Planning for a sustainable urban public transports. Water transport approach, a proposal for Beirut circulation

Master's in architecture

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Acknowledgments:

Resumo

Um desses problemas está no congestionamento do trânsito, perda de tempo e infraestrutura flácida para a realidade do transporte público. Alguns de seus problemas em geral e os motivos dessa fragilidade foram destacados na realidade do transporte, e minha sugestão é que

1- O percurso terrestre, a ideia passa por reviver a linha do eléctrico.

A rota marítima é aproveitar o mar colocando algumas balsas aquáticas para transportar passageiros de um lado para o outro, o que significa que estabelecemos várias estações na faixa costeira para evitar congestionamentos e reduzir carros e veículos.

O plano é que a cidade de Beirute seja dividida em várias regiões, e em cada região é instalada uma linha de bonde. Esta é a razão pela qual o bonde não ocupa espaço extra, e todos os veículos podem ter o espaço alocado para o bonde na ausência dele.

O elétrico pode chegar à zona costeira mais próxima para que as pessoas possam apanhar os barcos aquáticos para se deslocarem para a zona que pretendem ir sem terem de usar os seus carros ou veículos particulares, descongestionando assim o centro da cidade.poluição sonora, visual e ambiental

Palavras-chave.

Abstract.

One of these problems lies in traffic congestion, wasting time and flabby infrastructure for the reality of public transport. Some of its problems in general and the reasons for this weakness were highlighted on the reality of transport, and my suggestion is it
1- The land route, the idea lies in reviving the tram line .
The marine route is to take advantage of the sea by placing some water ferries to transport passengers from one side to another, meaning that we establish several stations on the coastal strip to avoid congestion and reduce cars and vehicles.
The plan is for the city of Beirut to be divided into several regions, and in each region a tram line is laid. This is the reason why the tram that it does not take up extra space, and all vehicles can have the space allocated for the tram in the absence of it.
The tram can reach the nearest coastal area so that people can take water ferries to move to the area they want to go to without having to use their cars or private vehicles, in this way de-congestioning the city center.

1. Introduction

Background

To understand the state of any city, you must go into the depths of the city, read its history, and understand the culture of society, especially in a city like Beirut, because it is a city full of changes. It is a mosaic of society with a long history like Beirut, which is the capital of the Lebanese state.

"Lebanon is a small country of 10,425 km2 in South-West Asia. The country has a 200km coastline, running north-east - south-west along the eastern shores of the Mediterranean Sea. It borders with Syria and Israel" (Fawaz & Peillen, 2002)

This distinguished location made it an influential centre throughout history. From the western side, it has the sea and is affected by the Mediterranean region, and what it brings with it from its neighbours in the countries participating in the same sea from the countries of southern Europe and the Arab countries, and from the east, Syria has the only existing land port, because in the south there is Israel (Occupied Palestine) and the Lebanese state have no relations between them, so it shares the land section only with Syria. Everything comes through it. Therefore, there are different relations at times, and Lebanon, despite its small area, most of its major cities are located by the sea, such as the Lebanese capital – Beirut–, Tripoli, Sidon, and other cities.

Beirut in general is the heir of the Phoenicians and given the importance of navigation in the Phoenician civilization, and wherever you look, you find notices of the Phoenician ship.

They need more robust transportation infrastructure in the face of the harsh conditions and difficulties they are experiencing in general and particularly in mobility.

An overview about the countries of the Mediterranean basin, show that in recent years, water mobility has been an integral part of the urban landscape in many places, cities, and regions in the northern part of the Mediterranean. However, in the southern part it is neglected or underutilized, despite being an opportunity to reduce environmental pollution because of the use of private cars and the consequent problems of congestion, traffic accidents and other health and social problems.

Since there are many Lebanese cities located by the sea, they can be linked together by transport via water ferries and a network of marines to compensate the shortage caused by the abandonment of the railway network, the traffic congestion due to poor infrastructures and high number of vehicles per capita. Furthermore, it will contribute to improve public transport to deal with the worldwide sustainable demand for future transportation.

Often with traffic congestion and delays due to the enormous number of cars entering and leaving Beirut in addition to a fragile and unreliable transportation system as a result, tram lines can be added and distributed to feed vital parts of Beirut in parallel with transportation by ferries to complement the already existing public transportation on the ground and other sustainable modes of transportation.

This study aims to be a source of inspiration or an innovative idea to take advantage of the city's privileged location to support it with other means of transportation through examples of water transportation in other cities.

"Municipal Beirut is at the geographical centre of the Lebanese coast, in the form of a cape extending over 9km into the sea. The city is built on an undulating site that falls sharply to the north-west, west, and east and more gently to the north where the port and the old city core are located." (

Fawaz, & Peillen, 2002).

Through this description, it is possible to understand the relationship of Lebanon and Beirut with the sea in general , which makes its location strategic a major seaport for many Mediterranean and Arab countries. It also had a distinguished port that had relations with more than 300 international ports and annually 3100 ships were docked in it.

Beirut can be considered (the sea front of Damascus) because of its proximity With the capital of Syria .

"It is one of the most important ports in the region, the main seaport for a large number of Arab countries, and an important trading station between the Arab countries producing raw materials and energy and the industrialized Western countries" (Lebanon: Studies in Society, Economy, and Culture *(The book is written in Arabic)., 2021).

In the month of August of 2020, a global catastrophe occurred -the explosion of the Port of Beirut It has been described as the tragedy of the era (. The matter is overly complicated, and this year we studied the subject of the port disaster and its effects on the neighbouring regions, as well as the repercussions related to the infrastructure of the port and the city of Beirut in general

"They Killed Us from the Inside" (Fakih, 2021)

Problematization

"40 years ago, getting as many cars as possible into the centre of the city was seen as the thing to do. That is certainly not the thing to do today." (Stubbs, AUGUST)

One of the infrastructure problems is transport and public transportation, many faced serious problems with heavy traffic congestion in many areas of Beirut. Overcrowding not only leads to wasted time, but also leads to increased pollution and accidents. Hence, the most obvious congestion problem occurs when demand (traffic) is greater than supply to expand capacity. If our house is too small, we make it bigger, if the internet is terribly slow, we increasy its speed. In roads and urban planning, this usually means adding lanes to existing roads. The first problem with this solution is that it is expensive. Moreover, the city is considered old, adding such a proposal may be impossible due to the presence of existing buildings and areas which cannot be demolished for such expansion as it is financially costly.

Adding a means of transport or returning a means of transport such as a tram may do the purpose to relieve pressure from using private cars and to encourage them to use public urban transport and thus can be to increase accessibility in a whole-travel-trip perspective (i.e., from door to door and from morning to evening).

Tram can be a solution, and access to ferry stations via tram can be a solution that makes it easier for us to reduce traffic congestion because of losing the seriousness of using public transportation. Just as widening the road is in theory a solution to the problem of congestion, building a competitive position is also theoretical.

This is beneficial for the development of Beirut's waterfront.

The aim and purpose of the thesis

The purpose of this thesis is to trace a comprehensive regional approach between the reality of public transport and its collapse, analysis of the coastal strip of Beirut and understanding the disparity between ownership patterns of the city of Beirut.

This study aims to give a comprehensive assessment of the mobility potential by water, in a transportation system along with land-based public transportation. Next, this thesis aims to realize the most

arguably value of sustainable urban planning in downtown locations with already high traffic congestion situations.

Therefore, the aim of the study is to clarify the comprehensive challenges, opportunities, and innovative solutions among the various sustainable mobility services and to benefit from weather factors such as solar energy..

Expected effects and study results

The study will provide a comprehensive picture of the existent traffic challenges, clarifying the relationship between the different transportation systems and lacunae within the city of Beirut.

The aim is to contribute to the research on how to achieve a sustainable transport systemin the framework of urban planning and the possibility of commuting between the capital and other coastal cities. The outcome is a proposal for a national and more specifically metropolitan ferry network. The proposal was futher specified by studying and design the specities of one terminal.

Method

This thesis is mentioned as a (holistic case study), based on a review and understanding of the literature relevant to the topic – sustainable public transport, making use of the local context and relation to the sea to improve the traffic problems of congestion, pollution, infrastructure and others). Besides the literature review, the author had visited several times the city on different occasions and historical moments, which allowed him to be acquainted with its reality. Furthermore, case studies identifying 'best practices' were analysed and characterized in detail which include Stockholm, Venice and Istanbul. Furthermore, it was deepening the knowledge on of how to move by boat, commuting times through water, and other modes of travel in cities.
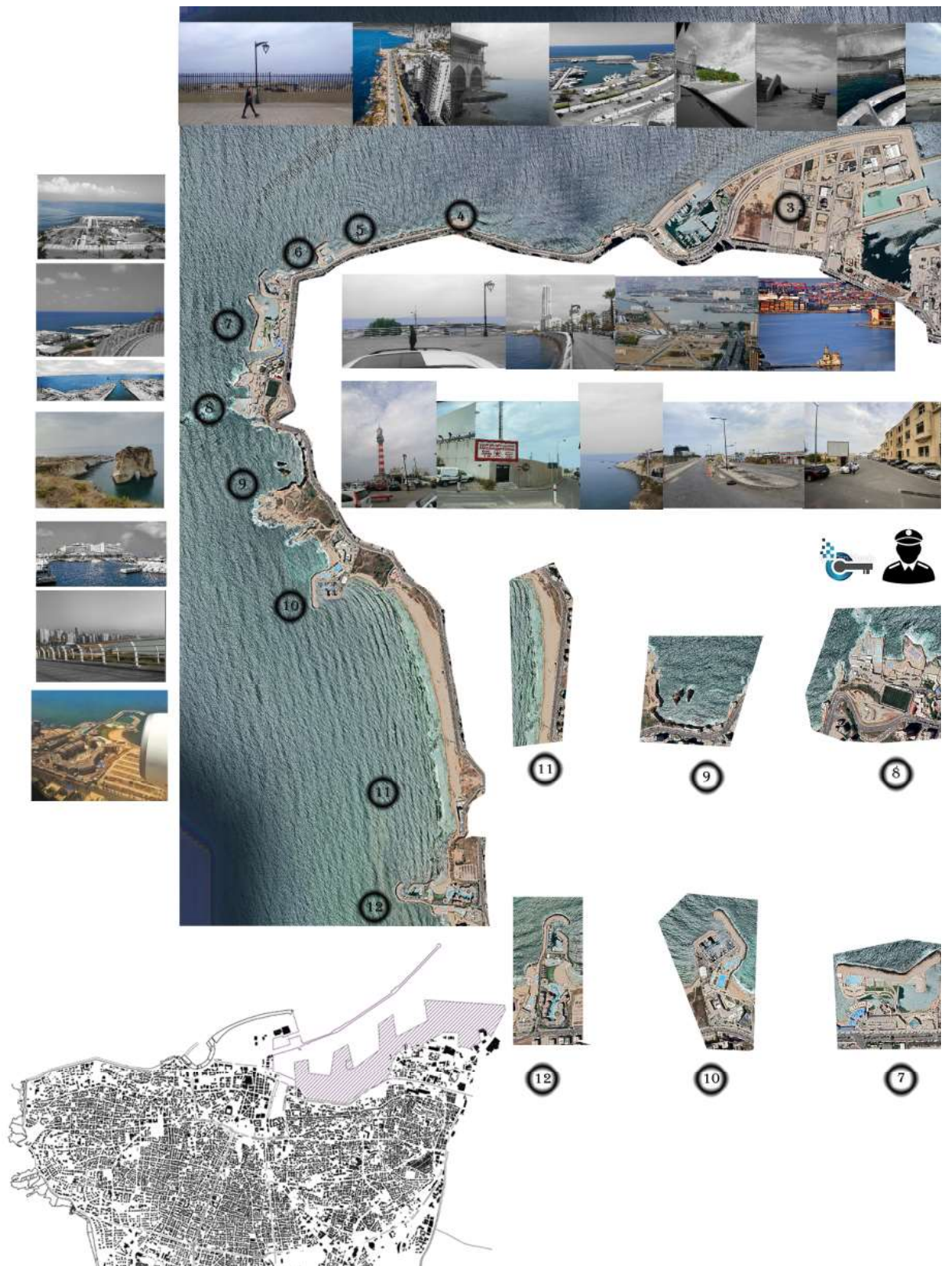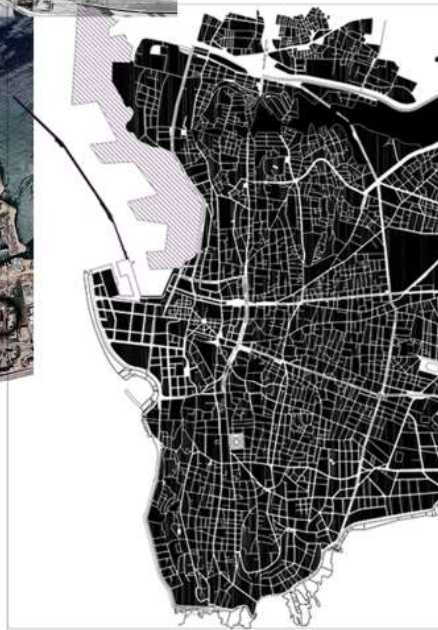
Figure 2 Map of the coast of Beirut city with some pictures Source : Author compilation

6

4

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1

2. Analysis

After Beirut explosion port in 2020 and its consequences, the atlas was a general research - geographical, historical, agricultural, environmental and socially, in addition to a survey of the existing infrastructure of the coastal strip and its differences, for the port area and its adjacent areas, and how architecture can contribute by understanding the reality of the city and the suffering experienced by the city and finding appropriate solutions to produce A future different from the current reality.

The most important here is the role of architecture in developing the face of the city and making it brighter and giving hope for the future. As usual, architecture always comes to look for needs and priorities.

In the following picture, which is a map of the city, the focus is on the coastal strip and the pictures it contains of some important areas on the coast of Beirut, as each area has its own story. Its unique location may be similar to the address (marina, waterfront, pier...etc), but if we are there or visit those locations, we will see the difference that will increase the beauty of Beirut.

When we visit one of these marinas, we can see the location, its nature, the quality of services provided, some details about the area and what is the difference between the location of this or that marina.

The people of Beirut love the sea and consider it part of their culture. They are a Phoenician people who at one time controlled a large part of the Mediterranean.

The coastal strip of Beirut was one of the public spaces (before the civil war in the last century) accessible to the public, but little by little, in the public interest, the spaces available to the public were reduced, and with the passage of time they almost vanished.

The places may be similar in some things, for example, public places can share with the private places on the waterfront and be available to the public, such as Al-Zaytouna Bay, although it is private, but at the same time the public can penetrate it, so it is not possible to classify the places accurately.

History and Program
In the beginning and first of all, the state of the port was studied and analysed after the bombing that 2020 Beirut explosion , the material and moral damages and their effects on the neighbouring to and adjacent areas of the port, focusing on the left area of the port, including the downtown area, Martyrs Square, Soldier's relations with the port and the Naval Base area, in addition to the social issue represented In ensuring overcoming the collective memory of the tragedy and trying to find appropriate solutions to those problems well like (Figure 3)..

Ecological Systems, Landscape and Topography
- WOODED SPACES : Through the great avenue Charles Habib Malik, a great transport infrastructure connects a diversity of green spaces to the rest of the city (Figure 4).
- PUBLIC AND PRIVATE DYNAMICS : Hamra has a high density of private green spaces and in Solidere's area of influence we can see a planning of public green spaces (Figure 5).

Communication Infrastructures
The focus in general was on public transportation and buses and it was an interesting topic for me as I was convinced by the idea that says
"*I think it's very important that historic cities are allowed to reinvent their future.*" (Ide, 2009)
I tried to find out how the people liv-

1. Figure 3: The Port and Downtown District.
2. Figure 4: Wooded spaces.
3. Figure 5: Public and private dynamics.

Espaços Verdes

Espaços Verdes Públicos
Espaços Verdes Privados

ing in Beirut spend most of their lives in commuting between home, work, etc., because the link between home and university or work, etc., is via the street and transportation, both public and private.

And what about the streets, how are the main streets of the city, the differences between them, and how communication takes place between outside and inside Beirut.

To understand the connection and communication between the city's neighbourhoods through the transportation network and the differences between them, and where the public transport network is one of the main things for any city, the network, transportation, and roads are the city's vital arteries, and the way people interact with their city will give an understanding of the city's character, for example (Figure 6)

- HIGHWAY 51: Elevated infrastructure in relation to the pedestrian level that could allow the permeability of the urban fabric. However, road traffic makes pedestrian crossing difficult.

- CHARLES HELOU: Above is the motorway where it is possible to enter directly to the terminal's car park and the ground floor is for the bus stop.

This mega infrastructure impacts the possible permeability of the area in question.

Infrastructure designed to function as the city's major bus terminal, however, it only accommodates two mini-bus routes, one of them to Tripoli. Its use has always been more of a highway than a terminal.
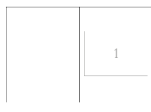
1. Figure 6: Communication Infrastructures.
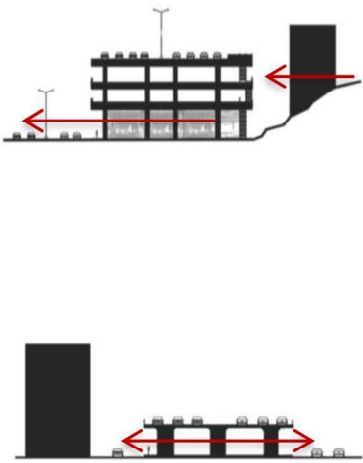
DISCONTINUITIES AND URBAN FRACTURES

The City of Beirut has been fragmented over the years through various infrastructures in the urban character, creating several barriers between the existing neighborhoods, as well as within them. These urban discontinuities become quite clear in various parts of the city and in this sense we consider their representation on this map relevant. At first, we can observe the presence of some fractures in the fabric of the neighborhoods of Achrafieh, Mafraa and Mousaitbeh. As with route 1. HAMRA2. COLLECTION 3. DORAChehab MarineMövenpick Marine Mina El Manara & Riviera MarineSt Georges BayDawra MarineGeneral Foaad that rips the fabric of three neighborhoods simultaneously. In a second moment, we can check the existing barrier on the northern limit of Solidere. This fracture precludes permeable access between the Porto program on Pond 01 and access to the City. On the other hand, in a third moment it is possible to verify the impact of one of the largest infrastructures in the city. Charles Helou is a highway that, in addition to making pedestrian access to Porto almost impossible. One of its main features is the fact that it passes through the old railway system of Beirut-Tripoli and Beirut-Damascus. After reading these urban discontinuities, the following question was asked: Is it pertinent to reactivate the railway line? Could it be that with the implementation of this element it would be possible to reduce the flow of private transport and make the city more permeable and pedestrian? Or would the fragmentation of the city by different religions not be overcome with the emergence of a public transport structure? Will all religious urban centers be able to use the same means of transport, or would it fall apart if it was abandoned? What is the future of Beirut in terms of infrastructure? How can the city progress to find its way to a better future.

1. Figure 7: Discontinuities and urban

Charles Helou

Cheik El Ghabi

Fouad Chehab

Mir Majid Arsalan

General Fouad

Hadi Hassan Nassrallah

Hadi Hassan Nassrallah

Mar Mikhail Train Station

Beirut Train

1972, Mar Mikhail

Mar Mikhail Train Station

2021, Anastasiya
Mar Mikhail Train Station

2021, Anastasiya
Rayak Train Station

2021, Anastasiya
Rayak Train Station

Mir Majid Arsalan

General Fouad

El Sachidine

Hadi Hassan Nassrallah

Khodor

Charles Helou

Cheikh El Ghabi

Fouad Chehab

MAPPING OF INFRASTRUCTURES

Based on the analysis carried out previously, it became essential to map the communication/road infrastructures. The strong presence of this type of infrastructure revealed that the city of Beirut is designed for cars and not for pedestrians. With a previous study of the traffic

it was possible to notice the daily increase in the use of the road network, resulting in traffic jams and heavy traffic. Some of the possible causes for these phenomena are the lack of public policies to encourage public transport, the lack of organized public transport and possibly the high cost in downtown residential areas.

With this analysis it became possible to organize and highlight the main axes/ways and create hierarchical systems. Fluid, road infrastructures and their use. Tectonic side (touch with the ground and intersections). Port of Beirut as a communication infrastructure.

Silos as an element of great influence due to the character of food storage (partial post-explosion collapse) and the memory of this event. Rua da Armenia as a structural element that separates two neighborhoods crossing the city and does not have a large traffic flow. The Saida and Damascus highway. Emile Lahoud Highway, the parallelism to the river as the limit of Beiru te and the accesses.

After the analysis made above, the theme that we tried to delve into in this map consisted of understanding the impact that the infrastructures addressed and the urban "nodes" created by them establish on the urban fabric and on the experience of space. At first, we mapped these elements in order to understand the relationship of these structures with the surroundings (namely, the

neighborhoods); we tried to understand the tectonic issue of these pieces, that is, how and when the touch with the ground happens and what were the architectural objects attached to these infrastructures (such as

tunnels, bridges, viaducts). In addition, the issue of partial or total destruction of neighborhoods for the construction of these pieces, as well as the appropriation of these places by the population, were themes

studied and mapped. We highlighted 7 main points of the city of Beirut.

"Carlota Garcez "
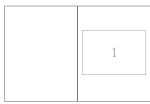
1. Figure 8 Map of road parts and urban communication elements

PUBLIC TRANSPORT SYSTEM

- **INFRASTRUCTURAL PARTS**

1 - Charles Helou: An extremely important and imposing element in Beirut, this motorway connects the north of the city to Tripoli, and represents a division between the Mar Mikhael neighborhood and Porto. In this specific case, the studied node was the Charles Helou Garage, one of the few surviving and functioning memories of organized public transport. We also highlight the issue of difficult access between neighborhoods and the port, and the existing barrier.

2 - Ring: Ring built around central Bei Rute. It is a viaduct that is far from constructions or buildings, and represents a space of transition between neighborhoods (no man's land).

3 - Enough: Relatively small bridge when compared to the others, despite its size, its color represents a prominent element, giving weight to that infrastructural piece.

It is worth noting the appropriation of the space under the viaduct (due to the proximity to the mosque, it becomes a space for living and socializing).

4 - Cola: It connects downtown to the airport, it is one of the public transport nodes, as is the Charles Helou garage. It connects with North and South Lebanon through minibuses and taxis. There is currently a garden, in poor condition, leading to appropriation by needy people and accumulation of garbage.

5 - Yerevan: 1.5 km viaduct, crossing 3 communities (Sin El Fil, Nabaa and Bou rj Hammoud). It is a dynamic area, where the space currently appropriated by the population was already used before the construction of this part. (built on top of an existing community).

6 - El Waiti: It is located on the edge of the metropolitan area. Due to the proximity of the river, it has a characteristic smell due to the garbage in the river. On weekends this space houses the market of Souk Al Ahad and a car park.

7 - Elias El Hraouri: Located close to civic buildings (ministries, unions), there is a greater concern with the appearance of this space. For this reason, contrary to what happens in the other places, there is a green space that has been treated and designed, however, it cannot be used by the population.

"Carlota Garcez "
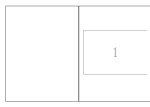
1. Figure 9: Map of nodes and viaducts in the city

Charles Helou Station

Ring Bridge

Basta Bridge

Cola Bridge

Yerevan Bridge

El Waiti Bridge

Elias El Hraoui Bridge

Charles Helou Station

Ring Bridge

Basta Bridge

Cola Bridge

Yerevan Bridge

El Waiti Bridge

Elias El Hraoui Bridge

- DOCKS AND MARINAS

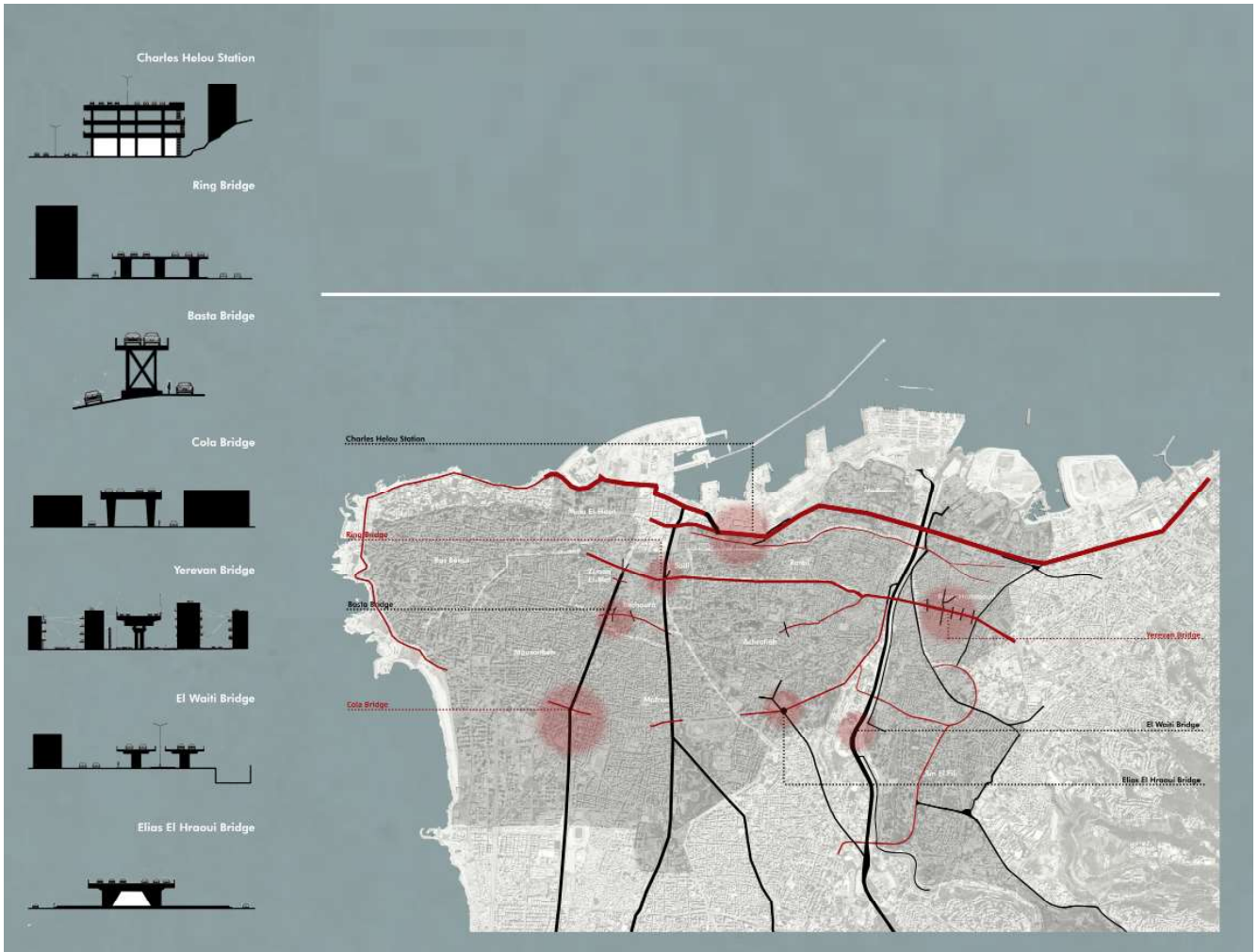of the mapping and study of the DOCKS AND MARINAS, allows an understanding of the nature of the coastal strip of Beirut and its activities, public vs private areas, and what are the differences in terms of infrastructure and basic relationships between the building and its neighbouring areas (Figure 10).

- Marina Dawra:
One of the features quite present in this place is the good relationship that exists between fishermen and the space of this marina, which in turn is full of fishing boats & when you feel the fresh sea breeze before entering the borders of Beirut and seeing the cranes and container terminals of Beirut Harbor, you will be in Dora Marina.

When you see wooden fishing boats anchored and dancing to the sounds of the sea waves near the shore and you see the fishers in their nets and this mixture of love and business messages between them and the sea, you will realize that you are in Durrat Marina.

In an atmosphere of calm and serenity. Gently and slightly sticky air and you see some unknown and incomprehensible drawings of white lines woven with some clouds in a high blue background, you will be sure to be in the course berth.

If you knew that now, you would notice the army checkpoint at the exit of the small port. It was hidden behind the boats.

Next to the marina to the left of a large vacant plateau: a flat, yellow, unmarked area of flat land around which a gravel road has been levelled. It is exceptionally large but deserted. The area and nature of this marina differ because there will be buying and selling inside the marina in general, and of course the floor is sandy and more natural than private marinas.

"*This marina is generally considered a centre for the gathering of fishermen, their boats, and their nets*" (Sokhon & Frischkorn, 2012)

The port of Dawra was enlarged and became the site of landfill which in turn caused the removal of fishers and the reduction of the fish trade.

- Marina Zaituna Bay (Saint Georges)

is an old but modern port at the same time.
After the civil war, the company Solidere designed this port with the aim of accommodating more than 250 vessels.

Its location is very strategic, being in a commercial area with several hotels nearby.

And This place can be described as a waterfront, a park, a pier, or a coastal view, or it can be all these terms combined to form something called Zeitoun
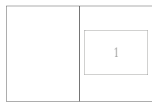- Bay or St. Georges Bay.

The common name is St. George's Bay because "*there an old hotel called St. George*" (SAL, 2022) in the previous century before the Lebanese civil war. It is a famous and well-known hotel, so people knew it as St. George's Bay.

We can read more about this through the company that established the project, which is Solidere Access to the project is through the seaside promenade to the north, the planned Rafik Hariri Wahat waterside city park to the east, and the Beirut corniche to the south. A 400-space underground public car park was built by Solidere below the corniche.
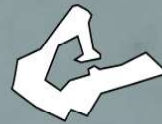
"*An innovative tourist attraction designed by Steven Holl (US) and LEFT (US) with Nabil Gholam et al*" (BEIRUT MARINA – ZAITUNAY BAY, 2014).her project is conceived as an urban beach. Extending the existing Beirut corniche and the new sea promenade, a series of overlapping platforms, reminiscent of sea waves, provide outdoor spaces and public areas for displaying artwork.

"*The Quayside Restaurant Strip with specialty stores has become one of the hub destinations of the city centre*" (steven holl . l.e.ft Zaitunay Bay MARINA . Beirut, 2014). Comprising seventeen restaurants and five retail outlets, it stretches along Beirut Marina, from the site's western limit to the Yacht Club building on the east. The one-floor construction remains below street level, with the roofs forming a continuation of the Corniche. The landscape design for the entry plaza, quayside, and corniche sidewalk, create open-air terraces in the form of a 'stone beach' over the restaurants and shops.

The other component of Zaytuna Bay is the Yacht Club, which was completed in 2014. The state-of-the-art development accommodates a clubhouse

2021, Anastasiya
Informal Fishing

2021, Anastasiya
Raouche Rocks

2021, João
Lighthouse

2021, Adriana
Matraa

2021, Beatriz
Hamra Street

2021, Luisa
Charles Helou

2021, Lázaro
Matraa

2021, Anastasiya
Burj Hammoud

Dawra Marine

St Georges Bay

Mina El Manara &
Riviera Marine

Mövenpick Marine

Chehab Marine

St Georges Bay
Riviera Marine
Mina El
Manara
Dawra Marine
Movenpick
Marine
Chehab Marine

and nine club suites with amenities on the ground and first level. The amenities include a swimming pool deck and bar, club restaurant, lounge bar, library, game room, and fitness and wellness center. The upper levels are home to forty-four fully serviced and furnished residences.

In this strategic area, there are many modern hotels and residential towers with excellent sea frontage.

-       Marina Riviera:

It is a space with a private fall. It is remarkably close to the Hotel Riviera where visitors/residents have the possibility to leave their yacht.

The Riviera Marina between the Zaytouna Bay area towards the Ras Beirut area on the coastal strip of the Corniche and before reaching the Al-Manara area there is the Riviera Marina, which is one of the old and famous hotels in Beirut. It was built in the fifties of the last century and always keeps pace with modernity

"*One of Lebanon's leading hotels, located in one of the most exclusive areas in Beirut City directly facing the Mediterranean Sea*" (Riviera Hotel & Beach Lounge, s.d.), as it is called. The goal was to revive Lebanon's pre-war model and attract international investment and trade, so we found Rivera beach closed to itself, preventing the public from freely accessing the sea - and preventing domestic workers from entering it at all.

"*The Riviera wants to revive the model of pre-war Lebanon*" (Shehadi, 2007).

Behind the walls of the resort there is a concrete pier that encloses the swimming areas and prevents its visitors from having full access to the sea, and in the middle of this concrete pier is a floating island.

Visitors and residents can outfit their own yacht and there are many restaurants and bars nearby. It also has many recreational and relaxation areas, including a pool area for families and a balcony overlooking the sea, and allows visitors to rent snorkelling equipment and water bikes on the beach.

"*Behind the walls of the resort there is a concrete jetty that circles the swimming areas, preventing its patrons from fully accessing the sea.*" (Saksouk & English Booklet Production Goethe Institute,

This Sea Is Mine, 2013).

-       Fishing Port, Marina Lighthouse (Mina Almanara) in Ain Mraiseh:

After we left the Zaytouna Bay area, we were accompanied by the sounds of sea waves until the Ramlet al-Bayda area. This area is called Al-Manara Corniche because of the presence of a marine beacon. In the same area there is a marina area for fishers and the "*Military Club built since the period of the French Mandate*" (Bain Militaire (Al Hammam Al Aaskary), s.d.) as well as the Al-Najma Sports Club and this coastal strip there is a waterfront front Fun. You will not get bored because there are a lot of events that we will encounter, for example, the American University and the residential and commercial towers, except for pedestrians who practice different sports on the Corniche, in the middle of the road in the Al -Manara area, "*and this corniche was planned by France during the French mandate*" (karam, 2016)

In this area, fishing boats meet with the lighthouse area, private pools, chalets, and restaurants.

Like Dora Marina, this marina is also for good fishers in its presence. It is within a private and security area in general and enjoys the same specifications as Dora, but with the advantage that it is in the heart of Beirut and within a vital and strategic place.

these are some of the statements made by fishers about the sea and space.

-       Marina Mövenpick

If we cross Al-Manara and Raouche towards Ramlet Al-Baida and before we reach it, we will face a cliff facing the sea. By the sea there is a modern hotel, Mövenpick Hotel and Marina.

"*Hagop and others used to also swim and fish in the adjacent area called "Rass," because the water there was blue, clear, and clean*" (Saksouk & English Booklet Production Goethe Institute, This Sea Is Mine, 2013).

It is a strategic place used by fisherman in that area before them because the water there was blue, clear, and clean, and the Mövenpick Hotel was built in the place of a cafe that was named Maryland.

So, its strategic location is close to Raouche, Ramlet Al Bayda and downtown Beirut and at the same

time far from the city's noise, as we said earlier.

"*The business contributions to the protection of local historical, archaeological and cultural properties, and permits access to them by local residents*" (SUSTAINABILITY MANAGEMENT PLAN 2018 Mövenpick Hote, 2018).

It has its own restricted beach, two Olympic-sized outdoor pools, an indoor pool, a squash court, and a private marina that gives it added significance.

There is also a concrete pier surrounding it like the Riviera Marina, and it can accommodate about 140 boats.

This hotel is located near the shopping district of Verdun. There is a restricted beach, two Olympic-size outdoor pools as well as an indoor pool, tennis and squash courts, a private marina, and full health and fitness facilities; This property is highly recommended.

- Waterfront and white Sand beach (Al-Ramla Al-Bayda)

It is a master urban plan formulated by the French in the 1940s as well. This beach is located between Movenpick Marina and Summerland Marina. There are few cities in the world that allow citizens to swim within the city, but this beach is special because we swim in the heart of Beirut and we do not have to leave the city to swim, it is a wide beach where tourists and locals can swim safely and close to it is - she. Lots of restaurants and bars and there are paintings and drawings to be seen there.

Ironically, this is a public beach, not a private one, and the area where the beach is located is considered a "*relatively expensive area*" (Saksouk & English Booklet Production Goethe Institute, This Sea Is Mine, 2013) ,and is an upscale waterfront type where modern towers can be seen. This combination of the famous free beach and modernity may add aesthetics to the place, and these waterfronts express the quality of Beirut residents and their desire to have the fronts of their house facing the sea. These areas are characterized by large areas of balconies and verandas.

Beauty Style described it as "*the charm of Beirut's past with the European luxury of the present*" (LAMAA, 2016/06/24).

It is the last marina in Beirut and close to the airport, and its location comes after the Ramlet al-Baida beach. Meaning that it complements the waterfront close to the high-end smart towers

As in the case of the Movenpick and the Riviera, there is a pier inside the sea to form a special basin for yachts and private boats

It has a hotel and resort near to downtown Beirut and close to Hamra Street. You can also enjoy the sunset at this location with a scenic view and walk on Al Quay. It also has a hotel of the same name, and this hotel is the only one in Beirut that has five stars, and there are many events that we can follow there.

The cost of owning a yacht in Lebanon

... Exemptions only for the rich! When we talk about marinas, we must know that we can leave the boats there safely, being necessary to rent them. Prices in Beirut are quite high for renting a yacht parking space. "*Values are close to 1000\$/ m2 per year*" (Samaha, 2017)

Basic Start

An understanding of the reality of public transportation and its concept for the citizens of Beirut, and the stages of change in public transportation during the past century until now.

Figure 11: A view shows damages at the site of blast in Beirut's port area

3. Atlas, a survey of Beirut urban transport systems

To analyse the reality of the city and the effects resulting from the explosion that occurred in the port of Beirut in 2020, the class focused on the relationship between the development of the port and the city, considering problems and potentials that could affect and benefit both through the use of maps and visualizations of these problems in general.

Through the atlas, we focused on some of the problems facing the city of Beirut, not only those problems caused by the explosion of the Port of Beirut, and these are some of the problems that my colleagues and I studied through individual work.

Note: All the information about the atlas is taken from texts of my colleagues, which they extracted after several studies and readings

Agriculture and livestock

The life in the country and the life in the city, two completely different lives. The connection between them, in the early days of civilization, started with the con-struction of what we now call infrastruc-tures (Saldanha 2013, p. 143). Howev-er, many spaces are forgotten along the way and others are simply not de-signed properly, causing several problems. If the design of this infrastructure is delicate and well planned, in its functional and ecological logic, it can offer the site many possibilities, such as the connection be-tween the rural and urban environments, and even allow the construction of a landscape, be it continuous, gradient, or, as will be presented in this dissertation, punctual.

"Tiago Neves"

City and port barriers

the intervention area of this project is the zero layer of the city that deals with the extrusion of the natural territory. The intervention area is a volume and never an area The problem to be ad-dressed is the disconnection of this layer - the disconnection from the urban fabric - and in this way, the city is seen here in its most natural state. Not before. Before, there were no buildings, roads or any type of infrastructure and therefore the analysis is divided into two distinct elements. One of them is the ground, the horizontal element, and in turn the most continuous. This element is con-figured in the territory, with its inherent charac-teristics.

" Adriana do Carmo"

A City by the Sea

In a journey along the coast of Lebanon, we find several types of use of this front. Being a country bathed by water, the population has the habit, at the end of the day, to go to the sea, sit at a terrace, on a beach, or even on a prom-enade to socialize and contemplate the sunset. When the waterfront does not offer a beach, it is also customary to find street vendors or just tables with chairs intended for peo-ple to meet and hang out. The Lebanese coast also offers restaurants, shops, and hotels, among others, that provide an increase in the economy, taking advantage of this strong relationship with the sea. Next to the hotels, it is customary to find their private marinas, where guests can not only dock their boats, but also enjoy this front.In the western part of Beirut, there is also a geomonument, called Dalieh, which offers boat trips and even a place to enjoy the sun on hot days. It is also customary to find recreational parks that bring the commu-nity together and offer a moment of leisure to the population, such as the Luna Park, next to the Dalieh geomonument.Despite the wide and varied offer of socio-economic activities, it is not always possible to have direct con-tact with the sea. Along the coast, there are several buildings and fences that obstruct the view of the sea, either private or public. Several times this restriction is due to private properties or military areas, which does not allow the enjoyment of the population. Adding to this factor, several times, there are illegally built buildings along the waterfront that create a visual barrier to the sea.

"Beatriz Portugal "

Access Infrastructure

The civil war of 1975-1990 marks the beginning of a crisis that continues to this day. In the Beirut peninsula, irregularities in electricity, excessive road traffic, lack of a stable transport network, difficulty in treating waste, very high population density, the entry of refugees from Syria, insuffi-

cient housing and sanitation, the barriers created due to road infrastructure, urban density, lack of green spaces are some of the problems that are on the agenda. The best and immediate answer to all would be utopian. Solving one could have positive effects on others. The reinsertion of the train, and the implantation of the underground and surface subway could be a guideline.

<div align="right">"Paulo Saiote"</div>

Military Influence in Lebanon

This analysis consists of the military history of Lebanon as well as the current military situation, also considering the influence of these events on the way of life of the City of Beirut as the design of the urban grid of the city's neighborhoods, and we can conclude that all these events helped to sculpt the city how it is today.

<div align="right">"Afonso Cardoso"</div>

Abandoned landscapes

Through the words of Elisée Reclus in L'homme et la terre, "This city is one of those that must live and revive, come what may: the conquerors pass and the city is reborn behind them" and Lebanese poet Nadia Twuayni, "a thousand times he died, a thousand times he was reborn", we can understand the strength of a resilient people who, despite having lived through countless events that removed the country from its economic and cultural potential, continue to see their hope clinging to what they believe, one day, it may become.

<div align="right">"Diogo Maia"</div>

Megastructures and megaforms

Prevent floods and improve the ecological functioning of watersheds by distinguishing the various ecological zones, the respective flow behavior in the presence of the various types of coating.

<div align="right">"Rita"</div>

Waste Landscapes

Any production process, regardless of the area in which it is inserted, generates some type of loss, thus there is a need to establish a plan that aims at the reduction and proper disposal of the gene-rated waste. Despite the constant evolution of societies, the problem of waste and what to do with it remains to this day. With the emergence of concern about the scarcity of resources, and the growing need to think about the future of cities according to the premises of sustainable development, the discussion about waste and its management system becomes extremely important and inevitable. The progressive increase in the amount of waste produced in cities, as well as the increased pro-duction and disposal of waste in a linear processing system, makes evident the lack of solutions that integrate urban design and ecology, in the context of large urban centers. Faced with such a fragile context of poor waste management and the need to rethink cities under the principles of sustainable development and the circular economy, the landfill method, currently used in many countries, lacks a questioning about its feasibility and the its character as an ecological and inclusive infrastructure. Therefore, it is necessary to develop measures that are able to respond effectively, in order to minimize the consequences suffered and, seek to make waste a resource to be used in Architecture, helping to mitigate the effects that current practices deposit in cities. contemporary. In this way, the present investigation aims to analyze the current relationship between Architecture and the waste produced in contemporary Mediterranean cities, in particular the problem of waste present in Lebanon, in order to rethink waste management methods and the role that Architecture plays in this field. In addition, it is extremely important to understand the perspective and the role that Architecture can establish in places with the problem addressed, operating in a way aimed at reducing accumulated waste, through the redesign of the landscape and the new metabolism created for this element in the cities.

<div align="right">"Carlota Garcez "</div>

Memory and Ruins

The city was deeply affected by the 4th of August 2020 explosion that took place in one of the warehouses, located next to the silos. A large part of the city located to the east was destroyed in the explosion, while the area located to the west was mostly preserved, as the structure of the silos absorbed much of the impact of the explosion.

<div align="right">"Anastasiya"</div>

Time Travel Through Martyr's Square

The context of war and important events in the history of Lebanon, influences the way the population lives the city and the military conditioning imposes a certain power over the community that does not feel free in the appropriation of public areas of the city. Additionally, roadways are superior in urban design, which means that there is a greater disconnection between these spaces and the city, and where access is often difficult.

"Joâo Canhão"

Lebanese architecture and the legacy of the ottoman empire

Lebanese architecture is strongly framed with the use of the arch as a defining feature of the urban fabric, as well as a central point in the creation of its own architectural typology. Its connection to the most diverse works considered to be Lebanese heritage is obvious.

However, the need to create a more consolidated urban fabric in this area of the city was a reality. How can the post-explosion enhance what was good in the pre-explosion.

"Duarte Leal"

Beirut Cruises

the creation of a pedestrian path throughout the city, in which the creation of pedestrian green spaces is allowed, with the main objective of creating spaces for leisure and coexistence in areas where the urban fabric is considered dense.

This proposal arises from the need for permeability, as such, this green space enters the port of the city through a light structure, which is assumed in three distinct moments: A pedestrian path, as an integral part of the program and as a leisure and living space. Additionally, this green space will create a connection with the riverfront. The axes that enter the port are also part of the program inherent to it.
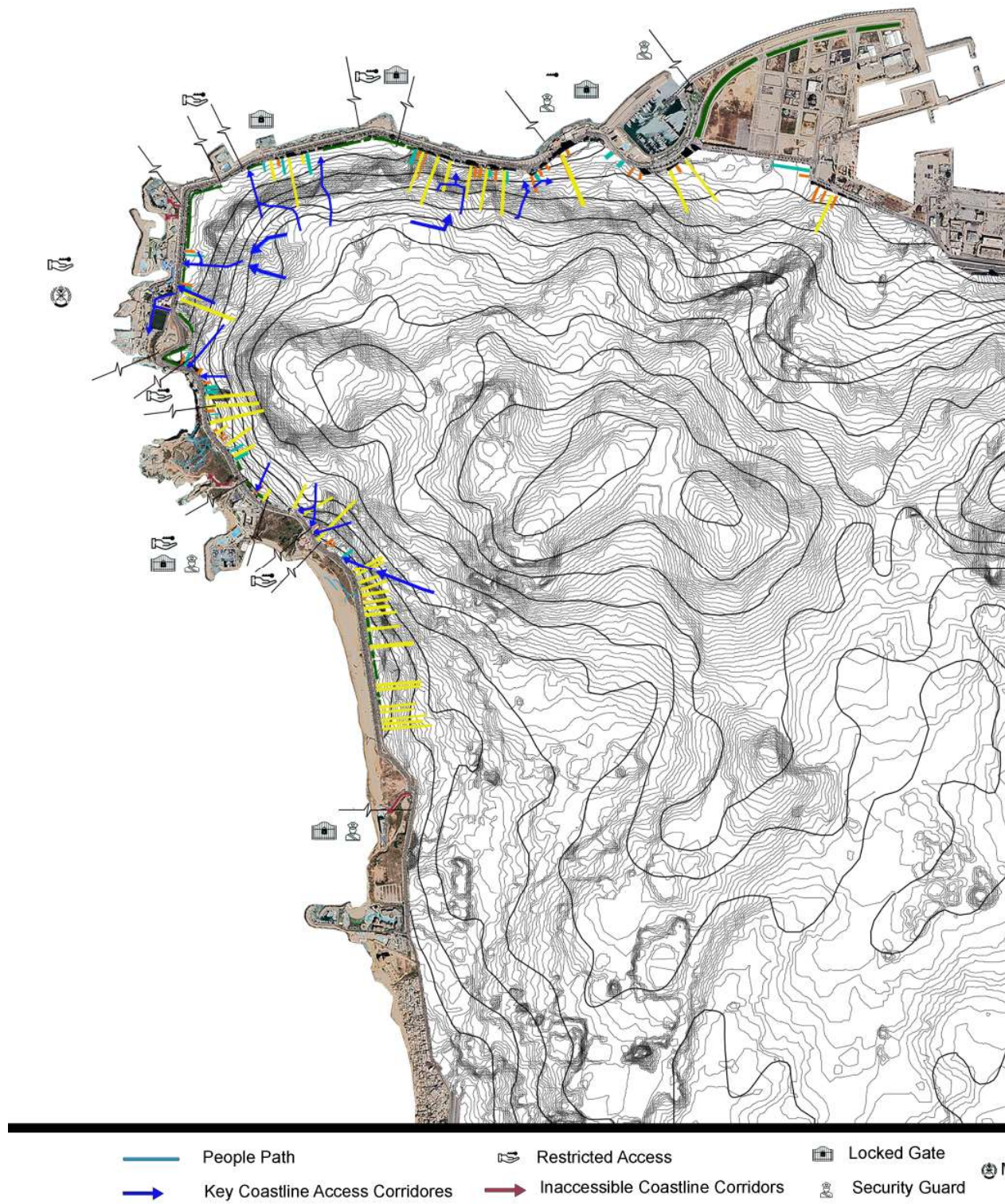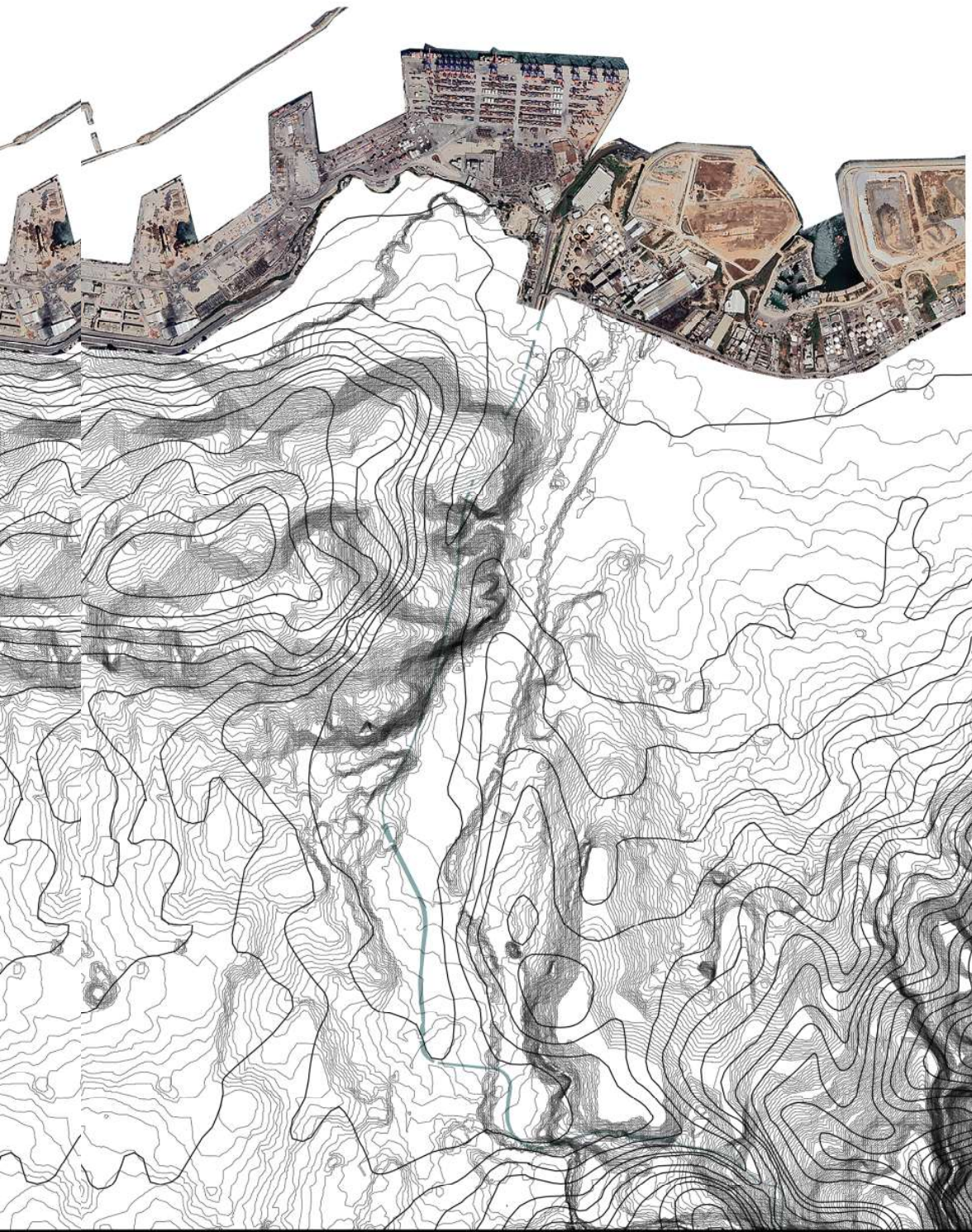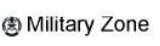
"Lázaro Raposo"

People Path

Key Coastline Access Corridores

Restricted Access

Inaccessible Coastline Corridors

Locked Gate

Security Guard

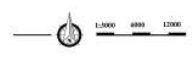Figure 11 Visual obstructions & accessibility to seashore

Military Zor ⊛ Military Zone   ■ Shops and Restaurants   ■ Business and Finance

■ Residential Area   ■ Empty Land

Diagnostic

Analysis of the coastal strip of the city of Beirut and what are the private and public areas in relation to the marina, etc. (Figure 8). The waterfront was the beginning of an understanding of the lifestyle and the suffering experienced by the residents of Beirut from poor transportation .

the public and their dependence on private cars more, which leads to traffic congestion, which doubles the burden of the problem. To avoid this problem, waste spaces can be used to reduce dependence on private cars and entice people to go and trust public transport.

Sustainable Public Transport

The reality of life in Beirut and the problems and defects it suffers from because of its dependence on the non-modern means of transportation and the damage and pollution it causes in the air.

Overview

After the civil war in Lebanon, it was scheduled to implement plans to develop the transport sector in general, including several axes, such as trains and buses, and the establishment of a metro line, as well as addressing the issue of taxis with the restoration of sidewalks and paving of roads, as well as the use of bicycles, in a general sense, the orientation was for a distinct infrastructure for this sector. This plan is for 20 years.

"SO, WHAT WENT WRONG AND WHY ARE WE IN A STATE OF CONSTANT GRIDLOCK?" (NAKKASH, 2016)

Transport System Collapse

They increased the number of traffic lights to curb the flow of cars, and the matter became more exacerbated by wasting time on the roads and waiting (Figure 13).
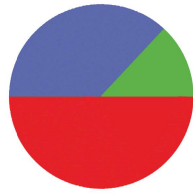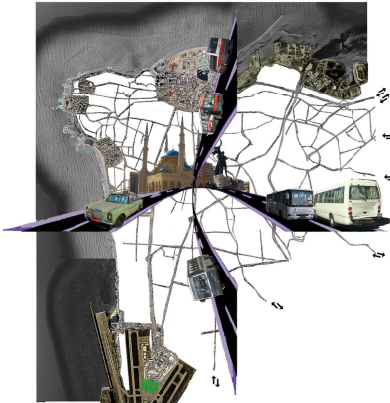
Note : Figure 13 is a dataset from an article by (Nakkash, Assessing the Failure of Beirut City in Implementing a Sustainable Transport System, 2016) on LinkedIn, who works as a Bid Manager and Researcher at FAIRTIQ dynamic company that makes traveling by public transport easier than ever before.

These data show the problems caused by negligence and lethargy in the reality of transportation for the city of Beirut and the consequences that follow as a result of such negligence.
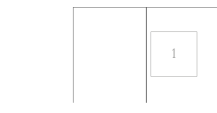
1. Figure 13: Structure of Transport System Collapse

Transport system collapse

Number of vehicles for service

transport vehicles is made up of 39,000 vehicles

■ 80% taxi-service
■ vans and buses

19% of all trips made, of that only 1.7% is catered to by buses

General situation

1.75 million licensed vehicles
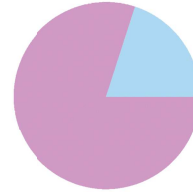
■ 38% 20 year
■ 12% 15 year

↑ 4%-5% growth each year.

 10-30 km/hr.

 50% to 70% increase in trip times

↓ losing a total of $2 Billion (5% of GDP) a year

210 signalized intersections

Causes of Failuret

1. Weak Enforcement : There is no serious application for employees and traffic police to enforce the law and lax penalties

2. Lack of coordination between Urban Planning and Transpc Planning

3. without Land Transport Authority (LTA)

4. Financial support from the government for mass transportation

5. The government should encourage a culture of public transport by raising parking prices to ease pressure on the use of private cars

Consequences

Going back, we can understand the implications of the concept of taxis and public transport.

"THIS LED TO THE OFFICIAL DISMANTLING OF THE TRAMWAY IN 1968 AND THE EMERGENCE OF INFORMAL NETWORKS OF SERVICE TAXI CARS AND BUSES WHICH REINSTATED THE TRAMWAY'S TRANSPORT ROUTES, AND ESSENTIALLY BECAME THE MAIN PROVIDER OF AFFORDABLE TRANSPORTATION IN LEBANON AND GUARANTORS OF RESIDENTS' RIGHT TO MOBILITY" (ISMAIL, 2021).

In a city like Beirut, the concept of using public transportation is restricted to poorer citizens who do not have their own cars. They can use public transportation to move between regions. And the first means of it was after the Horseless carriages, and then with the development, people began to use the tram as an idea for transportation, and it was popular until the sixties of the last century. Consider it the primary and enjoyable carrier, the Beirut tram called Nostalgia

Then people later became using cars and buses for transportation as an alternative to the tram. This global trend of the removal of the tram line became necessary because it takes up space in the streets and people have their own cars, so public transportation is limited to the unprivileged, as the residents of Beirut have the financial ability to get on a private car.

"After the end of the Second World War tram networks disappeared almost completely in many countries such as France, Denmark, Spain," (Nakkash, Beirut: From Public Transport Guided Growth to Automobile Dependence, 2017)

The concept of mass public transport became a common and accepted concept in Beirut, but there was a problem which was the increase in traffic jams. However, these buses became a symbol of the integration of Beirut's residents after the civil war ripped the city into pieces and the most important thing was that urban mobility was necessary to reconnect a divided city to recreate everyday urban life.

Now the demarcation place that was located within the city has disappeared, and this is a positive side, but unfortunately there has been no development in the issue of public transport, knowing that there are many schemes, but they remain ink on paper.

Unfortunately, the government has not taken enough measures for developing the transportation system, including buses and roads, despite the presence of an aid package worth more than three hundred million dollars. That there are plans to repurpose the money to cover cash cards for vulnerable families.

Neglect by post-Civil War governments led to a culture of private car use. Unfortunately, the road infrastructure, and the culture of the people is not developed. The meager public transport services currently available remain ineffective, unreliable, dirty, and non-functional.

Therefore, Beirut has become a symbol of chaos and pollution because of noise and congestion.

During the Lebanese Civil War and its aftermath, public transportation and urban mobility were essential as a form of reconnecting a divided city and to restore everyday urban life in general.

That is why the informal public transport network is so important and helpful to ensure the social and economic inclusion of urban development, recovery, and reintegration of a divided society not to mention the employment opportunities that have been made possible "The car has enabled the democratization of transportation, because with the shared taxi system, people of all budgets could access roads.

"The car enabled the democratization of transport, since with the shared taxi cars system, the roads were accessible by people of all budgets," (Ismail, 2021)

Positive aspects despite the problems

As mentioned previously, urban transportation was necessary for the communication between the outskirts of the city, torn apart by the civil war, and there was no other means other than informal public transportation, one of its advantages.

• The disappearance of the demarcation sites that were located inside the city, which separates East and West Beirut

• cheap

• It provides the opportunity for citizens to in-

teract with citizens from the other side, and this helps to avoid the tragedies and memories of the civil war
• Securing job opportunities
• A form of popular democracy in transportation
• Access to several diverse ways easily
"According to the 1995 Greater Beirut Transportation " (Nakkash, Assessing the Failure of Beirut City in Implementing a Sustainable Transport System, 2016)

Figure 14 To hail a bus ride in Beirut, "make yourself elegantly noticeable

4. Proposal

"*Beirut's rapid growth over the last century is tied to its economic role as a location of transit for goods, notably to Damascus, and its port, which plays a vital role in its economic life*" (Fawaz 1964, Mission IRFED 1963). IRFED 1963). (Fawaz, & Peillen, 2002)

The suggestion is that since there is suffering and weakness in the road and transportation network in general, it cannot be expanded, and there is an overcrowding of cars within the city. Also, this is expensive. I agree with the saying that says

"*There is no logic that can be superimposed on the city; people make it, and it is to them, not buildings, that we must fit our plans.*" (emerge, s.d.)

To try to solve this problemthe sea can be explored, in the sense that a new and different continuation of public transportation can be added in the city of Beirut, with maritime transport via ferries. It can be used in a positive and enjoyable way to reduce pressure on the city's streets, and some areas can be connected to each other by building some water ferry stations. And linking that station to a tramway that transports arrivals via water ferries and then the tram to some residential neighbourhoods adjacent to those stations, and so it is possible to reduce or dispense with the use of cars.

In the sense that the city of Beirut is divided into several coastal areas, ferry stations are distributed, and from the ferries, there will be a tram that travels within a certain area to provide a service for citizens and tourists, since the streets of Beirut cannot be changed and this is an expensive matter, and this will be explained in detail later.

Why Beirut:

Beirut suffers from a poor public transport system. The entry and exit of more than eighty thousand cars daily results in its severe congestion, traffic accidents, pollution and waste of time, which in turn impacts the productivity of companies and the quality of life of families (Figure 16).

"*More than 800,000 cars enter and leave the capital every day (BARAKAT, 2006 and Le Commerce du Levant, 2008), leading to traffic jams that are now a permanent part of daily life, and to endemic atmospheric pollution (AZIDJIAN-GERARD, 2006; CHELALA, 2008). In 2004, private cars accounted for 69% of motor vehicles in Greater Beirut (source: Lebanon-CAS transportation department). Parts of West Beirut, such as Hamra, the Corniche El Mazraa and Mar Elias, and the areas of East Beirut near the Hôtel Dieu or the road from Tabaris to La Sagesse, are notorious traffic black spots and produce significant forms of diurnal compartmentalization on weekdays*" (Bernier, 2010).

Lebanon has been considered technologically more advanced than other neighbouring countries such as Syria, Egypt and others in the south of the Mediterranean used as a result of its rather good relations with European countries and other developed countries. It has many immigrants living in those countries and this feature makes it keep pace with development and the ease of modernizing, the living reality. In some European countries it was able to take advantage of rivers and seas to develop transport by ferry, unlike those southern countries of the Mediterranean that do not have such a service, so we will find people who support and encourage it, and it is considered easy, cheap, enjoyable and has a tourist attraction. For the region and in the following chart, we can see the countries bordering the Mediterranean Sea from the European Union countries, how they excel, for example, over the Nordic countries in the use of water ferries (Figure 17).
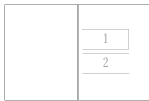
1. Figure 16: Traffic around the streets and traffic congestion

2. Figure 17: Share of the number of ferries amongst EU regions
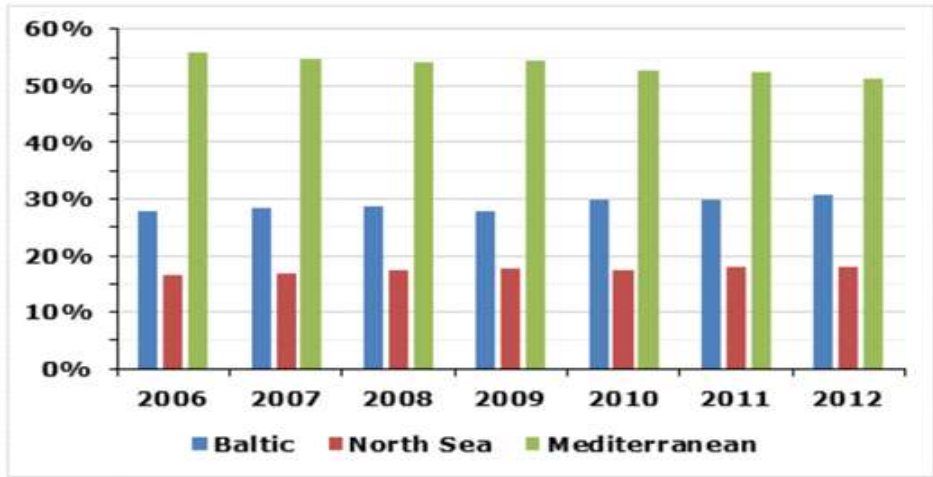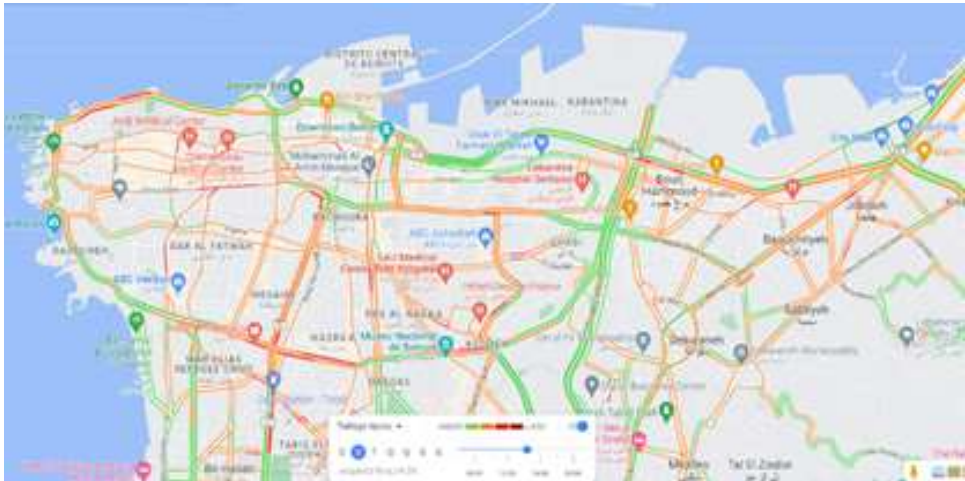
Water based route types

Water transportation methods vary according to diverse types of water. There are lakes, rivers, seas, and oceans, all of which can be used and considered as one of the types of transportation methods. The main goal is to use these paths to save time and enjoy until it reaches its destination. The boats or ferries connect with the land through the water pier or public stations. There are several Terminology for these platforms whose goal is to launch the sea voyage to its destination (Figure18).

"While the berths, marinas, terminals and floating stations are the places where passengers embark and disembark, as well as the boat parking " (SANTOS PEIXOTO, 2018).

There are several types of transport routes. These types are not concerned with where those water ferries are, marine or river, but tinstead in the number of necessary stations as the colours indicate. For example, ferries in Lisbon differ from ferries in Venice and differ from the ferries in Amsterdam. And this comparison is not in the sense of whether these places are in the sea, river or ocean, in the sense that the comparison and explanation here comes how many stations and the maritime transport system, and there are three types of the ferry transport system as shown in colours and letters.The first type is the linear system of ferries, meaning that there are several stops that this marine ferry will make within this city, such as Venice or Hamburg, and it would be a promising idea if it were implemented in Beirut to connect several areas together, and I will explain my suggestion later

"Type A refers to routes where boat services traverse along a river or water body stopping at multiple destinations connecting points of interest along a waterfront. Such services have been referred to also as linear ferry systems" (Cheemakurthy, Tanko, & Garme, 2017)

The second type, which is the oldest type of transport since it was known to transport via ferries, meaning that it is a shorter road that connects two or three stations at most. Istanbul, for example, the chairs are comfortable, and they are exposed so that the public can interact with na-

ture, and there is also a service of providing food, drink, toilet, and other services.

"Type B refers to shorter routes with two or three stops either in a simple river crossing or triangular three-point stop configuration" (Cheemakurthy, Tanko, & Garme, 2017)

This was previously the most ordinary form of ferry that was developed primarily in the absence of land-based transport connection.

The third type: They are roads dedicated to linking the city with the suburbs, as in the picture, and it is good if it is applied between Beirut and Jounieh, for example, or between Beirut and other nearby cities. The ports located in those coastal cities can be exploited and access to Beirut through ferry transportation to relieve pressure, as we talked about on the land route

"Type C routes are those which link suburbs with the inner-city area." (Cheemakurthy, Tanko, & Garme, 2017).
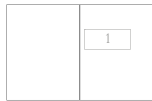
1. Figure 18 Route comparison: Type C (Yellow), Type A (Blue), Type B (Red) in Stockholm,

Figure 19 A view shows damaged buildings in the aftermath of a massive explosion in Beirut's port area, Lebanon August 13, 2020. (Reuters),

5. International examples on water-based Mobility Hubs. Case studies.

"The challenge of a Science of cities is to understand the links between urban morphogenesis, efficiency, and resilience. Mathematical regularities emerge in resilient cities, coming from the scale-free properties of complex systems that present the same level of complexity across their different scale" (Krafta & Neto de Faria, 2016).

How can Beirut benefit from the experiences of others, despite these problems in Beirut? It can rise again as it rose before. Perhaps the port accident revealed problems in the infrastructure and other disasters, but it is not the first it has passed through, but it needs simple things to return as it was It may be an adventure and a challenge to have ferries to transport passengers at sea, but every challenge has a price and the difficulties can be mitigated or overcome if there is a will.

But about the concept of urban transport, the question remains, how do some cities interact with such (water ferry transport).

1. Figure 20 Ferry quay at Barnängsbryggan.

" The city will act to reduce road traffic sufficiently for CO$_2$e emissions to fall by at least 80,000 tonnes
Objective for 2020, Strategy for a fossil fuel free Stockholm by 2040

Public Interests

Stockholm

Ferry traffic in Stockholm is concentrated in two districts, Vartahamnen and Stadsgarden. Vartahamnen is located near the E20 motorway, which connects the station directly to the road network that passes through the city from the north and aims to connect the city with the suburbs. City entry points and this represents another challenge is how the city of Beirut deals with large numbers of cars and where these cars can be placed during their coming to the city.

"Traffic from the Stadsgarden terminal is via the main ring roads connecting to the E20 motorway bypassing the city centre from the west" (Urbanyi Popiołek & Klopott, 2021).

The best way to challenges including environmental pollution, noise and other negative things were also reduced because they started using clean energy or environmentally friendly.

Stockholm also uses environmentally friendly technologies to reduce emissions through equipment in the stations to reduce noise and air pollution. And water pollution because fossil fuels are one of the reasons for the downsides of ferry transportation to help preserve marine life such as fish and other creatures inside the water.

"Investments in eco-friendly equipment are made in Helsinki, Stockholm, and Tallinn." (Urbanyi Popiołek & Klopott, 2021)

Stockholm was the first to use environmentally friendly liquefied gas in the Baltic Sea in 2013 to be beneficial to urban life and its goal is to reach zero use of fossil fuels in the year 2040 as in the picture.

The city will reduce road traffic enough to reduce carbon dioxide emissions by at least 80,000 tons Target for 2020, Fossil-free strategy for Stockholm by 2040

Seasonal variation in some cities may not dictate the type of station as much as other cities, for example, the water level in Stockholm experiences an annual fluctuation of about 10 cm in water levels. Finally, the effects of flooding must be considered in any structural design according to local weather conditions.

"Seasonal variation in some cities may not dictate terminal type as greatly as other cities, for example, *where Stockholm's water level sees an annual fluctuation of about 10 cm in its water levels. Finally, the effects of flooding need to be considered in any structural design according to the local weather conditions" (Cheemakurthy, Tanko, & Garme, 2017)* .

1. Figure 21 Best of the Bosphorus: Exploring Istanbul by Ferry,.

Istanbul

• Maritime services: conventional transport

One of the most important transport sectors between Asia and Europe, more than a hundred years old, and was essential until recently, before the construction of bridges linking east and west Istanbul, despite the presence of several bridges, but it remained in the memory of peoples, and this is what gives it beauty and every resident and visitor must use it and do not be surprised by its existence because The terrain of Istanbul, which sits on several Bosporus and Black seas, and the Bosporus Sea divides it into two parts, so using the phrase is a necessity that was inevitable.

Despite the city's development in terms of transportation such as metro, train, buses and bridges, the ferry transportation sector is still considered one of the easy and enjoyable means, and in 2016 the number of people who benefited from the ferry service was about 3.2 percent of the total public transportation trips.

"In 2016, sea services delivered about 3.2 per cent of total public transport trips" (Istanbul Metropolitan Municipality, 2017).

And they have a passenger transport service from Istanbul to the Princess Islands, considering the number of passengers, capacity, and what they need during transportation of food and drink, as I mentioned earlier.

"All our ferry terminals provide wheelchair access. Many terminals provide facilities, such as washrooms and waiting areas, especially designed for people with disabilities." (Istanbul Metropolitan Municipality, 2017).

• Technical specifications of the stations:

Materials have been put in place to help the visually impaired or those who are lost to reach the ferry easily or to the station, considering the stairs for going up and down. There are some special places for people with special needs or wheelchairs with special technical specifications for the issue of slopes connecting the berths of stations and ferries.

"Tactile paving has been installed in all İDO piers to facilitate ship access for visually impaired passengers." (Istanbul Metropolitan Municipality, 2017).

Since the centre of Istanbul connects the Black

and Mediterranean Seas, the burden of these ferries is heavy on the issue of environmental sustainability and to preserve the marine organisms that live in it.

"We are continuously improving our infrastructure and services to meet passenger demand, and to be future ready. In 2016, İMM started developing the state of the art "seagull shaped" transfer centre at Kabataş terminal.

The upgraded hub will integrate sea, road, and rail transport. To ensure uninterrupted pedestrian access along the coast, traffic will use a new road tunnel to be constructed under the terminal area.

The project will also connect Kabataş in the European side to Üsküdar in the Asian side with an underwater pedestrian and bicycle tunnel." (Istanbul Metropolitan Municipality, 2017)

This is their plan is to link this sector with different transport sectors or other in order to make transportation easier and easy access to multiple means of transportation after our arrival on land, other options must be available after reaching the ferry station to be reached, such as Lisbon when we move from Cais do Sodré, to Cacilhas, we can see that there are buses or a metro network that we can take, and there are several options for users.

1. Figure 22 Grand Canal transportation || public domain photo, annotated

vaporetto stop

traghetto

vaporetto

gondola

water taxi

Venice

Venice is a wonderful and unique city in that the only means of transportation is ferries or water transport passing through its canals, as there is no competitor to it, even if it is a bicycle.

Veneto region. It is built on a group of 150 islands with more than four hundred bridges that together form a network of roads. About four thousand roads are narrow and winding like labyrinths that will get confused at first when you first arrive.

There are several types of water transportation in Venice, even the police, their cars are a water ferry, and garbage is also collected via the water ferry (Figure 23)

The company that deals with the subject of transport in Venice is ACTV about six hundred land buses and 160 water vessels, which collectively carry approximately 194 million passengers on twenty-eight different routes.

"The ACTV public transportation system has over seventy different boat stops, both on the main island of Venice, and on surrounding islands such as Lido and Murano. The stops are made up of a rectangular dock with a metal overhead covering and walls, and each dock is labelled with the stop name. An image of a dock at the Piazzale Roma boat stop is shown below" (Capua, Guyette, Hetherman, & Hock, 2012).

Like metro stations, when passengers arrive at the ferry terminal platform, they disembark before the boarding of those who wish to use that ferry.

For tourists and visitors, it is preferable to take line No. 2 because it goes directly to the tourist places, and this means that the number of stations is less.

There is an advantage in Venice that people can build private residential boat docks. This serves as a car dock for people who live in cities other than Venice. To complete the technical condition of the dock, safety barriers and a gate must be placed on each allowed dock for protection and to avoid the use of this dock by the public so that there is no violation during Its use by public people that means like a parking lot in the streets to be used by the owner of the car only.

"Private residential docks constructed under the

previously approved permit are similar to private boat slips in a marina in that they are located in publicly owned areas but are reserved for private use." (E. Doty, 2001).

The sidewalks are small to preserve and protect the green layer of the cultivated plants for fear of being trampled on by passers-by.

"Construction of small docks on the banks of the canals in order to reduce the trampling of the banks and wetland vegetation" (Bureau of Engineering Environmental Group, 2001).
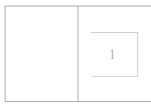
1. Figure 23: Garbage boat in a canal of Venice.

6. An Historical Perspective on urban water-based space

Ownership Patterns

Before entering to understand the differences between the different marinas, it is necessary to understand the nature of the lands extending along the coastal strip of the city. In this picture, it is possible to understand the distribution of lands between public and private, and the percentage of lands owned by the state or the public sector. As we mentioned at the beginning, there is a seizure of waterfront lands since the last century. To go back in history to the period of the French occupation, when the lands were turned into private property for families in Beirut (Figure 24).

"*Yet a historical inquiry into the cadastral documents of Beirut's seafront reveals that many of these seaside plots of land have actually been the private property of Beirut families since the French colonial authorities carried out a comprehensive land registration process beginning in the 1920s*" (Saksouk & English Booklet Production Goethe Institute, This Sea Is Mine, 2013).

Negative effects and Concerns of ferry transportation.

In the sixties of the last century, a problem occurred, which was an oil spill that polluted the coast, and this pollution led to the death of birds and marine animals, which had a main cause. He drew attention to the fact that there should be an agreement on the issue of the impact of maritime transport. The types of negatives in maritime transport were clarified, and these are some of them are related to the issue of passenger transport, and not all points, because there are some of them related to international shipping, and this is another topic.

"*Air pollution, greenhouse gas emissions, ballast water releases containing gaseous aquatic species, historical use of antipollution, oil and chemical spills, dry bulk release, litter, and underwater noise pollution; Ship strikes on giant marine animals, danger of ship grounding or sinking, and extensive sediment contamination in ports during transhipment or ship-breaking activities. This chapter summarizes the environmental impacts of shipping and describes the mitigating, legislative, and environmental performance measures currently available to better manage these global issues.*" (Sheppard, 2019).

But there is research talking about a comparison between air pollution by sea transportation or land transportation. Some data were positive for marine transportation, as the emissions from NMHC, CO, PM and CO2 are less than 50%, but NOX emissions are much higher, but this problem can be avoided to develop marine ferry engines, and this is an environmentally favourable indicator

"*NMHC, CO, PM and CO2emissions with current ferry technologies are lower than those of matching on-land modes at the 50% occupancy level. Ad-vanes in emissions control technology will clearly be needed to obtain air quality benefits from ferry service expansion, the most important challenges are in NOX control, and in Control for CNG engines.*" (E. Farrell, J. Winebrake, H. Redman, & J. Corbett, 2003).
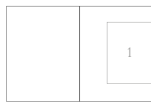
Ferry Terminal state of art

• *Other good examples of waterborne mobility services and system solutions:*

The idea of the project is that the space is somewhat modern, empty, and strategically located on the coastal strip of Beirut, which is located near vital and active places in abundance, and thus will serve as an excellent means of transportation added to the city of Beirut, which can be used for all groups and segments of the people because it is close to the Downtown and close From the port, close to Charles El Helou station, relatively close to the American University of Beirut, and close to some governmental institutions.

can be save time to reach the city centre by ferry, as I explained earlier, because the congestion and long waiting inside the car or within the few public transports is annoying, not to mention the traffic congestion and so on.
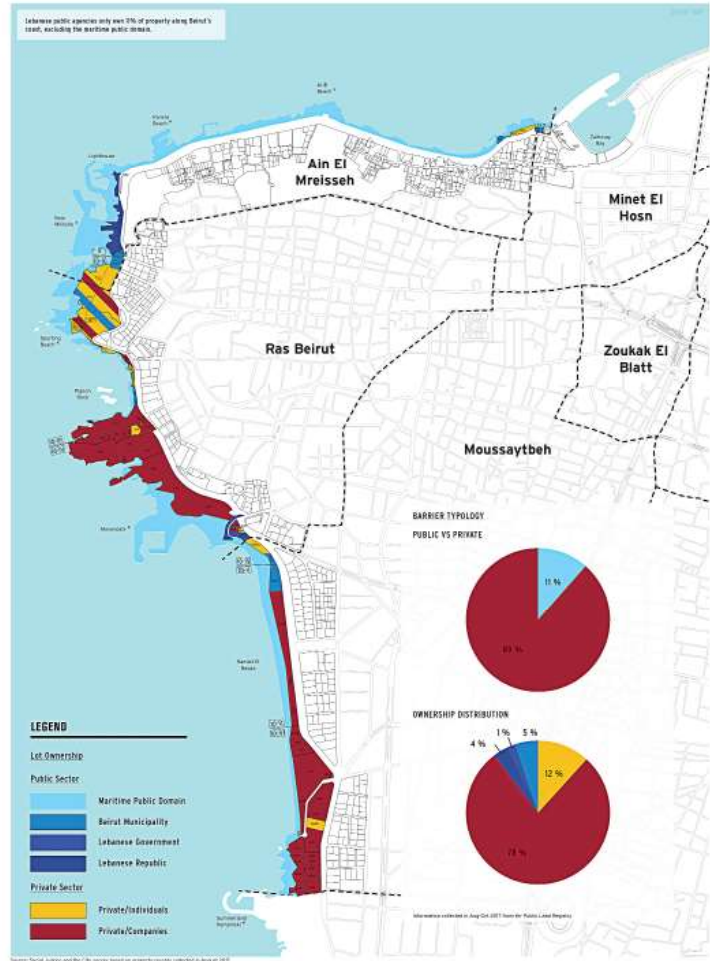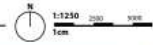
Or take the ferry to arrive or move from one area to another inside Beirut or go outside the city to other Lebanese coastal cities (Figure 20)

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1. Figure 24: Map of property ownership patterns in the city of Beirut

6. **OWNERSHIP PATTERNS I** PUBLIC/ PRIVATE (CORPORATE & INDIVIDUAL)

Lebanese public agencies only own 11% of property along Beirut's coast, excluding the maritime public domain.

Ain El Mreisseh

Minet El Hosn

Ras Beirut

Zoukak El Blatt

Moussaytbeh

BARRIER TYPOLOGY
PUBLIC VS PRIVATE

OWNERSHIP DISTRIBUTION

LEGEND

Lot Ownership

Public Sector

- Maritime Public Domain
- Beirut Municipality
- Lebanese Government
- Lebanese Republic

Private Sector

- Private/Individuals
- Private/Companies

63

Ferry Terminal state of art

• *Other good examples of waterborne mobility services and system solutions:*

The idea of the project is that the space is somewhat modern, empty, and strategically located on the coastal strip of Beirut, which is located near vital and active places in abundance, and thus will serve as an excellent means of transportation added to the city of Beirut, which can be used for all groups and segments of the people because it is close to the Downtown and close From the port, close to Charles El Helou station, relatively close to the American University of Beirut, and close to some governmental institutions.

can be save time to reach the city centre by ferry, as I explained earlier, because the congestion and long waiting inside the car or within the few public transports is annoying, not to mention the traffic congestion and so on.

Or take the ferry to arrive or move from one area to another inside Beirut or go outside the city to other Lebanese coastal cities (Figure 20)

1

1. Figure 25: Some Lebanese coastal cities and the distances between themt

Trypoli

Batroun

Byblos

Jounieh

Sidon

Tyre

Coastal Cities

68 Tripoli

55 Batroun

29 Byblos

14 Jounieh

Beirut

39 Sidon

74 Tyre
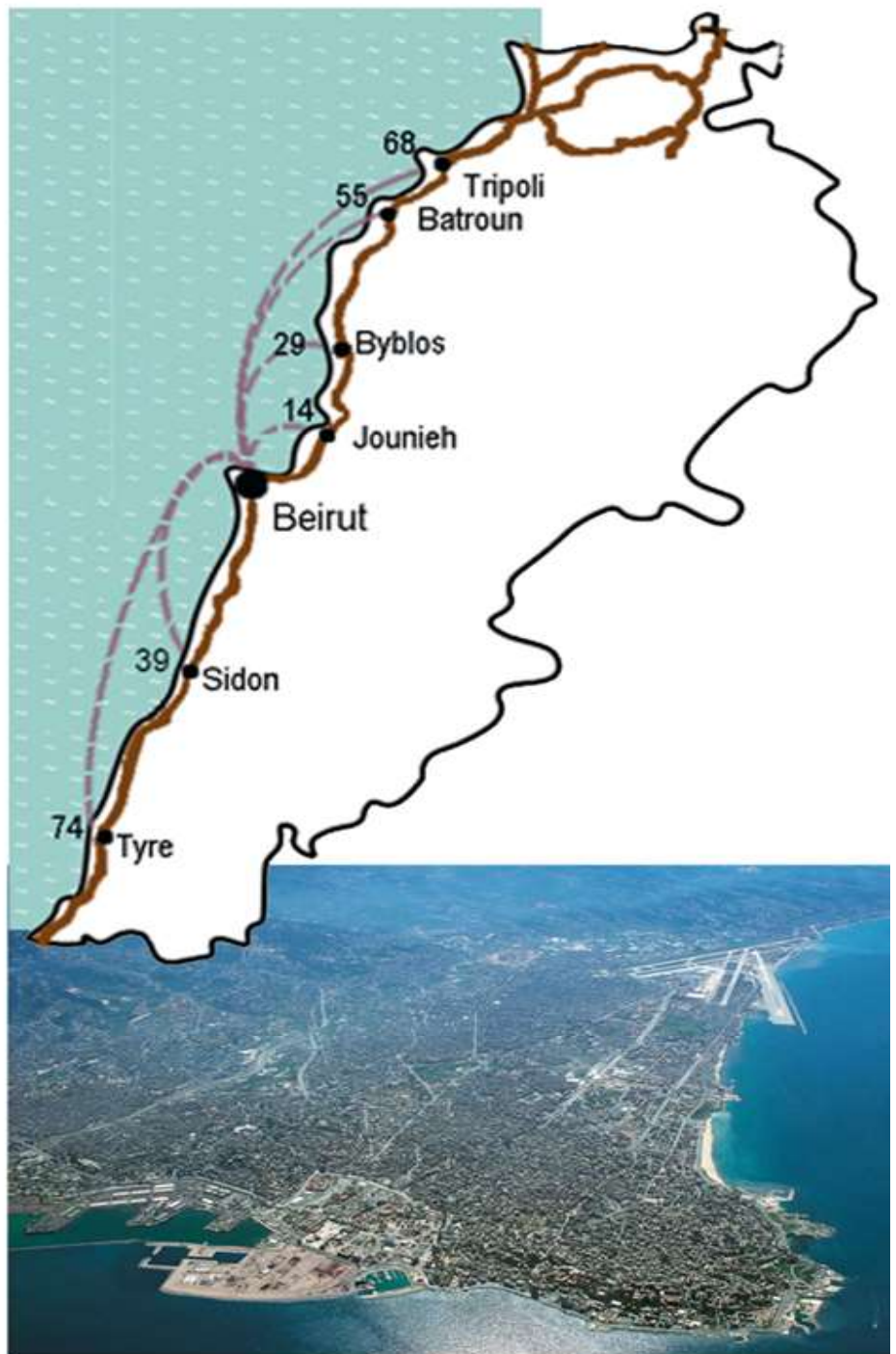
Beirut

7. Location disadvantages:

- One of the disadvantages of this site is that it will cut off the waterfront, which is a place residents use for picnics, some sports such as running or fishing , but they can be compensated by setting paths and places for them to practice their hobbies without conflicting with the function of water ferries.

- There is also the noise that some boats will emit, as well as the dirt that they may cause, and the loss of some marine life that live in the region, but it is possible to benefit from the experiences of some countries that use water ferries as a means of transportation. That Stockholm was the first to use green liquefied gas in the Baltic Sea in 2013 to be beneficial to urban life.

Also, the first things to pay attention to is that transportation by sea is not the same as transportation across the river due to weather factors in Beirut, although the weather is moderate and tends to be warm, but there are some days when there are winds and waves, but these things can be controlled by also knowing how they are done Dealing with such matters, for example, in Graham-Island in Canada, although the weather conditions are much more difficult, but the ferry transport does not stop in the winter, so it is possible to understand the way they work, and what they do to overcome the problem of weather and weather factors in the winter.

There can be several stations on the coastal strip of Beirut for ease of communication between neighbourhoods and linking them with each other, and later I will explain in detail why such sites were chosen, considering the distance, location, land ownership, advantages, and disadvantages of those areas, etc.

Main station location

At the outset, I can say that the location of the main station can be in the Down Town, as it was mentioned previously, and this area was built and is being developed by Solidere, which began work on.

"The development and reconstruction of downtown Beirut on an area of 1.9 million square meters, of which about 700 A thousand square meters of newly developed land on the sea." (Issue 311, 2011).

An holistic approach

After a deep research, which included readings and studies on the specifications and requirements of water ferry transport stations, it was noticed that there is a station that is similar in design to a building in the modern area of Beirut, which is the Beirut Souks, and this station is called the ferry station, St. George Ferry Terminal in New York City, so I began to prioritize and supplies the buildings and the space we need to build a ferry terminal, taking into account the criteria, including those that have been set "comparing air pollution from ferry and landside commuting.

Ferry terminal access factors:

(existence of feeder buses, park, etc.)

The plan consists of two paths: land and sea.

1. **The land path or land route:** It is the return of a means of transport that was cancelled in the 1960's, which is the revival of the tram line, because there is a crisis and a density of cars, and one of the solutions to address these problems is to add tram lines, as the tram does not need more spaces. Cars and buses run over these railways, like many examples in Lisbon, Istanbul and other places where other means of transportation can be walked over it in the absence of a tram vehicle above it, and this is also a solution that helps alleviate the transportation crisis and traffic congestion, in other words, it can be divided Beirut to several neighbourhoods or regions, and a tram line can be set up to serve a specific area that can reach the ferry transfer station to deliver the beneficiaries of the transportation service, and this will push them to use public transportation in a comfortable and enjoyable way

2. **The sea route or waterway:** Moving through the coastal strip of Beirut by ferry, and in the same way the land route will be treated, the marine route will be handled, meaning that several ferry stations will be distributed in different areas of the city to replace, at least partially, the use of cars. This will reduce congestion and allow to quickly reach he places people need to go to, taking into account the vital places so that there is a
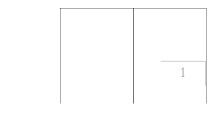
1. Figure 26 East Berlin - Brandenburg Gate
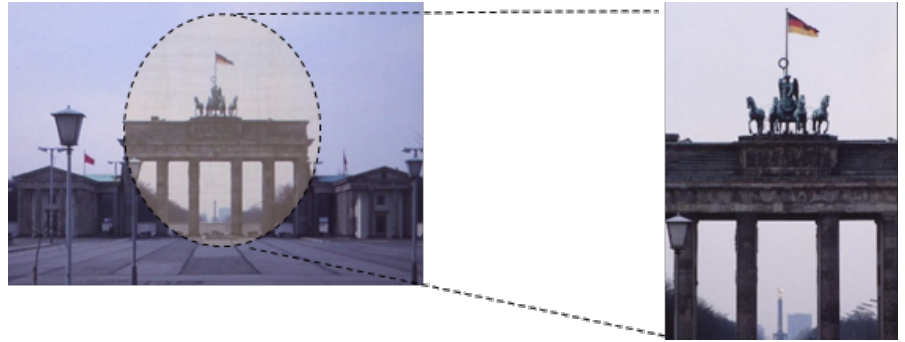
ferry transport station available there, and when he reaches the appropriate station, he will find the tram waiting for him to move through it to the place he wants, and so the citizen will not need to use his private car or wait for a long time to use public transportation. Beirut by tram and water ferry, I will talk in more details later.

3. **Parking availability (at both terminal and destination)** :

Considering the commuting between diferent parts of the city, or its fringe, and the station it was proposed a car park to stimulate the use of the ferry, but also to avoid future parking problems.

Land use.

The ferry terminal is an important node in the city, which should be connected with its urban fabric, both spatially and programmatically. Therefore the proposed terminal will be part of complex which will be explained further ahead.

Population density.

Looking at the location of the project as an overview, we will find the downtown road separates the area into two parts.

A dense section full of people and many vital places, and the section where the ferry transport station will be located is almost empty, almost devoid of any significant activities.

So, my plan revolves around how to attract people from that intensive section to the empty section and entice them to spend some time and use the ferries. The plan is centered on two points.

Developing the road from Nejmeh Square to the main road can become like the city of Venice in the sense that it can be free of cars only for pedestrians.

The path of the square to the waterfront in the area where the ferry terminal is to be located is similar to the path between the Brandenburg Gate (Figure 27) and the Tiergarten in Berlin, or even to the path between Dom Pedro IV Square, Arco da Rua Augusta and then Terreiro do Paço ferry terminal in Lisbon.

Car paths can be found outside that area to promote a clean environment and an area free from vehicle noise and visual pollution.

Then from the main road to the ferry transport station, where cafeterias, parks and green spaces will be placed, and a water canal can be built remarkably like many cities through which the river passes water streams, and within several commercial, residential, and service markets that can be next to the station. The development of the waterfront and overlooks can be activated to be used by Beiruti people who love public spaces, parties, and places of entertainment.

A practical approach : The project is in two parts

1. **The inner part**: It is in front of the sea. It is a large green public square surrounded by several buildings on three sides, and the fourth side is open to the sea., somewhat like Commerce Square in Lisbon, and a water canal passes in its middle. Ten floors and in the left section a lighthouse, a commercial building, and another hotel like the hotel on the right

side, and they connect to each other through several columns and an arch in the form of a gate to enter the square and people can take a walk and sit next to it.

These buildings with the square are similar in general to the shape of a Beirut Souks building (Figure 27), but by emptying and removing the buildings in the central area and also similar to St. George Ferry Terminal in New York City (Empire Outlets) (Figures 28 & 29), it is not rectangular or square in shape, but rather oblique in shape to give the impression that it is in line with the neighbouring buildings. It will resemble an arm that embraces people. In other words, the exit area from Beirut will be smaller and the area of entry to Beirut will be larger.

As referred, the entrance passage to the square will be through an arch on either side of it, columns of the Phoenician style, and on its right and left sides are several shops consisting of two floors. The latter is for people to enjoy the waterfront and the scenic view that will allow them to see Beirut and the sea from a high place, and there are two towers stationed on both sides of the square, and these buildings are separate from each other.

On the top floor of the buildings is a view or facade to see the sea and enjoy watching the city from the top.

This means that the inner section consists of:

- Two hotels with thirteen floors, each with services for tourists and residents, who can enjoy the view of the sea and Beirut at the same time.
- Two commercial buildings, the first of which includes shops, and on the top floor there are restaurants.
- The ferry transport station consists of three floors, including service, commercial and administrative.
- The lighthouse building and there is a restaurant at the top.
- Green space and a water channel to enjoy nature.
2. **The external part** : when we come from the inner city road, the road will be developed and the road will be relatively wide, adding some green spaces, interspersed with a water channel in the middle, as I described, and some cafeterias to enjoy the time and before reaching the square, the road will become somewhat narrower to give the impression that we will leave Beirut The further we go, the narrower the road will be, and on both sides of the road there are pillars.

On the road parallel to the coastal strip, there can be green spaces to give public spaces for people to rest and have fun in front of the sea.

This design can be the beginning of activating the rehabilitation of the area to attract people in an effective way, and this area when adding public and green spaces and multiple recreational places, which helps to create numerous opportunities to benefit from the aesthetic and revitalization of this space.

Sustainability requirements for ferry transport.
There are factors that must be taken into consideration such as that there is a commitment to the departure and arrival times and that the boats are clean, tidy, and sustainable environmentally and climate and avoiding previous mistakes to encourage people to use public transportation and restore confidence in this vital sector such as:

- Boats of good specifications and of varied sizes that run on renewable fuels or on solar energy to maintain the cleanliness of the sea and reduce environmental impact, noise, and other negatives.
- We do not hear much about the problems that occur on water ferries, such as major accidents, congestion, or large costs.
- The way stations and berths are designed so that the traveler can access the berths with multiple transportation options such as walking, cycling, tram etc. Ground transportation options, as an alternative to any necessary bus supplies.

1. Figure 27: The downtown Souks
2. Figure 28 Empire Outlets map
3. Figure 29 Empire Outlets building

Distribution of stations:

The idea is how to provide and exploit the Beirut area to provide public transportation without expanding or demolishing streets and moving people from east Beirut to west or north to south in an appropriate time, and with convenient transportation.

 Therefore, I divided Beirut into several regions, as I explained previously, and in each region, it will be divided into two parts: land, sea, or water.

- Land transport is an independent tram line within a geographical area that runs on electric or clean solar energy. Passengers can be transported to reach the transport station by ferries located in that area, or they can move to other places of their choice, and this will encourage them to leave their own cars and use public transportation.

Since this tram will run within a not large distance, or in a more correct sense, not the whole Beirut area, it is possible to take advantage of sunlight without the need, and that this tram runs on fossil fuels. Traffic has reduced private cars, and we do not need to spend additional expenses to develop roads, only need to put railways on the street so that the tram can move, but I did not focus specifically on the tram, only a suggestion, but I focused on the second section, which is,

- Ferry stations aquatic and divided into several regions, namely (Figure 30):
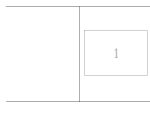
1. Figure 30 : Map of Beirut with suggested water ferry terminal areas with tram lines.

Beirut Area

Tram Area

Marina Area

Ferry Terminal

Ferry Line

the main ferry area

The main or vital ferry terminal will be in the center of Beirut, the modern area developed by Solidere, and it will be strategic and close to the vital and influential places. The building is located on the waterfront and will cross an area where the fishers practice their hobbies in fishing, but they can enter this building via a ramp or stairs.

The building consists of three floors, the ground floor below sea level, which consists of shops, supermarkets and restaurants, and the front of the restaurant is a glass facade through which you can enjoy and sit in the restaurant and watch the sea from below, permeated by light from the sea, as well as several ceiling windows through which the light will pass, such as Orient Station and Shopping Vasco de Gama.

The first floor, which is a gateway, places to buy tickets, and a cafeteria for two waiting halls, one outside, goes and returns to form a link between the coastal cities of Lebanon such as Tripoli, Tire, Sidon, and other governorates.

Others are internal. They move between several different areas of Beirut. We will get to know them later.

The second floor is administrative offices, and all the facades are glass to benefit from the sunlight and enjoy the view of the sea, which gives the building natural lighting.

Residents of the area, tourists, and those who have transactions in the port, and those who want to go to the Corniche area and search for calm, will benefit from this station. It is also close to Martyrs Square, commercial places and other commercial activities and offices (Figure 31).

The second ferry terminal

A station near the Riviera Marina,and does not have to be a station. We can use a gate to enter the passengers and then a jetty they can wait for the boats.

It will be used by students and employees of the American University, as well as workers in the surrounding areas, as well as visitors to the Riviera or other hotels from tourists, as well as fishers and those who want to go to some nearby swimming pools and the residents of the area of course

Third Ferry Terminal

It is close to the Officers Club, a station close to Raouche, which has memories in the memory of Beirutis, and all those who visit Beirut must visit it. Also, there can be a gate for passengers to enter and wait on the pier waiting for boats to save space, and there is no need to build a station that will be like the city of Venice It is just a waiting station

Tourists or those who want to go to Al-Najma Club or some nearby clubs, as well as residents working in the surrounding areas, will depend on this station.

Fourth Ferry Terminal

Between Ramlet Al Bayda Beach and Movenpick Marina, it is a vital station because the residents of this area are of the high class, so it will be a vital station for visitors and for those who want to go to the White Ramlet Beach or tourists who want to enjoy in the Movenpick Marina, as well as workers in that area

Fifth Ferry Terminal

The final ferry terminal within the city of Beirut is the link to the airport, but unfortunately, I searched for the data of that area, but I did not find any plan for that area.

But how beautiful it is when a tourist or anyone comes to Beirut through the airport, and when he leaves the airport, he will take the tram, then the ferry, and then move into the city of Beirut or vice versa without using taxis or private cars, which will lead to a reduction in pollution, noise and traffic congestion.

1. Figure 31 The most important landmarks available in the Downtown area

Waterfront   Naval Base

Zaitunay Bay

Souks   Charles Helou Station

Grand Serail

Roman Baths

AUB   STAR SQUARE   Duty free

8. The reason for these locations

In the Ownership Patterns section, I described the private and public places of the coastal strip of Beirut, and I tried to locate these ferry transportation stations within the public places, although there are some places where the proportion of the area owned by the government does not exceed 15%, but I just want the road to be owned by the government because The station can be located inside the sea, like some of the water bus stations in the city of Venice, because the issue of space and places has been dealt with in a smart and wonderful way.

9. Distances and Time

When we use the Lisbon Ferry Terminal between Cais do Sodré to Cacilhas, the distance is 2.3 km, and the journey time is 8 minutes (Figure 32)
This gives us that every 1 km equals 3.4 minutes as an average speed, meaning that we need about 13 minutes to travel the distance between Downtown and the Marina Riviera station.

And we need about 21 minutes to reach the third station, and we need about 31 minutes to reach the fourth station (Figure 33). If we want to go to the airport, we will take about 40 minutes to reach the fifth station with luggage and comfortably and save expenses while we need more than 50 minutes if we decide Going by car on the coastal road with congestion.
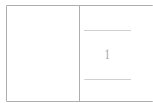
1. Figure 32 distance between Cais do Sodré to Cacilhas

LEGEND

Lot Ownership

Public Sector

- Maritime Public Domain
- Beirut Municipality
- Lebanese Government
- Lebanese Republic

Private Sector

- Private/Individuals
- Private/Companies

6.2 KM

8.7

1
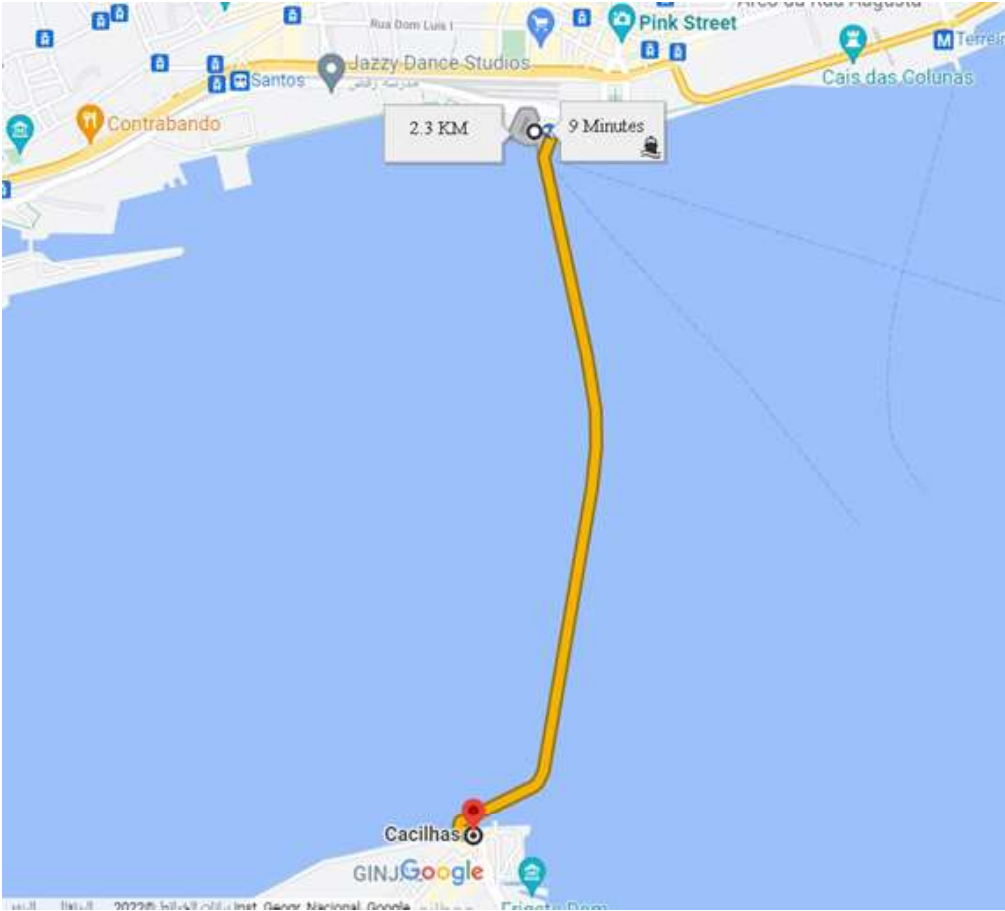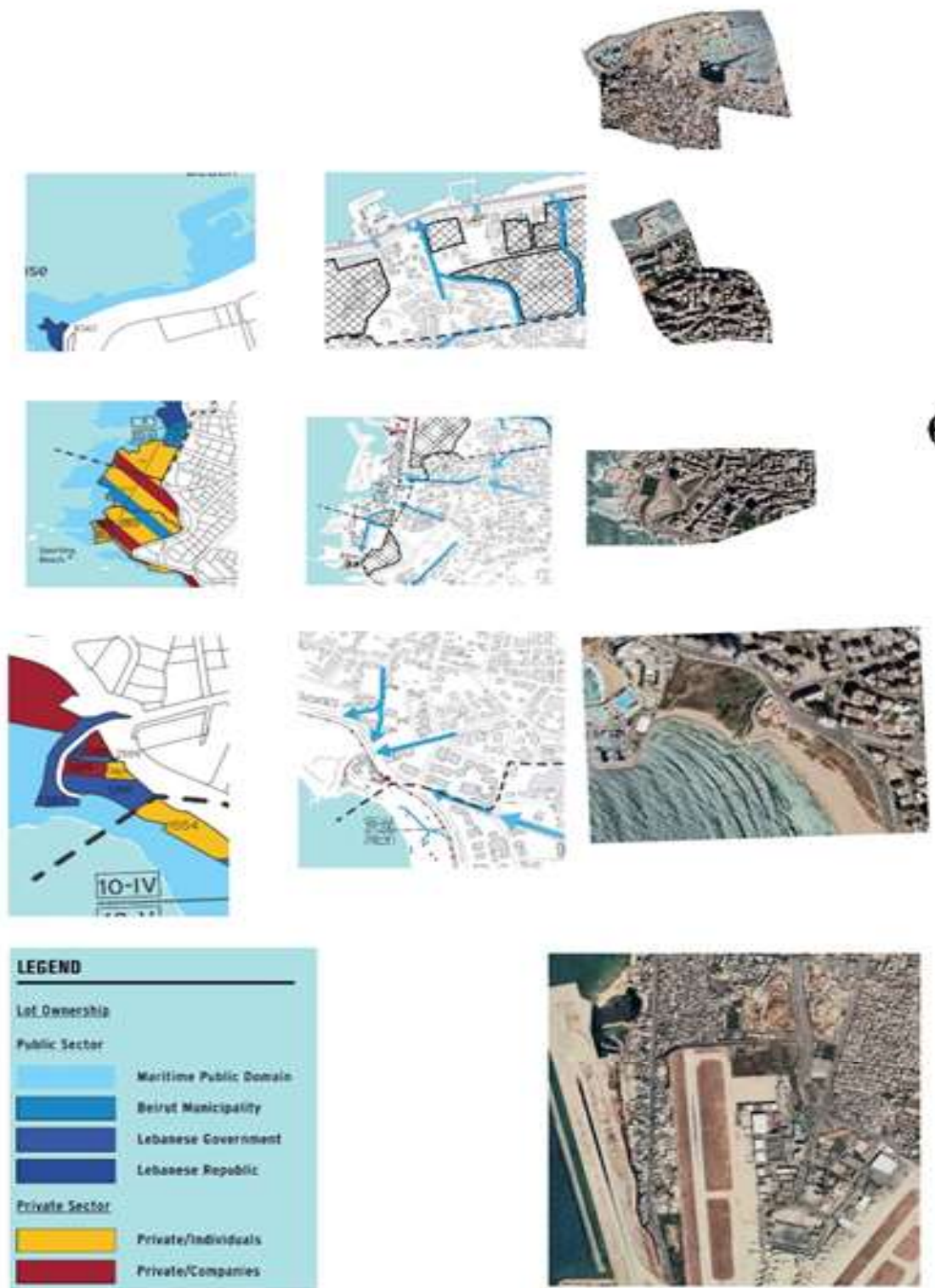
Figure 33 Map of the city of Beirut and some suggested areas for water ferry transfer stations with the distance from the city centre to those areas and ownership patterns ,

3.7 KM

KM

1.7 KM

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12- My work

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