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ESCAPING DESTRUCTIVE COMMUNITIES TOWARDS AN UNDERGROUND UTOPIAN SPACE

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ESCAPING DESTRUCTIVE COMMUNITIES TOWARDS AN UNDERGROUND UTOPIAN SPACE

Abstract

Going to the underground has always been the escape for people in harsh cases like wars and natural disasters. While the city centers are surrendered to the seizing through global capital, more density is forced on the territories of the city in the form of urban sprawl, leading to the uncontrolled, unplanned and unrestricted urban spreading, and then forcing to look for an escape for this continuous growth. Subterranean architecture would be the escaping solution that architects will depend on in the future. Subterranean architecture refers to the underground structure that is built in unique sites and where traditional buildings can not be built. Humans sought for subterranean architecture years before when tunnels and caves were built. According to that, this architecture type was known as flexible, secure and protective for its location and conservation. In the case of over populated cities, subterranean architecture is caused by the need of the urban residents to escape density towards a more settled environment. Therefore, this research aims to design a well-defined studied strategy for designing underground space, and shed the lights on the importance of underground space for the cities and environment in the future. To achieve this aim, the study will start by presenting a literature review after reading and analyzing subterranean architecture and underground structure articles and case studies, to discuss this phenomenon and its effect on urbanization, city structure and pattern and architectural heritage. For the urban pattern to be maintained, and for the future architecture to be more relevant, this architecture would be the solution that will be followed in the coming years.

Keywords

Underground Architecture, Subterranean Architecture, Underground Structure, Population, Destructive Cities, Future Architecture

1. INTRODUCTION

Subterranean architecture is an ancient type which will be renewed in the future as utopian architecture. Subterranean facilities were caused by nature simultaneously when caves were created as shelters, temples reflect religion, halls protect from nature, and underground cities for safety. As underground cities are used in the modern era, this is to control the population development caused by urban sprawl that is increasing with time, or to protect from the natural disasters that may attack. In every era, new requirements have been raised to improve the quality of underground architecture so that it meets the needs of its time such as concepts, designs, building materials used and the construction methods. Designing underground cities, gave the possibility to gain more areas on the above ground; and therefore, more social and public spaces started to generate and spread over the cities. As cities grow, infrastructure became more complex and the density increased, architects started to look for a substitute for this expansion different from the vertical growth. Therefore, utilizing the underground development is a way to solve insufficient areas in urban cities and the deterioration of the urban quality, where the above ground space can be gained and used for the social and public spaces and activities. According to surveys and studies done by the World Urbanization Prospects, a result showed that 54% of the world's population lives in urban cities, and most of them moved from their rural areas toward the city. The report showed that by the year 2050, 66% of the population will be moved to the cities (United Nations, 2018). Figure 1 shows that the urban population in 2007 overcame the rural population and started to increase in an obvious way (United Nations, 2018). This inner migration is known as urban sprawl, and it is caused due to the lack of some facilities in the rural areas, and especially the economical ones, and fulfilling them in the urban. This sprawl that affected the city and its structure, forced architects to find a substitute for a controlled urban spreading. Subterranean architecture aims to preserve the space found aboveground, and benefit the space underground as commercial and entertaining, leading to solve the exceeding density attacking the city. Therefore, this research aims to design a well-defined studied strategy for designing underground city, and shed the lights on the evolution of subterranean architecture. Thus, this research hypothesizes a well-studied architecture strategy, subterranean architecture, in which architects could refer to in case of any future sudden that could happen, related to health, environment or urbanity.

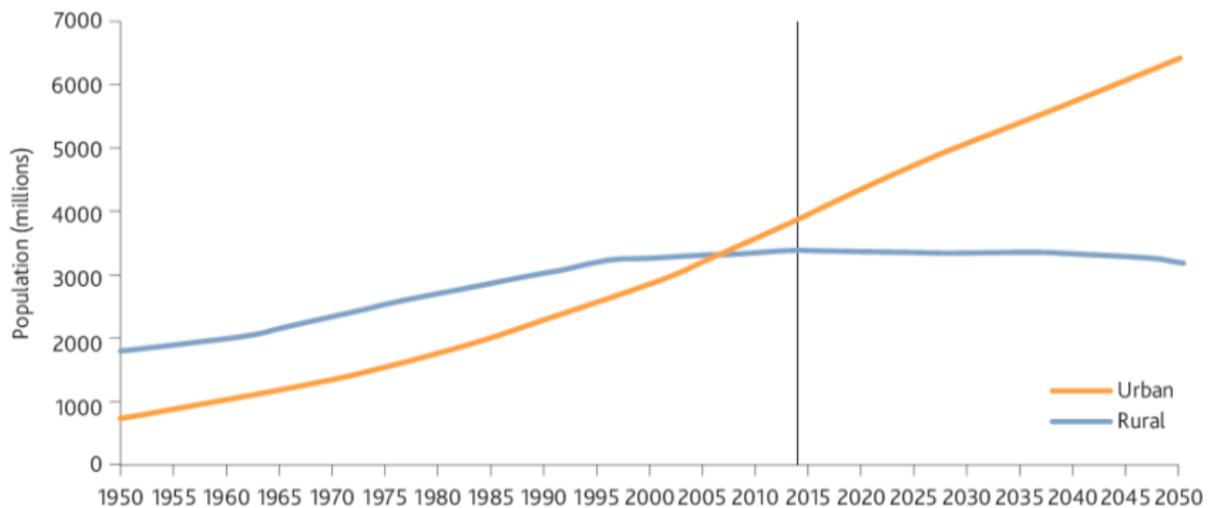


Fig.1: Urban and rural population of the world by the years 1950-2050
Source: United Nations, 2018

2. LITERATURE REVIEW

Underground space has been considered as unsuitable space for residents due to the function it served in some buildings like storages and mechanical rooms. As in urban cities and population started to increase and areas decrease, a solution had to be found to serve the over density that is facing the cities. Janette Sadik-Khan a former commissioner of the New York City said:

“Until a few years ago, our streets looked the same as they did fifty years ago. (...) We’re updating our streets to reflect the way people live now. And we’re designing a city for people, not a city for vehicles.”

As people can’t dispense with the city, additional area has to be created and found in it so that it can fit all. Therefore, importance was focused on the underground space, this neglected forgotten space, so that the urban cities can have an additional area underground to serve it, and therefore the above area could be used as for nature. Urban underground space is considered as a part of the urban development so that it can serve a larger population in the city. The term “urban underground” is known as the space under urbans that has the ability to serve the city directly. It is expected that the use of the underground space will increase in areas, importance and requirements, as it will integrate with the above ground spaces.

2.1 Historical Background of Underground Architecture

Underground spaces were formed by nature when caves and sheltering craters were created; and with time, these spaces started to grow and develop to meet different requirements. Religious that called for buried temples required underground spaces, wars and natural disasters called for the need of underground areas as well for protection. This space started to be used from the old ages and continued to the modern era, where underground areas are used for energy conservation, technological serveries, and as an escape form the chaos found above ground. The historical overview of underground architecture shows how the communities changed over time. The start of underground architecture was through digging under the earth’s surface, or formation of natural caves in the rocks. These were mainly used as for housing, but over time, it started to expand and wide the services in which other uses started to take place like mining, storages and worship (Khayat, 2014).



Fig.2: Cross section of underground city of Cappadocia

Source: Brilliant Maps Derinkuyu, 2016



Fig.3: Last residents of Tunisia’s underground houses

Source: Aljazeera, 2018

2.2 Types of Underground Architecture

As underground architecture started over years and centuries before, it passed through different evolutions and functions.

2.2.1 Caves

Caves are considered to be as the first habitation for man. It was used as a shelter for them to escape the summer season and the high temperature outside, since it is considered as an insulation from the outside. Moreover, it was the escaping point for protection from any exterior attacks that may happen (Mehta, 2015).

2.2.2 Dungeons and Cellars

Dungeons were used in the Middle Ages as a passageway that connects different parts of a castle, in addition to storing goods since it provides a cool atmosphere inside the dungeons. This underground architecture was then converted to a prison, but it didn't match the human conditions (Mehta, 2015).

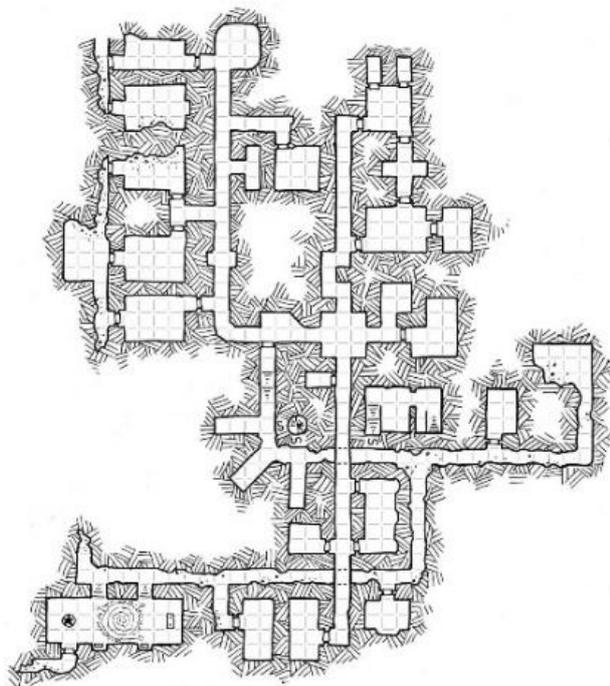


Fig.4: Dungeon plan connecting different parts of the building
Source: Simple Linear Dungeon, 2016

2.2.3 Bunkers

Bunkers were mostly developed during the World War I and World War II to protect for any attacks that may happen. It consists of a monolith shell built from heavy concrete walls with just one open in the end to spot any move outside. Bunkers provided a sense of protection and safety for the inhabitant due to the submerge structure, in addition to the light that penetrates and gives the feeling of safety (Mehta, 2015).

2.2.4 Grottos

Grottoes were the result of the industrial revolution in the second half of the 18th century. This development wasn't meant just for a residential mean, but also a connection with the nature for all social classes. Its structure provided a natural insulation from the harsh weather outside and provided a cool and low temperature inside the grotto. Grottoes were then used a place for meditation and relaxation due the natural connectivity (Mehta, 2015).

2.2.5 Cryptoporticus

Cryptoporticus had a private use before in which it was used as an underground connection between different villas in the site. It was developed by the romans and mainly used by the family and the servants of the villa. Its location underground provided a protection from the exterior weather as it provided a cool atmosphere inside. Over time, cryptoporticus became a living place taking into consideration the living parameters (Mehta, 2015).

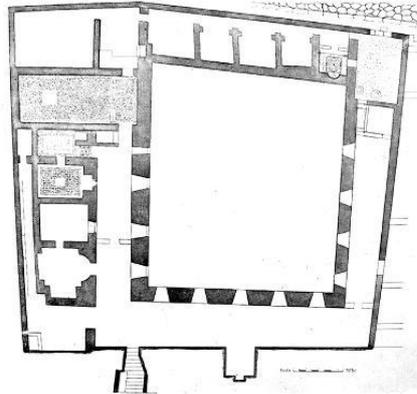


Fig.5: House of Cryptoporticus, Pompeii
Source: <https://research.ncl.ac.uk/>

After recognizing the types of underground architecture, the paper will analyze two underground similar examples, Arcosanti and Berber Cave, in order to come up with underground architecture principles.

2.3 Underground Architecture in the 20th Century

Approaching the 20th century, underground facilities started to expand and became a vital section of the architecture evolution, in which it became a main and efficient part of the design. Facilities like labs, parking, museums, metro stations and many other facilities were built underground in this century. The structure of these underground buildings was based on vernacular materials as bricks, but then with the evolution, additional materials started to be added to the structure of a building as steel, glass, wood and tiles. During the last decade of the 20th century, greater attention was given to the energy conservation and environment, in which underground buildings had important role in implementing energy conservation, and therefore new facilities started to show up like commercial markets and educational buildings. This evolution is still going till the 21st century and later, where on the other hand, it is allowing the city to gain more free areas for the public space, and this is what urban cities are looking for (Khayat, 2014).

2.4 Arcosanti: Example of Underground Architecture

Arcosanti, located in Yavapai County, central Arizona and designed by the architect Paolo Soleri, is one of the underground project that escaped the urban area and went towards the rural ones. This project follows the arcological concept that is based on architecture and ecology. This implies that the project has a strong link with the earth and nature. As people left the urban cities, they moved towards suburbs and the exurbs of the city, and Arcosanti was one of these cities people moved towards. This sustainable city attracts people to experience its environment that is considered a walkable city, and includes social spaces and private business related to the city in order to aid people living in it. Due to the typology of the site, Soleri was able to design an underground vertical city as shown in figure 3, in which the dense urban setting was pushed vertically upward, and all benefiting from the natural sunlight. This project due to its sustainability, consumes only 1/5 of the energy consumed in the urban areas (Malloy, 2018).

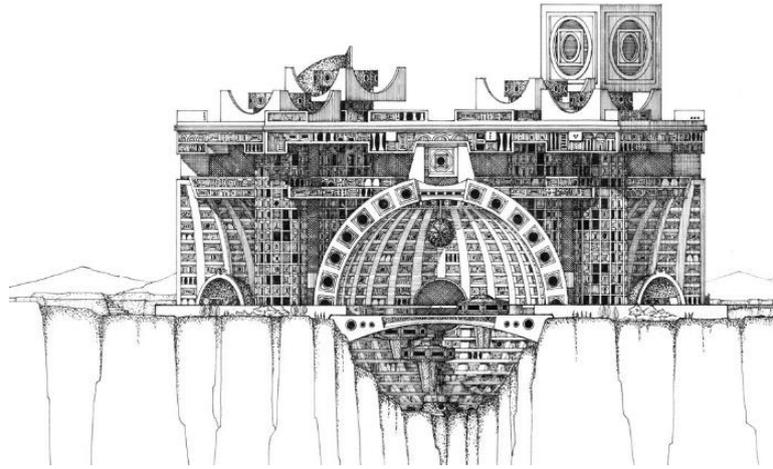


Fig.6: Soleri's sketch in 1960s showing the underground concept in Arcosanti
Source: Politico Magazine, July /August 2018

2.5 The Berber Cave Homes: Example of Underground Architecture

The Berber cave homes is an underground housing project in Matmâta, dessert of Tunisia. This project is designed underground in order to avoid the intensive heat in the dessert and the high temperature there. The project is built by digging in a dessert hole to form the homes, caves and tunnels. The dwellings are gathered around a one main courtyard, and then linked to the other courtyards. As all the dwellings are dig underground, which leads to an insufficient lighting ventilation, this created courtyard played a sustainable environmental role to serve environmental features of the project (Taylor, 2018).



Fig.7: Underground troglodyte houses in Matmata
Source: The Atlantic, 2018

2.6 Principles of Underground Architecture

According to the architecture principles and studies, it is clear that the traditional principles of urban planning can't be applied to the underground spaces. Therefore, underground spaces have a different track to tackle in order to get rid of the negative underground vibes, otherwise "insurmountable problems could occur if ignored in design" (von Meijenfeldt & Geluk, 2003, p. 168). Designing underground architecture has a special focus on the environmental psychology of the space due to the lack of windows and exterior configuration. Urban subterranean areas have to be designed in a way to benefit from the whole underground space, and in the same time to create a special link with the urban development. Fetching for the main principles of subterranean architecture, there must be a relation between the quality of urban public space, and the principles of underground areas. After the analysis of similar examples, and according to "Underground Space Design and Underground Building Design Commercial and Institutional Structure" a set of principles categorized into 5 sections were deduced to start up an underground space.

2.6.1 Exterior and Entrance Design

"A good environmental image gives its possessor an important sense of emotional security. (...) Indeed, a distinctive and legible environment not only offers security but also heightens the potential depth and intensity of human experience."

Stated by Kevin Lynch

As one can't see a real built building in front of him, he can start having negative vibes and drawing past memories. Here comes the architect's challenge to follow a new design criteria and principles. The exterior image of this underground space will have a great impact on the entrance of the project which in turn can affect the users experience (Wright, 2012).

2.6.2 Layout and Spatial Orientation

This principle has the most crucial interior setup, for example, the interior circulation, plan, area, and relation of spaces inside the facility. Planning an underground space requires an important unique design approach different from the above ground one, and that to be acceptable and flexible for the user (Wright, 2012).

2.6.3 Interior Design Elements and Systems

Since the above ground design has a special connection with the outdoor spaces, the underground spaces will not have this relation. Therefore, the main relation it will have is itself, and in deed, the interior design and systems used will play the major role in accepting the space (Wright, 2012).

2.6.4 Natural Light

This principle is the most important element in designing underground space since it partners with the most widely recognized disadvantages of underground spaces like natural light, gloom and obscurity. On the other hand, artificial light can't replace sunlight (Wright, 2012).

2.6.5 Sightline

As for the user to have a convenient space to experience, he must have a visual connection with the outdoor space and the nature. Therefore, well studied and oriented apertures have to be used in order to have this connection (Wright, 2012).

2.6.6 Life Safety

A special attention has to be given to the life safety principle while designing, to avoid any fire and emergency situation that could be faced, and in case so, the plan has to be design in an open sense with the addition to the escaping facilities (Wright, 2012).

To sum up the principles concluded from previous studies and readings, this table is presented to list the parameters of underground architecture.

Table 1: Table showing the parameters of Underground Architecture

Parameters of Underground Architecture
Exterior and entrance design
Layout and spatial orientation
Interior Design Elements and Systems
Natural Light
Sightline
Life Safety

3. METHODOLOGY

In this paper different types of research methodology are used. These methods are inductive method, field method, analytical method and deductive method. Inductive method is based on gathering data about the case study which will be "Tyre Underground City". After that comes the field method where the author will visit the site in Tyre, takes live photos and sketches in addition for doing a questionnaire for the people in the site or near the area.

Later, analytical method comes to analyze the studies and the questionnaires done in the field method. Finally, a strategy and solutions will be mentioned and discussed in the deductive method. These methods were used to analyze the case study and come up with the objective that aims to design an underground city in Tyre, that will be the escaping the chaotic community towards a serene underground city that will be the link between the dense city center and the serene boundaries of Tyre.

3.1 Introducing the case study of “Tyre Underground City” in Lebanon

Most of the urban cities in the world are experiencing the inner migration, and specifically the rural-urban migration. According to Lebanon, this phenomenon is being increasing with time and this is due to the missing amenities and job opportunities that are found in the rural areas. Therefore, most of the Lebanese people moved from the rural areas to the major cities where most of the amenities and more job opportunities are available for the citizens. This migration caused an over population and density in the city in which the density became 653.15 p/km², and the urban population reaches 88% to the total Lebanese population. Tyre is one of the largest Lebanese cities which experienced this migration. This migration expanded the cities to form suburbs around it, and after time this expansion will cause decentralization of the city leading more expansion and suburb formation.

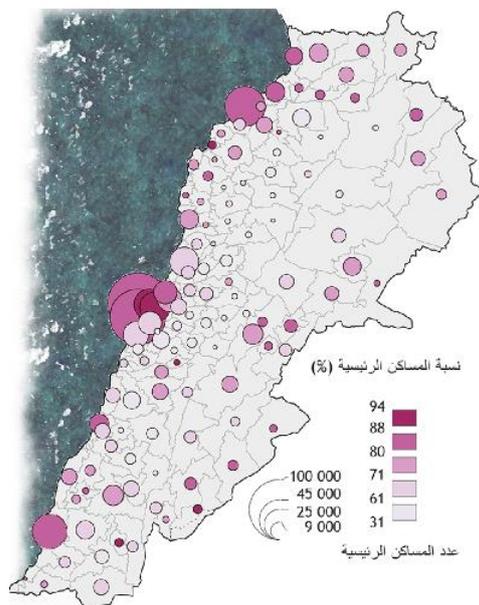


Fig.8: Lebanon’s map showing the main dense cities
Source: Internal Migration and Spatial Change

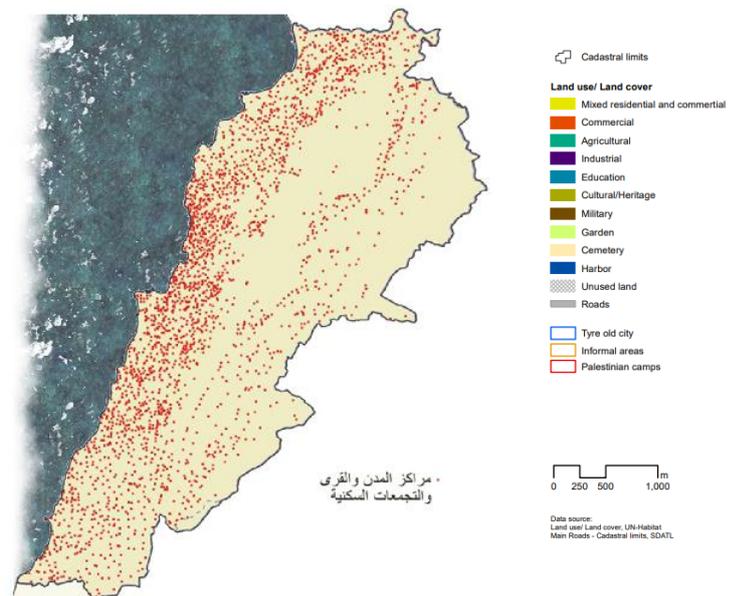


Fig. 9: Lebanon’s map showing the residential spots
Source: Internal Migration and Spatial Change

3.2 Urban Analysis of “Tyre Underground City”

Tyre’s population equals to 135204 people living in a 4 km² area. The majority of Tyre land use is agricultural which forms 44% of the total area, followed by the built up which forms 38% of the total area of Tyre. Only 4% of the total Tyre area is being unused. This implies that over time, this unused area will then be used, and if it wasn’t enough, man will use the agricultural land, and therefore, the city will become deprived empty lands and green areas, then looking for a breath for the city (UN Habitat, 2017).

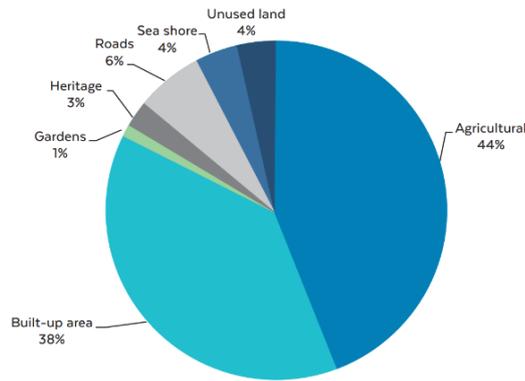


Fig.10: Tyre Urban area land use
Source: UN-Habitat, 2016

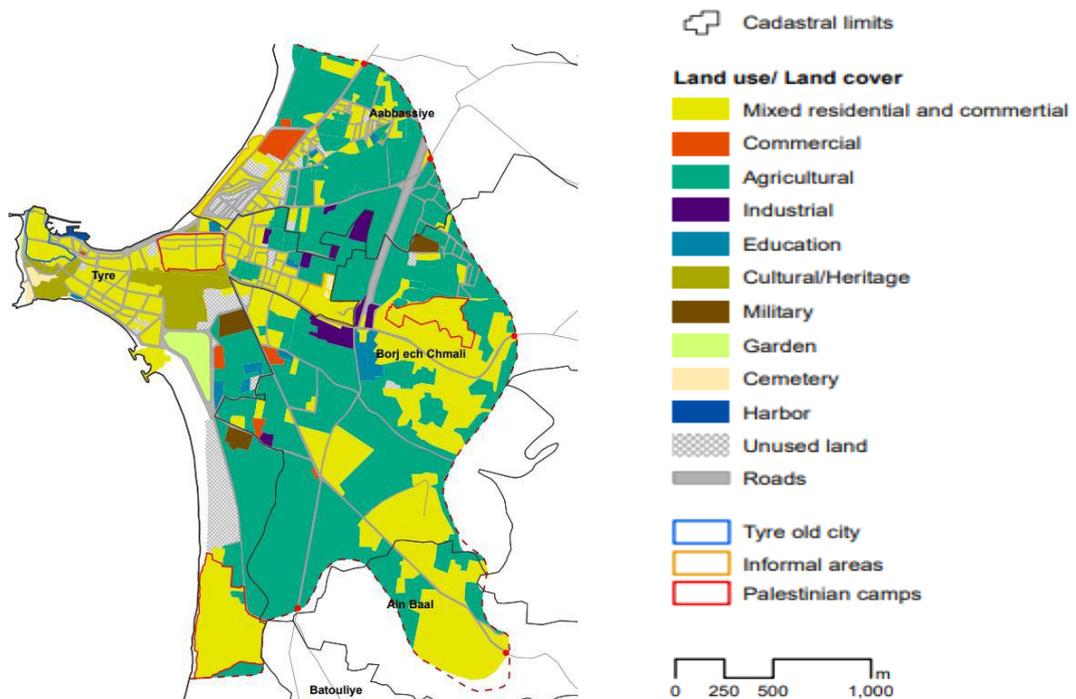


Fig.11: Major land cover in Tyre
Source: UN-Habitat, 2016

Tyre is divided into two main areas, the old, and the modern. The old Tyre is known as “Harat El Maseheye”, a residential area and a point of attraction for tourists. It is located on the coastal side of the city. The modern city, where the main city is found and where the amenities and municipalities are found. This part of the city is the Tyre Union of Municipality, which consists of 60 municipalities and is divided into 4 main sectors known as Abbasieh, Borj El-Chemali, Sour and Ain Baal (UN Habitat, 2017).



Fig.12: Tyre Suburban Areas
Source: UN-Habitat, 2016

3.2.1. Urban Density

The adjacent analysis shows the density in Tyre. This density is found in the center of the city, and mainly near the refugee camp, and on the entrance, whereas on the boundaries of the city it shows low density buildings, which means that most people moves to live in the center of the city, especially that the other part of the city is mainly protected areas due to the presence of the shore, and Tyre Hippodrome (UN Habitat, 2017).

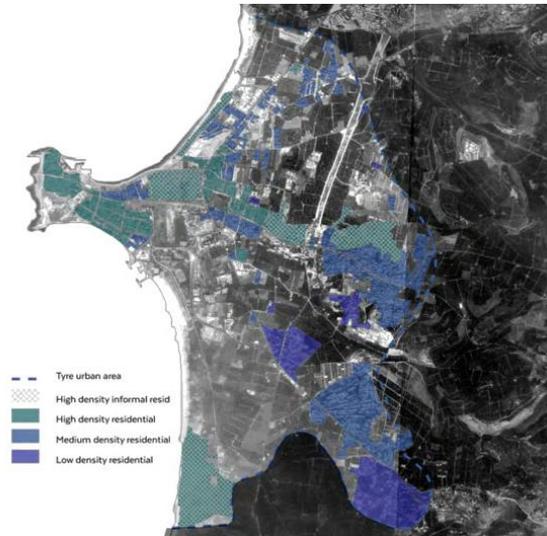


Fig.13: Tyre urban area building density
Source: UN-Habitat, 2016

3.2.2. Buildings' Quality

The analysis shows the quality of the building in Tyre. The refugee camp buildings quality indicates very poor, and the buildings in the city center indicates good to fair quality. This is due to the old age of these building in which this area was build time ago and it is still the same till now giving the city this poor identity (UN Habitat, 2017).

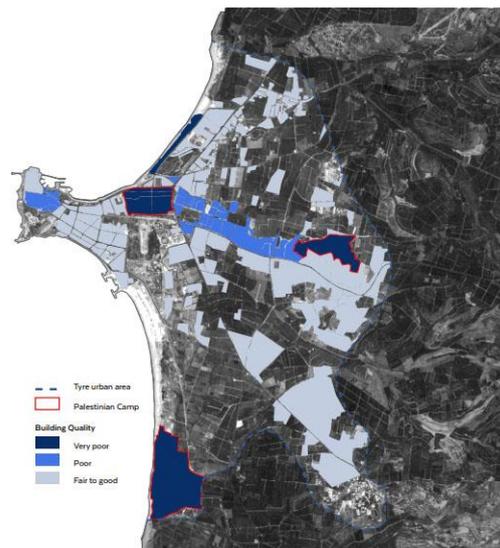


Fig.14: Tyre building quality
Source: UN-Habitat, 2016



Fig.17: Tyre city elevations
Source: Heritage conservation ideologies analysis, 2017

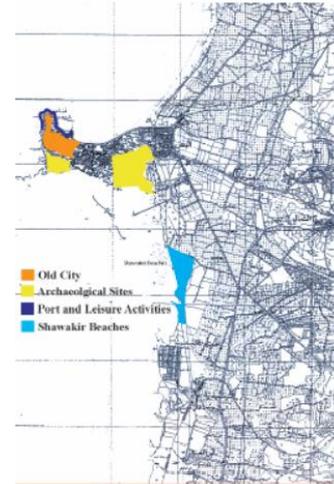


Fig.18: Tyre city zoning
Source: Sour (Tyre)

Figure 16 shows the four elevation of Tyre city, north, south, west, Al Raml district southern elevation. These elevations reflect Tyre now. The chaotic planning, and population found now, led to the excess buildings in the city, in which one will start missing the green areas in the heart of the city in the future. For that, it is a vital aim to try keeping and preserving any green area in a city, well even create these areas for the people to have a breathe in it.

3.4 Selection of a Specific Area in ‘Tyre City’

To have a well-studied research for a well-designed project, a specific site was chosen in Tyre according to site selection criteria in order to design and underground city in Tyre and to apply the studies and analysis done. This area was chosen on the boundaries of the city, in order to escape the chaos found inside and to create a new spot for Tyre away.

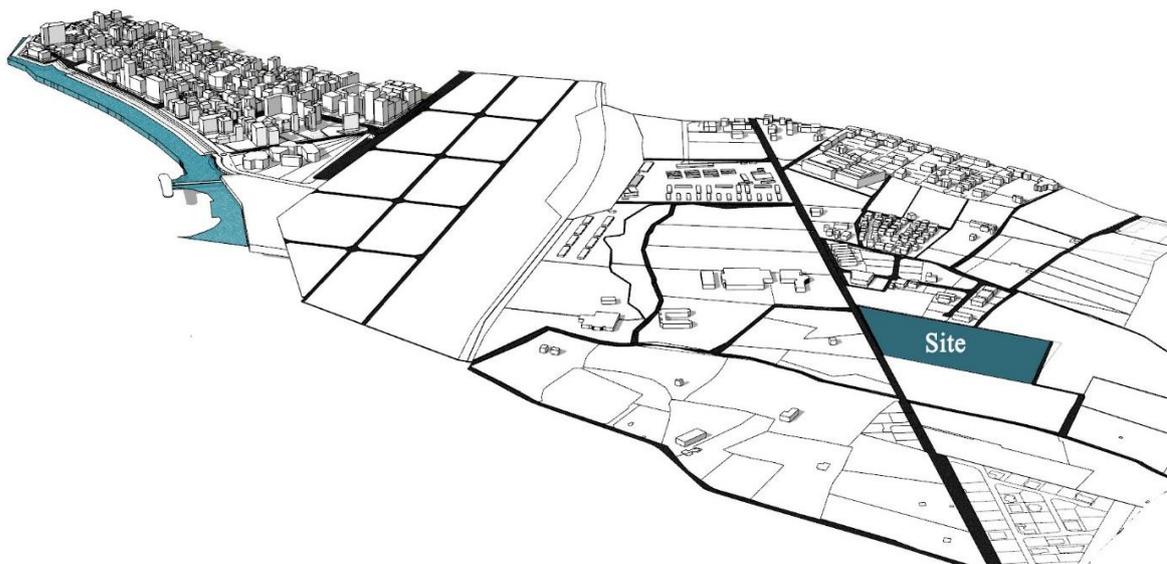


Fig.19: 3d model for Tyre city specifying the city, 2020



Fig.20: Site surrounding, Tyre Hippodrome
Source: Michel Khoury, 2017



Fig.21: Site specified on google earth
Source: Google Earth, 2020

3.5 Different Perspectives of Public on Tyre City

For a more studied and authenticated project, and to gain the credibility of it, interviews were done live with some people in the selected area of the city to spot the pros and cons of the area and the city. In addition to that, an online questionnaire was done and spread for a wide variety of people so that analysis and conclusion could be done and based on a more specific studies and therefore fulfilling the needs of these users in the future.

3.5.1. Holding Interviews

During the site visit to Tyre on 23/11/2020, interviews were done with different people with different ages and backgrounds, to gain as much points of views as possible in order for a well defined design strategy for the project. During the interview, 4 questions were asked for the different people from Tyre:

- a- Are you mainly from Tyre? Or are you an emigrant to the city?
- b- Would it be possible to leave your city “Tyre” one day for a certain reason?
- c- What is the main problem Tyre residents are suffering from?
- d- Do you feel your belonging to this City ?

Some answers were similar, but most of the other answers were discussing a major problem facing the city.

Nidal Khalifeh, 45 years

“I am not from Tyre, nor my husband. We’re from a city far from Tyre, but for certain reasons and mainly job, we moved to live here in this city and we’ve been living here from 17 years. We have a family now, and my kids consider themselves from Tyre, were they have all their life, school, friends... The problem we’re facing here is the traffic and the foreign people coming to the city causing several problems and accidents.”

Hala Bawab, 24 years

“I am from Tyre, and I have been living all my life here in this city. Whenever I go outside this city, I be waiting the moment till I come back, I feel this is the place where I can take a my breathe. I won’t be able to leave this city any day. I got my studies here, and now I am looking for a job ,it is a bit difficult, but I will keep on looking for it and will stay in this city.”

Hussien El Kiki, 75 years

“I am not from Tyre, I am from Ain Baal Tyre suburb, But I love this city very much and I can't dispense from it. I finish all my work and documents here in the city, I get all my home stuff from this city, eve in summer, it is an attraction for us, especially its location on the sea. The problem facing this city today is the over density and population in it. This is causing a slow circulation in the city.”

Alaa Hissi, 22 years

“I am from Tyre. I got my education in Beirut, but lately I moved back to my city Tyre, to start my life journey. I like this city, its location and touristic features, But at the same time, it suffers from many problems, we as youths are having. As I finished studies and came here to find a job, I found it difficult, job opportunities here are rare, maybe not just here, but all over Lebanon. Regarding entertainments, all what Tyre offers in winter is restaurants and cafes, and these will be fully booked and occupied, whereas there is no other chances for entertainment such as entertainment centers, cinemas, malls, sport centers... Tyre is one of the most important cities in Lebanon, but it is a small city compared to its population.”

3.5.2. Questionnaire

Beside the interviews that were done life and specifically for the people in Tyre, an online questionnaire was also done and spread to a wide range of people in order to base on real, credible results. This questionnaire was answered by educated people, which means that their answers were used on readings and studies that were done before.

This questionnaire included simple and directed questions, for a better analysis later.

- What is your vision for the Lebanese Cities?
- How is the over-population affecting our country and amenities in it?
- Would it be possible to design an ideal city far away from all these problems?
- Mention a solution that can solve condensation in the cities

4. FINDINGS

After using the analytical methodology, the results will be shown in a form of charts to analyze it in a better way.

4.1 Analysis of the Interview Results

Answers of the interview were translated into statistical charts to come up with a more accurate result for the interview. After this, it will be translated to design an outcome that will be executed later in order to fulfill the needs asked and track the paper's aim.

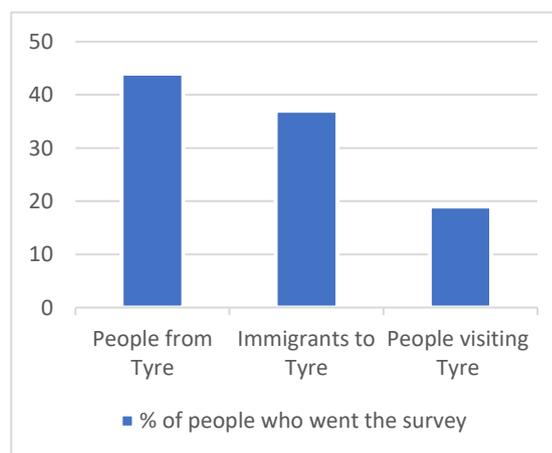


Fig.22: Figure showing the underground promenades from the site to the city

Figure 22 shows the origin of the people who went the survey in Tyre city. This chart shows that the percentage of the immigrant people living in Tyre is mostly high, in which it forms 37% of the total number.

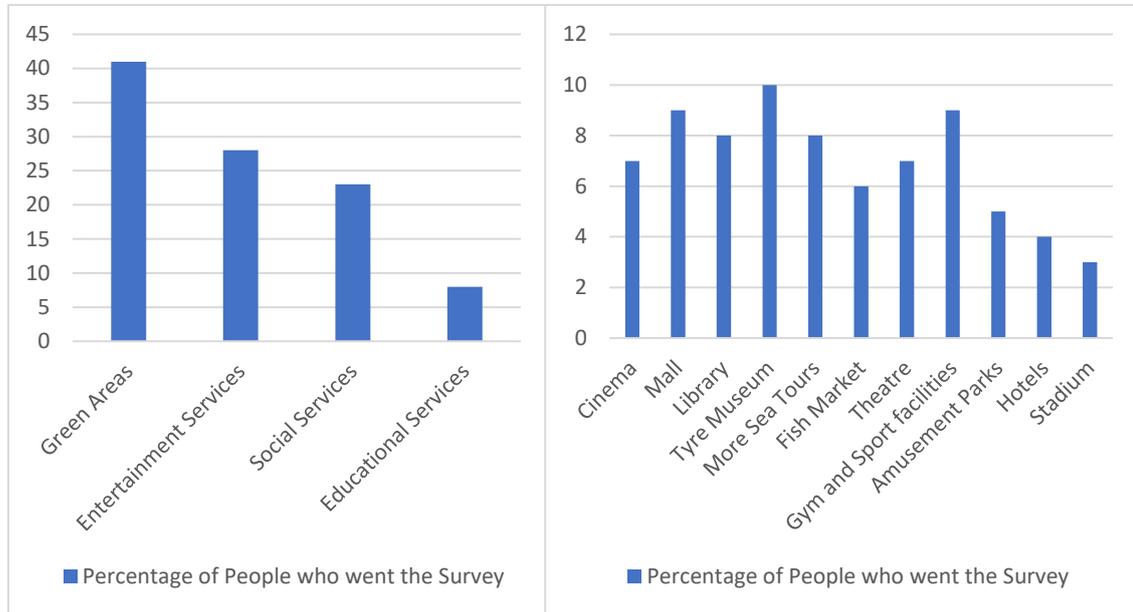


Fig.23: Results of "Tyre Underground City" survey in a chart

Figure 23 shows the most needed facilities that the people asked for in the interview. This result shows that the most needed services were green areas for the city, and this was asked from parents mainly for their children, and facilities that gives Tyre its historical value.

4.2 Analysis of the Questionnaire Results

The results of the questionnaire was the key for the underground design, in which the questionnaire discussed the over population and the cities cons these days. The results of both the interviews and questionnaires are presented in the discussion to show up the design proces.

5. DISCUSSION

The previous findings show the importance of having different and new services for Tyre city, which the residents need and asked for in the interview. Two kinds of services where mostly needed and asked for by the interviewers, one was the outdoor green spaces to benefit from the city's weather, and the other was mostly social serves for the residents. Most of the needed services they asked for where social services and the youth asked for, or services that shed the lights on the Tyre historical city to differentiate it. As an urban planning strategy to develop an underground city that serves Tyre city and its residents, set of strategies will be followed and designed to create this underground space.

- An underground space will be designed on the edges of the city to decrease the density in Tyre, then this underground space will be an escape from destructive community to an underground space to reach utopia in a dystopian space.
- A railway going underground and aboveground; due to the sensitivity of the site, will be connecting the site with Tyre's main landmarks for a faster and better connection.
- A museum showing all Tyre's history till today will be found underground in the site to explore the city and gives the historical value it deserves.
- Regarding the site, an underground library consisting of all Tyre's history and books will be found to serve the educational services asked by the people.

- e. The most important strategy that will be followed, is providing a green space for the, therefore, the aboveground of the site will be a green social space for all ages and all social levels, in addition to its environmental aspects that will be found as the biking tracks that will be connecting the site with the city in the above ground.

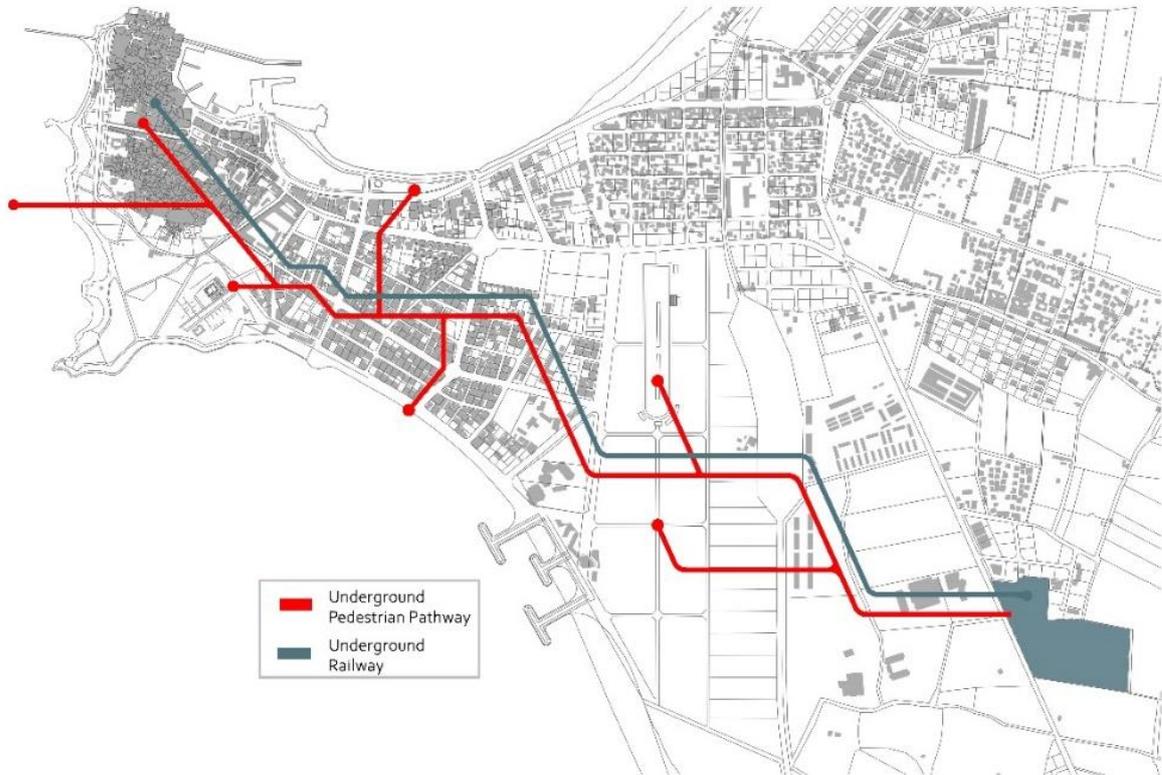


Fig. 24: Underground Promenades connecting the site with the city

Figure 24 shows the promenade that will be designed underground in order to connect the site with the city, so that there will be a connection between the city centre and its surrounding green areas, in addition to the historical and cultural value that will be focusing on.

6. CONCLUSION

Underground cities is a topic that has been discussed several times before. It is somehow considered dystopia imagining going down to a dum abandoned space, however, after the discussed thesis, and extracting the needed parameters for designing this space, dystopia will become utopia, the space will become the escape for the citizens and a landmark for the city. The results of the studies came up with having an underground space to escape the destructive communities in the country and find a better solution for the future. Going underground can save the nature and our environment by saving the nature elements of any city, and in this way, especially after all the technologies the world reached, it would be possible to go underground and serve all the functions that would be done underground. As a conclusion, this paper will present a set of conclusions that reflects the main aim of it:

- The site will be considered as a landmark for the city in which it will include the services that the residents asked for
- This project will revive Tyre's historical value and fulfill the residents needs
- The underground concept tracked the main problem of the paper which is the over population that is killing the empty green spaces in the city
- Designing such a project focuses on the needs of the city, the psyche of the visitor, and the experience that will be printed in every visitor's mind.

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