200 m2	RDC + 5	Residential	6	Occupied	Modern	Concrete	Modern	-	
	Building 11	390 m2	1170 m2	RDC + 3	Residential	1	Occupied	Ottoman	Natural Stone	Traditional	Cat. B	
	Building 12	340 m2	1360 m2	RDC + 3	Residential	3	Evacuated	Modern	Concrete	Modern	-	

		Footprint	Total Surface	Number of floors	Functions	App / Floor	Occupation	Era	Structure	Typology	Categorization	Degree of damage
Zone 5	Building 1	500 m2	2040 m2	RDC + 2	RK House	1	Occupied	Ottoman	Natural Stone	Traditional	Cat. A	
	Building 2	255 m2	765 m2	RDC + 3	Residential	2	Occupied	French Mandate	Concrete	Traditional	Cat. B	
	Building 3	350 m2	1050 m2	RDC + 4	Residential	1	Abandoned	French Mandate	Natural Stone	Traditional	Cat. B	

		Footprint	Total Surface	Number of floors	Functions	App / Floor	Occupation	Era	Structure	Typology	Categorization	Degree of damage
Zone 6	Building 1	600 m2	1200 m2	RDC + 1	Residential	Palace	Occupied	Ottoman	Natural Stone	Traditional	Cat. A	
	Building 2	680 m2	2040 m2	RDC + 2	Polyvalent	-	Occupied	Ottoman	Natural Stone	Traditional	Cat. A	
	Building 3	280 m2	560 m2	RDC + 1	Residential	1	Abandoned	French Mandate	Natural Stone	Traditional	Cat. B	

Table 5. Survey of description of the characteristics of the buildings in each chosen zone. (Source: UN Volunteers, September 2020)



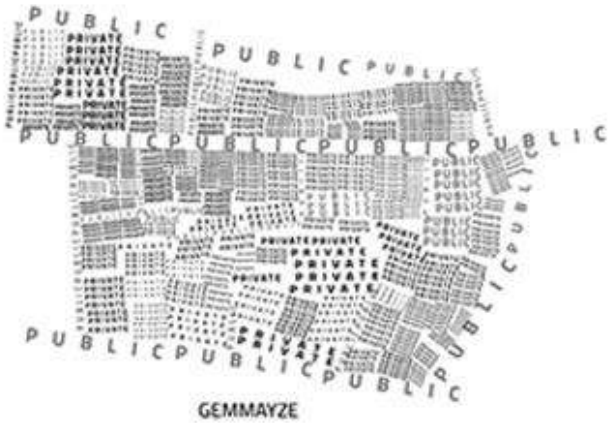
3.4.3. ARCHITECTURE OF THE VOID

"Architecture of the void" can be used to describe spaces or regions of a city that lack any built surroundings or physical structures. Along with natural landmarks like mountains and rivers, these may include open areas like parks, town squares, and untouched lands. While the name "void" may imply a lack or absence of anything, the spaces that make up the void's architecture can serve essential purposes and have significant function for the urban fabric. People can congregate, mingle, and engage in leisure activities in public spaces like parks and plazas, for instance, while rivers and mountains can serve as significant monuments and markers of a city's character. Additionally, these voids may serve crucial ecological purposes like supplying green spaces for biodiversity, controlling urban temperature, and enhancing air quality. The significance of these voids in developing livable, sustainable, and equitable cities has gained more attention in recent years. As a result, architects, urban planners, and decision-makers are more and more thinking about how to incorporate the architecture of the void into city planning and design.

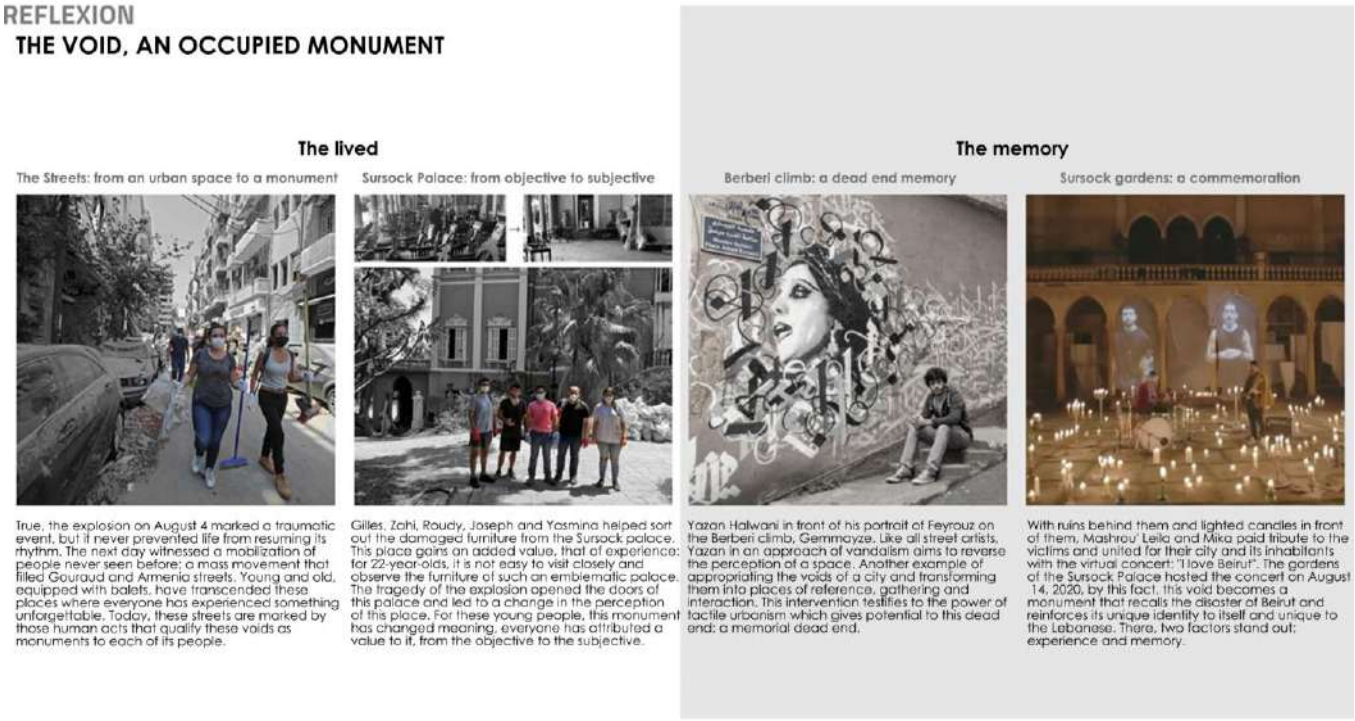
LE VIDE COMME MONUMENT

La présence du vide exprime aussi la dimension fondamentale de la ville moderne...
...du fait de son inscription dans la ville, le sol subit une transformation, minime mais essentielle, en devenant le support de toutes les traces de l'usage des lieux, comme en temoigne les lignes des chemins tracées par les pas des pietons...

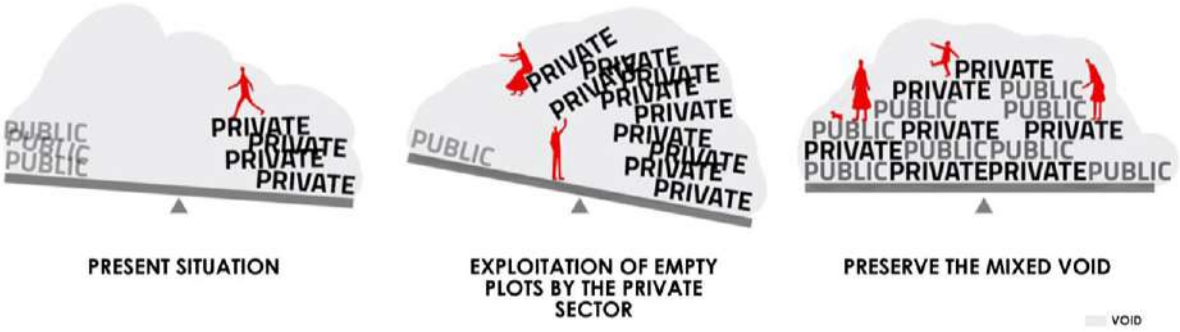
ERIC LAPIERRE, *architecte français*



GEMMAYZE



Diversity is a main characteristic of the Gemmayzeh region. It is the flow of people and the exchanges between them that build the charm of these districts, hence the importance of meeting spaces and places of interaction that take place in these architectural voids. Without them, could the mix continue to grow over time?



3.4.4 Site Selection

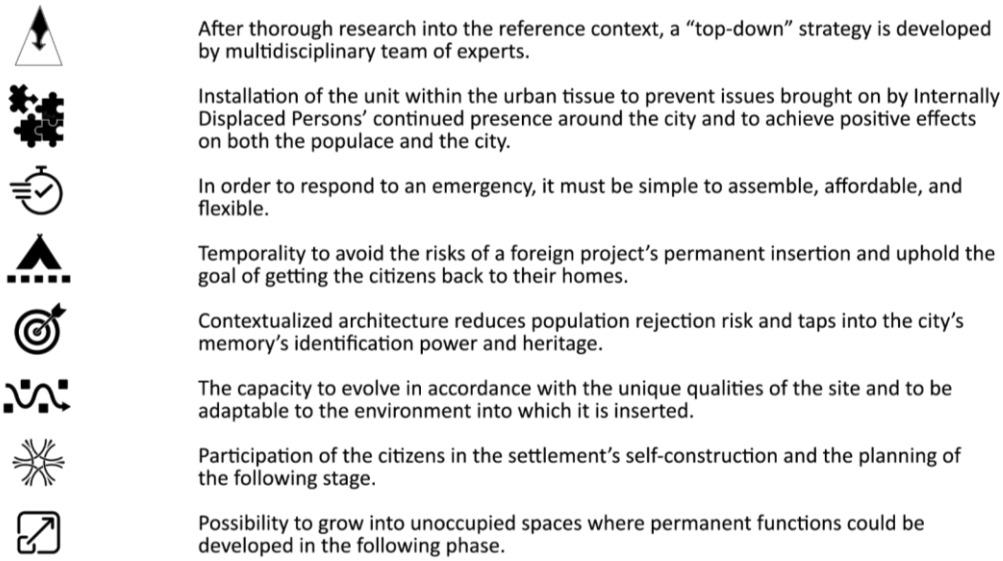
Figure 90. Map of the three potential spaces for the integration of the project.

For the implementation of the project, three potential spaces have been observed in Gemmayzeh, consisting of green public wastelands as well as empty plots currently serving for parking. The "Space 1" illustrated in the map will serve as a basis for the construction of this project, since it offers a higher potential of land usage due to its high percentage of green wastelands.

Figure 91. Plan of the current state of the site (Space 1).

3.5 Temporary Emergency Unit

The following is a summary of the key ideas to bear in mind when organizing the settlement:



3.5.1 Construction Technique

The framework is being built using a temporary, lightweight reticular structure with beams and pillars that may grow to fill in the remaining open space. This aims to be elevated in order to permit the partial disposal of the debris in this area prior to the settlement and the ability to carry on the job even so. The overall system is made of the light structure as well as the modules which will serve as the cells in which the functions will be housed. The structure used in order to create the supporting reticular construction starts with prefabricated standard aluminum reticular modular beams and pillars. The size of the planned module, 4x4m, was chosen to strike the correct balance between a liveable area that could be used in a variety of ways, and, at the same time, a structurally stable and compact one. Each module is properly composed of a steel channel structural frame as well as steel tube columns, a platform that acts as the settlement's paving, and a maximum of three overlapping rooms to house both homes and any other settlement functions. The exterior rain-screen walls are made stratigraphically, moving from the outside to the inside, by corrugated metal, an insulation layer, a covering of exterior sheathing, a light gauge steel framing, and lastly a painted gypsum wall board, exposed to the interior space. Each module is prefabricated and placed in the structural grid already erected in the site.

Modular construction presents many advantages, such as a quick construction, its low cost of construction as well as its energy efficiency. Moreover, it uses materials from the area, it is better for the environment, less damaging to living things, and improves effectiveness. Just like any type of construction, it offers disadvantages as well, though minimal. First of all, the price of transportation rises, and the design variations are very limited.

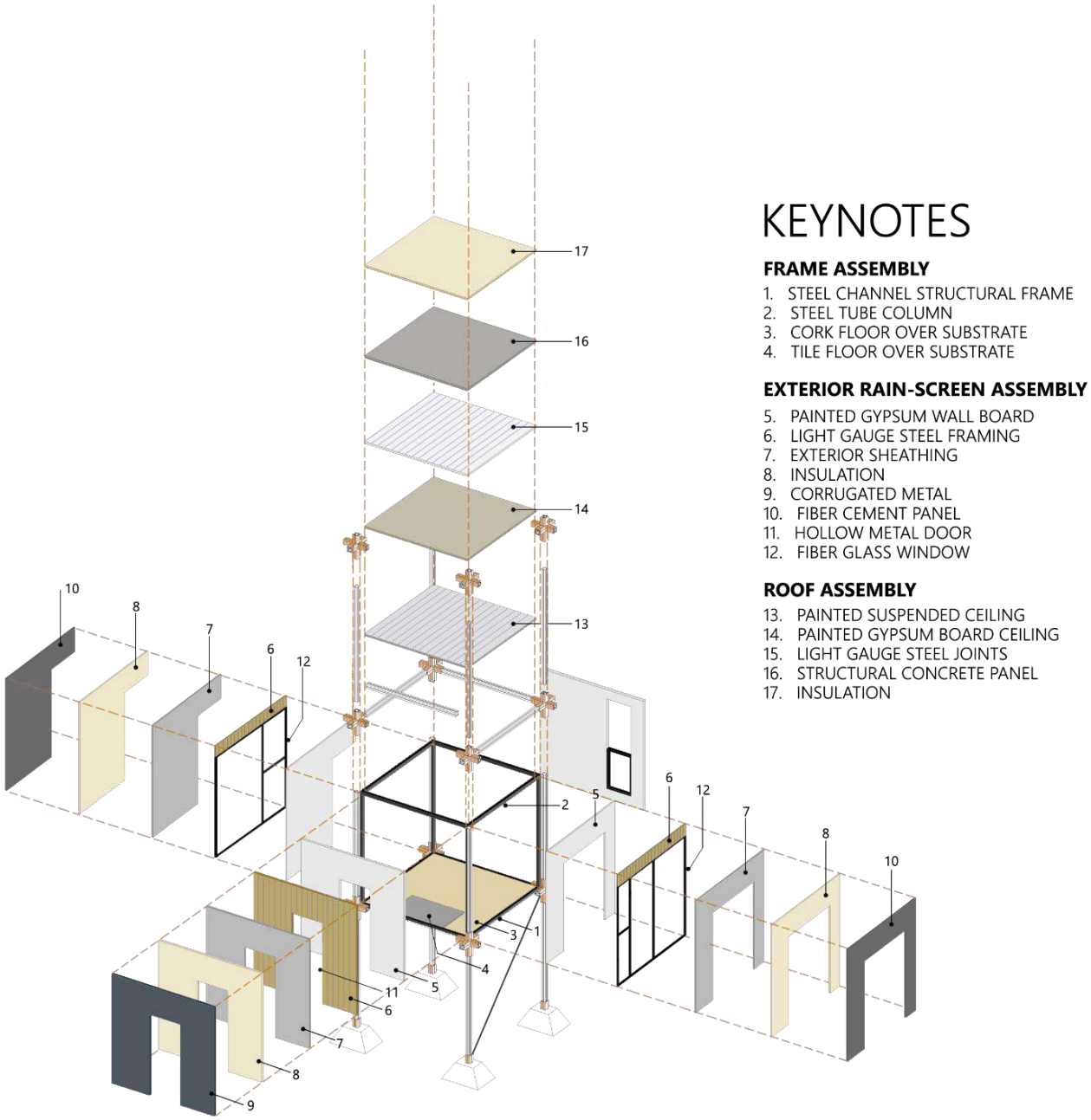


Figure 92. Conception and construction process of the module.

3.5.2 Module's Morphology

In any temporary camp, it was recommended by the UNHCR to utilize a strategic grid design for the speedy building of the settlement. However, given the detrimental effects it has on the locals, this solution is not very effective since the grid represents an uncharacterized, non-symbolic, and amorphous place that does not help the inhabitants reconstruct a shared identity, turning what should be a transient space into a kind of permanent city. In this sense, the regular, efficient, and ordered structure of the UNHCR standard camp will be superimposed on the urban morphology of Beirut. Planning for temporary settlements must take into account the urban fabric into which this new system must be injected without running the risk of being refused, utilizing the pre-existing context as an opportunity to construct a relationship with the common identity of the entire population of Beirut and actively taking part in the transformation processes sparked by the propulsion system.

The two systems overlap in two identical ways; first, through a typological declination of the city's urban fabric within the project, particularly considering the residential buildings in the Middle Eastern matrix, and second, through the settlement's development over time, in its construction process, related to the site's morphology.

The procreated process is developed by putting together the temporary cell after installing the grid on top of the debris in the site. These modules will first hold the communal functions and the first rising mechanisms, allowing the people to occupy these spaces as soon as possible. The settlement is then enlarged to take up the neighboring vacant spaces, acting as a snake and filtering the voids in the city.

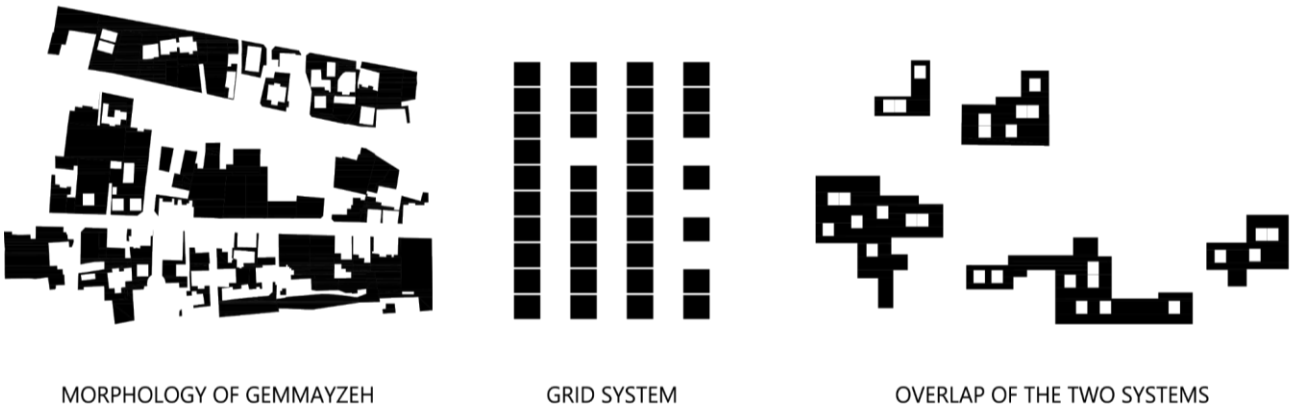


Figure 93. Superposition of the morphology of Gemmayzeh and the grid system.

The form is a massive structure that is modular, extensible, and has a framework into which smaller pieces could be plugged or replaced to meet the needs of users in order to attain the concept of flexibility. A building that can expand by adding more areas for future growth and actively adjusting its spatial layout to accommodate varied usage patterns throughout the day.

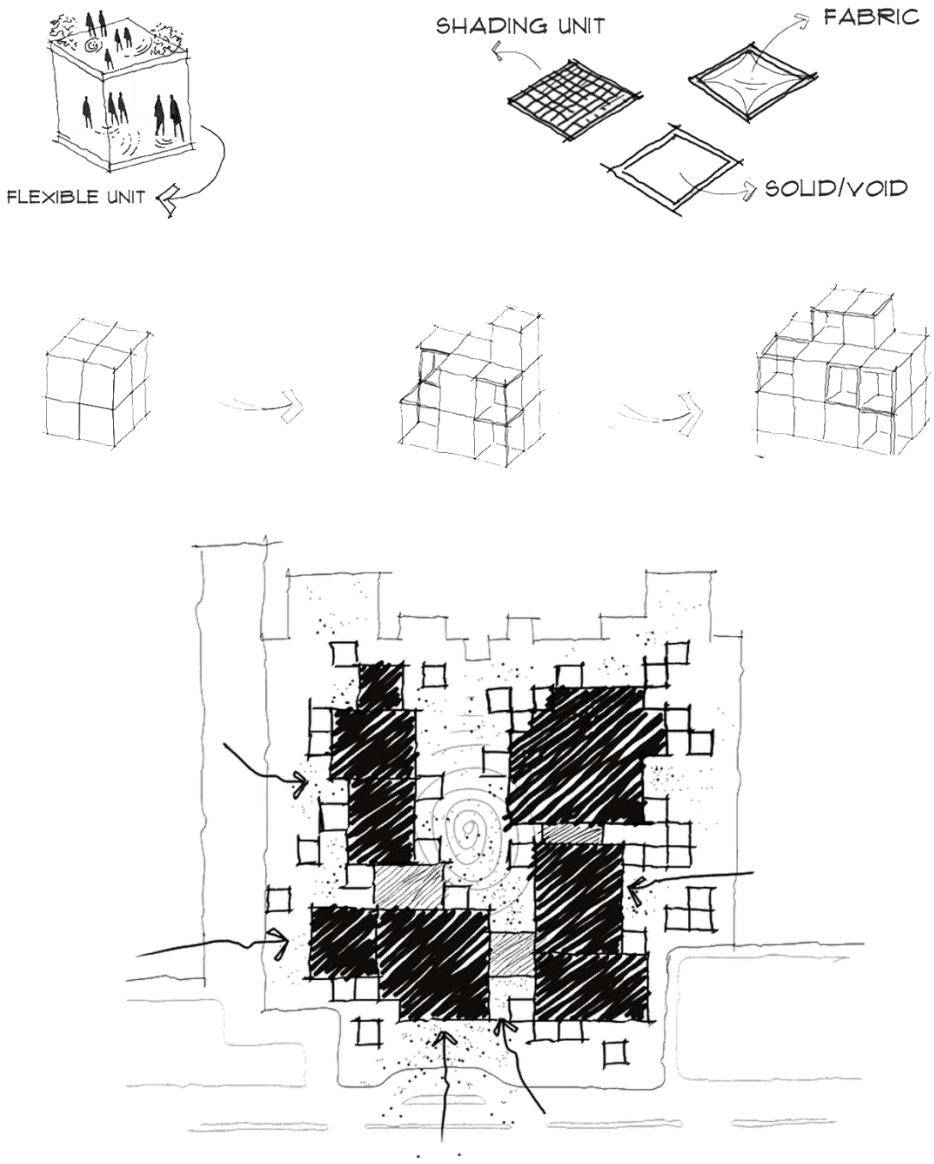


Figure 94. Sketches of the variations of the module unit and its insertion in the site.

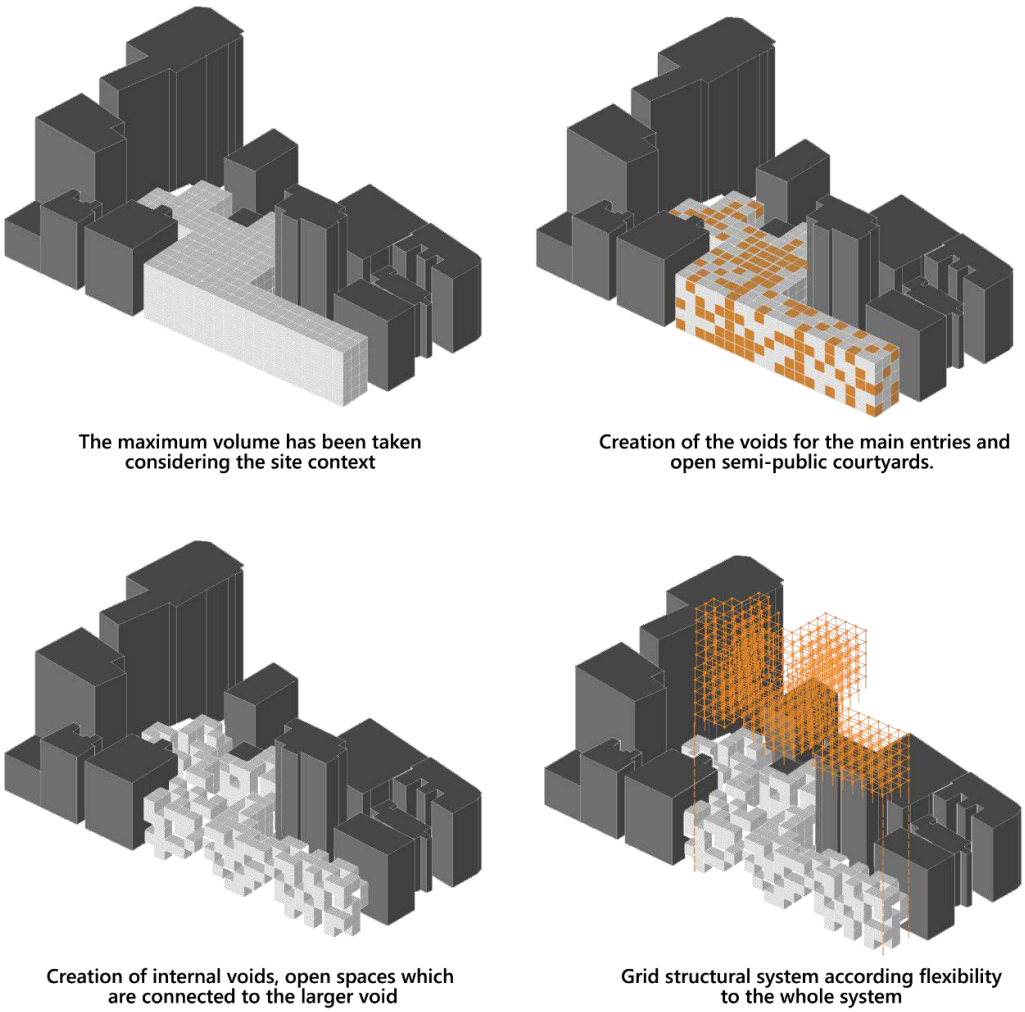


Figure 95. Sketches of the variations of the module unit and its insertion in the site.

The form was initially a pure composition that was modified to fit the project's concept and function to create the final mass. The primary idea of the Metabolism theory is shown in how the masses are formed. As a result, the masses were conceptualized as organically developing cubes. It was possible to connect one cube to the next one both horizontally and vertically. Additionally, the cubes may be distinct areas with distinct uses that look out onto one another, creating usable outdoor areas on the roof.

As a result of the previous examination of the residential typologies in Beirut, the following principles have been organized and will be used to the construction of temporary homes:

- The central courtyard, which serves as the center of family life and is visible from every opening in an Arab home, guarantees the residents' physical and mental well-being, and is only occasionally overlooked, is the typical feature of the Arab home.
- Rather than being the first of many transition areas that allow for gradual entry from the public area to the more private one, the entrance is never linearly directed towards the central courtyard.
- A building type that typically consists of a center courtyard that expands irregularly to fill the exterior vacant space.
- The implementation of flat roofs as living areas in homes, especially as open-air bedrooms to stay cool during the sweltering summer nights.
- Presence of a well in the open courtyard that provides drinking water.

3.5.3 Modules' Functions

The fundamental monomodular functions were developed as a result of the residential typological study of the typology of Beirut, in their essence, seek to represent their social needs and summarize the key characteristics of the Lebanese's culture and identity as expressed by the local architecture. The building of the temporary dwelling units for the settlement is based on these fundamental cells, made of a kitchen, a bathroom, double or single rooms. Variations of each module exist in order to provide flexibility during the day and night.

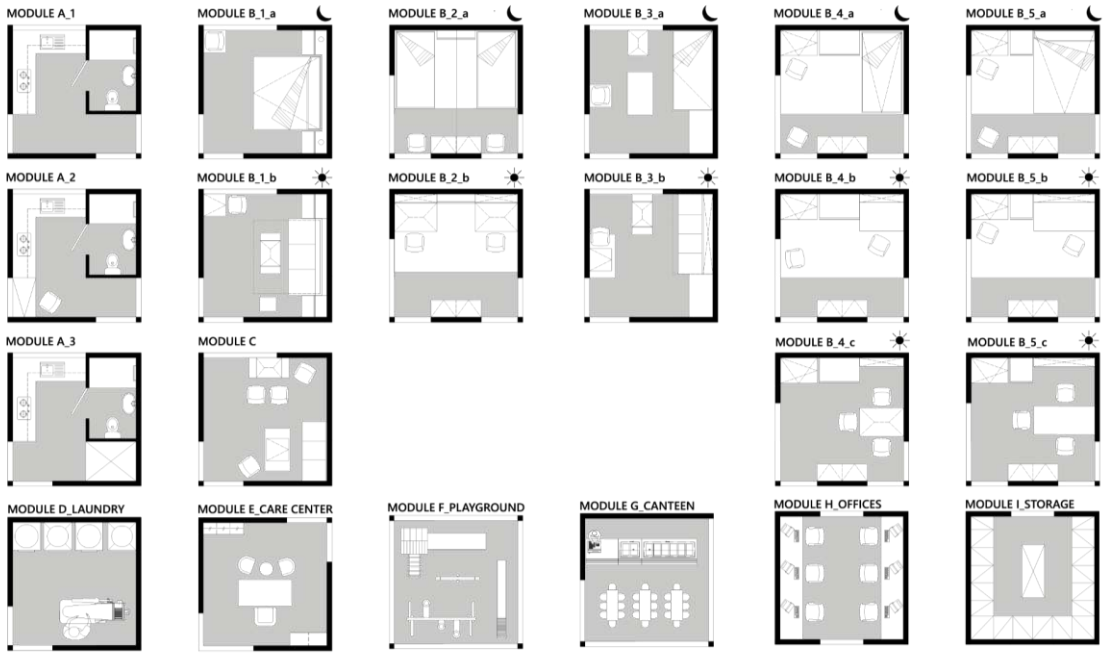


Figure 96. Variations of day/night modules.

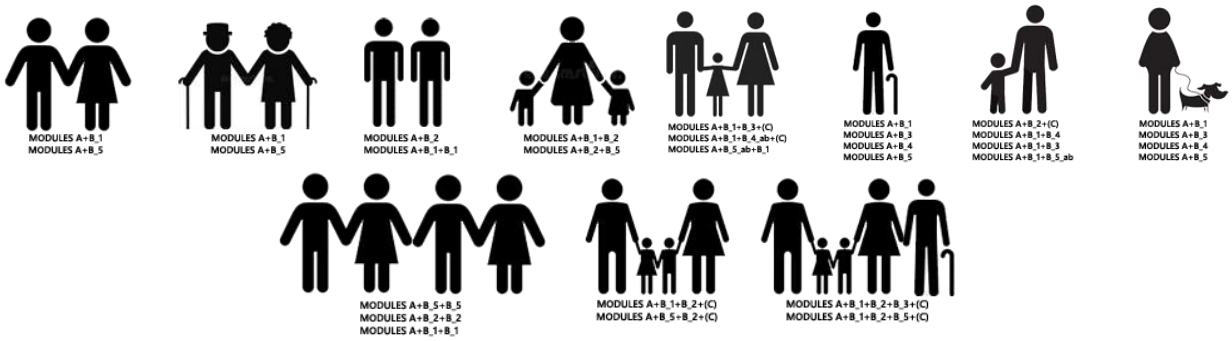


Figure 97. Options of systems accorded to different possibilities of users.

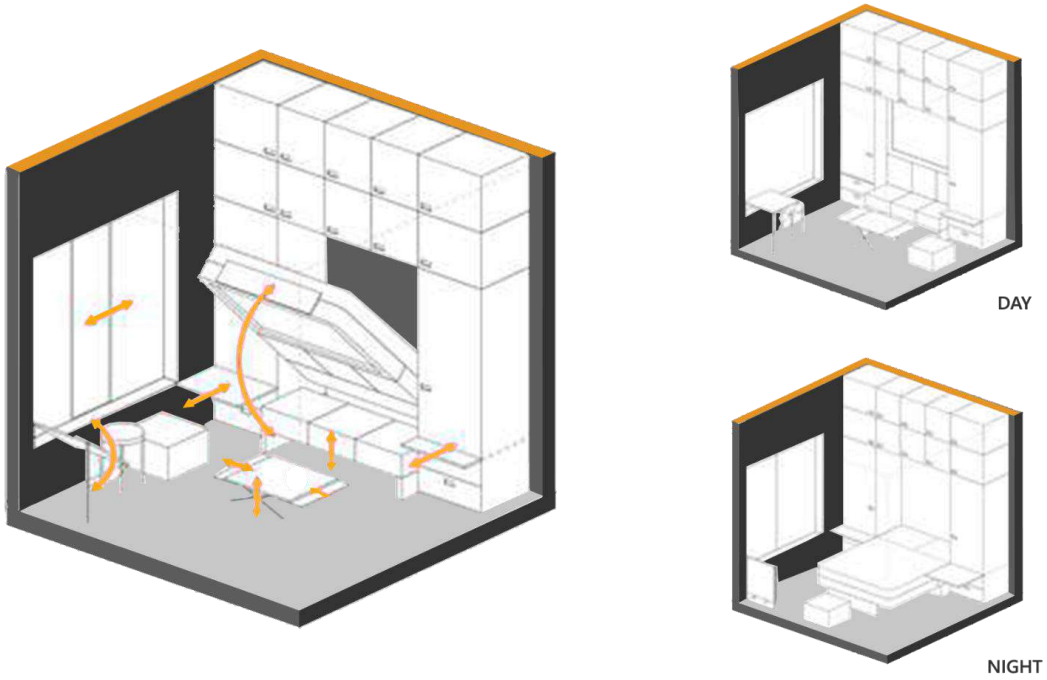


Figure 98. Flexibility of the furniture arrangement in the module.

Prefabricated modular homes that may be modified to fit changing household needs. Modular housing units can be added to or removed from a dwelling unit to accommodate the expansion or contraction of a household. Each autonomous unit is outfitted with a flexible furniture arrangement that includes hidden beds, mobile tables, and other foldable and compact parts to minimize the amount of personal space needed by each occupant. Each autonomous unit also has a bathroom and a kitchen. Large common areas can be made available for meetings, socializing, and leisure activities by eliminating personal space. Additional modules can offer communal places for workspaces, offices, laundry rooms, and storage areas.

Figure 99. Assembly of the modules corresponding to the needs of different users used in the project.

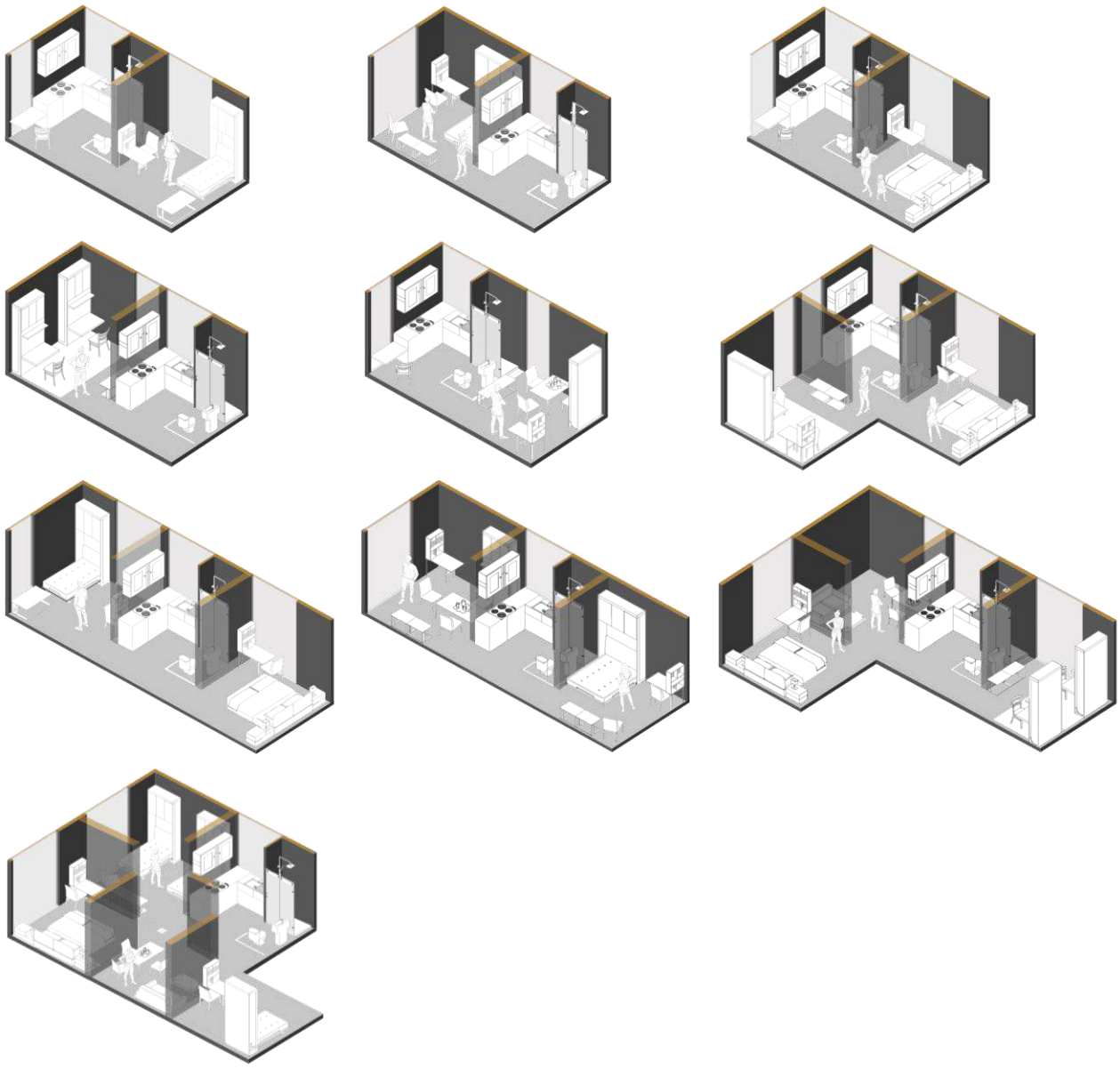


Figure 100. 3D Assembly of the modules used in the project.

- Concept of Reusable component

A building part or module that is intended to be utilized in several projects or different variations of the same project is referred to as a “reusable component”. These parts are frequently prefabricated or pre-engineered, which makes it simpler to produce and assemble them on-site. The project develops a number of modular dwelling units that can be integrated and set up in various ways to provide a number of layouts. Each module acts as a reusable part that may be applied and customized for various design settings.

During the construction process, time and resources can be saved by using modular, prefabricated components. Modular components may also be moved to the site more simply, minimizing environmental effects of both building and transportation. The advantages of reusable components in architecture are numerous, such as improved efficiency, decreased waste, time saving, and more design flexibility. In the project, six main components have been designed in order to be used in the residential demand. The same component can be assigned to different configurations and lead to different designs and variations.

Figure 101. Diagram showing the concept of reusable components applied in the project.

3.5.4 Interpretation of the provisional module

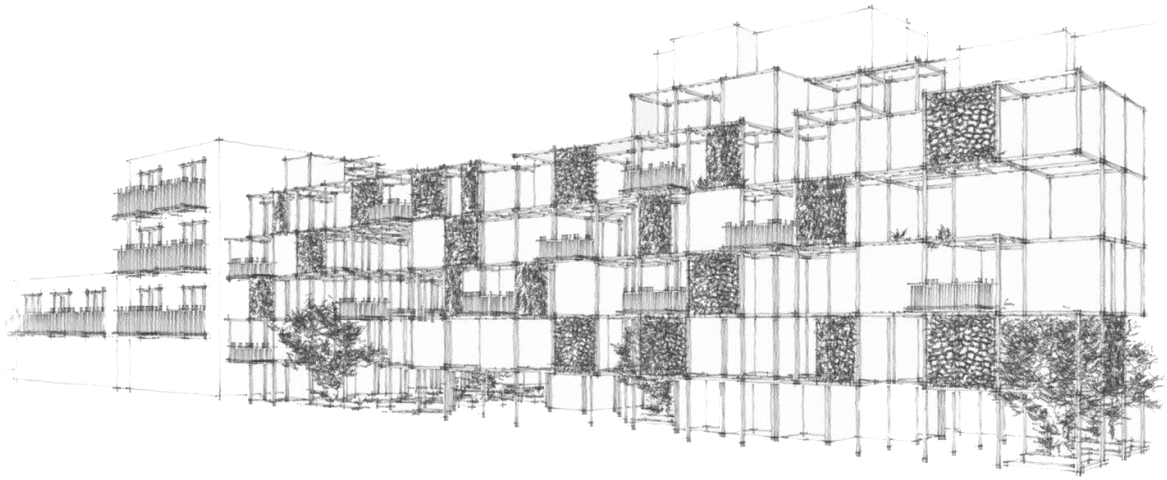


Figure 102. Early sketch of the project.

At user level, the size of the project is determined by dividing the free area of the site by the size per capita referred to as the minimum living space. The area of 3200 square meters was divided by the surface of 45 square meters per inhabitant, for a total of about 350 people to be hosted in the site, divided between a minimum of 100 mixed residences. This not only comprises the functional area for residential houses but also all communal and mobile spaces combined. It is therefore conceivable to move further with the design of the cell once the number of citizens hosted, the functional program, and its quantities have been decided.

First, the surrounding cells which are at the periphery are built, making their way into the center which is left vacant in order to guarantee a central courtyard, typical of the Lebanese typology.

The common spaces are gathered at the heart of the project, easily accessible to all the residents. The ground floor hosts a canteen, a care center, medical assistance, laundry, a playground, offices and workshop spaces. The project's design takes into account how inhabitants interact with one another and how facilities are accessible. The proposal guarantees that all residents have easy access to shared amenities by placing communal areas on the ground floor. By promoting interaction and engagement among inhabitants, this strategy promotes a sense of community. In order to ensure that all inhabitants, regardless of ability, may readily access and use the communal facilities, the project has also adopted universal design principles. With this strategy, diversity is encouraged and everyone in the neighborhood can take full advantage of the advantages of the communal areas.

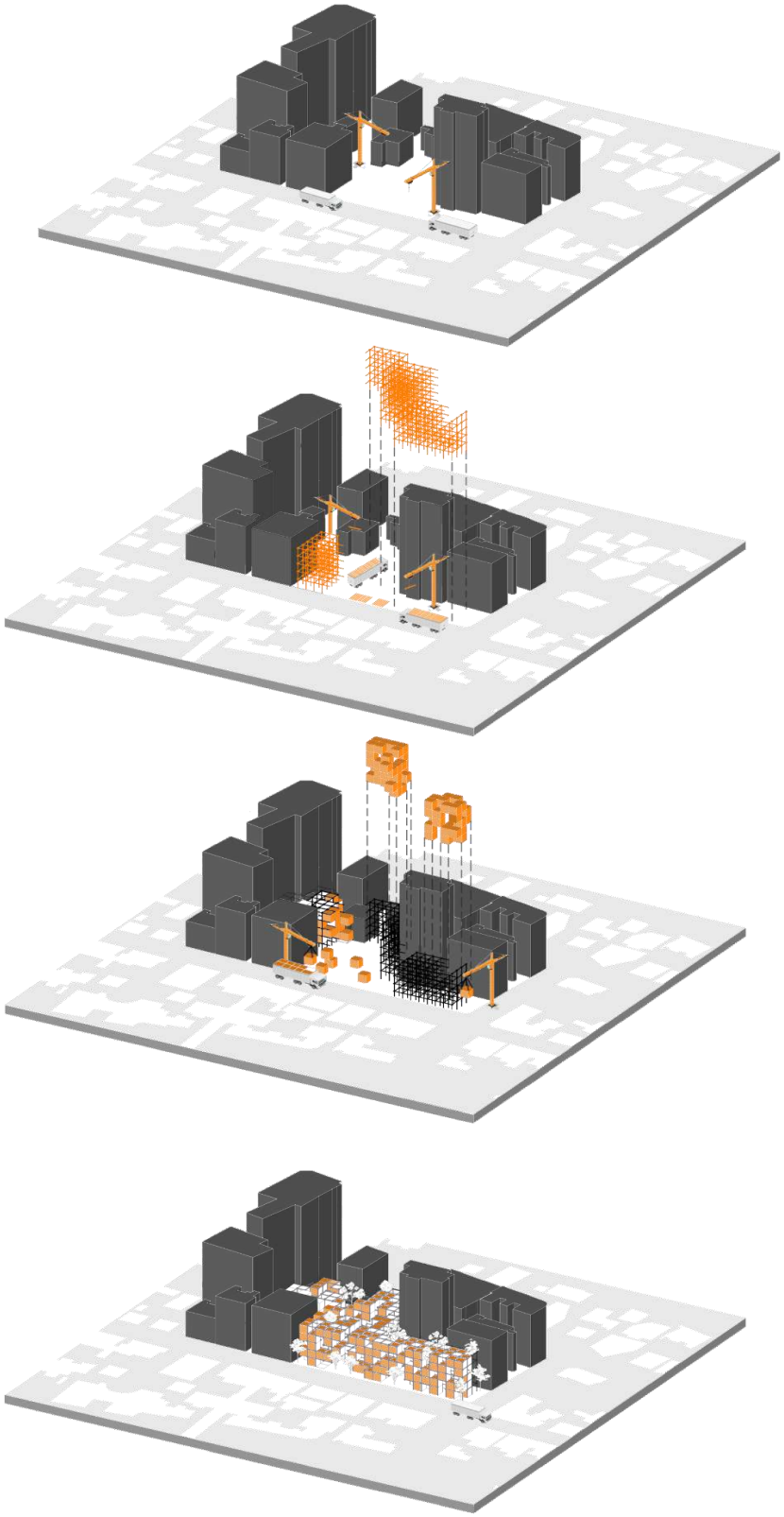


Figure 103. The construction and growth of the temporary emergency cell.

3.6 Resonating with the Lebanese Context: A Design Manifestation

Understanding and respecting the site's particular context and cultural heritage become crucial in the effort to produce a meaningful and significant architectural project. In constructing a story that depicts the complex thread of Lebanon's identity, this section examines how this project incorporates the Lebanese setting. This design manifestation takes shape as an authentic statement of Lebanese identity by digging into the nuances of the regional environment, cultural values, and historical significance.

I set out on a mission to understand the essence of the in-between space - the vacant and negative spaces that hold enormous potential - within the busy urban fabric, surrounded by structures. The design has developed into a seamless fusion of the past, present, and future thanks to input from specialists, members of the local community, and my extensive research on Lebanese architecture, culture, and history.

My concept aims to create an environment that resonates with the Lebanese setting by drawing influence from the distinctive architectural styles, traditional craftsmanship, and magnificent natural beauty of Lebanon. It is a holistic manifestation that reflects the goals, needs, and cultural values of the Lebanese people rather than just a collection of structures.

I will explore each of the components that contribute to the resonance between the project and the Lebanese setting. We will look at how the combination of material choice, architectural details, landscape, and cultural integration results in a coherent design narrative. We will also go over the social and environmental factors that have influenced my strategy. My goal is to leave a lasting legacy that speaks to Lebanon's collective memory and identity while also serving as a physical monument by embracing the Lebanese setting and incorporating it into the very fabric of my design. My initiative is a tribute to the past, a celebration of the present, and a declaration of hope for a thriving and culturally diverse future.

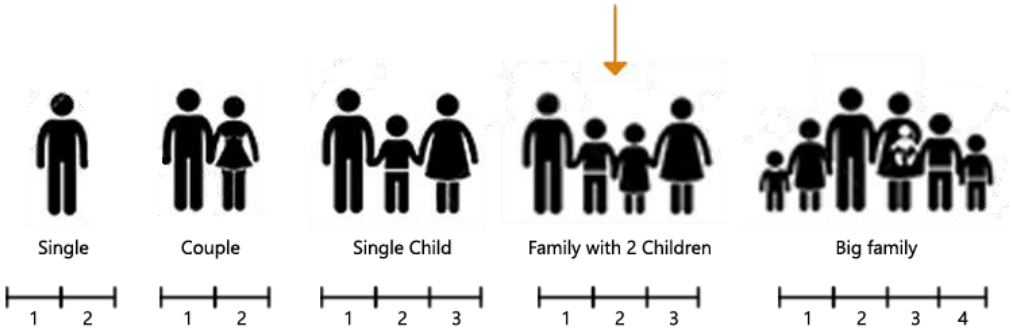
1. ***Authenticity:***

It goes beyond including particular features or aspects to ensure authenticity in the design approach. It entails an in-depth understanding and fusion of numerous facets of the Lebanese setting and culture. In order to enhance authenticity in the design, many points should be looked into.

Undertaking a detailed investigation of the project site and its surroundings is a must before beginning the design process. This will help me gain priceless knowledge about the neighborhood's magnitude, character, and existing urban fabric, making sure that my design melds seamlessly into the surroundings by being aware of the context. Knowing how my project will interact with nearby structures is a key component of the site investigation. I consider the scale, massing, the presence of voids, and architectural style of the nearby buildings. It is crucial to design in a way that respects the current environment and enhances the overall architecture composition. Other public places and the existing voids in-between the buildings are assessed as well, taking note of how people utilize and interact with them.

Contextual response, in which we seek to develop a project that actually responds to the local context and serves the requirements of the community, is a key component of the design approach. In order to understand the needs, goals, and cultural values of the community, I have engaged in significant research and community interaction. The project's flexibility is seen in its supply of flexible dwelling units that can be merged according to family size. The system created primarily consists of modules that can hold three

units because it is known that the typical Lebanese family has an average of four members. This strategy demonstrates the commitment to addressing neighborhood issues and guarantees that the project will not only be useful but also have an impact on the neighborhood it serves. By targeting the size of the Lebanese family, this also proves the authenticity of the project and its aim targeted towards the local community.



2. Cultural Reference:

Cultural references are essential for giving the project a distinctively Lebanese identity and a sense of place. A visual language could be developed that resonates with the local culture by including design components, patterns, and themes that are inspired by the Lebanese culture. One strategy is to get ideas from the classical architectural elements that are frequently seen in buildings in Lebanon. For instance, integrating verandas, a key component of Lebanese architecture, can give the design a touch of elegance and cultural value.

Mashrabiya screens, renowned for their elaborative geometric patterns and perforated designs, can also be incorporated into the project to offer a layer of cultural depth while providing shade and privacy to the rooms. Additionally, adding ornamental tile work that is reminiscent of the vivid mosaic tiles frequently found in Lebanese historical buildings and traditional homes can provide a sense of artistic flair and legacy to the flooring of the general open spaces. A visual narrative can be built that not only accurately depicts Lebanese culture but also fosters a sense of pride, identity, and belonging in the project by carefully choosing and strategically using these cultural elements.

Mashrabiya *Veranda* *Mosaic Tiles*

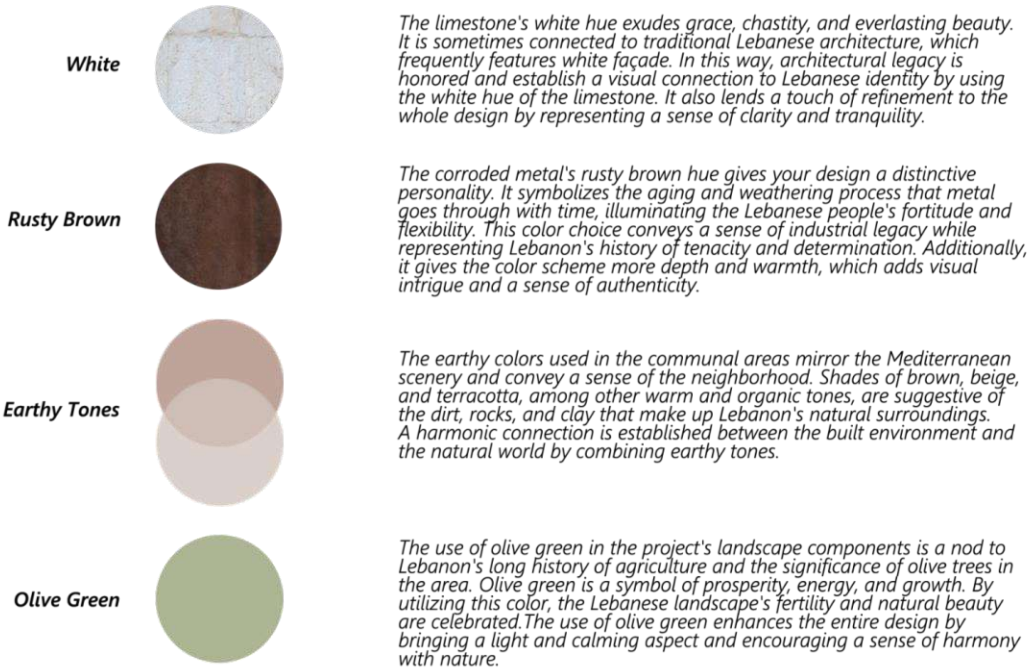
3. Material Selection:

A project's personality and identity are greatly influenced by the material choices made, which take into account both cultural significance and practicality from an economic standpoint. It is crucial to use regional or traditional building materials that are also financially viable to represent the Lebanese character and forge a strong connection to the area.

White limestone; a readily available and reasonably priced stone, has a long history of use in Lebanese architecture and is an excellent choice for the project. It is widely accessible in Lebanon, making it possible to affordably preserve a visual connection to the nation's cultural legacy. The stone's innate beauty, texture, and warm tones convey a sense of authenticity and timelessness while fitting within financial constraints. Furthermore, white limestone has exceptional durability, which lowers long-term maintenance costs and makes it a sensible option for environmentally friendly building.

Oxidized metal can be incorporated into the design while taking into account cost considerations. Although metal may not be a common building element in Lebanon, there are several ways to get the oxidized finish. With this strategy, Lebanon's industrial heritage and workmanship may be honored while staying within financial means. The patina and aged appearance of oxidized metal produce a distinctive aesthetic that illustrates the tenacity of Lebanese culture and the passage of time. Additionally, the strategic placement of metal in the building can provide structural efficiency, lowering material costs and speeding up construction.

4. Color Palette:



By carefully choosing and including these hues in the design, a harmonious color scheme is produced that highlights the Lebanese character. Each color selection reflects various facets of the nation's history, culture, and natural surroundings, enabling the design to resonate with the regional setting and foster a sense of authenticity and belonging.

5. Landscape and Green Spaces:

Enhancing the Lebanese identity of the project, landscaping and green spaces are essential in establishing a harmonious relationship between the constructed environment and the natural surroundings. A sense of peace is fostered, beauty, and environmental sustainability by incorporating green spaces and landscaping with Lebanese floral inspiration. Utilizing indigenous plants and trees that flourish in the area is crucial to forging this connection. Native plants require little water and care because they are well adapted to the Lebanese ecosystem. They maintain the local ecology and preserve natural biodiversity, adding to the project's overall sustainability.

The project exhibits a deliberate design approach that encourages community participation and connectivity through the careful use of voids and negative spaces as meeting areas and courtyards. Conversation, relaxation, and a sense of community can be fostered by repurposing these unused spaces into lively social spaces.

The placement of a native tree as the primary focal point in the center of these meeting areas and courtyards becomes a potent symbol. The tree acts as a focal point, bringing people closer to the natural world while offering them shade, aesthetic appeal, and a sense of rootedness. It stands for the Lebanese people's continuing power, development, and resiliency.

6. Community Engagement:

In order to create a design that appeals to the Lebanese population and satisfies their unique demands, community engagement is essential. The local community can be actively involved in the design process to learn important information about their preferences, objectives, and cultural values. Some important requirements of the Lebanese community are highlighted by this project. Lebanese families come in a variety of shapes and sizes, therefore flexibility and adaptability are crucial factors to take into account. Understanding the community's desire for adaptable housing units that may support various family configurations comes from active community engagement.
The importance of outdoor interactions and gatherings in the community should be recognized, resulting in the inclusion of well-designed outdoor spaces that encourage community engagement.
Priorities for green building techniques, energy-saving technologies, and components that honor Lebanese heritage also include sustainability, resilience, and cultural preservation. The project fosters a sense of ownership and pride within the Lebanese community by taking into account their suggestions and desires, while also attending to their particular needs and capturing the distinctive Lebanese identity.

7. Public Art & Installation:

Incorporating public art and installations that honor Lebanon's rich legacy, history, and modern culture into the project is crucial for showcasing the Lebanese identity. Gemmayzeh, which is well-known for having a thriving arts community, provides plenty of inspiration in this area. Numerous eye-catching public artworks that beautifully express Lebanese culture line the streets of Gemmayzeh. These works of art, which range from vibrant murals representing historical characters and famous locations to provocative paintings highlighting the social issues and the tenacity of the Lebanese people, add a special vibrancy to the area. When including aspects from Gemmayzeh's street art culture into the project, a vibrant and exciting setting is produced that honors the community's spirit. These creative features will not only be the project's main points but will also help create a sense of place, start dialogues, and encourage inhabitants to feel more connected to their surroundings.

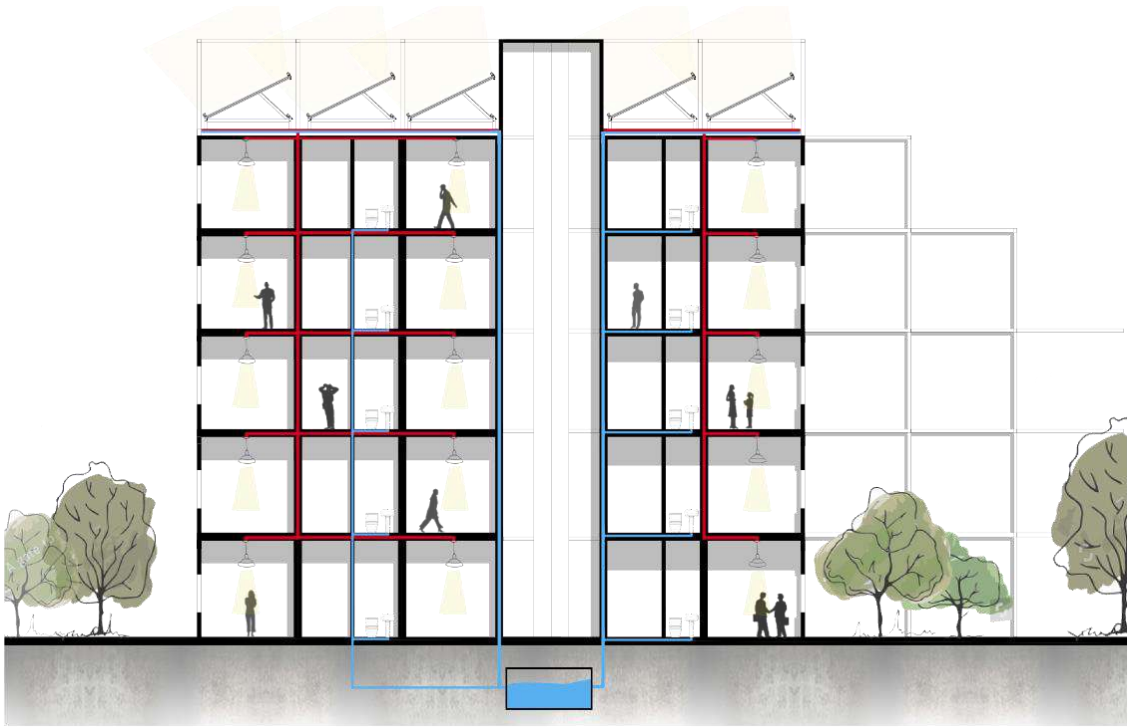
8. Sustainability:

Integrating sustainable design ideas into the project is vital to maintaining Lebanon's environmental values. This strategy not only demonstrates a dedication to environmental protection, but it also fits with the increasing global emphasis on sustainable practices.

Including renewable energy sources, such as photovoltaic (PV) panels is one way of achieving this goal. PV panels can capture solar energy and transform it into electricity, giving the residential units a clean and renewable energy source for heating and powering. This decreases dependency on conventional energy sources and helps the project become self-sustaining.

The project's sustainability can also be increased by maximizing passive design techniques in addition to renewable energy. The energy required for heating, cooling and lighting can be lessened, thus lowering the project's total environmental impact, by carefully analyzing the orientation of the buildings, implementing shading devices, and optimizing natural ventilation and daylighting.

Rainwater harvesting systems should be included as another factor. Rain is present in Lebanon, and collecting and storing rainwater can help to lessen the country's reliance on conventional water sources. By putting in place rainwater harvesting systems, non-potable water applications like irrigation, toilet flushing, and cleaning communal spaces can have a reliable supply of water. This helps to make the project more sustainable and self-sufficient while also conserving water resources.



9. Social Integration:

The design of areas that promote social interactions and motivate inhabitants to congregate is one of the essential elements of developing a feeling of community and encouraging social integration. This project provides locals chances to meet, communicate, and form relationships by including well planned gathering spaces, seating areas, and community facilities. Designed areas for gathering are considered, serving as hubs for social interactions as part of the project. A few examples of these sites include courtyards, plazas, or community gardens with facilities like picnic tables, outdoor sitting, and covered areas. To ensure inclusivity and accessibility for all people, these facilities are thoughtfully planned to suit a range of activities and group sizes. Shared facilities are included, in addition to physical areas, that encourage community interaction. For social gatherings, workshops, or shared meals, residents may congregate in common areas, multifunctional halls, or communal kitchens. By making these facilities available to residents, they are encouraged to participate in group activities, building a feeling of community and fortifying interpersonal bonds.

10. Adaptability:

To produce a robust and sustainable project that can meet the changing needs and wants of the Lebanese community, adaptability must be incorporated into the design. By including adaptation and flexibility into the design process, the project will be able to handle future development, shifting demographics, and new trends.

Designing residential spaces to be flexible and easily adaptable to various family sizes and lifestyles is one facet of adaptation. Since modular units have been employed, the project already presents a flexibility advantage. Tenants have the option to personalize their living spaces in accordance with their unique demands by permitting various unit arrangements and combinations. The typical Lebanese family size is five individuals, and this flexibility may accommodate both smaller and bigger families while also being flexible to future long-term changes in family patterns.

Additionally, designing public areas and amenities is taken into account in a way that permits a variety of uses and functions. These areas must be adjustable and flexible enough to accommodate a range of activities and events. For instance, a multipurpose room offers flexibility for various community requirements by being used for gatherings, fitness, or community meetings.

Figure 104. Ground floor plan of the project (level +0.00, Scale 1:200)

Figure 105. First floor plan of the project (level +4.00, Scale 1:200)

Figure 106. Second floor plan of the project (level +8.00, Scale 1:200)

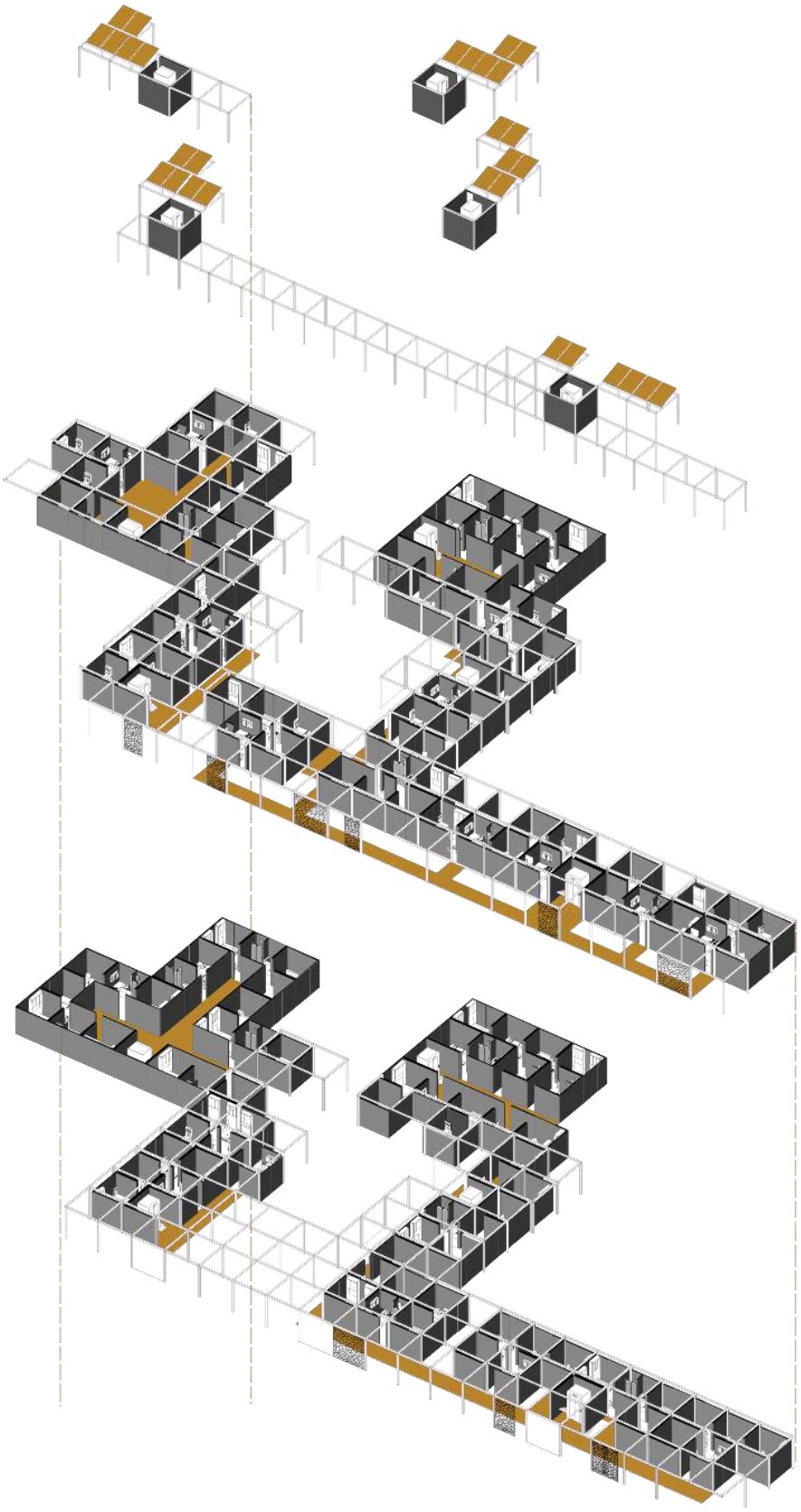
Figure 107. Third floor plan of the project (level +12.00, Scale 1:200)

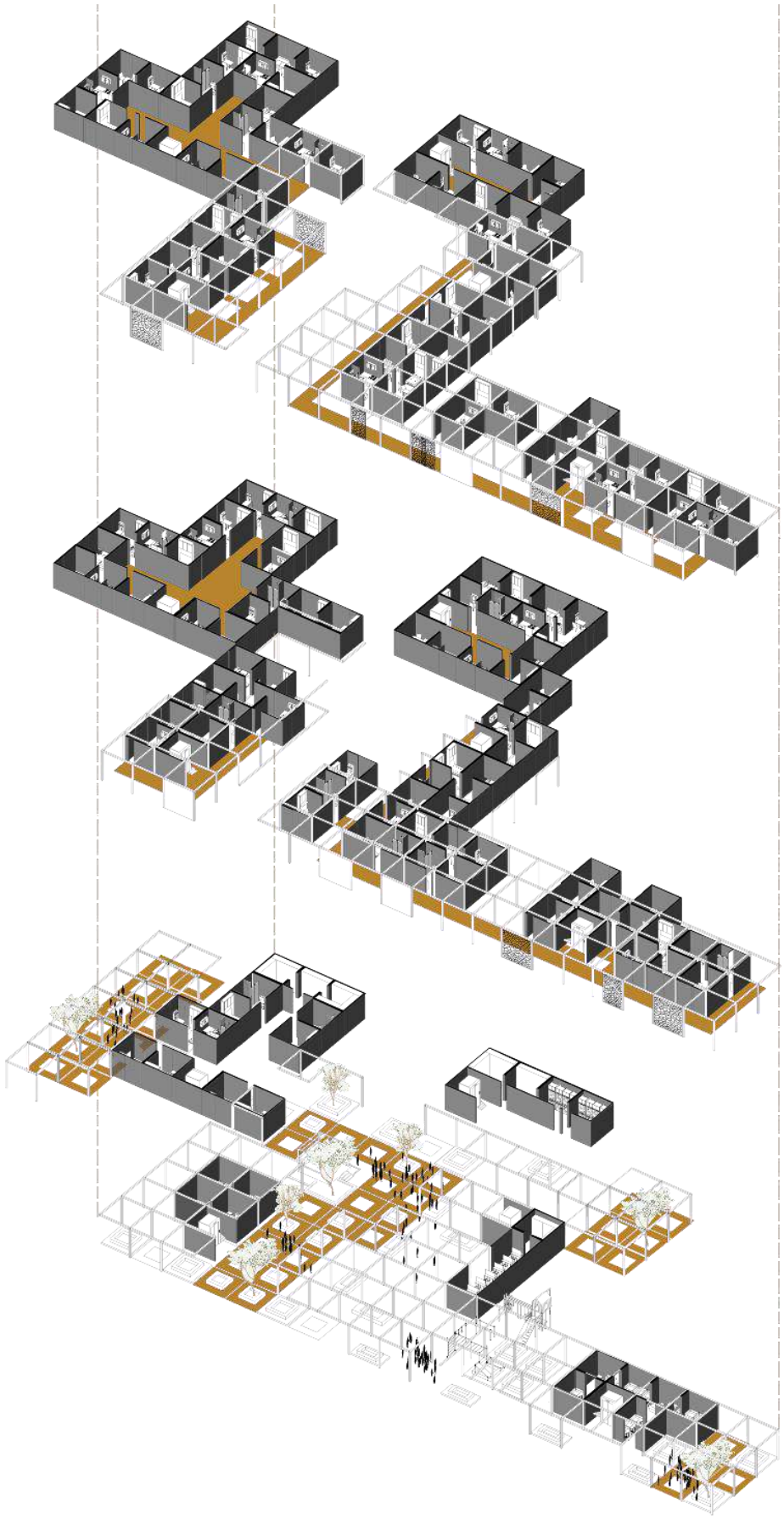
Figure 108. Fourth floor plan of the project (level +16.00, Scale 1:200)

Figure 109. Roof floor plan of the project (level +20.00, Scale 1:200)

SECTION
A–A
SC. 1/200

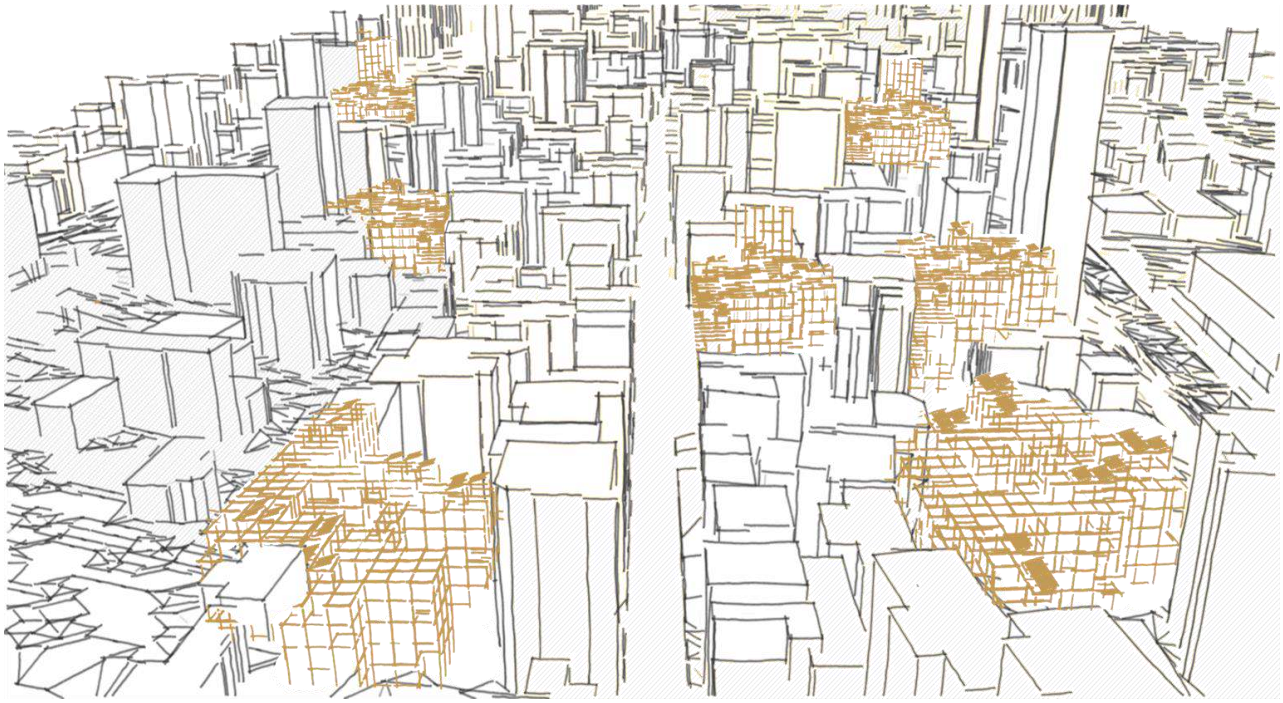
SECTION
B–B
SC. 1/200


ROOF
4TH FLOOR
3RD FLOOR


2ND FLOOR
1ST FLOOR
GROUND FLOOR

- **Ripple effect of positive change**

The following sketch demonstrates the project's distinctive incorporation into the selected site and highlights its function as a transforming skeleton that invades the city's voids. The design, which takes cues from the urban fabric, aims to establish a strong and distinctive presence that blends in with its surroundings while attending to the crucial residential requirements that emerge in the wake of a hazard event. This architectural intervention acts as a robust framework that embraces and enriches the city's voids, weaving itself effortlessly into the fabric of the urban landscape, much like a skeleton offers critical structure and support to the human body. The sketch demonstrates the project's deliberate placement into urban voids, emphasizing its capacity to cleverly take vacant places and give them a fresh meaning. These gaps, formerly disregarded and forgotten, are now ideal locations for new architectural designs and neighborhood redevelopment. The project restores the urban fabric and reclaims abandoned places by carefully choosing and settling in these voids, changing them into lively gathering spots, public facilities, and green pockets that encourage social contact, cultural exchange, and shared experiences.



Furthermore, by showing how the building smoothly blends into the voids, acting as a catalyst for urban regeneration and rejuvenation, the sketch illustrates the project's transformative potential. The project revitalizes the city by embracing and developing these areas, creating a positive ripple effect that encourages additional development and community involvement. By using an integrated strategy, the project goes beyond simple functioning and transforms into a transformative force that revivifies the urban setting, brings people together, revives a feeling of place, and renews the collective spirit of the city.

Conclusion

Using the aftermath of the Beirut Port explosion as an instructive case study, this thesis is a thorough examination of the architectural requirements that emerge in the wake of a catastrophic danger. An innovative and adaptive approach has been created through a thorough examination into Beirut's urban morphology and a profound grasp of the underlying causes and dynamics determining settlement patterns. This approach aims to capture and reflect the essence of Lebanese identity in addition to addressing the urgent need for residential solutions. The concept embodies a revolutionary framework that subtly infiltrates the city's unoccupied areas and gives them a fresh life by skillfully blending cultural allusions, sustainable design principles, and active community interaction.The project's adaptability, which has been painstakingly knitted into its fundamental fabric, is a key component of its success. The design will continue to be adaptable and sensitive to changing needs thanks to the flexible structure and modular approach, which provide the necessary framework for future expansion and modification. Because of its intrinsic adaptability, the project can act as a catalyst for urban and social change, encouraging local communities to pave their own way to a better and more sustainable future. This research is a compelling tribute to the transforming power of architecture in the face of crisis with its blend of visionary design, cultural preservation, and community empowerment. It emphasizes the important role architecture plays in creating social integration, protecting cultural heritage, and inspiring hope and resiliency in addition to providing for immediate housing needs. This project is a powerful illustration of how architecture can be used as a tool for good transformation and social healing by embracing the complexity of urban difficulties and representing the spirit of the Lebanese people. It challenges us to rethink our towns and cities as vibrant, welcoming places that celebrate the past while embracing the opportunities of the future.

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