AMERICAN UNIVERSITY OF BEIRUT

AN ECOLOGICAL APPROACH TO RIVERFRONTS REVITALIZATION: THE CASE OF ABU ALI RIVER CORRIDOR IN TRIPOLI

By
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AN ABSTRACT OF THE THESIS OF

Manal Abdul Ghani Ginzarly for Master of Urban Design
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This thesis seeks to develop an ecological urban design strategy to address deteriorating urban rivers that have lost over time most of their ecological functions, as well as their spatial and cultural relations to cities and people. Within the context of cities with historic urban cores, cultural heritage has primarily focused on the built urban fabric neglecting the rivers that gave reason for their location. The city of Tripoli is such a case where some urban and planning zoning or master plans have neglected the integration of the Abu River into the urban and social fabric of the city. Accordingly, this thesis investigates the application of an integrated approach that combines two disciplines urban design and landscape ecology to integrate river systems into the cultural heritage design of cities where the natural and built environment are perceived as a single entity rather than separate ones. It defines six theoretical themes: time, complexity, hierarchy, spatial structure, typology, and connectivity; these are used as analytical tools to develop a multi scale analysis approach for the Abu Ali River. The scales of analysis range from the landscape to site levels in order to propose an ecological urban design strategy that would contribute towards re-integrating the river into the city as a public amenity, and revitalizing its ecological and cultural values.

To achieve its goals, cross cutting themes are extracted from urban design and landscape ecological literature. Different types of urban and landscape design strategies and interventions that are applicable to the study area are extracted after the analysis of six case studies on urban rivers. An in-depth analysis of the site at the said scales led to the definition of three character zones that have different ecological and cultural values. Strategies for each character zone were developed taking into account the built fabric and the river morphology and ecological condition. A master plan was developed in more depth for the transition zone between the urban core and the agricultural sections of the river.

The findings from the analysis and the development strategy and master plan show that ecological and landscape approaches could be easily incorporated in urban master and zoning plans; multiple scale analysis is necessary to understand the relationships governed in the process of integrating natural and built systems into the design and planning process; and finally, the adopted approach shows the need to integrate multiple disciplinary approaches to ensure a result that balances multiple considerations.

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CHAPTER I

INTRODUCTION

1.1 Introduction

The Abou Ali River in Tripoli has a long history of urbanization that dates back to the Fatimid period and was in the Middle Ages the social and economic focus of the historical core because of its water resource that was used for domestic and agricultural supply and surrounding agricultural lands, and vegetative fields (Mneimneh, 2013). Through history the river flooded fifteen times (Tadmori, 2013). However, after the flood in 1955 the river corridor was transformed into a thirty meter wide concrete open canal with six meter high retaining walls, in addition twenty four meter Wide Avenue at each side of the river were built at the expense of old buildings surrounding it (Nahas, 1998). This engineering approach to the river solved the flooding problem but damaged the ecological function of the river and its landscape structure (CES, 1998), causing fragmentation between the two sides of the river, and affecting the social and cultural relation between the city, the river, and the locals.

This research takes the Abou Ali River as a case study, identifies the river as a cultural heritage landscape, and investigates the application of a multi-tool approach that combines urban design and landscape ecological principles to revitalize the ecological and social value of the river and re-integrate it with its urban context. By defining an integrated theoretical frame, and establishing a multi scale analysis and cognitive mapping; the character and components of the river and city fabric are identified and analyzed to propose an ecological urban design strategy that would

revitalize the riverfront and contribute towards preserving the cultural landscape heritage of the city.

1.2 Research Objective and Questions

The objective of this thesis is to reintegrate the Abu Ali River into the urban fabric providing public amenities to urban dwellers as well as recalling the ecological and cultural value of the river. The aim is not to recreate historical connections between the city and the river but to provide an ecological urban design proposal whose authenticity is derived from engagement with the ongoing trajectory of change, and leading to a renewed engagement of the city with the river.

To address the objective, this research will raise multiple issues. The following questions direct the inquiry:

1. How do the locals in Tripoli perceive the Abu Ali River? Do they see any benefit to the city in the revitalization of the river?
2. To what extent can the river's ecosystem be revitalized to integrate it as a public amenity and improve the environmental conditions in the city?
3. How can urban design and landscape ecology be integrated into a single approach to address the built and landscape heritage simultaneously in order to enhance connectivity between buildings and their surrounding landscape.

1.3 Methodology

My methodology is based on applying an integrated design approach to understand the spatial composition of the urban fabric and landscape structure morphological, perceptual, and typological, and to provide an ecological design strategy in the urban context. The morphological dimension in this approach is historical and analytical; it conceives the city and the landscape as a process and

emphasizes on the need of understanding their pattern of change over time, while the perceptual dimension sees the city through the eyes of its residents through analyzing their mental image of the city. The typological dimension studies the city with respect to different physical and ecological attributes.

The methodology in this research follows four broad lines of inquiry:

1.3.1 Literature Review and Case Study Analysis

To ground my research approach within the theoretical body of knowledge definitions of cultural heritage landscape are revised, and Urban design and landscape ecology disciplines are reviewed to extract cross cutting themes and concepts across the two disciplines and use the themes as tools for documenting and analyzing the site at different scales, then apply the concepts in the design strategy and intervention.

In parallel to the literature review, I have selected six case studies on urban rivers revitalization and analyzed them to extract knowledge and ecological urban design principles and interventions that are relevant to my case study. These principles helped me to better formulate my strategy and develop it.

These literature reviews and case studies gave me an understanding of the urban and landscape systems and helped form an approach that can address both built and natural features within the bigger context of the landscape as a whole.

1.3.2 Questionnaire and Interviews

I designed a questionnaire that includes two questions the first is:

1. Planners and designers use their professional expertise to map cities. They end up drawing a map that document the different physical elements in the city such as buildings, streets, trees and so forth. However, specialists look at cities in

a different way than the users. Usually, every person has its own mental map of the city. This map is a personal guide to walk through the city and a subjective reflection of different interactions that occur between the user and its surrounding environment. Accordingly, draw your own image of the city.

2. In your opinion what is of better benefit to the city and its residents restore architectural monuments such as the Saint Gille citadel or revitalize the river front? Why?

I have collected fifty mental images in coordination with two social assistants who work for Safadi foundation, a nongovernmental organization in Daher el Megher Tripoli. Interviewees included shoppers, shops owners, and households. Afterwards, I extracted the different elements represented in every image and analyzed the different positions towards the river revitalization to end up presenting in a schematic way how in general people perceive the city and the cultural and social relation between the city and the river. It is worth to mention that fifty interviewees do not represent all the locals but they give a general idea of people's perception.

1.3.3 Archival Research

I looked back at the history of urban development in Tripoli from the Mamluk till the independence period to investigate processes of change that occurred over time in the morphology of the historic core. The data relevant for the study area was obtained from archival documents from the DGU (Directorate General of Urban Design) and the CDR (Council of Development and Reconstruction), and from local data sources such as aerial photos and maps from architects.

1.3.4 Site Documentation

To conduct a strategic analysis of the study area at the landscape, urban, and site scale, the fourth phase of the work includes documentation of the different features of the site this documentation starts with an overall characterization of the rivers watershed on the landscape level, later on it goes into a more detailed analysis on the urban scale to the matrix of the study area and the different patches and corridors in it. Finally, it ends up zooming on the selected site of study then profiling and analyzing it critically. The data relevant to the study area was obtained from published data, field visits, photographs and visual surveys.

These methodological tools aim to address the research questions. Accordingly, I developed the following table to show which tools will be used to answer which question.

Questions	Methodological tools				
	Field work and Questionnaires	Archival review	Lit review	Site documentation & analysis	Case study review and analysis
Question1: How do the locals in Tripoli perceive the Abu Ali River					
Question2: To what extent can the river's ecosystem be revitalized to integrate it as a public amenity and improve the environmental conditions in the city?					
Question3: How can urban design and landscape ecology be interconnected into one approach to connect the built and landscape heritage in order to enhance the legibility and identity of the old city?					

Table 1: Methodological tools used in the research

1.4 Research Significance

Previous heritage conservation projects in the historic core of Tripoli have addressed the built cultural heritage in the city to boost national tourism and improve urban development. Since the Abu Ali River is a landscape cultural heritage, it has not

been incorporated yet as part of these conservation projects. Therefore, the effects that this ecological corridor imposes on the morphological and ecological characteristics of the old city have not been addressed yet. Moreover, this research applies a methodology that combines two disciplines urban design and landscape ecology. This integration helps designers to look at cities as ecosystems, which their different components (buildings, streets, rivers…) are linked and affected by each other. Moreover, the urban design strategy developed is an application of the proposed integrated approach. It is the outcome of superimposing the different layers of the city, such as topography, open spaces, corridors, land use, buildings condition, and road network. Therefore, it provides an example of how an ecological approach to urban design interventions could be applied.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The objective of this chapter's analysis is to come up with an ecological approach to cultural heritage preservation. This will be carried out by investigating recent approaches of heritage and cultural landscapes. Then, it will investigate concepts and themes in urban design discipline as well as landscape ecology to come up with a matrix that shows how these two bodies of theories compliment each other and where they intersect.

These common principles tie together the built environment, natural features within a mosaic of patches, edges, and corridors. Therefore, they will help approaching the Abou Ali River and the city as a holistic unit , analyzing the later across different scales such as urban, landscape, and site scale, and finally guiding the proposal. To sum up, the matrix is a guidance to approach the research and the project proposal.

2.2 Cultural Heritage

2.2.1 Cultural Heritage: An Evolving Concept

The term heritage has evolved considerably over time. Since the Venice Charter in 1964, the scope of heritage conservation has broadened from a concern for the built

heritage to the more intangible[1] aspects. For example, this progression has shifted from single historic monuments and buildings to groups of buildings; or, historic urban and rural centers to natural heritage such as historic gardens, cultural landscapes; and to non-physical heritage including environments, social factors and, lately, intangible values (Yahaya, 2006).

UNESCO has been in the forefront in defining common terminology and scope of heritage since 1965. By the end of the 1960s the definition of heritage as historic monuments adopted by the Venice Charter in 1964 was interpreted somewhat differently by UNESCO (Yahaya, 2006). Heritage was defined as 'cultural property' that was no longer confined to historic monuments and buildings. Instead, it was extended to include groups of buildings and sites (historic quarters). However, this scope of architectural heritage was again broadened in 1972 at the UNESCO world heritage convention (UNESCO, 1972) to include both cultural and natural heritage. Moreover, between 1992 and 2002 the World Heritage Committee recognized 'cultural landscapes' as a category of site and defined them as cultural properties that " represent the combined works of nature and of man" (UNESCO, 2002). In 2003, UNESCO adopted a convention to recognize intangible values as part of the cultural heritage and emphasized on the importance of their protection. Intangible cultural heritage was defined in article 2:2 as the expressions inherited from our ancestors and passed on to our descendants, such as oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe or the knowledge and skills to produce traditional crafts.(UNESCO, 2003)

On the other hand, in Europe there was a concern to deal directly and fully with European landscapes and their preservation (Guido, 1999). Therefore, after the

[1] Intangible Cultural Heritage is the living heritage. It includes the practices, representations,

European Architectural Heritage year in 1975, the council of Europe has launched the "Europe, a common heritage" Campaign to promote a wider concept of heritage to include movable and immovable assets, sites, the natural environment, non-material assets and the landscape (Guido, 1999). The campaign acknowledged the importance of landscape and the role it plays in the context of people's common heritage because of its cultural, environmental, aesthetic, and social values (Guido, 1999). In October 2000, The Council of Europe launched 'The European Landscape Convention' that recognized the landscape as an essential component of people's surroundings, an expression of the diversity of their shared cultural and natural heritage, and a foundation of their identity. The emphasis in Europe has shifted from monuments to people and landscape where the latter was defined as "an area, as perceived by people" (Guido, 1999:15). The European cultural heritage committee extended the concept of cultural heritage to include the cultural environment and the values embedded in it as perceived by people where the landscape was conceived as a human right and a basic component of collective and personal identity (Dury, 2002). Therefore, the committee set specific and general measures to achieve landscape protection, management and planning, and to organize European co-operation on landscape issues.

The council of Europe Convention is distinct from the 1972 UNESCO Convention both formally and substantively (Maguelonne, 2002). The first is regional in scope and can be considered as complementary to the UNESCO one which is worldwide. Regarding the substantive scope, the council of Europe Convention covers all landscapes, even those that are not of outstanding universal value, unlike the UNESCO Convention (Maguelonne, 2002). Moreover, the main objective of the first is not to draw up a list of assets of exceptional universal value, but to introduce

protection, management and planning rules for all landscape based on a set of principles. Thus each convention has its distinctive features.

The scope of cultural heritage has evolved over time to overpass its limitation to architectural master pieces, monuments, and sites ignoring the landscape and the cultural meaning embedded in it. The landscape has been recognized in Europe as a cultural heritage that reflects the perception of people to their environment and their unique identity.

2.2.2 Cultural Heritage Landscapes

2.2.2.1 Definitions and Types of Cultural Heritage Landscapes

The European Landscape Convention (2000) defined landscape as "an area, as perceived by people, whose character is the result of the action and interaction of natural and /or human factors". The cultural aspects of landscape and its material remains are created over a long period by human activity. In other word, cultural landscape is "fashioned from a natural landscape by a cultural group. Culture is the agent, the natural area is the medium, cultural landscapes the result" (Sauer, 1925:22). It includes places and processes. In other word, it includes natural and man-made components of the physical environment, and the creative act involved in making a place according to specific sets of underlying values and ideals. This fact causes changes to the physical environment over time (Hohmann and Stepenoff, 2008). The convention also emphasized that landscape exists everywhere. It can be urban as well as rural, maritime as well as terrestrial, degraded as well as well-preserved, every day as well as outstanding, typical as well as special (Fairclough, 2002). As a result, the concept of landscape today comprises distinct values. It has environmental value as part of an ecosystem; cultural value as the historic evidence of a site and its

transformation; aesthetic value as a visual and representative expression of the relationship forged over the centuries between human beings and their environment; and social value, in that it increasingly reflects human identity (Guido, 1999).

Cultural landscapes were defined by the World Heritage Committee as cultural properties that "represent the combined works of nature and of man" (UNESCO, 2012: 14). They are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal (UNESCO, 2012). Cultural landscapes represent tangible and intangible values of different people that took advantage wisely from the nature resources, in which they based their believes, knowledge, habits, practices and uses. The World Heritage Committee has identified and adopted three categories of cultural landscapes :

1. "a landscape designed and created intentionally by man"(UNESCO, 2005: 84)
2. An "organically evolved landscape" (UNESCO, 2005: 84)
3. An "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element (UNESCO, 2005: 84).

2.2.2.2 River Corridors as Cultural Heritage Landscapes

As Francis (2012) argues, rivers are important features within both the physical and cultural landscapes of urbanized areas. They have key ecological and societal roles within broader urban systems. Since a cultural landscape is any landscape that has been shaped by man (Ermisher, 2003) and since most urban areas have

historically begun at locations where key resources and services are found, including fresh water, food, and transportation links (Grimm et al., 2008) and river systems provide generally all of these. Therefore, river corridors have been desirable areas for urban development (Francis, 2012). Accordingly, most of river systems have a cultural value since they have witnessed a history of urbanization and site transformation. Rivers are central to the identity of towns and cities since they reflect the relation between human beings and their environment.

2.2.3 Implications

This section has discussed how definitions of cultural heritage have evolved through time to include not only architectural monuments but also the natural cultural landscape and the latter has been given a social dimension since it's the outcome of social practices and cultural interactions between people and their environment over history. Not only the approach to heritage conservation has recognized the role of human activities and natural processes in shaping and structuring the environment, but also the perception of cities has developed over time from treating them as machines to conceiving them as the consequence of a complex interaction between the multiple purposes and activities of human beings and other living creatures and of the natural processes that govern the transfer of energy, the movement of air, the erosion of the earth, and the hydrologic cycle (Spirn , 2012). Since, in my research I am conceiving the city as part of the natural landscape and I am trying to achieve a higher degree of connectivity among them I will review in the following section the literature in urban design and landscape ecology to come up with an integrated approach that addresses the urban fabric and the natural landscape.

2.3 Investigating Urban and Landscape Systems

2.3.1 Introduction

Most cities were developed on the edges of water bodies (rivers, lakes, seas, and oceans). Waterways were so valuable because they served different purposes. At the beginning, waterways only provided water supply for agricultural fields and domestic buildings. As time went on, they began to be used for transportation. However, in the late 19th, early 20th century the city was in a process of transformation. Societies began to depend so much on science and machines which influenced urban form and means were developed to facilitate movement within cities (Otto et.al, 2004). Accordingly transportation shifted from water to streets and rails. River- edge lands were filled to accommodate new infrastructures, and the river edge became less important as a social and retail space, and the city's downtown moved away from the river (Otto et.al, 2004). Similarly, urban waterfronts were highly altered to keep downtown areas from flooding. Engineering projects straightened and deepened channels, removed vegetation, and added floodwalls, completely severing the river from its floodplain.

However, in the early 21st century, a radical shift took place to thinking about cities and societies as organisms, as biological rather than physical systems. This is also a switch from the modernist approach of modeling cities after machines and the post-modernist approach of emulating cities of the past to thinking of them as complex systems that evolve, that grow and change in ways that might be steered and managed(Ellin, 2013). Moreover, researchers turned their attention to studying the relationship between nature and cities. Urban ecological studies have grown tremendously and have begun to influence broader, theoretical thinking on the form of cities and the role of natural processes in sustaining life on Earth (Spirn, 1984).

Accordingly, rivers have been recognized as important ecological and social components in urban systems , and research interest in urban river systems began to increase notably in the early 1990s, with a more dramatic increase from 2001 (Francis, 2012). As the purpose of this study is to develop an analytical framework for integrating urban and ecological systems in an urban landscape, previous attempts to understand the structure and function of these systems provides the most relevant basis for further exploration.

2.3.2 Investigating Urban systems

2.3.2.1 Cities and complexity

The city consists of several interlinked subsystems—social, economic, institutional, and environmental—each representing a complex system of its own, affecting all others at various structural and functional levels, and generating complex human-dominated landscapes (Alberti, 2005). More recently, several disciplinary approaches have been combined to study the interactions between complex human behaviors and ecosystem functions (Pickett et al. 1997; Alberti et al. 2003). These interactions are spatially determined and affect both socioeconomic and ecological processes at various scales (Alberti, 2005).

Approaching cities as complex systems is not new. In 1954 Ethnographer Levi Strauss (1954, p. 137) described the city as "the most complex of human interventions…at the confluence of nature and artifact". In 1961 as a response to modern urban design and planning practices, Jane Jacobs, author of the classic book, *The Death and Life of Great American Cities*, identified cities as problems of "organized complexity" (Jacobs, 1961,p.433), similar to living organisms, and that there are lessons for urban design from the study of systems where "half-dozen or

even several dozen quantities are all varying simultaneously and in subtly interconnected ways" (Jacobs, 1961, p. 433). Jacobs built her arguments around the emerging ideas of Warren Weaver, whose 1948 article, *Science and Complexity*, proposes a shift in thinking towards systems as complex entities (Batty, 2005). This type of thinking, termed 'complexity theory', is being illustrated in different scientific disciplines (Batty 2005), including contemporary ecological theory, which will be explored in a subsequent section. One year earlier, Lynch introduced the theory of urban form in his book *The Image of the City* (1960). He argued that an urban environment is a complex system of interactions between people (users) and various surrounding objects. Lynch stressed the importance of how people structure their perception of the city around them, proceeding from human perception to understanding the sense of place. He explored the role that natural features play in enhancing the identity, legibility, coherence, and immediacy of urban form, from the scale of the street to that of the region. His findings produced a vision of the city as composed of identifiable interconnected patterns that continually change in space and time. These patterns are categorized as paths, edges, nodes, landmarks, and districts (Figure 1). However, Lynch did not conceive these elements as separate pieces to be moved and placed around the city as a means of structuring urban form and identity. On the contrary, Lynch's city is a "multi-purpose, shifting organization" where these elements are linked over the whole of the city in a "dense and vivid image" (1960, p. 91; p.108). For a subsequent explanation of the whole theory, Lynch perceived the city as a complex entity composed of different interconnected layers that are constantly changing. These layers are not only restricted to the physical spatial elements of the city but also to the users. Therefore, Lynch tried to come up with a new perception and vision of cities that does not reflect the image of expertise like

urban designers and planners but the mental image of users (Figure 2) that is a two-way process that results from an interaction between the observer and the environment.

Lewis Mumford (1895, 1990), who was a historian and a theoretician of the city, promoted an integrative approach to cities and their regions: “once a more organic understanding is achieved of the complex interrelations of the city and its region, the urban and the rural aspects of environment, the small-scale unit and the large-scale unit, a new sense of form will spread through both architecture and city design” (Mumford, 1968, p. 164). To Mumford, this new urban form “must include the form-shaping contributions of nature, of river, bay, hill, forest, vegetation, climate, as well as those of human history and culture, with the complex interplay of groups, corporations, organizations, institutions, personalities” (Mumford, 1968, p.164). Accordingly, Mumford had an interdisciplinary thought of cities. He saw cities as an interconnected city-landscape rather than viewing the city as corruption of nature. He perceived the city as an organic whole in a hierarchal organization of interconnected components from the scale of the region to the scale of cities’ smaller units. To Mumford cities are the basis for ongoing transformations because of natural and manmade reasons. Therefore, they are not only defined by the built environment but by the relation between the built form, the landscape, human activities, and cultural productivity.

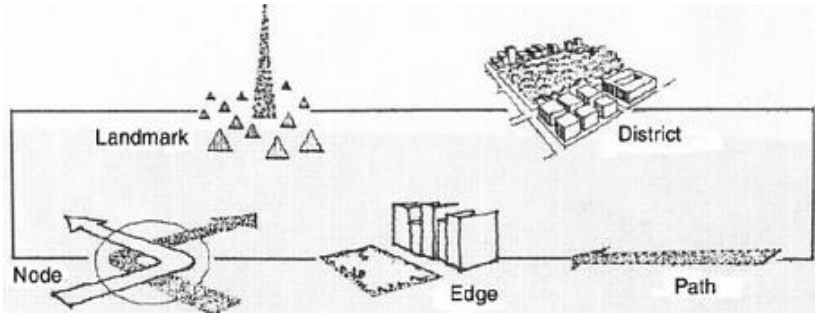


Figure1 : Five Key Elements of Urban
Source: Lynch, 1959, p.47

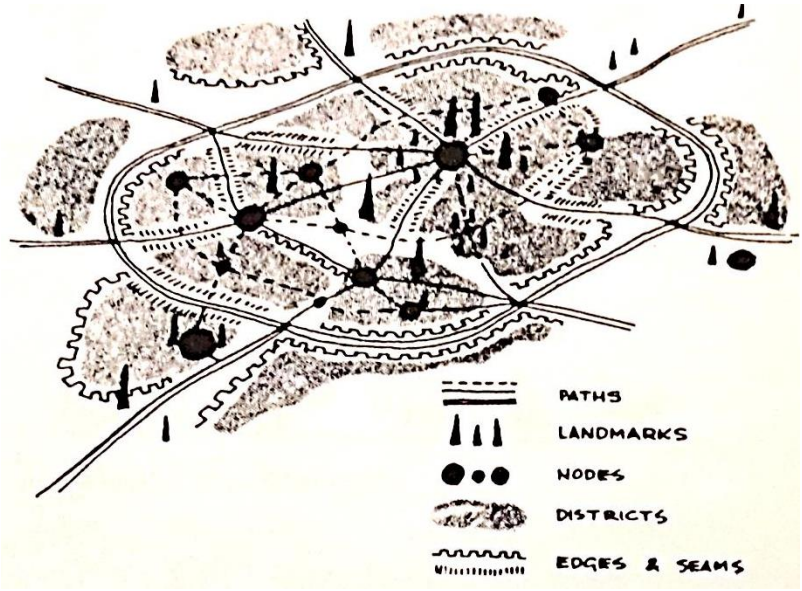


Figure2 : Example showing the mental representation of a space
Source: Spreiregen, 1965, p.51

By 1980 there was a body of knowledge on urban nature and a growing interest in an ecological approach to urban design and planning. Particularly important was the emergence and development of landscape ecology, which expanded the spatial scale of ecologists and acknowledged both biological and social spatial heterogeneity [2]as fundamental aspects of the structure and function of ecosystems (Forman and Godron, 1986, Pickett et.al, 1997, Forman, 2008).Important concepts of ecological approaches include: cities are part of the natural world; cities are ecosystems; urban ecosystems are dynamic and interconnected (Pickett et.al,2001).

Approaching cities as ecosystems clarifies the degree of complexity in the composition of cities. The urban ecosystem encompasses all the processes which flow within and through the city: cultural processes as well as natural processes, flows of capital, people, and goods, as well as flows of water, air, nutrients, and pollutants

[2] Heterogeneity is defined as the complexity and/or variability of a system property in space and/or time (Pickett, 1991).

(Pickett et al. 1997). The city as a whole, itself an ecosystem, is composed of many smaller ecosystems: of ponds and river corridors, parks, buildings and neighborhoods.

Jacobs's, Lynch's, Mumford's, and ecological ideas to the design of cities understood cities as socioecological systems. First they approached the city as a complex system composed of different subsystems of nature and humans that are interconnected together, and acknowledged the role of humans in shaping the environment. In addition to the emphasis on human alteration to the spatial composition of the landscape, Lynch added another dimension to cities representation that is the outcome of the users' mental perception to cities. So there are different meanings embedded in the spatial composition of cities, accordingly cities' physical structures are interpreted differently according to users depending on their personal experience and perceptions.

In order to organize understanding of the city as a complex system, researchers and theorists have employed hierarchy theory to distinguish the fine-scale elements and their role in generating the larger patterns of a city.

2.3.2.2 Urban hierarchy

Cities are reflected in a hierarchy of different sub centers or clusters across many scales, from the entire city to neighborhoods, organized around key economic functions. Thus, elements in cities are apparent at different scales (Salingaros 2000). Hierarchy theory provides a means to organize these elements so that the whole of the city can be related to its smaller parts. The ability of fine-scale elements to interact and connect affects the ability of a city to emerge as a complex large-scale whole (Salingaros 2000).

Conzen (1960) showed that the urban landscape could be seen in terms of several key elements that he divided into ground plan, building design and material, and land use. These are regarded to an extent as a hierarchy in which the buildings are contained within the plots or land use units that are in turn set within the framework of the town plan. The town plan in turn can be subdivided into streets and their arrangement into a street system, with plots and their arrangement into street blocks and buildings (Figure 3). This has become a standard way of reducing the complexity of reality into more manageable proportions.

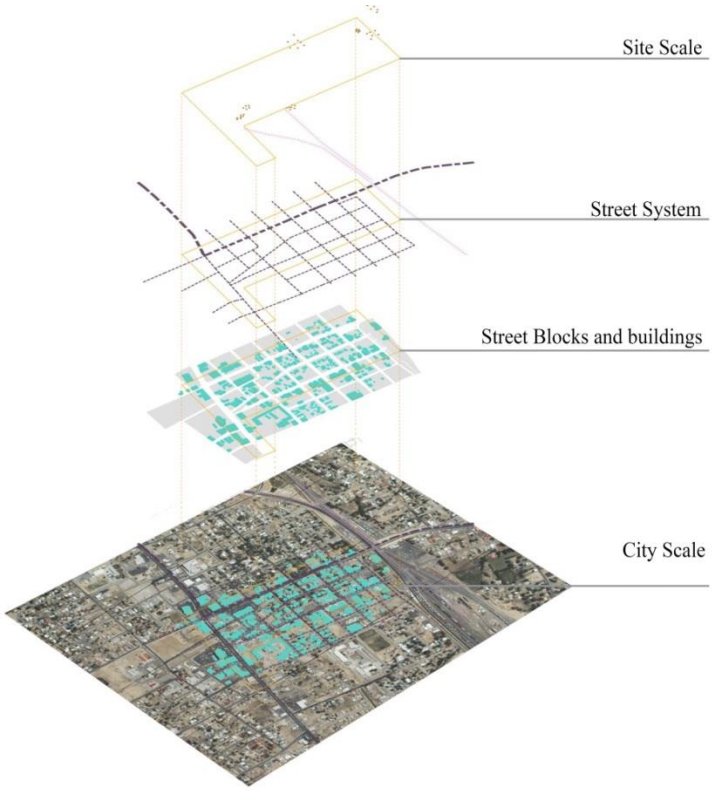


Figure3 : Spatial hierarchy of cities
Source: Design Planning Assistance Center at the University of New Mexico, 2011.Retreived from http://thebelenproject.files.wordpress.com

2.3.2.3 Urban morphology

Urban morphology started to take shape as an organized field of knowledge at the end of the nineteenth century (whitehand, 2007). It is primarily concerned with the

physical form and spatial structure of the city. Some of its most important roots were in the work of German-speaking geographers. Arguably the father of urban morphology was the geographer Otto Schlüter (1872, 1959). He envisaged the city as part of the wider landscape (Schlüter, 1899). Particularly under his influence, the urban came to occupy a central place within human geography in the first three decades of the twentieth century. This early period of urban morphology within geography had a marked influence on how the field developed in the course of the twentieth century. Urban morphological methods have developed into a comprehensive and systematic approach to understanding the urban landscape (Moudon 1994). With a morphological approach, the city is analyzed to understand how it was generated, how it has transformed, and the reasons for its changes. Accordingly, the city is seen as a process, not an object, which is developed incrementally as the result of many cultural and environmental forces (Moudon, 1994). This dynamic nature of the city has led many urban morphologists to prefer the term ‘urban morphogenesis as a better descriptor of their field (Moudon 1997).

The study of the elements of the urban fabric over time can be used to describe the social and economic conditions that produced and transformed the urban form. These elements are essentially buildings and their supplementary spaces, plots or lots, and streets (Moudon 1997). Society’s ideas, choices, and actions are manifest in these elements, as are society’s reactions to the environmental conditions in which buildings and streets are a direct result of actions and are historical signs referring to the events that caused them. Thus, as Kropf (1996, p.255) argues: “The history of a town is written in its fabric”.

Cities also develop in distinct phases throughout their history, growing in stages producing a patchwork of different areas (Kropf 1996). Comparison of these areas can

distinguish the constraints, conditions, and design principles that formulate the character of a place. The evolution of the elemental 'types' - buildings, plots, and streets - thus serves as the basis for descriptive and explanatory studies that could fit between Lynch's categories of assessment theories and functional theories.

2.3.2.4 Type, typology and typomorphology

The concept of 'type' has its foundation in architecture as a means for understanding the most basic form of building structure. For the definition of the word "type" in architectural theory we can turn to Antoine-Chrysostome Quatremère de Quincy's masterful explanation in the Dictionnaire d'architecture (1825) that formally introduced the notion into the architectural discourse; "The word type presents less the image of a thing to copy or imitate completely than the idea of an element which ought itself to serve as a rule for the model". Type consequently is an element, an object, a thing that embodies the idea. Type is abstract and conceptual rather than concrete and literal (Typological Urbanism Abstract, p.17).

In common usage the words "type" and "typology" have become interchangeable and understood as buildings grouped by their use: schools, hospitals prisons, and so on. Type, however, should not be confused with typology. The suffix "-ology" comes from the Greek logia, which means "a discourse, treatise, theory or science". Thus, typology is the discourse, theory, treatise or science of type. Its reduction to categories of use is limiting, as buildings are independent of their function and evolve through time (Lee, & Jacoby, 2011, p.17). In urban morphology, typology is employed to study the physical and spatial structure of cities in an approach called typomorphology.

Typomorphology is the study of urban forms (morphology) derived from studies of typical spaces and structures (typologies). It serves as a rich launching ground for studying the nature of building design, its relation to the city, and to the society in which it takes place. That is because type in typomorphology is not monumental or siteless but combines the volumetric characteristics of built structures with their related open spaces to define a built landscape type. The inclusion of land and its subdivisions as a constituent element of type makes land the link between the building scale and the city scale. Moreover, this type is a "morphogenetic, not a morphological unit because it is defined by time – the time of its conception, production, use or mutation" (Moudon, 1994, p.290)

Types are no longer arbitrary borrowed icons. They are structuring concepts which have been tested in the reality of city building. They are "place-bound and time-bound, responding and adapting to new social, economic, and technological circumstances" (Moudon, 1994, p.308). Eventually, a typomorphological approach to the study of building types is not concerned about the form of buildings or in their architectural style as it is for the relationship between buildings and the open spaces surrounding them. The built environment is treated not as a static object but as one constantly changing in the hands of people living in and using it (Moudon, 2003).The concepts of typology and typomorphology are very powerful analytical tools in that through an assessment of building and open space types an understanding of the relationships between forms and the society that produced those forms can begin to be deduced.

2.3.2.5 Cities and natural systems

Designing with nature is not new. It is a well-established pedigree with old as well as more recent precedents. In 1969, landscape architect Ian McHarg advocated "*design with nature"*. His book indicated the beginning of a new era of environmental planning and analysis. McHrag provided a holistic understanding of cites and drew on ecological theory to connect the value of natural systems to urban development (Legates and Stout, 1996). He argued that form must follow more than just function; it must also respect the natural environment in which it is placed. McHrag also developed a suitability analysis for cities. The main concept behind this analysis is to make a map transparency for every factor in the city including historic, water, forest, wildlife, scenic, recreation, residential, institutional, and land values, then superimpose all the layers upon one another to formulate a deep understanding of an area before taking any urban design or planning decision such as constructing a major traffic artery (Corbett, 2001). In the last two decades researchers have turned their attention to studying the relationship between nature and cities and recent version in urban design aspires to support and incorporate nature (Spirn 1984, Hough, 1995,Corner, Corner, 1997, Pickett et al., 2010 , Ellin , 2013). Expressing this intent Sim van der Rhyn , and Stuart Cowan (1996) argued that it is time to acknowledge the complexity of life and mirror nature's deep interconnections in the study and theory of urban design .In 2006 , Nan Ellin provided an integral approach to urban design that emphasize on building relationships between the different components of the city , respecting the natural flows of existing systems, and enhancing them through recognizing existing assets natural, built, and human. Building upon existing assets, integral urbanism takes into consideration existing flows, both naturally and human (Ellin, 2013). These may include wildlife corridors, waterways, streets and roads,

transit lines, and line of sight. This approach seeks to integrate natural processes into the built environment and translate it into a usable urban design approach. Such a phenomenon can simply include bringing nature back into a place (Ellin, 2013) such as uncovering a covered river. Accordingly, integral urbanism pertains five qualities to urban design: Hybridity, connectivity, porosity, authenticity, and vulnerability.

Linking natural, built, and cultural systems enhances biodiversity, enviromrntal conditions of cities, recreational opportunities, and social interaction. Urban design discipline have been learning about biodiversity, conservation, efficiency, permeable membranes; and adopting concepts from ecological disciplines such as landscape ecology, urban ecology, and landscape urbanism.

2.3.3 Implications

This section has explored how cities are understood by examining the work of urban planners, designers, morphologists, and landscape architects and how they conceive the city regarding their research and theoretical assumptions. This theoretical overview provides urban design concepts for addressing the city.

The city is conceptualized as an entity in constant change as people move and alter their environment. Two approaches to city spatial structure dynamics have been explored. The first is mental and perceptual, and the second is more functional. However, both present methods for understanding the complexity of cities as an outcome of different social, cultural, and environmental forces.

In order to better understand the complexity of cities, urban morphologists deconstruct cities to their primary structure into hierarchal compositions where the different components are interconnected together and the city is the outcome of interactions of the smallest constituents. This basis of understanding that brings on

concepts of time, change, complexity, heterogeneity, and hierarchy has strong implications for integrating urban and ecological methods, which will be demonstrated in the following section by discussing how natural systems are understood through the science of ecology.

2.3.4 Investigating Landscape Systems

2.3.4.1 Defining ecology

Ernst Haeckel (1896) was the first to define the term ecology:

> "By ecology we mean the body of knowledge concerning the economy of nature - the investigations of the total relations of the animal both to its organic and inorganic environments; including above all, its friendly and inimical relations with those animals and plants with which it comes directly or indirectly into contact "(Haeckel,1896 in Likens 1992,p.6).

While this definition focused on animals, it has since been adapted to serve a variety of scientific interests. Since 1866 the discipline of ecology have developed a continuum of ideas, concepts, and approaches that range from those focused on more abiotic (non –living) relationships to those focused on more biotic (living) relationships (Figure 4)such as , plant ecology (Weaver, 1938, Schulze et.al, 2005; Keddy, 2007), aquatic ecology (Morgan, 1982; Vidondo et. al 1997), applied ecology, , landscape ecology (Godron, 1986 ; Forman et. al, 1995; Wu, 2006), ecological design (Hough 1995; Van der Ryn & Cowan 1996; ;Corner 1997; Berger & Brown 2009; Saunders 2012), landscape urbanism (Mohstafavi 2003, Waldheim 2006, Almy 2007) , and ecological urbanism(Huston et al., 1988).Generally, ecology is defined as "the study of interactions among ecological entities, e.g. individual organisms, populations, and systems, and their environments (Forman et al., 1996).

Interactions can occur on many temporal and spatial scales (Figure 5).

This research will investigate two approaches the ecosystem ecology and the landscape ecology.

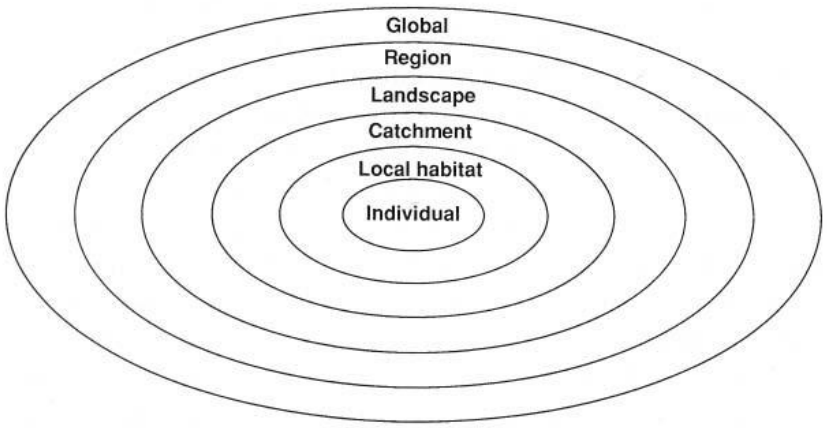


Figure5 : Spatial hierarchy commonly used in different ecological approaches

Source: Huston et al., 1988

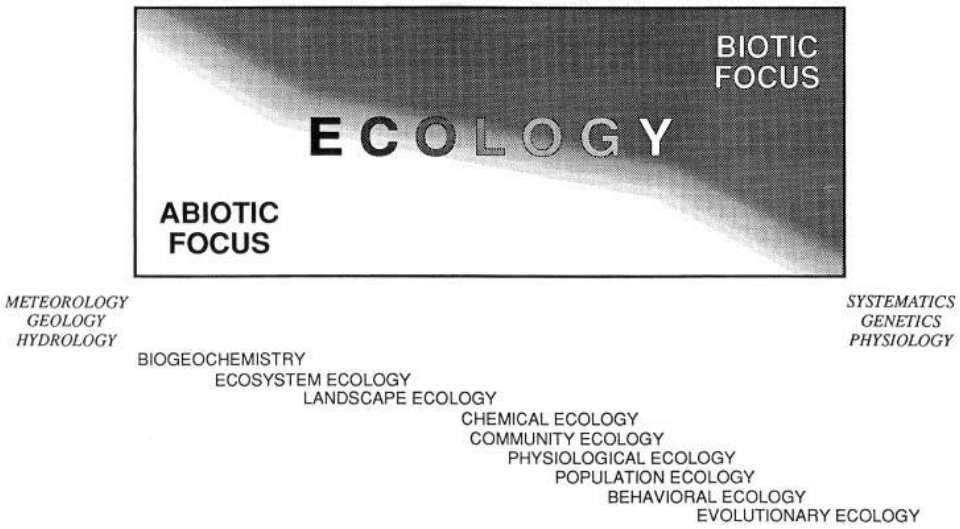


Figure5 : Different Concepts and approaches within the discipline of ecology.

Source: Huston et al., 1988.

Ecology, as represented in this illustration, is softly bounded on one end of this spectrum by disciplines, and on the other end by systematics, genetics and physiology. Obviously, the abiotic biotic focus is only one of the dimensional axes for sub disciplines in ecology. Another axis is the spatial or temporal scale of the ecological process or phenomenon being considered, e.g. landscape vs. organism (Huston et al., 1988).

2.3.4.2 The Ecosystem

Tansley (1935) introduced the term ‘ecosystem’ in the 1930s as an overarching means to describe the interactions between an environment’s living (biotic) and nonliving (abiotic) components. An analysis of ecosystems represents one approach to the study of ecology, and it is one that I pursue.

The ecosystem provides a conceptual framework for the study of the interactions among individuals, populations, communities and their abiotic environments, and for the study of the change in these relationships with time (Huston et al. 1988). Because the structure and function of ecosystems change with time, ecosystems have a history of biotic-abiotic interactions. Ecosystem development is the change in structure and function of abiotic and biotic components that occurs with time (Likens, 1993). Therefore, central to the ecosystem concept are the notions of structure, function, and change.

- Landscape structure is the spatial pattern of landscape elements. The structure of an ecosystem includes all elements within a spatially explicit unit that is defined by the researcher. These could include plant material, individual organisms or communities, soils, and landforms, among others as determined by the scope of the study (Forman et al., 1996).
- Function is the movement and flows of animals, plants, water, wind, materials, and energy through the structure in which Hydrology (water flow) is among the most important cycles that occur within ecosystems (Forman et al., 1996)

Ecosystems can be large or small, as Pickett et al. (1997, p. 186) argue, “both the entire biosphere and a rotting log on a forest floor can be delimited as ecosystems”. Like urban systems, the ability to view ecosystems as being composed of multiple hierarchical scales is one of the most important aspects of the concept, and

has been influential in the formulation of new ecological theories and disciplines. Developed in General Systems Theory, hierarchy theory orders the whole of the universe as "an organization of multilevel stratified systems, each higher level being composed of lower levels of systems with additional emerging qualities" (Naveh et al. 1990, p. 50).

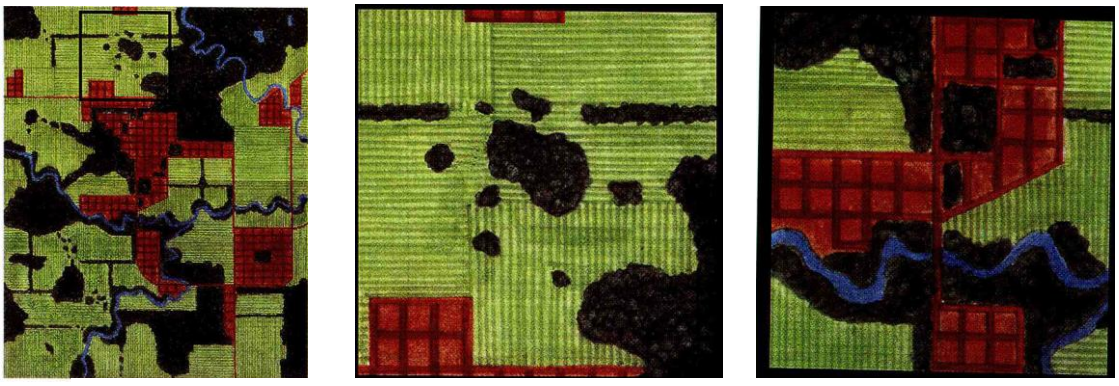
According to the ecosystem approach, the urban landscape is a complex mosaic of human modification and built structure (Dale et al., 2000). It recognizes the city as an ecosystem that is composed of many smaller ecosystems: of ponds and river corridors, parks, buildings, and neighborhoods that are linked with the physical space they share and by the channels through which energy, material, and information flow (Cadenasso and Pickett, 2007). Given this connectivity, changes to one feature may produce consequences in many others (Pickett et al., 2004). Ecological function of an ecosystem can be classified into three main types, i.e. the biological production such as the production of plants and water, environmental service such as the control of climate and pollution, and cultural support such as spiritual and recreational benefits (Wang, 1995; Wang, 1996; Wang and Han, 1998).

2.3.4.3 Scale and hierarchy

In ecology, scale is applied in different methods. Scale can refer to the difference in fineness or coarseness of patterns illustrated on a map to that is perceived in reality (Forman 1995). Ecologists typically imply a scale of inquiry based on the scale of the phenomena they are investigating (Figure 6). Thus, the 'regional scale', 'landscape scale', or 'parcel scale' refer to a generalized understanding of a certain spatial dimension (O'Neill et al., 1998).

Hierarchy theory structures various elements in an organizational framework of lower to higher levels (Figure 7). In an ecological hierarchy, each level is made up of elements from interacting lower levels and is constrained by the level above (Turner et al., 2001). An advantage of viewing ecological systems with this approach is that the whole can be distinguished from the sum of its parts and elements (Naveh et al., 1992, Odum 1997, Turner et al., 2001). Accordingly, elements at lower levels contribute to the identification of the character and identity of the whole and any changes in the small scale elements may lead to a different whole. Turner et al. (2001) point out that there is no single correct scale for studying ecological systems but that as scale changes, so do the relevant processes and relationships.

Linking scale and hierarchy theory provides the necessary means to measure and perceive the world (scale), and to organize it for analysis (hierarchy) related to system structure and dynamics (Pulliam et al., 2002). Different disciplines use different levels of organization in their approaches to ecological systems, but in general, they use a similar structure.



1- Regional Scale 2- Landscape Scale 3- Site Scale

Figure6 : Ecological investigation from a macro to a micro scale.

Source: Forman et al., 1996.

Forman et al., (1996) argue that the ability of applying an ecological approach across a range of scales shows that the principles of this discipline are all applicable and effective independent of the size of the project.

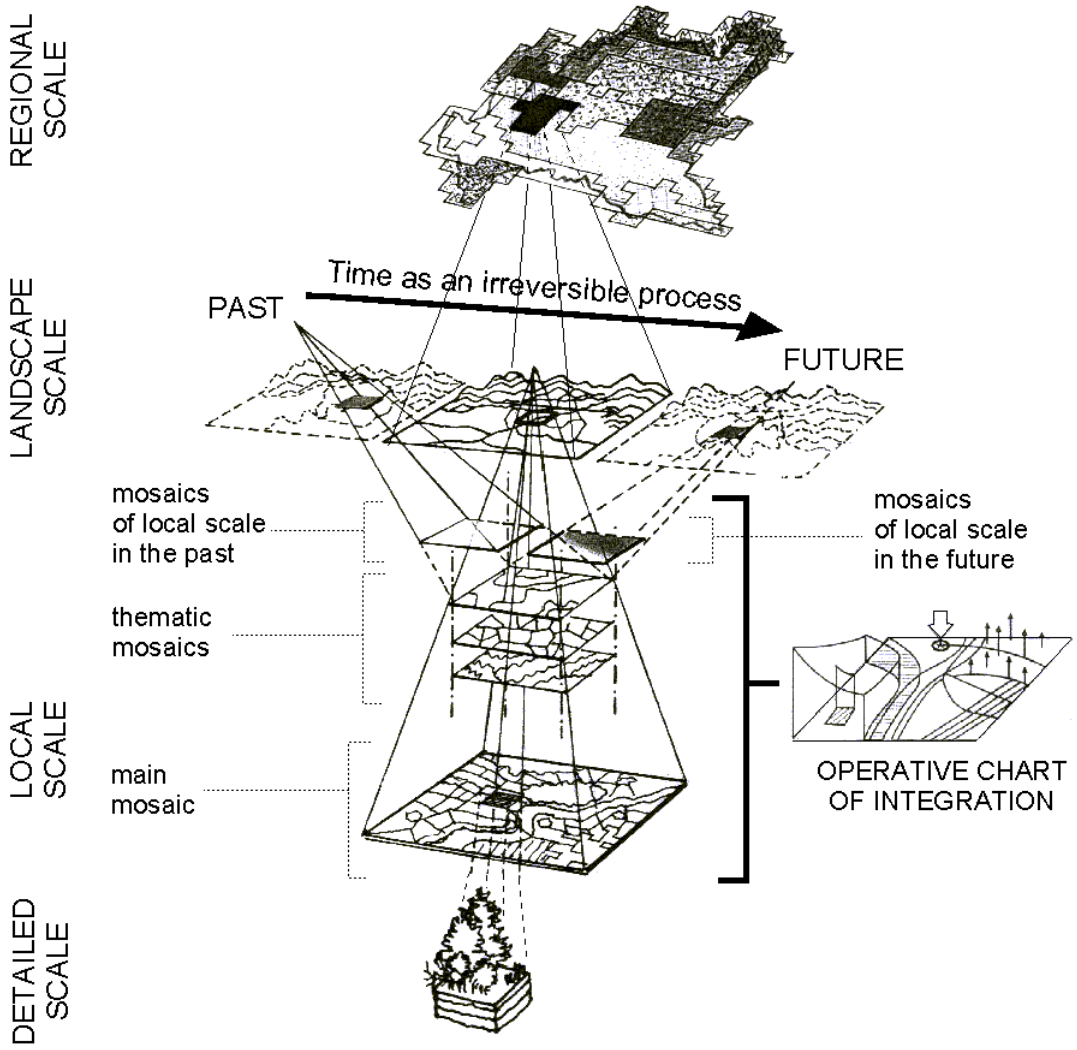


Figure 7: The complex structure of a landscape in a hierarchical composition. Source: Ingegnoli, 2002.

2.3.4.4 Landscape ecology

Landscape ecology is the science of studying and improving the reciprocal relationship between spatial pattern and ecological processes in a landscape on multiple scales (Wu & Hobbs, 2002) (Figure 8). This discipline studies the structure and function of different types of landscapes , including natural, agricultural, and urban landscapes (Wu & Hobbs, 2002).The field of landscape ecology first appeared in the 1980s as a holistic approach used by planners and designers to develop new

forms of linkages between natural, human, and urban systems (Naveh and Lieberman ,1990; Wu and Hobbs, 2002; Forman, 1995). The concept focuses on spatial pattern in a section of a landscape, where biological communities interact with the physical environment (Troll, 1968). For instance, modifications of habitat connectivity or patches size, and/or shape, and/or diversity can have strong influences on species abundance, distribution, movement, and persistence. In a study of forest fragments in an agricultural landscape, larger and more heterogeneous forests had more species and bird pairs, suggesting that regional conservation strategies should maximize both patch size and forest heterogeneity (Freemark ,& Merriam, 1986 from Turner, 1989).

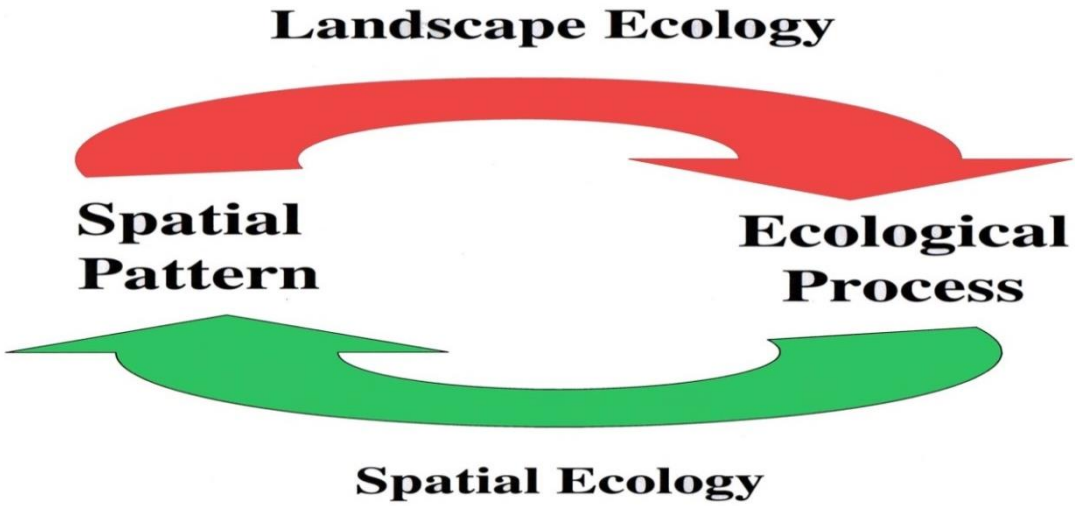


Figure8 : The reciprocal relationship between spatial pattern and ecological flows
Source: With at Kansas State University .Retrieved from http://www.k-state.edu/withlab/landecol/

2.3.4.4.1 Landscape Spatial Structure

The structural pattern of a landscape is composed of three types of elements: matrix, patches, and corridors (Forman, 1995) (Figure 9). The model applies equally in a natural environment, a built environment, and a mixture of both. The whole landscape is a mosaic, but the local neighborhood is likewise a configuration of patches, corridors, and matrix (Forman, 1995).

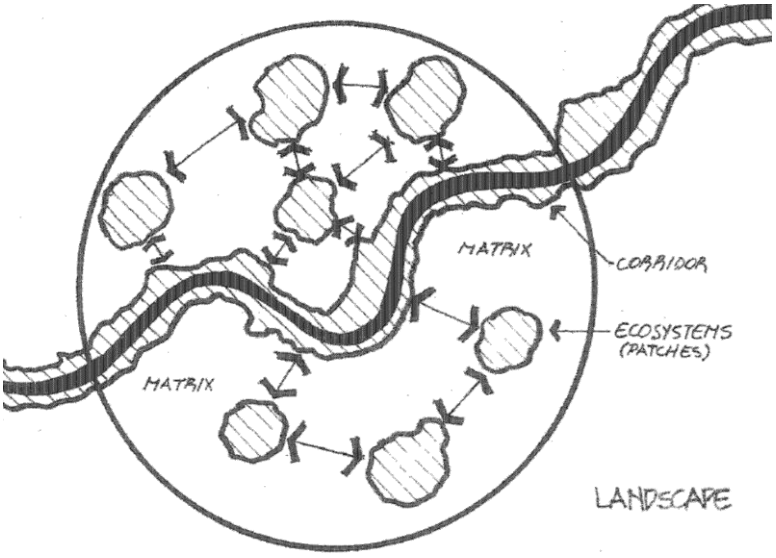


Figure9 : The structural elements of a landscape.

Source: Homero, 2004, p. 25.

Matrix

The matrix is the underlying structure of a landscape (Figure 10). It is the dominant land-use and controls the overall landscape dynamics (Forman 1995). In human dominated landscapes, it is typically defined by agriculture and/or varying degrees of human settlement patterns, with biophysical elements interrupting the continuity.

Patch

Patches are aggregating adjacent covers of the same land use category (Forman, 1995) (Figure 10). Wu (1995, p. 446) points out, "patches can be characterized by their size, shape, content, duration, structural complexity, and boundary characteristics". Four origins or causes of patches are usefully recognized: remnants, introduces, disturbance, and environmental resources.

Edge

An edge is described as the outer portion of a patch where the environment differs significantly from the interior of the patch.

Corridor

Corridors provide connectivity between patches in the landscape. As development increasingly fragments habitat, landscape ecologists stress the need to provide adequate corridors for wildlife connections (Dramstad et al. 1996). However, some corridors may act as barriers to species movement. Such as roadways, railroads, power lines, canals, and trails, may be thought of as barriers. Stream or river systems are corridors of exceptional significance in a landscape (Forman, 1995).

Forman (1995) outlines six broad categories that highlight the benefits of corridors to society: 1) biodiversity protection; 2) enhancement of water quality; 3) agroforestry enhancement through windbreaks and erosion control; 4) recreation; 5) community and cultural cohesion through greenbelts, and; 6) dispersal routes for species.

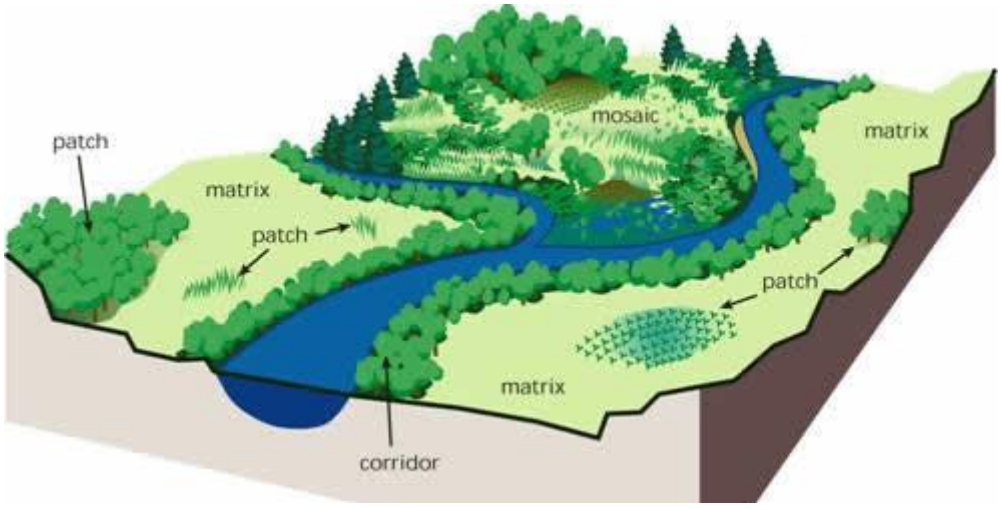


Figure10 : patches of forests and grasslands in a wetland matrix.
Source: The federal interagency stream restoration working group, 1998. Retrieved from http// cals.arizona.edu

2.3.4.4.2 Patch dynamics perspective

To infer landscape function from spatial patterns, it is necessary to know what causes spatial patterns to form and subsequently change. Understanding the forces of landscape change is one of the main areas of research concerning ecologists and

landscape ecologists today (Burgi et al. 2004). Grouped generally under one of two categories, human or biophysical, the interventions and processes that have formed the state of a landscape occur on multiple spatial and temporal scales. The concept of patch dynamics seeks to understand the relationships between landscape structure, function, and change.

Patch Dynamics

Forman (1995, p. 43) defined patch as "a wide, relatively homogeneous area that differs from its surroundings". Patch dynamics, has emerged as a valuable perspective when viewing ecological systems due to its emphasis on the dynamic relationship between pattern, process, and hierarchical scales (Wu et al. 2003). It focuses on the agents or causes of patchiness and the resultant changes in species over time (Forman 1995). Patch dynamics has emerged to understand spatial heterogeneity within ecological systems. It emphasizes spatial patterns of patches and the relationships and interactions between patches that result in subsequent changes in the patch configuration. As such, patch dynamics is best understood through four concepts: patch generation, patch change, mosaic configuration, and flux among patches (Pickett et al. In press).The boundaries and edges between patches become important regulators of flows across the mosaic. The flexibility and scalability of the patch dynamics concept makes it a valuable lens to view and understand spatial heterogeneity, not only within ecological systems, but other systems as well.

2.3.4.4.3 Landscape Classification

Classification in ecology, like typology in urbanism, holds assumptions about the structural characteristics and functional capacity of an element. In urban design and planning disciplines, landscape classification describes land cover types for

human purposes: “road”, “park”, “orchard”, “field”, “forest”, ”lake”, etc. However, these labels are not very useful for quantifying ecological consequences of plans or designs (Corry and Nassauer, 2005. In Lafortezza and Brown, 2004). Landscape classification for ecological purposes includes the classification of land cover types as, for example, habitat quality or units of landscape for some target society or species. Each landscape unit (e.g., land-cover type) is considered as part of a separate patch mosaic. Units in landscape ecology can be distinguished at multiple scales and are typically based on vegetation, soils, topography, biological potential, climate, and also human factors (Naveh et al. 1990, Kronert et al. 2001).Landscape units are then subject to further analysis and computation aimed at determining quantitative measures of landscape composition and spatial configuration. In general, landscape composition refers to the relative amount of landscape units within the landscape mosaic, whereas landscape configuration refers to the spatial arrangement, location, and functional connectivity of landscape units.

Another type of classification investigates the size, shape, and location of patches to understand a patch potential role in overall landscape function (Forman et al., 1995, and Lafortezza and Brown, 2004). These characteristics are analogous with the spatial configuration of parcels, buildings, and streets used in an urban typomorphological analysis. The size, shape, and location of each of these elements can provide much information on their functional role in urban landscape systems.

2.3.5 Implications

This section has discussed how natural systems are understood through ecology and landscape ecology. Like cities, the natural environment as understood through ecology is conceived of as a complex system that is organized hierarchically.

Ecosystem ecology emphasizes understanding the interaction of components through various processes that result in subsequent changes in the ecosystem. Using the basis of structure, function, and change, landscape ecology employs the ecosystem, or patch, as its basic unit of study.

To assess the spatial structure and function of the built and natural environment within an urban landscape system a common conceptualization is developed between the analytical methods of urban design and landscape ecology to combine biophysical patches and built typologies in a collective framework. Defining vegetative patch types, wetland patch types, building types, street types, block types, and various other types will allow assessment to occur with an integrated language and with integrated methods. The purpose is not only to include biophysical components as spatial elements within an urbanized environment but as structural features that affect the function of the urban landscape as a whole. As the majority of ecological systems in urban landscapes have been altered, designed, or managed by humans, using typologies for ecological components could facilitate the establishment of desirable ecological types to be recommended or zoned for through the planning and design process. This would reinforce Rossi's (1982) definition of type as a model for future variations.

2.3.6 Integrated Urban Ecological Framework

In the first section of the literature review several definitions have been discussed for the term cultural landscape. However, this thesis adopts the European definition of cultural landscape where the latter is any landscape that has been changed and formed by man. Accordingly, it is the transformation and perception of the environment by human beings that turns the environment into a landscape(

Ermisher, 2003). This paper recognizes that human ideas and social practices are not only reflected in architecture but they also influence and shape the landscape. Therefore, this thesis investigates and analyses typologies of buildings and open spaces between buildings, as well as analyses the river way and typologies of river edges. Accordingly, the second and third sections of the literature review addressed urban design and landscape ecology disciplines to merge methodologies.

Through the literature review on urban design and landscape ecology disciplines the structural components and functional processes of urban and natural systems were identified and common concepts, principles, and perspectives were examined. This section will highlight commonalities between the two fields. The purpose of this analysis is to apply the extracted mutual themes as guidelines to document and analyze the site then to develop an ecological urban design strategy for revitalizing the Abu Ali River in the Historic core of Tripoli and re-integrating it into the urban fabric.

Common themes and concepts include:

Scale

The idea of Scale is very strong in urban design and landscape ecology concepts in general. Cities and Landscapes and can be approached at different scales from the scale of the region to the scale of the site. Hierarchal scales of investigation in landscape ecology and urban design can be integrated together providing an intermediate scale between the city and the region. This additional scale aims to look at the landscape structure and function where the urban becomes a patch within the matrix of the landscape (Figure 11).

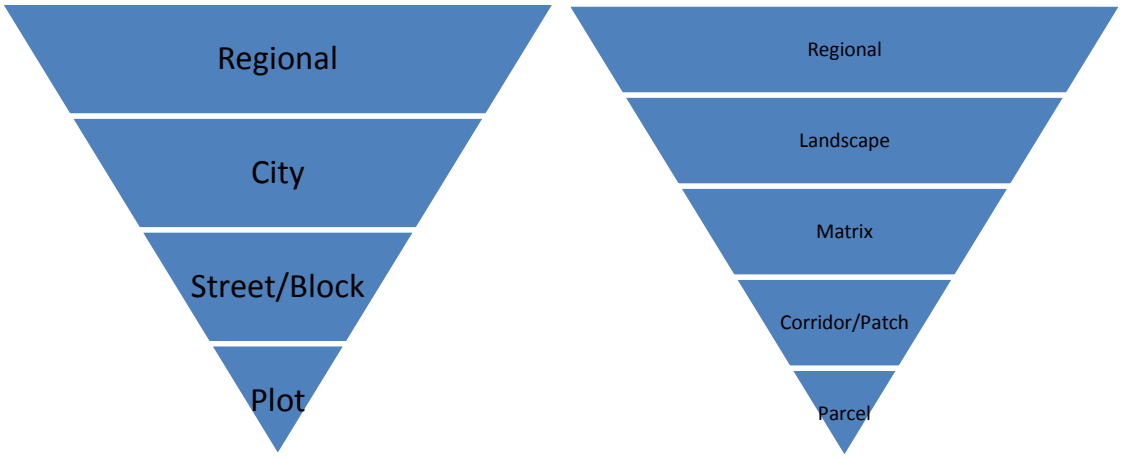


Figure11 : Different scales of investigations in urban design and landscape ecology

Spatial Structure and time

In urban design the spatial structure is studied through looking at the physical composition of cities, including streets pattern, buildings, blocks, and open spaces. However, users approach the morphology of cities in a different way. They reflect in their mental image of a space the spatial composition of the latter according to their own perception. The mental image includes paths, edges, nodes, landmarks, and districts.

In landscape ecology the structural pattern of a landscape is composed of three types of elements: Patches, corridors and matrix. Structure is determined by the composition, the configuration, and the proportion of different patches and corridors across the landscape.

Both urban design and landscape ecology studies acknowledge the landscape as process that is shaped by ongoing physical, biological, social, and cultural processes. Therefore, both disciplines study changes that occur in the spatial structure of the landscape over time.

Complexity

Urban design and landscape ecology disciplines recognize the urban landscape as a complex entity composed of different interconnected layers are linked with the physical space they share. These layers are spatial, cultural, social, economic, and institutional.

Type/typology

In urban design typology is the study of buildings and open spaces types and their relation to the city and the society in which they take place.

In landscape ecology different patches in the landscape are classified according to their land cover type and/or to their physical characteristics such as their size and shape to understand a patch potential role in the landscape.

	Spatial Structure	Time	Scale	Complexity	Type-Typology	Connectivity
Urban System	Physical Mental cultural	City as process	From the plot scale to city than regional scale	Cities are composed of different superimposed layers	1-Buildings and open spaces types 2- Relation between form and society	For people
Landscape System	Physical cultural	Landscape as process	From the plant leaves scale to the landscape than regional scale	The landscape is a complex mosaic composed of different interconnected ecosystems	1-Vegetative patch type-wetland patche type….. 2- Relation between form, society, and nature	For wildlife habitat and people
Outcome	Cities are urban patches within the landscape matrix	Time >>>>> change	plot>>block>> city>> landscape >>region	The city should be analyzed through its layers to form a holistic understanding of its structure	Extract different Typologies of urban and landscape units	Provide connectivity for people and other species

Table 2: Cross cutting themes between urban design and landscape ecology

2.3.7 The river in the urban system

Urban waterfront is the interface between a city and a body of water which may be a river, lake, ocean, bay, creek, or canal. Urban waterfront is the place where humans and the water meet, making visible the dichotomies between the urban and the ecological, the cultural and the natural. It presents complex relationships, with conflicting and matching functions; on one side, the natural processes; on the other, human needs (Breen and Rigby 1994). The importance of urban rivers systems both ecologically and socially increased research interest in these systems in the early 1990s, with a more dramatic increase from 2001 (Francis, 2012) (Diagram 1).

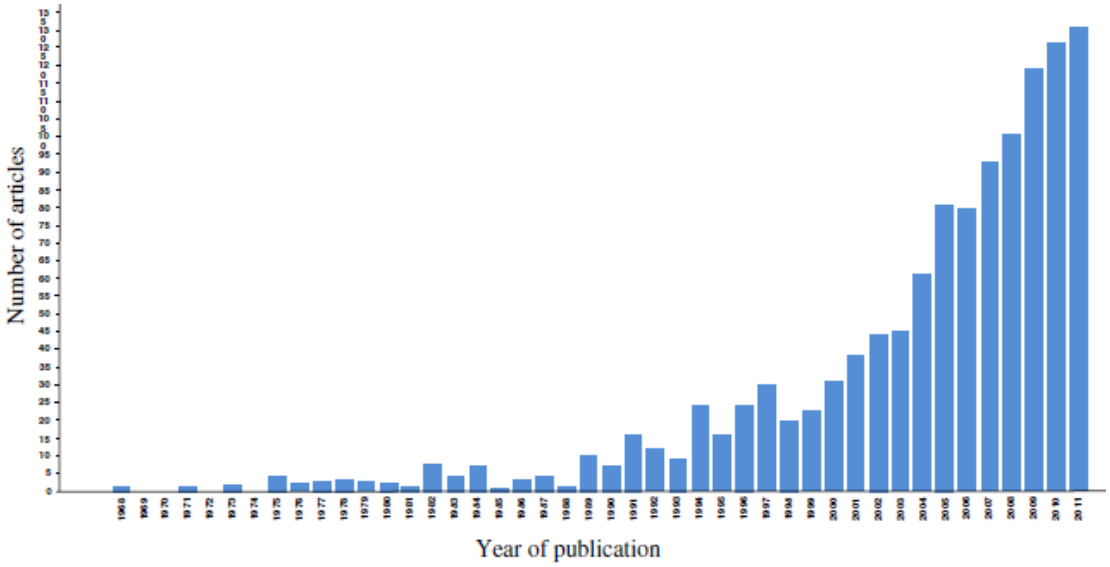


Diagram1 : Publications on urban rivers .Search conducted on 14 January 2012.
Source : Francis, 2012.

Historically, most cities and urban areas developed at locations where key resources and services are found, including fresh water, food, transportation links, ease of defense, and waste disposal (Grimm et al. 2008). River systems generally provide all of these. Prior to the development of extensive and dedicated transport

networks that allowed the movement of people and goods such as the railway and highway networks, river and coastal systems were the foci for most urban development (Francis, 2012). Generally, the result of this development is widespread degradation and destruction of riverine habitats coupled with impacts to hydrological regimes, water quality, and geomorphological patterns (Groffman et al. 2003).

2.3.7.1 Landscape ecology of urban rivers

Rivers are corridors and, as corridors, they are structural components of the landscape. River ecosystems are complex, with many interacting components. In order to understand how an urban river functions, it is first essential to understand the basic components of a natural river ecosystem.

The river or stream corridor as defined by Forman and Godron (1981) is formed by the watershed, the channel, the river banks, and the floodplain, surrounded or limited by hill slopes and uplands (Figure 12).

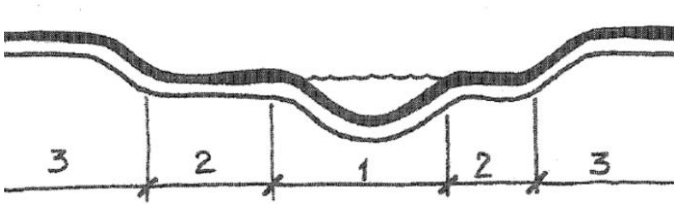


Figure12 : the River's units.

Source: Homero, 2004, p.31

1-channel and river banks
2- Floodplain
3-Hillslope and uplands

The landscape units of rivers are defined as follow

Watershed

A watershed is the area of land from which water, sediment, and dissolved materials drain into a given river, stream, wetland, or lake (Otto et.al, 2004). Water movement through a watershed begins with rain or snowmelt or groundwater that wells up to the surface of the land (Otto et al., 2004) (Figure 13). The natural system by which water circulates through the Earth's atmosphere, over its surface, and beneath the ground is called the hydrologic cycle.

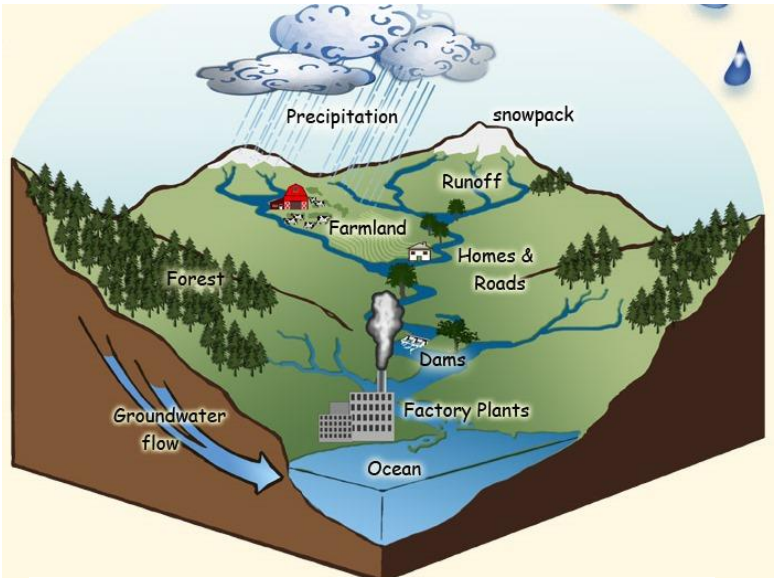


Figure13 : Watershed and the formation of rivers.
Source: US forest service, 2014.Retreived from http://www.fs.fed.us

Floodplain

The floodplain is the riverside land that is periodically flooded by a river's floodwaters and it serves important purposes (Otto et al., 2004). It temporarily stores floodwaters; improves water quality; provides important habitat for river wildlife; and creates opportunities for recreation.

Natural floodplains help reduce the heights of floods. During periods of high water, floodplains serve as natural sponges, storing and slowly releasing reducing the

velocity of the river and increasing the capacity of the river channel to move floodwaters downstream (MacBroom ,1998). However, many communities continue to allow building in floodplains (Figure 14).

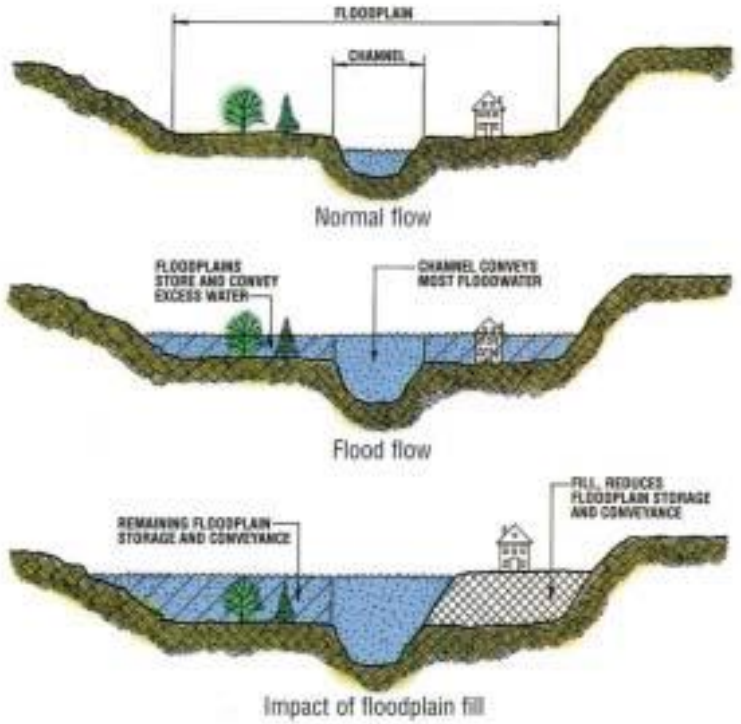


Figure14 : Impact of building in floodplains

Source: MacBroom ,1998.

Channels

Nearly all channels are formed, maintained, and altered by the water and sediment they carry. The dimensions of a channel cross section define the amount of water that can pass through without spilling over the banks (Otto et al., 2004). Two attributes of the channel are of particular importance channel equilibrium and stream-flow. If one variable changes, one or more of the other variables must increase or decrease proportionally if equilibrium is to be maintained (Otto et al., 2004). For example, if slope is increased and stream flow remains the same, either the sediment

load or the size of the particles must also increase. Urbanization changes stream channels directly and indirectly. To accommodate buildings and infrastructure, urban stream channels are often straightened or moved altogether (MacBroom ,1998) (Figure 15).

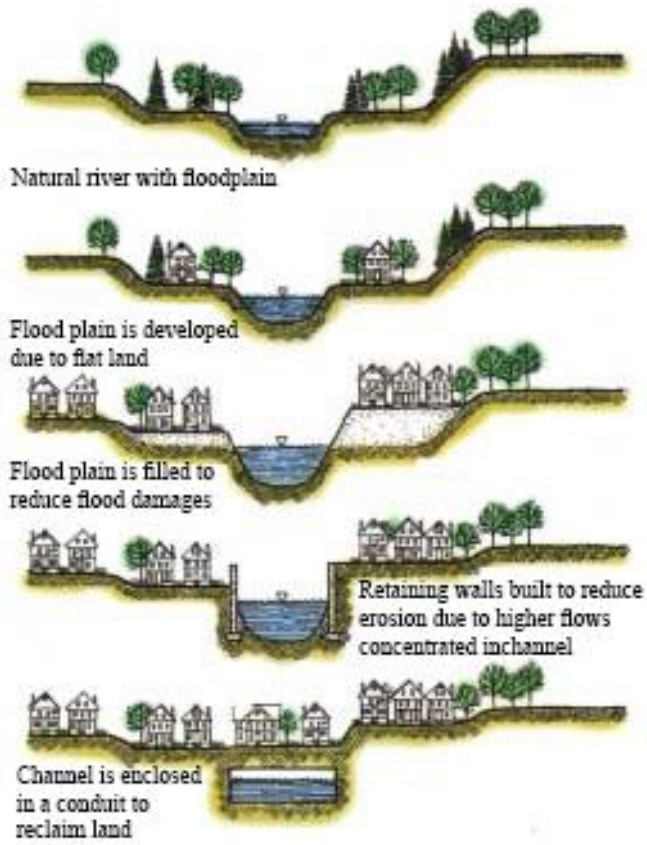


Figure15 : Urban River Degradation
Source: MacBroom ,1998

The riverfront is an area that has been transformed by urbanization; it is on the interface between the river channel and the uplands and includes the river bank and the floodplain, where the riparian vegetation originally existed. Engineering modification of rivers for human activities or settlements changes their dynamics and reduces flood area, consequently interrupting the river continuum, altering the flood pulse, and the hydraulic stream ecology (Pedroli et al., 2002). As a consequence,

diversity in habitats and patterns is reduced. Ecological function is lost with the substitution of vegetal cover by buildings, urban infrastructure, port facilities, or flood control structures on the floodplain. The transformation of the landscape structure into an urban structure creates an urban change regime, different from the natural river regime governed by cycles of floods. For instance, the straightening of a river makes the stream flows more rapidly, which can vastly increase soil erosion. Channelization can also cause loss of wetlands, loss of fish habitat, decrease in water quality, and pollution.

Any intervention on a riverfront must take into consideration whether restoring their natural or original state is possible or desirable. The attempts to restore natural conditions have to contemplate the problems caused by urbanization on the landscape, its ecosystems, and the function of the ecological objects within the city (Otto et.al, 2004). Artificial manipulation of the river structure should be used in order to create the necessary changes that would generate a new structure and consequently new function (Pedroli et al., 2002).The presence of humans in the city must also be considered, and is part of the success of the design incorporating human use, culture and identity into the process (Otto et al., 2004).

2.4 Connectivity in urban rivers

‘‘Connectivity’’ is a key concept for riparian and landscape ecologists, who use it as a measure of natural integrity in a river ecosystem and as a key to managing landscapes for biological diversity. Urban designers and politicians use the same term to promote human access to riverfronts and to integrate the life of the city with its riverfront. Even though the term has very different meanings in the context of river

ecology or of urban waterfront planning, a common ground between them is found through the pursuit of ‘‘cognitive connectivity,’’ or educational and aesthetic interventions that allow urban dwellers to experience their place in the urban watershed in ways that do not jeopardize its ecological systems (May, 2006).

2.4.1 Defining connectivity—biophysical approaches

The overall structural and functional integrity of a landscape can be understood and evaluated in terms of both pattern and scale. One essay of the ecological health of a landscape is the overall connectivity of the natural systems present (Forman et. Al, 1995). From the perspective of landscape ecologists, connectivity describes the natural habitat continuum throughout the landscape (Harrison, 1996). Rivers and riverbanks are connecting elements (or landscape corridors) between patches. Rivers typically connect an upstream, forested area and a downstream wetland, and riverbanks serve as paths along which animals can move and plants can spread with ready access to water and nutrients. The most important similarity among landscape, ecological, and hydrological connectivity is their common defense of undisturbed river environments against fragmentation, impermeability, and channelization (Pringle, 2003.In May, 2006).

4.4.2 Defining connectivity—cultural and design approaches

In urban design and planning disciplines connectivity is also given a high value. However, the term is defined in a way that places paramount emphasis on connecting humans to the river. For urban planners concerned with riverfronts, the main issues are making the river accessible to people from the most densely used or occupied parts of the city (pedestrian paths and bridges, transit linkages), linking the river visually and conceptually to the city (greenways, parks, attractive riverfront

destinations, integrated design elements, vista points, identifiable images and logos), and providing social and cultural attractions along the riverfront. However, human interaction with the riverfront disrupts biophysical connectivity along the river, because it depends on crossing the banks with roads and bridges, and landscaping for recreation, not wildlife (May, 2006).

2.4.3 Cognitive Approach

May (2004) stresses the need of applying a cognitive connectivity between cities and rivers through integrating the complexity of river ecosystems into the public image of cities. A cognitive approach includes both urban design and ecological connectivity. It recognizes humans as the dominant species in urban ecosystems, thus connectivity of all kinds must include a connection to us, and from us to the system as a whole. However, these connections don't have to be only physical. They can also be visual, cultural, and educational (May, 2006). Three types of cognitive connections between rivers and cities have been applied in recent design interventions:

1- Pedagogical[3] cultural features : it comprises river restoration plans that incorporate pedagogical elements into the landscape (e.g. .Pedagogical restoration plans).

2- Popular water museums: it provides virtual or conceptual tours of the riverfront without exacerbating the human impact on the riverbanks themselves (e.g. The Rouge River Gateway Plan).

3- Artistic works: it incorporates works of art that facilitate and call attention to natural processes (Spaid, 2002. In May, 2006).

[3] The term "pedagogical" refers to the word pedagogy. Pedagogy is the activity of educating or instructing; the activity that impart knowledge or skill. Retrieved from: http://en.wikipedia.org

In all three cases, the goal is to reverse the historical pattern of asserting human dominance over river ecosystems by making people aware of the complexity and interdependence of all parts of those systems.

CHAPTER 3

CASE STUDIES

3.1 Introduction

To formulate strategic urban design guidelines that can eventually lead to a design intervention, it is important to look at case studies to extract recommendations and design principles. I have surveyed twenty case studies. However, I selected six case studies because they have similar context as my case study, and/or have used a relevant approach to the integrated approach I intend to apply, and / or have applied a design strategy that is applicable in my case study, and/ or have applied smart urban design interventions. The criteria of selection are identified in the following table.

	Urban River	Covered river	Canalized river	Restoration of some of the rivers' ecological functions	Approach the river as a cultural heritage	Connect the river to its urban context	Improve public access to the river
Rio River, Madrid Spain							
Cheonggyecheon River,Seoul Korea							
Gomti River, India							
Rouge River,USA							
LA River , USA							
Isar (Munich) River, Germany							

Table 3: Criteria of case studies selection

3.2 The Los Angeles River Revitalization Project, USA

The Los Angeles River flows approximately 51 miles from its origin in the San Fernando Valley region of the City of Los Angeles, to Long Beach Harbor and the Pacific Ocean. The River is the original source of life for the City of Los Angeles (Ad hoc committee on the Los Angeles River, 2007). It is where first the Native Americans and later the Spanish built the City's earliest settlements. Over time, with the rail yards, warehouses, and other industrial uses that line the River's edge, the River has become both literally and figuratively isolated from most people and communities. For the last six decades since the River was paved, it has been treated as an unwelcome guest in many neighborhoods (Ad hoc committee on the Los Angeles River, 2007). Therefore, in June 2002, the Los Angeles City Council launched the revitalization of the Los Angeles River project (Ad hoc committee on the Los Angeles River, 2007).

Project goals and objectives are (Ad hoc committee on the Los Angeles River, 2007) : (a) Create a continuous river greenway; (b) Connect neighborhoods to the river ;(c)extend open space and water quality; (d) Restore the river's ecosystems functions and structure; (e)enhance river identity ; (f) and enhance flood storage

To achieve the project's goals a design strategy was applied for the short and long time (Figure 16 & 17)

Near term improvements (Ad hoc committee on the Los Angeles River, 2007)

- Provide green arterial connections to the River.
- Establish a River Buffer area within and adjacent to the River that meets riparian or upland habitat requirements.
- Increase direct pedestrian and visual access to the River.

- Create safe, non-motorized routes between the River and cultural institutions, parks, civic institutions, transit-oriented development
- Make improvements near the top of the existing banks by providing “green strips” and tree plantings that provide wildlife habitat, shade, and cover.
- Provide in-channel terraces, trails or overlooks, and pocket parks or native areas.

Long term improvements (Ad hoc committee on the Los Angeles River, 2007)

- Reconstruct the channel bottom and lower bank to provide a pool and riffle system for fish, and to reestablish a riparian ecological corridor.
- Provide terraced access for people on both sides of the river.

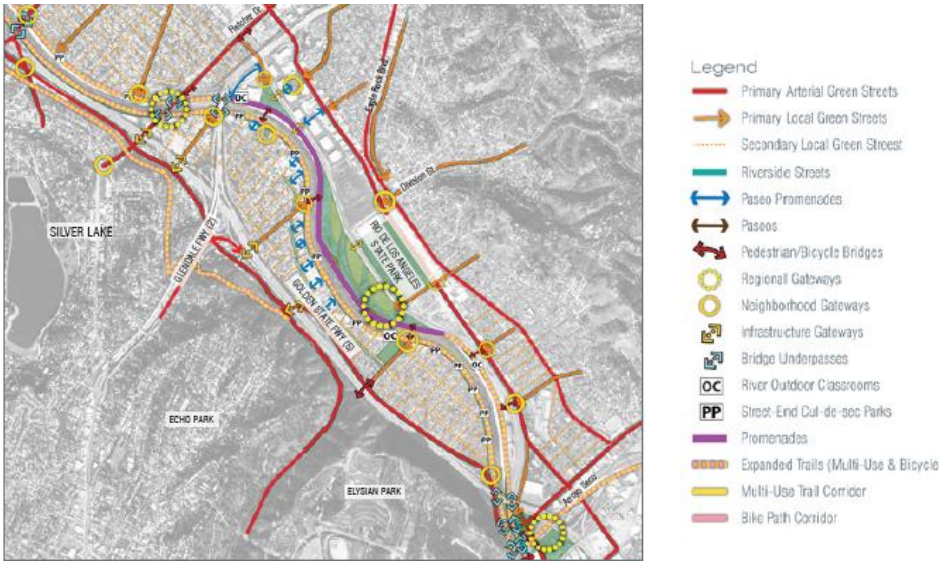


Figure16 : Connectivity plan between neighborhoods and a section of the LA River

Source : Ad hoc committee on the Los Angeles River, 2007. Retrieved from http://www.lariver.org. 2007

Figure17 : Near and long term improvements in the Los Angeles River channel

Source : Ad hoc committee on the Los Angeles River, 2007. Retrieved from http://www.lariver.org. 2007

Relevance to the Abu Ali River

Two concepts used in the LA River are significant to my project. The first is the issue of scale. The project applied strategic interventions that vary from the scale of the street to the scale of the city to achieve its goals. The second is the issue of time. The project was approached as a process with near and long term improvements .Moreover, most of the urban design interventions applied to connect the river to surrounding neighborhoods are applicable in my case study.

3.3The Cheonggyecheon Stream Restoration Project, Seoul Korea

Cheonggyecheon is a stream which used to run through the central part of downtown Seoul from west to east until mid-1970's. Its total length is 8.14km and the restored section is 5.84km long. The covering of Cheonggyecheon started in 1958 and was done in 1978. Over the covered Cheonggyecheon, 5.84km long Cheonggye elevated highway was constructed during 1967-1976 (Kee-Yeon, 2007). The restoration of Cheonggye stream included the removal of the roads covering the stream and the elevated highway, then the re-naturalization of the river's channel. The removal of expressway was completed within two month and the rest of the stream restoration work was completed on Sept. 30, 2005 (Kee-Yeon, 2007).When the restoration was done, only 13.5 meter-wide road was left at each side of the Cheonggyecheon which consists of two lanes for vehicular traffic, sidewalks and riverside walks (Kee-Yeon, 2007).

Project goals and objectives (Lee ,2006)

- Improve resident's quality of life
- Restore the ecological functions of the river

- Revive the historical relation between the river and the city
- Accomplish regional development

In order to achieve the project's goals the project applied the following design interventions (Lee, 2006) (Figure 18&19):

- Create a new green belt with waterfront from West to East
- Create pedestrian tour routes that link the river to cultural centers
- Transform the river's channel gradually from urban infrastructural corridor to more natural corridor
- Create ecological biotop and environment
- Establish environmentally friendly transportation system

  * Discourage driving cars in the city centre
  * Improve public transport system: subway system and bus only lane

- Provide solutions to merchants

  * Relocate street vendors
  * Market remodeling

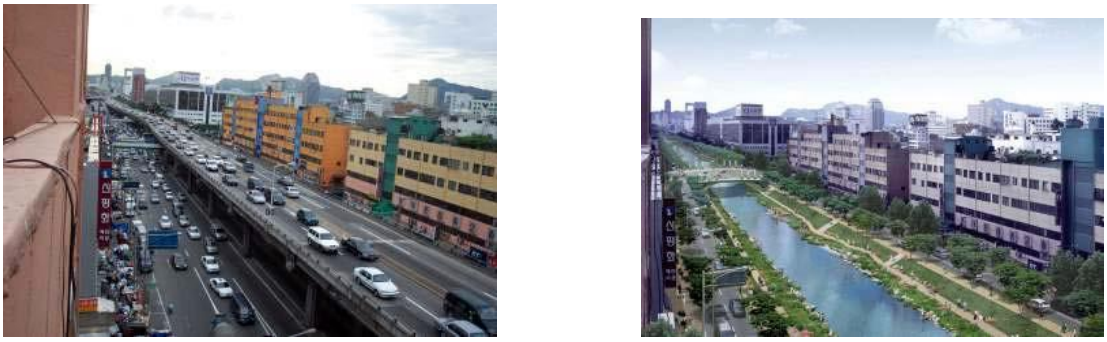


Figure18 : The transformation of Chenggyecheon River from an express way to an ecological corridor.

Source: Lee, 2006.

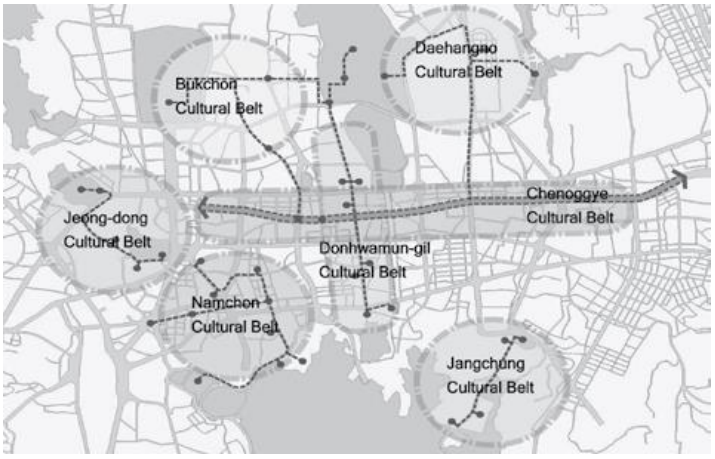


Figure19 : Pedestrian tour routes that link the Chenggyecheon River to cultural centers.
Source :Kee-Yeon, 2007

Relevance to the Abu Ali River

What is of interest to my project is how the river was transformed gradually from an infrastructural to an ecological corridor, and how the river was protected from the pollution delivered from vehicular through traffic along it through the creation of a green buffer zone along the river. Another important design solution for my case study is the one that addresses street vendors. The project has simply relocated the street vendors away from the river to protect the latter from waste pollution and to reduce vehicular traffic.

3.4 The Rouge River Gateway Project, Michigan USA

The Rouge River Gateway Corridor is one of the most important natural and cultural assets of southeast Michigan. It includes the last eight miles of the Rouge River and neighboring communities. This area has all of the basic ingredients for a vibrant urban place: nature, culture, people, and economic might (jhonson et.al, 2002). However, like many urban waterways, pollution, channelization, and industry have severed the Rouge from people and ecology (Jhonson et al., 2002). Concrete channels and poor water quality have limited the river's capability to support wildlife.

Moreover, inaccessibility to the river's edge has severed the historical connection between the Rouge River and people (jhonson et al., 2002). In 1999, powerful stakeholders, realizing the renewed potential of this neglected river, have combined forces to create a vision for the Gateway Corridor, and a master plan has been developed (Jhonson et al., 2002)(Figure 20&21). The main goal of the plan was to ''Restore relationships between the Rouge and its natural and social systems'' Additional goals include (Jhonson et al., 2002):

- Ecosystem restoration,
- Heritage preservation,
- Increased recreation,
- Economic development

The master plan included the following interventions (Johnson et al., 2002):

- Hydrological interventions include restoration of an oxbow and partial removal of a concrete channel
- Ecological interventions include re naturalizing the river banks (Figure 22)
- City connections include a public greenway and riverboat taxi to link the various usage zones in the popular image of the river, and a path system to connect to existing greenway through adjacent communities and become a critical link within a larger greenway plan for southeast Michigan.

Figure 20: The Rouge Gateway master plan in 3D
Source: Jhonson et al., 2002

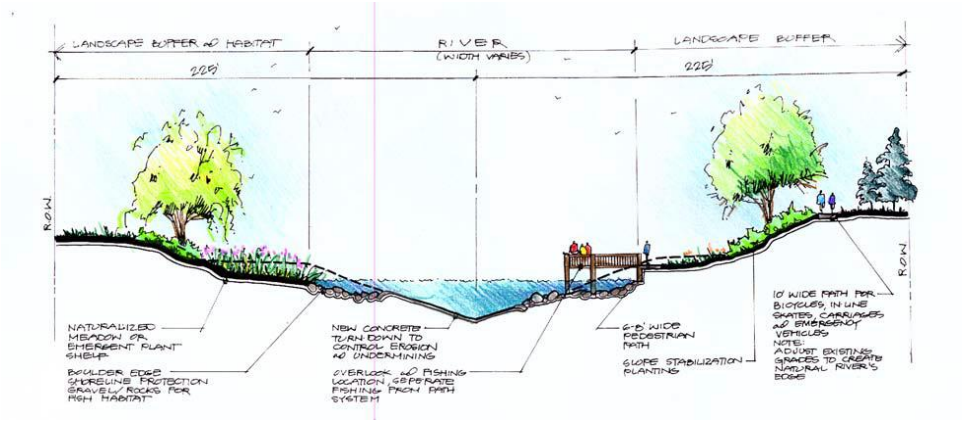


Figure 21: The Rouge Gateway master plan

Source : Jhonson et al., 2002

Figure22 : The Rouge River proposed channel cross section

Source: Jhonson et al., 2002

Relevance to the Abu Ali River

The strategy that guided the master plan in the Rouge River Project could guide my work too. It divided design interventions into three broad frameworks hydrological, ecological, and urban. This division of design interventions is applicable in my site since I am addressing the river in its urban context, and using both urban design and ecological concepts.

Another important similarity between this projects and my case study is the main goal which is restoring the social and cultural relation between the river and the city. The design interventions applied are very useful for me, including the creation of a greenway along the river, and a path system that links neighborhood to the greenway and the river.

3.5 The Isar Munich River Restoration Project, Munich Germany

Isar River is 270 km length. It consists of five sections: 1 Upper Isar (alpine Character), 2 Isar in Munich (urban character), 3 Middle Isar (alluvial forest), 4 Lower, and 5 Danube (Wulf& Schaufuß, 2013). Within Munich the river has been straightened and dammed. Accordingly it has lost its water quality, ecological functions, and wildlife habitats. In addition, the river suffers from interruption of physical continuity, Cut off floodplains with flood risks, disturbed interaction between river bed and surrounding landscape, and absence of access to waterline landscape (Wulf& Schaufuß, 2013). At the beginning of the year 2000 an urban river restoration project addressed a stretch of the River Isar extending over 8 kilometers in Munich. The project was completed in 2010.

Project objectives (Arzet & Joven, 2013)

- Ecological: the project was aimed at improving the ecological conditions, at restoring the permeability for aquatic animals, at creating and linking habitats for plants and animals, at increasing the residual water and at allowing and supporting the river to develop dynamically.
- Economic: the project was focused on going in for active flood protection, on securing and improving flood protection.

- Social: the project was targeted at enhancing the recreational value within and next the city and at enabling people to experience the river space.
- Planning/urbanistic: particular in the inner city area it focused on matching town and river scenery.

The master plan included the following design interventions (Arzet & Joven, 2013) (Figure 23& 24):

- Raising and reinforcement of river banks (flattening, fixing and covering with gravel)
- Removal of concrete embankments
- Widening of the river cross section from 50m up to 90m
- Increase of capacity in river runoff
- Natural river bottom rock ramps or slides with riffles and pools, instead of linear low dams
- Longitudinal river continuity to allow river organisms, e.g. fish, to swim upstream
- Establishment of typical river habitats
- Provide terraced access for the public to the river

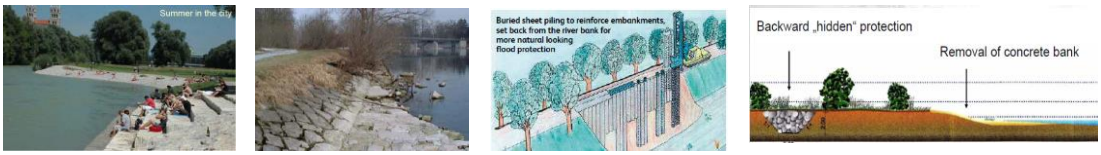


Figure23 : Isar Munich River interventions
Source: Wulf& Schaufuß, 2013

Relevance to the Abu Ali River

What are of interest to me in this project are simple ecological and urban design interventions that can improve the river's water and landscape quality , and transform the river into a recreational hub such as replacing concrete river bottom with rocks and gravel, and providing terraced access to the river.

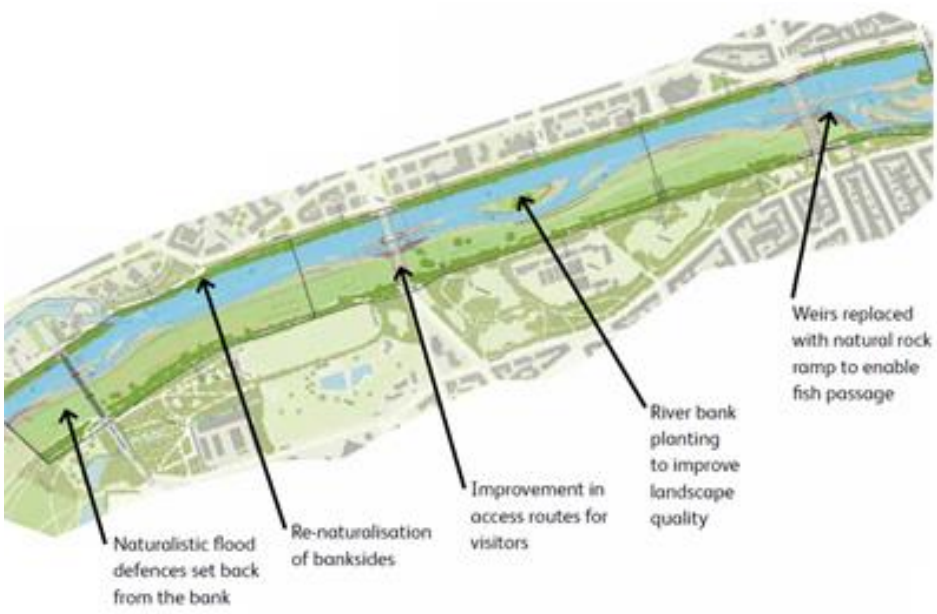


Figure24 :Isar Munich River Master Plan

Source: Wulf& Schaufuß, 2013

3.6 The Gomti River Revitalization Project, Lucknow India

The Gomti in Lucknow India River was appreciated because of its cultural value derived from architectural monuments concentrated on the southern bank as well as for its utility as a transportation artery. However, this riverfront landscape was transformed into backwaters and disappeared from the public eye over time (Nagpal,& Sinha, 2009). Its centrality as a landscape of power was lost as a result of the momentous political and economic changes, beginning with the Indian Uprising/Mutiny in 1857. A design proposal was suggested in 2009 by Swati Nagpal a & Amita Sinha to apply an urban conservation model that would revitalize the riverfront and contribute towards preserving both tangible and intangible heritage of the city.

The project visualized the river as a “heritagescape”, as a unified landscape of heritage, as opposed to de-contextualized, walled in historic monuments with their relationship to their urban context.

The projects goals and objects are (Nagpal,& Sinha, 2009):

- Develop the Gomti River as a public realm accessible to everyone.
- Restore the historic connection between the heritage buildings and the river
- Reclaim intangible heritage such as arts and crafts
- Establish economic revitalization

The proposed master plan included the following design proposals (Nagpal,& Sinha, 2009) (Figure 25&26)

- Transform vacant stretches on the floodplain to public spaces with civic functions: parks, exhibition spaces to sell traditional crafts, spaces for workshops, cultural festivals and music and dance performances.
- Redesign the riverbank as well as historic buildings grounds
- Propose an aquatic heritage trail with boat rides to the historic buildings and to new monuments and public places arrayed along its banks
- Propose steps to waterline from some buildings along the river , and design water plazas

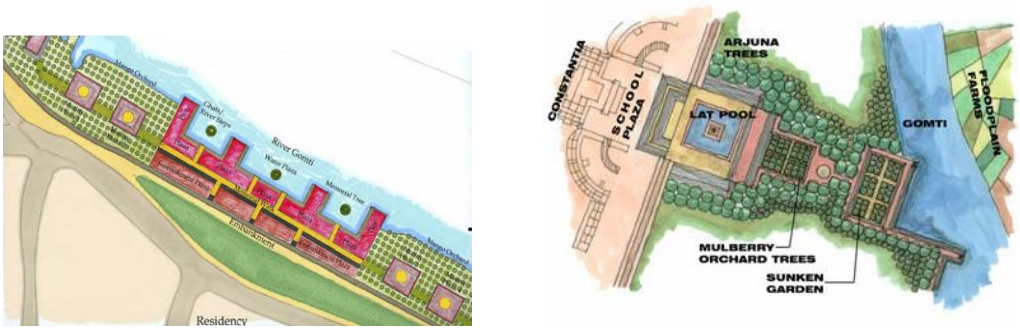


Figure25 :Gomti River punctual Interventions: water plaza and connections between the river and monuments.
Source: Nagpal & Sinha, 2009

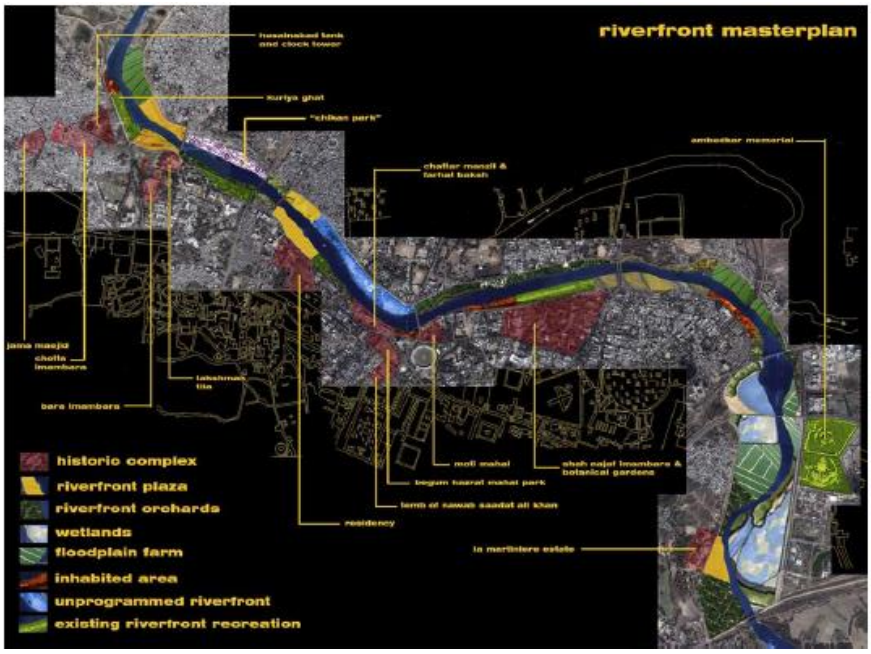


Figure26 :Gomti River proposed master plan

Source: Nagpal & Sinha, 2009

Relevance to the Abu Ali River

The Gomti River is located in a historic city, which is similar to my case study context. Moreover, the project main goal aim to achieve a high degree of physical connectivity between historic monuments and the river, and social connectivity between people and the river, and these objectives are very similar to my project goals. However, few of the design interventions are applicable in my case, including rethinking the function of the river's floodplain, and providing access to waterline.

3.7 Madrid Rio project, Manzanares River, Madrid Spain

In the 1970′s Madrid was cut off from the Manzanares River by construction of the M30 ring motorway. Madrid's "waterfront" flowed through the middle of the city, not at the edge and so Madrid lost not only its river… it was cut in two (http://www.ifhp.org). Neighborhoods once just over the river were instantly relegated to the periphery. In 2003, the section of the M-30 ring road running parallel to the

Manzanares River was moved underground and more than 10 Km long empty space along the river. In 2004, the Rio Project was launched to revitalize the river. The project was completed in 2011.

Project Goals (http://www.ifhp.org)

- Reclaim the river as a public amenity
- Reclaim road corridors along the river
- Enhance accessibility
- Provide visual and physical connectivity from the city to the river
- Enhance life quality of local residents
- Attract tourism

Urban design interventions included the (http://www.ifhp.org) (Figure 27):

- Creation of an urban park along the river above the ring road tunnel
- Creation of a green belt between the river and urbanized areas
- Construction of bridges and walkways to connect both banks of the river
- Linking of existing historic parks to new parks and sports and cultural sites

Figure27 : Madrid Rio Project master plan and design interventions

Source: http://www.ifhp.org

Relevance to the Abu Ali River

This revitalization project did not address the river's channel like most of previous examples, but has transformed the river into a green corridor through the design of an green belt between it and urbanized areas. I addressed this project because it is essential to recognize that an ecological approach to revitalizing urban rivers don't necessarily has to change the river's channel cross section to regain its original natural structure. Another important aspect is how the space above the underground ring road was rethought to create an urban park along the river.

3.8 Conclusion

The six case studies represent projects on river restoration in different urban contexts. However, the overview on how rivers are approached and on applied design strategies shows a lot of similarities:

- Rivers have cultural, ecological, and economic values.
- Rivers restoration should be applied gradually and the design strategy should provide recommendations for short and long term improvements.
- Greenways and green belts along rivers provide public spaces on one hand, and form a buffer zone between rivers and transportation arteries on the other.
- Connectivity should not only address people but also wildlife habitats.
- Safe pedestrian accessibility should be provided to enhance connectivity between cities and rivers.
- Providing access to waterline strengthen the cultural and social interaction between people and the landscape.

– Pedestrian trails between the river and other public spaces and cultural assets in the city enhance the identity of the river.

Most of the design interventions applied in the case studies will be used as design guidelines for my strategy. The following table displays the different types of interventions that will show in my strategy.

Project	Types Of Strategies and Interventions						
	Phase the project(near & long term improvement)	Divide design interventions into urban and ecological interventions	Restore the river's channel	Create a greenway along the river	Provide arterial connections from the city to the river	Provide access to waterline	Rethink land uses along the river
Los Angeles River	■		■	■	■	■	
Cheonggyecheon River	■		■	■	■		
Rouge River		■	■	■	■		
Isar Munich		■	■			■	
Gomti River						■	■
Madrird Rio				■	■		■

Table 4: Types of strategies and interventions applied in the case studies

CHAPTER 4

CASE STUDY APPLICATION

4.1 Introduction

In the previous sections I have extracted theoretical concepts from the literature review (table 2) and urban and ecological design guidelines from the analysis of different case studies (table 4). I will use these outcomes in the application of my case study. My site documentation and analysis will rely on the theoretical frame outlined in my research, and my strategy will follow the track of the case studies.

4.2 Context

Situated 85km North of Beirut along the Mediterranean coast, Tripoli is considered as the country's second capital and the most important city in its region. The city of Tripoli was built on two different sites by successive civilizations. The people of Arwad, Saida and Sour first founded Tripoli in the first millennium BC in the area of al-Mina. In 1289 the Mamluks conquered the Crusader city that was situated on the peninsula, razed it to the ground and rebuilt a new city two kilometers to the east at the foot of St. Gilles citadel and across the Abu Ali River. In addition to a distinctive cultural and historic character, Tripoli also boasts a small harbor located along al-Mina peninsula.

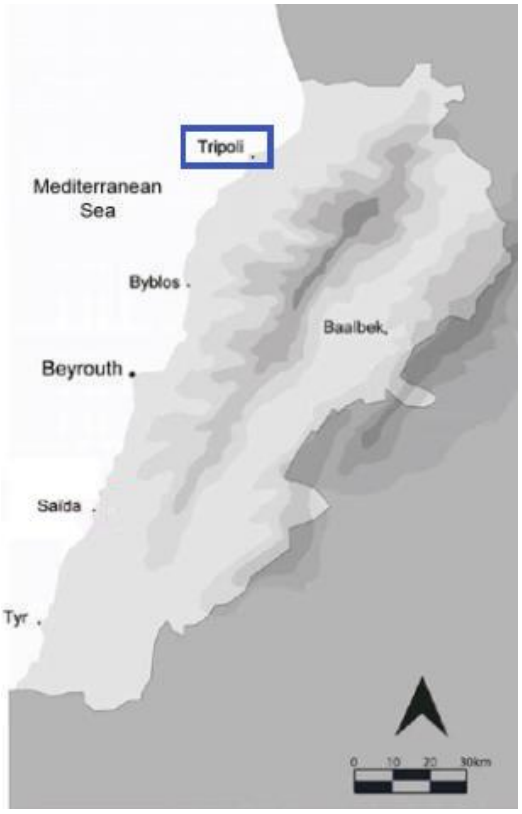


Figure28 : Tripoli in its regional context

Source: Rodier, 2005

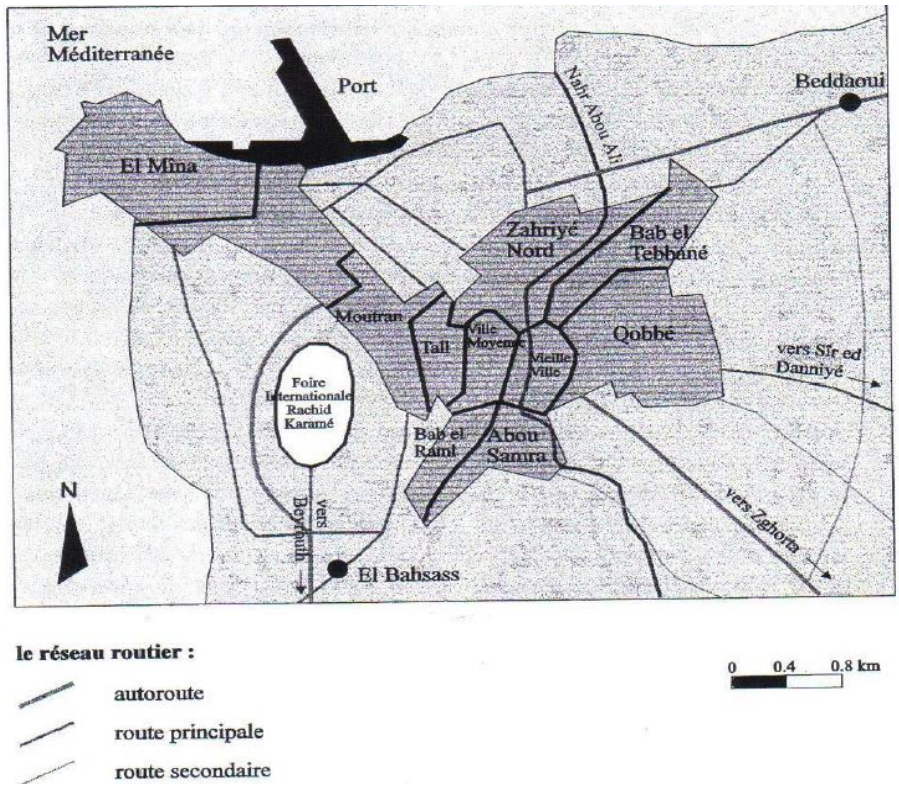


Figure29 : The districts of Tripoli

Source: Thomas, 2009

4.3 Socio-Economic characteristics

4.3.1 Living conditions in the old city and surrounding neighborhoods

The old city and surrounding neighborhoods are characterized by high population density because of the dense urban fabric and congested dwellings. Old houses have been divided into two apartments or more (Kayal, Atiyyé, 2006) with an average of seven persons per family (Thomas, 2009). These families have an income that does not exceed 400 dollars per month which means less than two dollars for a person per day, a level of resources that is below the threshold of "extreme poverty" defined for Lebanon (Laythi et al, 2008 from Thomas,2009). This Population density reaches between 260 and 500 persons/hectare in the old city and Haddadin and and raises dramatically in the areas of El Soueiqa and Tebanneh to reach occasionally between 1000 and 1400 persons/hectare (Information International, 2001, p. 82 from Thomas, 2009).

4.3.2 The problem of illiteracy

According to a study done by the Central Administration of Statistics (CAS) in 2004, North Lebanon had the highest illiteracy rate across the country with 17.1 %. The educational level is correlated to poverty. Laythi et al, in 2008, showed that households headed by individuals who have an educational level lower than primary education form 45 % of all poor. The following table shows the educational level in the old city and surrounding neighborhoods as indicated by Maha Kayal in 2007.

Educational Level	Qobbeh	Abou Samra	Old City
Illiterate	23%	20%	8%
Read and Write	3%	14%	16%
Primary education	29%	26%	34%
Secondary education	33%	23%	33%
Vocational education	2%	5%	6%
Superior education	10%	12%	3%
Total	100%	100%	100%

Table 5: Educational level in the study area

Source: Kayal,2007

4.3.3 The adoption of a "culture of poverty"

Atif Attiyeh (2006) describes the mechanisms behind the implementation of what he calls the "culture of poverty". The first is donations. Islamic law calls for donations to create balance between rich and poor people and this practice is still active especially during Ramadan period. The second mechanism is the politicians. Politicians take advantage of the absence of social and economic safety in the city and pay for the poor not to only help them but also to attract new voters. This way of distributing money for religious, political, or social reasons has a negative impact on beneficiaries .It establishes a relationship of obligation (Briquet, 1997) and a situation of dependence. Thus, some political and religious parties contribute to the establishment and reinforcement of the culture of poverty.

4.3.4 The old city and the economy of the souks

The economic activities in the Tebbaneh district are distributed to 87.2% in the commercial sector, 11.6% in the artisanal sector and 1.2% in the industrial sector, according to the Chamber of Commerce and Industry Tripoli (Thomas, 2009). However, these activities are declining over time because of the security problems. Today the area is characterized by low income, under qualification, and underemployment (Thomas, 2009).

In the old city, which concentrates a large part of economic units (especially commercial) area, 35% of heads of economic units are illiterate and 55.2% did not exceed a primary education (study by Habib Debs and Jad Tabet for CDR, 2002).Moreover, a study done in 2007 under the aegis of the Cultural Heritage and Urban Development project in Tripoli showed that only 16,4% of economic activities are related to heritage or tourism (catering, accommodation, traditional crafts…). It also showed that only 4% of customers were tourists which means that economic activity does not increase much during the high season.

4.3.5 The problem of unemployment

The old city in Tripoli suffers from a high unemployment rate comparing to poor Lebanese cities; 50% of the educated youth are unemployed and suffer from depressed economic status. (The Living Conditions in Lebanon: A comparison between 1995 and 2004, PNUD, MAS, 2007).

4.3.6 Conclusion

Given the depressed social status of most residents in the old city and most important the problem of insecurity and bad economic condition , any urban planning and design strategies could not succeed and reach its goals without reaching consensus concerning the project between all relevant local stakeholders and without their participation in the implementation of the project . Local stakeholders include local political parties, local NGOs, the municipality, institutional foundations, and the residents. This participatory approach that explores ways for integrating urban form with active living is paramount for the success of an urban development project. Therefore, after analyzing the different typological and morphological characteristics of the city and proposing an urban design strategy it is very important to provide an implementation strategy.

4.4 Historical Overview

In the theoretical frame I have emphasized on the issue of time, and on how cities should be conceived as process. Therefore, before starting to document and analyze the current different morphological and typological characteristics of the site I will review the history of urbanization in the historic core of Tripoli.

In the last four decades, The Abu Ali River in Tripoli has experienced changes in its structure and function. Changes did not only affect its ecological role but also its relation to the city and the people. The river has been transformed through time from an ecological corridor that flows through the city providing it with public amenities and valuable water resource into an infrastructural break that harms the environmental

conditions of the city and divides the quarters from each other. The historic core had a fine urban grain composed of many small sized street blocks characterized by an organic grid; their layouts appeared to have been generated naturally rather than being consciously manmade. this “deformed” (Moudon,2003) layout of the city worked in complete harmony with the natural organic flow of the river as if the latter is part of the city’s street pattern forming a high degree of connectivity between the urban and natural environment . However, twentieth century roads have cut through the urban fabric and have harmed the river leaving fragmented townscapes and isolating the river from communities.

In this section I will develop a historical overview to Tripoli that investigates patterns of urban development and processes of change that occurred over time in the morphology of the historic core and its landscape structure. The morphology of the city will be seen in terms of several key elements: land uses, buildings structures, and street pattern (Conzen, 1960). The intention is to be able by the end of this investigation to display how the spatial relationship between the river and the built fabric has changed over time, and how the social and cultural relation between the river and the residents has correspondingly transformed. Accordingly, this analysis will cover the Mamluk (1289-1516), Ottoman (1516-1918), French (1918- 1946), and independence periods.

The city of Tripoli was built on two different sites by successive civilizations. The people of Arwad, Saida and Sour first founded Tripoli in the first millennium BC in the area of al-Mina (The port). In 1289 the Mamluks conquered the Crusader city that was situated on the peninsula, razed it to the ground and rebuilt a new city two kilometers to the east.

4.4.1 Mamluk Tripoli (1289-1516)

During the Mamluk period, the city was transferred inland around the castle of Saint-Gilles at the foot of Mount Peregrinus and along the banks of Abu Ali River for protection against the crusaders. Even though defense was the main reason behind the relocation of the city (Tadmori, 1981), the Abu Ali River was the dynamic and the heart of the new settlement. The party wall map (Figure 30) shows how most of the buildings are directed toward the river. A party wall map is a map that shows nodes of attraction in the city through drawing only one façade of each building. The chosen façade should have the same orientation in all the buildings. This illustration was first developed by Professor Omar Aziz Hallaj while developing a project in Aleppo.

Economy:

Tripoli became a major trading port of Syria supplying Europe with candy, loaf and powdered sugar. The main products from agriculture and small industry included citrus fruits, olive oil, soap, and textiles (cotton and silk, especially velvet). The Mamluks supplied the agricultural fields and the urbanized area with water from the Abu Ali River, thus the river was an important ecological corridor creating economic value and growth.

Urban Form

The urban form of Mamluk Tripoli was dictated mainly by climate, site configuration, defense, and urban aesthetics (Jidejian, 1986). The layout of major streets was set according to prevailing winds and topography. The city's urban form was characterized by an organic grid with fine grain plot pattern in addition to narrow and winding streets, and heavy building construction. Mosques evenly spread with

major concentration of madrasas around the Grand Mosque . All khans were located in the northern part of the city for easy accessibility from roads to Syria. Hammams (public baths) were carefully located to serve major population concentrations: one next to the Grand Mosque, the other in the center of the commercial district, and the third in the right-bank settlement (Tadmori, 1981). Since the city was built along the river two bridges were constructed to link the two sides of the city. Moreover, several windmills were built in the middle and along the river's edge (Tadmori, 1981).

Figure30 : Tripoli's party wall map

Urban Growth

Mamluk Tripoli witnessed a high rate of urban growth and a fast city development. Poles of Urban development included al kobba, Abu Ali River Banks, the fortress, and the orchards in the flat plains to the west, north and south. The city had no fortifications but several gates: Al Hadid to the east, Al Tabaneh to the north east, al Haddadin to the west, Al Ramel, and al tal. Tripoli did not extend beyond its gates until the late ottoman period.

4.4.2 Ottoman Tripoli (1516-1918)

Tripoli was one of three major administrative districts during the early Ottoman period. It linked the entire coastal strip from Byblos to Tartus and the provincial towns of Homs and Hama. During this period, the city witnessed an economic hegemony instead of being dictated mainly by defense, kept its historical core and developed (Figure 31).

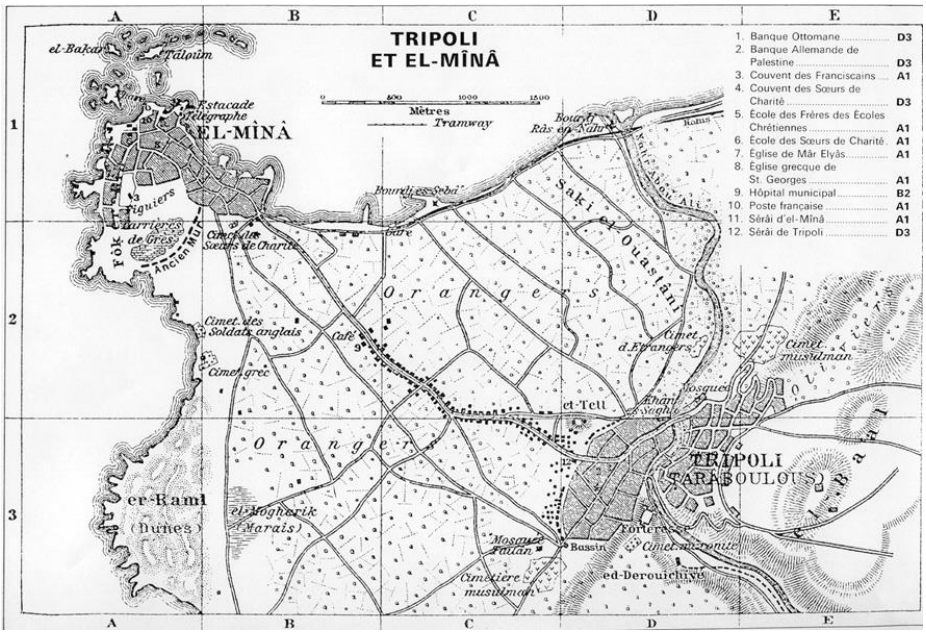


Figure31 :1906 map of Tripoli and El Mina

Source: Baedeker, 1906

Economy

Until 1612, Tripoli was considered as the port of Aleppo. It also depended on Syrian interior trade and tax collection from mountainous hinterland. Tripoli witnessed a strong presence of French merchants during the 17th and 18th centuries and became under intense inter-European competition for trade (Tadmori, 1981). From the late nineteenth century until the end of the Ottoman era Tripoli played a very important role in the country's economy, even greater than Beirut. The economy of the city was mainly based on the trade sectors, particularly on agricultural products from the citrus and olive fields**,** therefore the river kept its status as a major element in the economic development of the city.

Urban Form

Early Ottoman Tripoli witnessed the development of the southern entrance of the city (al-Muallaq Mosque and Hammam al-Jadid). Khan al-Saboun (originally a military barrack) was constructed in the center of the city to control any uprising. The new settlements outside the city gate introduced to the city new typologies of buildings, street patterns, and public spaces. Buildings became elements within urban spaces instead of being elements defining the urban space. The city witnessed the construction of the first tram around 1881, which was pulled by horses (MoPWT & DGUP ,2001), and of new roads that connect the two cities of Tripoli and El-Mina. Moreover, the ottomans introduced the first public garden in Tripoli (Al Mashiya) in Al Tal quarter .

Urban Sprawl

The Ottomans started to be more interested in the western world in the second half of the nineteen century and they were fascinated by the western products and wanted to have trade with Europe, mainly via Tripoli. This was the beginning of the city's urban development westwards towards the harbour city of El- Mina and the residents of the city, especially the Christian residents started to be interested in moving out of the old city (Kayal and Attieh 2001). The reason behind the construction of new roads and the tram is the interest of Ottomans in expanding the development beyond the old city wall and in connecting Tripoli and El-Mina for trade purposes. At the beginning of the twentieth century the railway to Syria was ready, too. This step gave the reason for the Tripolitan investors to start constructing new buildings along the two sides of the new main street.

During the Mamluk period, the river was the vital artery of the city. However, during the Ottoman period transportation arteries became the drivers of development.

4.4.3 French mandate

In 1921 the French founded Great Lebanon, including Tripoli as the capital of the North Lebanon Province and Beirut as the capital of the country. This decision was firmly rejected by the Tripolitans and a revolution against this decision took place, particularly because they knew that with such decision the important role would be given for Beirut (Danawoui 1998, DGUP 2001, Gulick 1967, Kayal and Aatieh 2001).

Economy

The economy of Tripoli declined until 1930 when for the first time electric power supply reached the city, which was the first step in the industrialization of the city. The most important phenomenon of that time was that the crafts industry grew very strongly between 1931 and 1937 “while workers in Tripoli’s old-style workshops were almost three times the number they had been in 1931” (Gulick , 1967). Several other industries such as the cotton industry, “Arida”, were opened at the southwest part of the city and the founding of the Iraq Oil Refinery at the northern entrance of the city of El Bedaoui played an important role in the economy of the city at that time (Kayal and Aatieh 2001). At that time Tripoli was helped by the first drinking water supply and water tanks were constructed serving mainly the old city. In 1940 the railway between Tripoli and Beirut was completed. The last important economic boom in the area of Tripoli was during the late 1940ies when the campaign against the establishing of the Israeli state on Palestinian territory started. That had a positive effect on Tripoli’s economic growth because the Iraq Petroleum Company (IPC) refinery in Haifa had to close and to be moved to Tripoli. That gave Tripoli’s economy a great chance, especially in that IPC moved all the staff, who were mainly English, from Haifa to Tripoli, and indeed Palestinians, who mostly stayed afterwards in Tripoli (Kayal and Aatieh 2001). The same period saw the establishment of the first industrial zone in Tripoli, the Bahsas Industrial Zone at the southern entrance of the city. The situation did not hold for long because of the civil war that affected the economy greatly.

Urban Sprawl

The construction of the first road between the citadel and el mina and of the roads that connected Tripoli and Beirut with railways to the Syrian border in the

1930ies played a major role in defining the pattern of urban growth. The city continued to grow mainly around the old city and the two roads Beirut-Tripoli-Homos and from the historic core to El- Mina(Figures 32&33) and again the civil war affected the situation, so the city has grown without control (Kayal & Atieh, 2001). When the French defeated the Ottomans and became the rulers of the area, they built new residential areas and especially several schools on the periphery of the old Mamluk city of Tripoli. The development of Tripoli continued around the old city until the 1947 master plan developed by the French Planner Eglie.

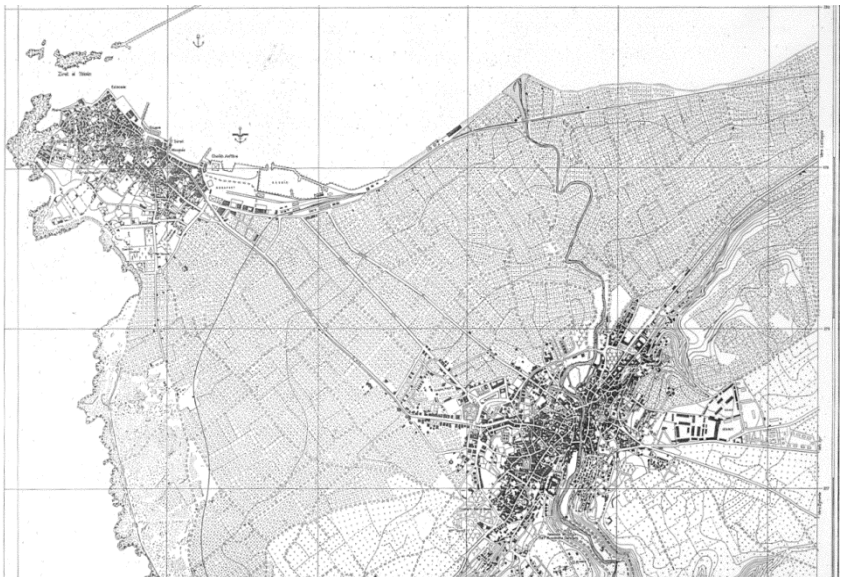


Figure32 : 1925 map of Tripoli and El Minal

Source: Archival documents at the Council of Development and Reconstruction

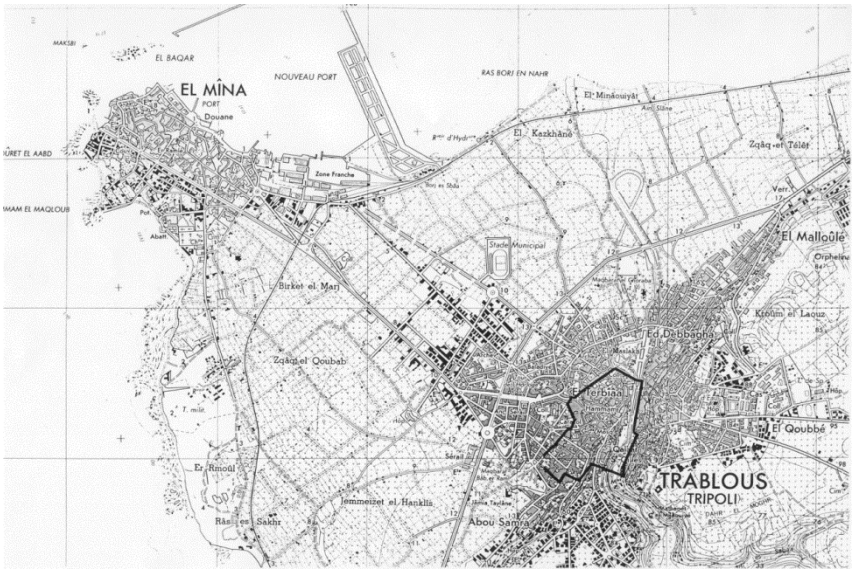


Figure33 : 1963 map of Tripoli and El Mina

Source : Archival documents at the Council of Development and Reconstruction

Urban Form

Urban planning in the Mandate era added to the city a modernist planning rational. The modern parts of the city stretching from the medieval center down to the Mina region followed a Haussmanian type model of grand boulevards, roundabouts and open spaces that allowed for maximum surveillance and control. As most of the Lebanese cities, the prototype of place de l'etoile (Sahet al Nejmeh) was replicated near the historic core. The new types of roads and buildings constructed around the old city changed the character of the city. The city's urban form was characterized with a fine grain structure in the Mamluk core and a coarse grain with large blocks and free standing buildings in the new extensions.

4.4.4 Independence

Economy

By the 1970ies the city had developed from an agricultural and harbour town into a city dominated by industry and commerce. With the beginning of the civil war

in 1975, in Lebanon the City of Tripoli like as in the whole economic sectors of the country was hardly affected.

Urban Development

After the announcement of the Lebanese State different urban development projects were applied in Tripoli. I will review the master and zoning plans from 1947 until today to capture the effect urban design and planning projects on changing the morphology of the historic core, the structure of the Abu Ali River, land uses in the city and along the river, then to conclude how these changes affect the spatial relationship between the river and the city.

4.4.4.1 Tripoli's 1947 Master Plan

After independence from the French in 1943, the Lebanese Government developed the first Master Plan for Tripoli in 1947 that was limited to the cities of Tripoli and El-Mina. El-Mina was planned to expand to the south and to the beach area in the south-west from one side and to meet Tripoli in the middle around the main road connecting the El-Mina and Tripoli city Centre. Tripoli was planned to extend mainly around the old city to the plateau and around the Crusader castle and Abu-Ali River. This shows a clear interest of the planner in concentrating on the industrial areas and their distribution around the city. According to the plan the Abu Ali River can be divided into three sections to analyze the proposed land uses along its edges (Figre 34). In the north (S1) two industrial zones were proposed along the coast and the agricultural fields along the river's edge were maintained. Section 2(S2) consists of the urban riverfront and it remained active and vital as an economic center. In the south (S3) began the appearance of industrial land uses along the river. However, a green belt separated the industrial zones from the river's floodplain. The

1947 master plan kept most of the agricultural fields along the river but it introduced an industrial riverfront in the south.

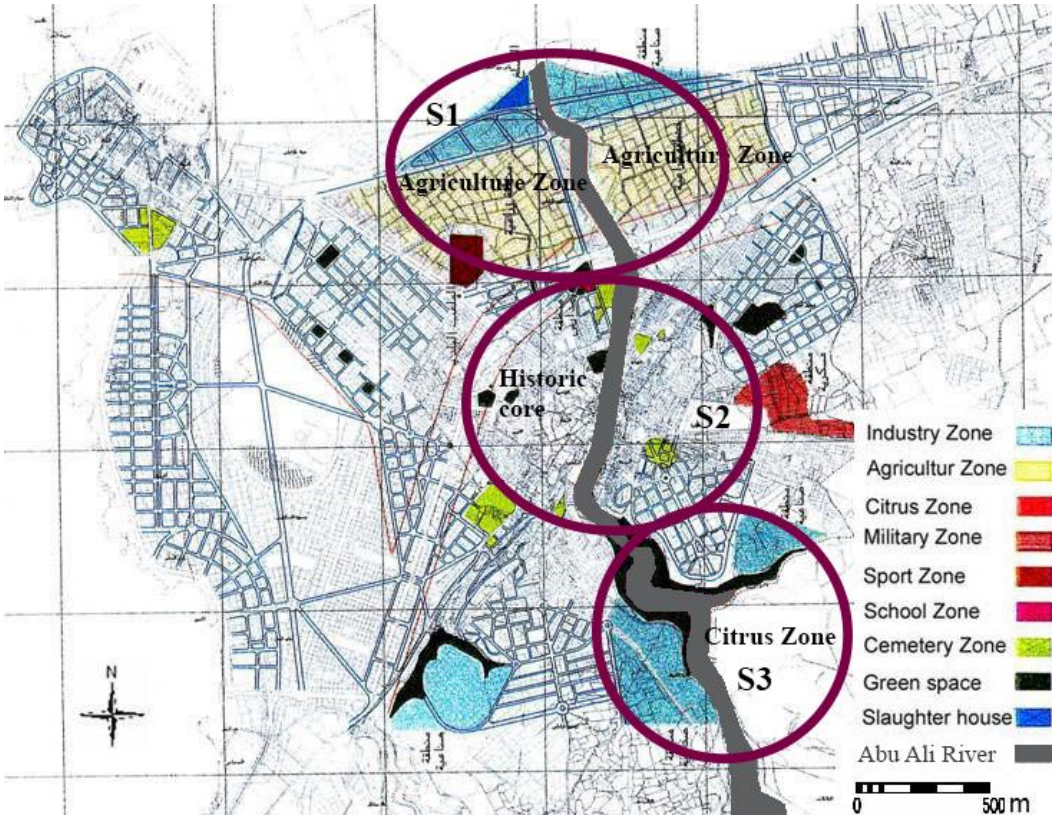


Figure 34 : Land uses along the Abu Ali River according to the 1947 master plan.

Prepared by the author based on the 1947 master plan developed by Eglie

4.4.4.2 Tripoli's 1964 Master Plan

The two Lebanese architects and planners Henri Edde and Georges Doumani were asked by the Ministry of Public Works and Transports (MoPWT) and the Directorate General Of Urban Planning (DGUP) to prepare a new Master Plan for the City of Tripoli and El-Mina in 1964. The proposed Master Plan of Edde and Doumani (Figure 34) faced great pressure from the local authorities, who were mainly political stakeholders, and also from the major land owners, who could influence the political leaders in the area of Tripoli (Doumani ,2005). The concept of Edde and Doumani, which was based on the 1947 Master Plan, was to reclassify the residential area and to remove the different Industrial zones from the high plain area to an area at the southern entrance to the city. This area is called El-Bahsas Industrial Area. Other major components of the plan were that the industrial area on the northern coast should be extended to the Iraq Petroleum Company harbor. The citrus fields on the low plain in the north were kept, but the proposal added the southern agricultural area which was to be almost all the lower plain area as a protected agriculture zone. This proposal protected the river from urbanization and industrial land uses along its edges (Figure 35). However, the master plan was not applied because it did not meet the interests of the landowners and the political stakeholders.

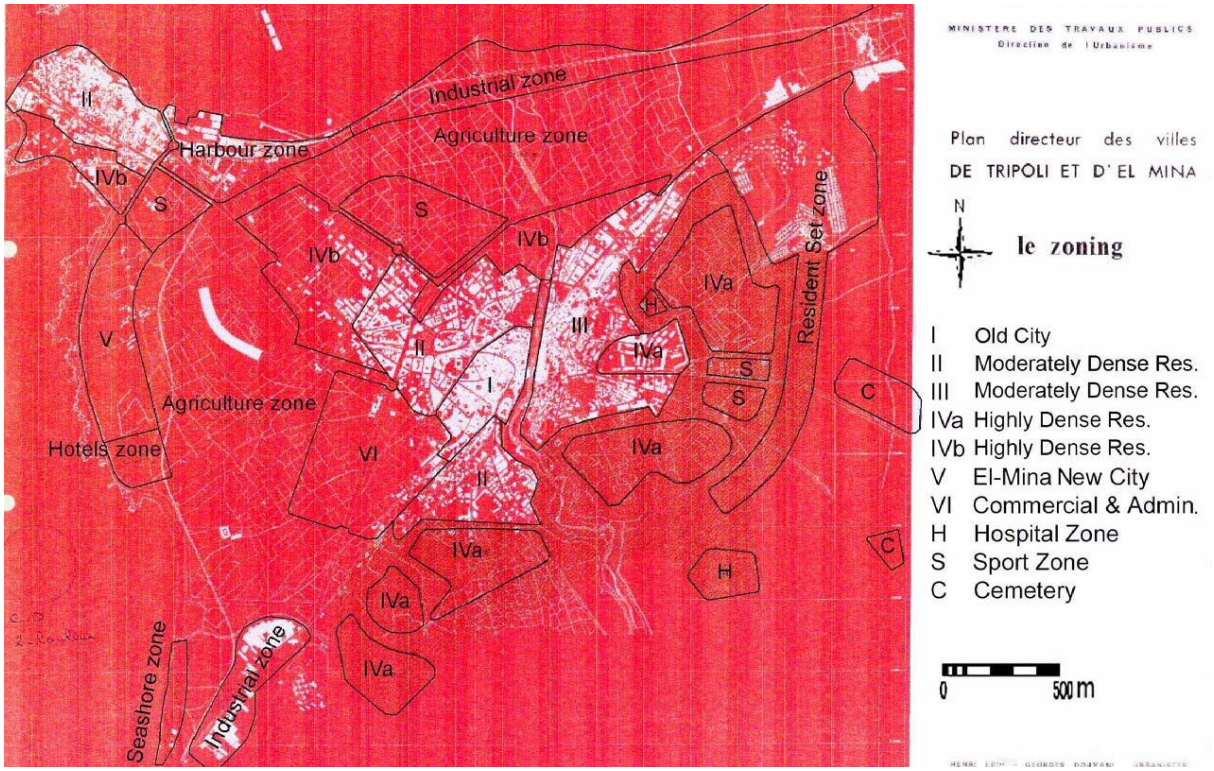


Figure35 : Tripoli's 1964 master plan

Source: Edde and Doumani, 1964.

4.4.4.3 The Reconstruction of the Abu Ali River Bed

After the flood of the Abu Ali River in 1955, by the end of 1968, the downstream river course was straightened to reduce the risk of flooding and an artificial, near rectangular concrete channel was constructed with vertical lateral retaining walls (»5 m high) and it was surrounded by 24 m wide avenue at each side. These avenues have been rapidly transformed to major circulation axis linking Zgharta to the east of Tripoli. The channel has a total length of approximately 3 km and its width varies between 24 and 29 m (CES, 1998). The channel capacity was designed for flows of 1,500 $m^3 s^{-1}$, which allows for the safe routing of a 1,000 year flood event in combination with the upstream retention basin (CES, 1998). Around 2,000 homes were demolished so as to re-align the riverbed with reinforced concrete (Nahas, 1996) .

Channelization of the River was intended to provide armor against the floods, but while limiting the potential for damage outside the channel, it also ended up harming the river and the city. By taking the River's water away from the City, wetlands and other habitats were dried up and the River's ecological functions were lost (CES, 1998). Moreover, physically, it divided the neighborhoods from each other by splitting the city in two parts (Nahas, 1996) and isolated the river from residents since it lost its function as a public amenity and ecological corridor.

Figure36 : The street pattern of the old city before the channelization of the riverbed

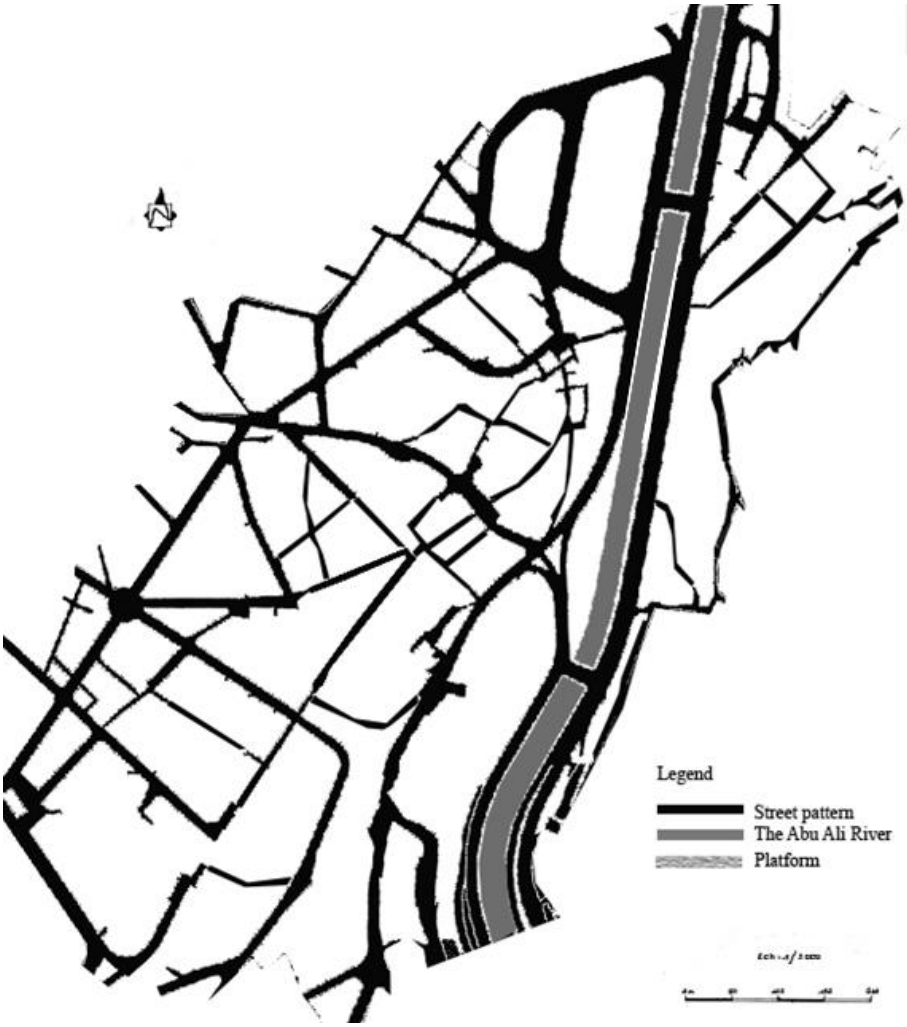


Figure37 : The street pattern of the old city after the channelization of the riverbed

4.4.4.4 Tripoli's 1971 Master Plan

On 14 September 1971 The Lebanese Government decided on a Master Plan proposal from the DGUP which is very different from the 1964 Master Plan proposal. The new proposal opened all of the plain area for urban expansion, which meant that the two agricultural zones of the 1964 proposal were removed and no agricultural zone was mentioned at all.

The 1971 Master Plan presents six main classes (Figure 38):

1. The old city Zone A and A1

2. The residential zone around the old city was divided into three sub-areas B1,

B2 and B3

3. The residential zone, including the newly-developed area of Tripoli and the area under development, was divided into four sub-areas C1, C2, C2.1 and C3

4. Future expansion with three different sub-areas D1, D2 and D3

5. The recreational zone included two classes E1 as a coastal area and E2 as a tourist area including aspects like beaches and hotel construction

6. The Industrial zone was divided into three areas the old industrial areas: the southern entrance of the city, around the harbour area and a third area from the northern entrance to the city to the Mediterranean coast.

What are of interest in this master plan are the proposed interventions in the

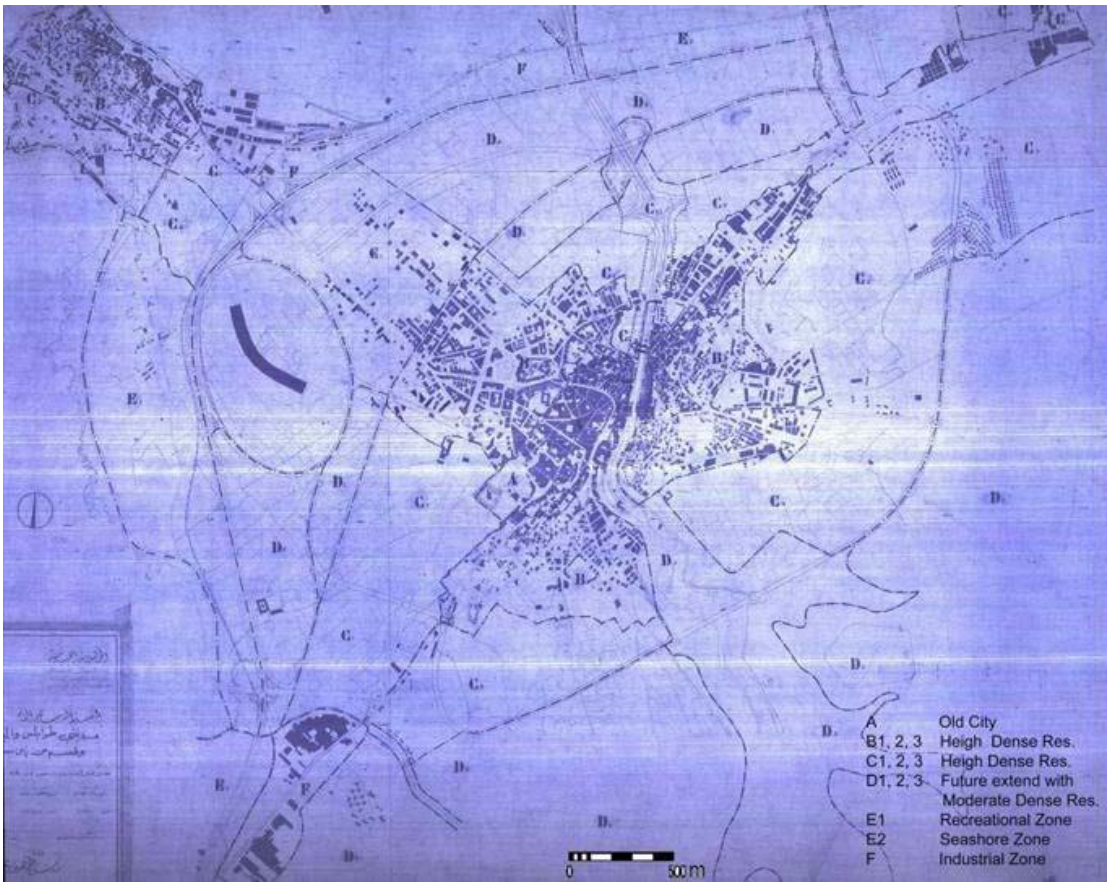


Figure38 : Tripoli's 1971 master plan

Source: Directorate General of Urban Planning

historic core. To make way for two major arteries following the 1971 master plan, two souks (al-Nahasin or coppersmiths and al-Kendarjiyeh or shoemakers) were demolished. Physically, these changes carved up the city into four small islets and changed the character of the historic core (Figure 39). The first is the Bab al-Haddadin. The second is Muhaitra, the area of most interest to local historians due to the high proportion of listed monuments. Adjacent to Muhaitra is the al-Tarbiaa, in the Bab al-Hadid quarter, which lost much of its original character in the constructions mandated by the 1971 master plan.

This zone functions today as the industrial sector of the city, where the majority of furniture making enterprises and galleries prevail. It is also the commercial extension of the adjacent Rummaneh quarter. On the other bank of the river is the al-Souaika

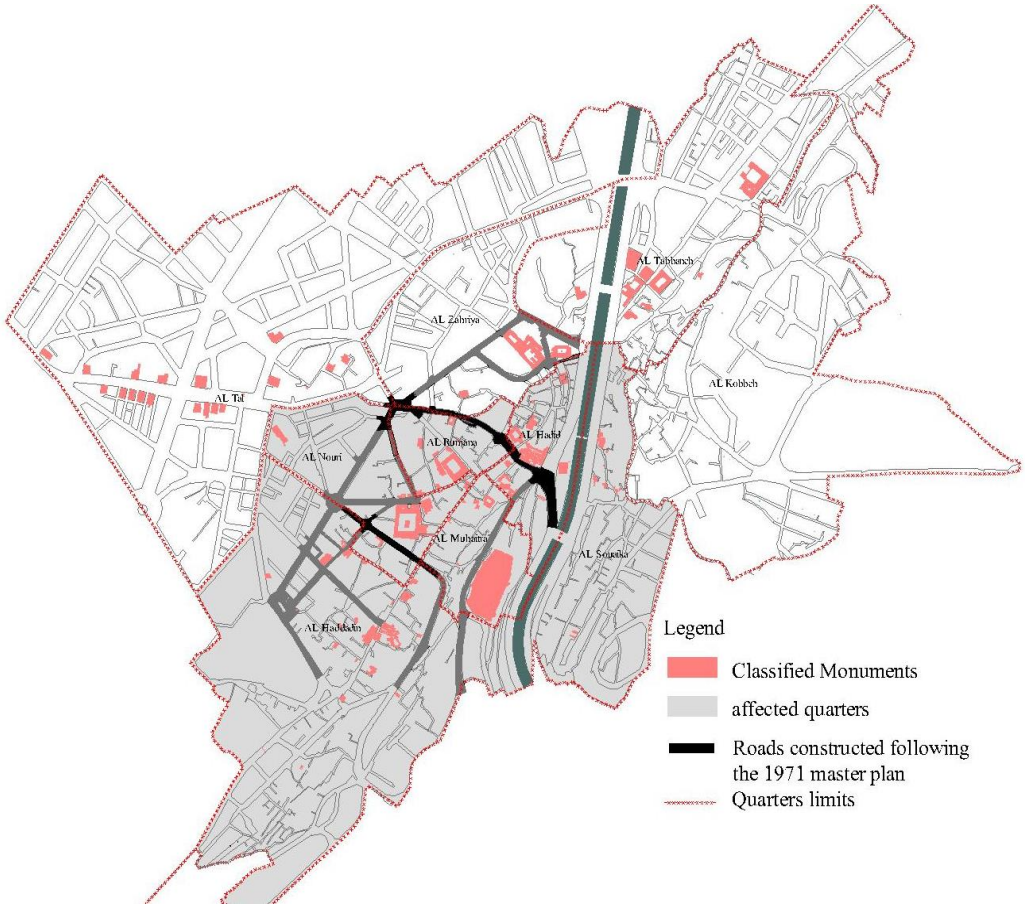


Figure39 : The 1971 master plan carved up the historic core into four small islets.

quarter, historically an extension of the Mamluk city. Constructed on the edge of the hillside, and primarily residential in character, access to this zone is limited to steep staircases. Large sections of al-Souaika were demolished during the enlargement of the riverbed.

4.4.4.5 The outbreak of the civil war (1975-1990)

During the civil war, the sidewalks of the two avenues built on each side of the canalized Abu Ali River in 1968 were squatted by vegetables and fruits vendors (Tadmori, personal interview, 2013). The informal vendors claimed the public space, affected traffic circulation, and increased the pollution of the Abu Ali River because they used it as garbage dump (Tadmori, personal interview, 2013). These facts increased the damage of the river and transformed it from a public recreational space for residents to interact with each other and their natural environment to a space that is isolated from most communities.

4.4.4.6 Tripoli's Cultural Heritage and Urban Development Project

The Tripoli cultural heritage and urban development project is part of the Lebanon-cultural heritage and urban development project that has two key development objectives. The first is to create conditions for local economic development and enhance the quality of life in the historic centers of five main secondary cities (Baalbek, Byblos, Saida, Tripoli, and cities Tyre) which still show serious effects of damage, decay, poverty and economic stagnation resulting from the civil war. The second is to improve the conservation and management of Lebanon's built cultural heritage (World Bank & CDR. Project Appraisal Document.March 24, 2003.PDF file).

Profiling Tripoli's Cultural Heritage and Urban Development Project

Stakeholders

The Government of Lebanon requested assistance from the World Bank to scale up dispersed urban heritage rehabilitation efforts to a national level by assisting major secondary cities, and leveraging investment and technical assistance from other donors and United Nations, Educational Scientific and Cultural Organization (UNESCO). The project is funded by the World Bank, and Agence Francaise de Developpement (AFD).The main institutions involved in the project implementation are (a) the Council for Development and Reconstruction (CDR). CDR is a public authority established to be the Government's arm for planning and implementing projects for economic development and for rehabilitation and reconstruction of public infrastructure;(b) the municipalities have an important role to play, small municipal implementation units in the five cities coordinate local initiatives, participate in and serve as a bridge between the public and the project ;(c) Directorate General of Antiquities (DGA); (d) Directorate General of Urban Planning of the Ministry of Public Works (DGU) . In Tipoli the planners are Mr Mosbah Rajab, Mr Jad Tabet, and Mr Habib Debes.

Planning Process

The Tripoli cultural heritage and urban development project came to intervene in the historical core of Tripoli (Refer to map 2). The CDR wanted to offer the inhabitants opportunities for local economic development through investing in the built cultural heritage. It set the objectives of the project with interventions that have direct impact on the city. These objectives included (a) Providing better access to the old city; (b) Upgrading public spaces of great value and improving pedestrian qualities; (c) Restoring some key monuments to become magnets and anchors for a

new set of cultural and community activities; and (d) Encouraging the owners to maintain the historical buildings to regain value, and attract private investments for their rehabilitation (Itani, personal interview, 2011).

Before developing the master plan and proposing the interventions, different studies were conducted by specialists to cover the different aspects of the old city and get a broader knowledge of its economic, environmental, and social structure. Dr. Motassem Fadel conducted the environmental studies, Dr. Maha Yahya conducted the stakeholder analysis, Mr. Jad Tabet , Mr. Habib Debs, and Mr Kamal Hamdane conducted the social studies. After gathering the different data the team of planners realized that to achieve an efficient urban development two major problems should be resolved first and should be given priority. The first is the disconnection of Bab El Tebbaneh neighborhood from the rest of the historic city. The second is the bad living conditions of Khan Al Askar residents (Rajab, personal interview, 2011).
Accordingly the planners specified their goals concerning every problem depicted within the old city (Table 6) then set up a working strategy that included several inter-related interventions.

PROBLEMS	CONSEQUENCES	OBJECTIVES/GOALS
Khan Al Askar residents are living in poor conditions	Investing in cultural heritage will not be enough to improve the living conditions of these residents.	Their case should be given priority during the planning process.
The disconnection of Tabaneh district from the rest of the city due to the river construction after the 1955 flood.	Tabaneh district have become unsafe.	Bab El Tabaneh neighborhood needs to be reconnected with the rest of the historic city.
Vegetables and fruits vendors are squatting the public space along the river.	Vendors are causing high traffic congestion and affecting the surrounding buildings	Vendors' stands should be relocated.
The inhabitants of the historic city suffer from a depressed micro-economy, lack of social services, and general neglect by public institutions.	The physical condition of private properties and, monuments is declining over time. Moreover, the environmental condition of the city is deteriorating.	Inhabitants should be offered opportunities of local economic development and a better quality of urban life
The historic city center is suffering from both lack of public spaces and pedestrian and vehicular accessibility difficulties.	This fact prevents people from visiting the city.	Better access to the old city must be provided.

Table 6: CHUD Project goals

Project Components

Different design interventions were proposed in the master plan. However, not all were implemented since the project was interrupted several times because of security issues mainly the battles between Tebbaneh and Jabal Mohsen, and conflicts

between the different stakeholders in the city. In general the project proposal aimed to pedestrianize most of the streets in the historic core, provide different open spaces along the Abu Ali River, provide parking solutions, and rehabilitate some of the historic monuments and deteriorated facades in the old souqs .The following describes the different interventions proposed as well as applied.

Bab El Tebbaneh, fresh produce market

The Eastern side of the historical city has degraded due to the encroachment of modem high-rise apartment blocks and the poverty of the Bab El Tebbaneh neighborhood. The vegetable and fruit market that caters to the population of this area has spilled over on the riverside boulevard causing significant traffic congestion on a main through-traffic artery. Accordingly, a large pedestrian platform was built over the Abu Ali River to host the market (Figure 40).

Bortassi Square

To revive the historical spatial relation between the Bortassi mosque and the Abu Ali River a public open space was designed near the mosque with terraces going down till the river bed (Figure 40).

River-side circulation, parking solutions and landscaping

The project proposed the renovation of the Western river-side Corniche Rachid Karame up to the Al Bourtassi Square with the introduction of sidewalks, the planting of trees, the narrowing of the carriageway and the creation of parking areas on either side. It also proposed the diversion of through-traffic to the Eastern river-side so as to relieve congestion in the historic city. The dead-end street below the Citadel was planned to lead to a parking area, and a landscape proposal was designed for the Maoulawiya Park for the benefit of the local residents (Figure 40).

Figure40 : Open spaces strategy applied by the CHUD project along the river (a) Market place on the platform over the river, with kiosks, and palm trees; (b) Landscaping of the promenade along the river banks; (d) Bortassi garden with terraces going down till the river bed.

Source: Tabet and Debes, 2002

Resettlement housing

To accommodate the families and activities that are currently occupying Khan el Askar, alternative housing was built with municipal financing on nearby public land, and municipal retail spaces were allocated accordingly in neighboring areas. The first phase entailed the provision of 27 apartments and of 28 commercial units, and the second phase included 28 apartments and 3 commercial spaces (Figure 41).

Figure41 : Khan el Askar resettlement housing

Source: Tabet and Debes , 2002

Northern neighborhood, Khan el Askar, public space and street frontage

The project proposed the rehabilitation of Khan el Askar to house the Lebanese University Center for Restoration and Conservation of Monuments and Historic Sites, the Municipality's technical office for rehabilitation of the historic city, and other cultural, educational and community facilities. The square between the Khan and the Al-Taweb Mosque was proposed to become fully pedestrian and to connect it to the

entry to the main Souq Al Bazerkan. The proposal included the upgrading an landscaping of The Western intersection between Abdel Hamnid Karame and the Souq al Najjarine, providing access to the historic city. And the pedestrianization of Souq al Najjarine leading to the Al Bourtassia Mosque Square, and the provision of a drop-off round-about in front of Khan el Masriyyin (Figure 42).

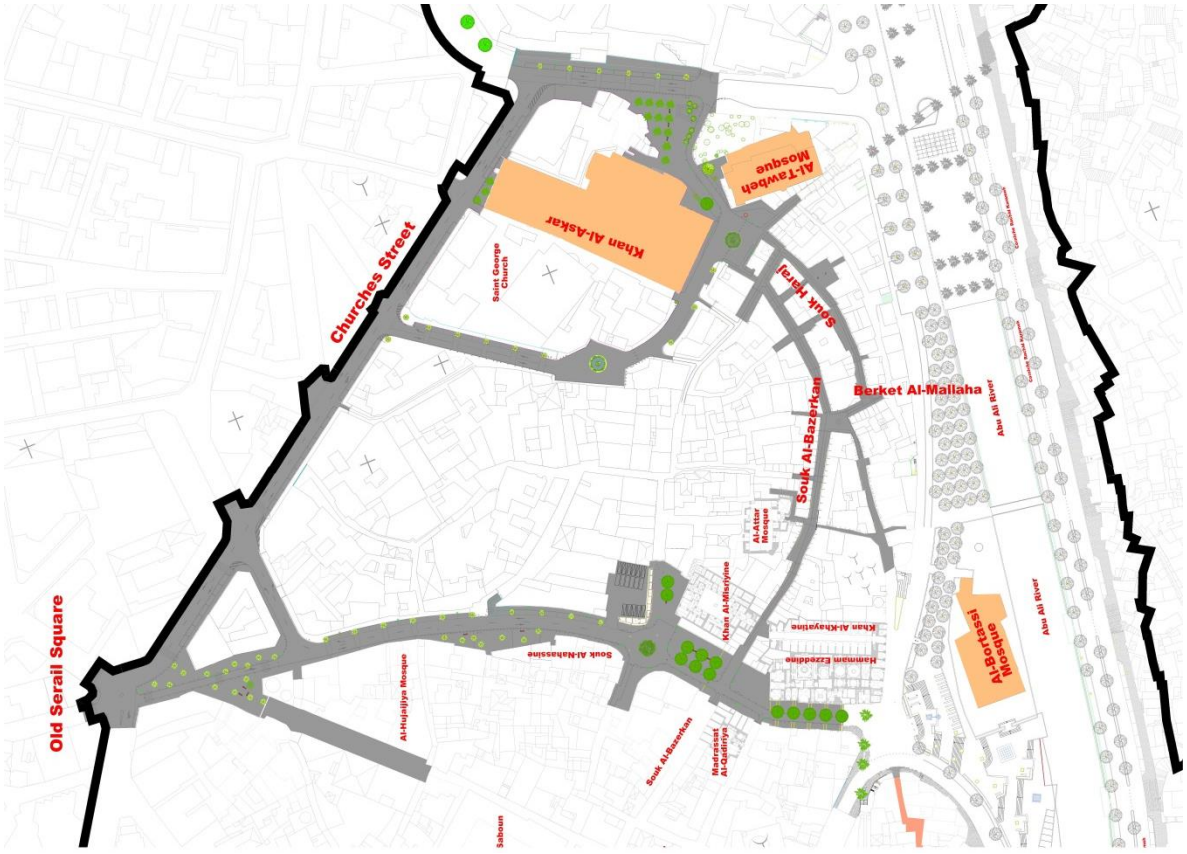


Figure42 : Restoration works proposed by the CHUD Project.

Source: Tabet and Debes , 2002

Central neighborhood, Hammam ElNouri, public space and street frontage

In the central neighborhood the spine of the Souq Al Attarine up to Tallaat Rifayia St. and some adjacent pedestrian streets would be rehabilitated with improvements to the public space. El Nejmeh Sq., another important access to the historical city would be upgraded and landscaped, as well as the vehicular street

leading to the Great Mosque. The Hammam al Nouri situated next to the Great Mosque and belonging to the Waqf, will also be restored and become a museum of traditional religious and historical manuscripts and calligraphy (Figure 43).

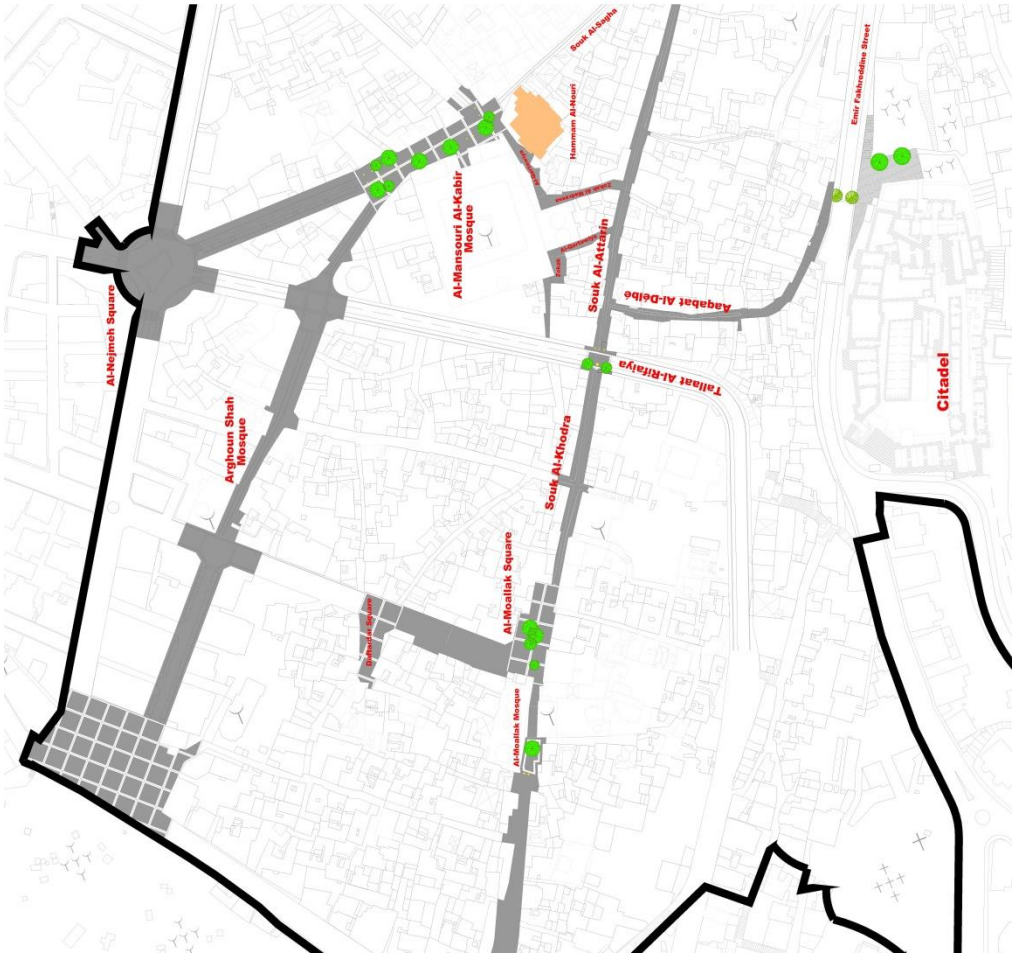


Figure43 : Restoration of facades and public spaces in the central part of the Souks

Source: Tabet and Debes , 2002

Archaeological site of the St. Gilles Citadel (Figure 44)

The Citadel is the most visible and well-known monument in Tripoli, and the main attraction for the visitors to the historic city. A number of conservation measures will be carried out on the Citadel's medieval structures and surfaces, and site accessibility

and safety of visitors will be improved with the introduction of hand-rails, signage and other devices. In addition, a central area within the Citadel that has already been partially renovated will be fully equipped in order to become the Tripoli Museum, that will contain local antiquities, panels and artifacts pertaining to the history of the city and of the Citadel itself.

Circulation and landscaping around the St. Gilles Citadel (Fig 44)

Emir Fakhreddine St. running Parallel to the Citadel will become one-way in the direction of the bridge and Al Bourtassi Sq., its carriageway will be reduced, sidewalks and street furniture will be introduced. A bus stop will be created on Emir Fakhreddine St. opposite the Citadel to enable the drop-off of tourists. New pedestrian alleyways and stairs will be built or upgraded to enable visitors and residents to reach the parking and the Maoulawiya Park.

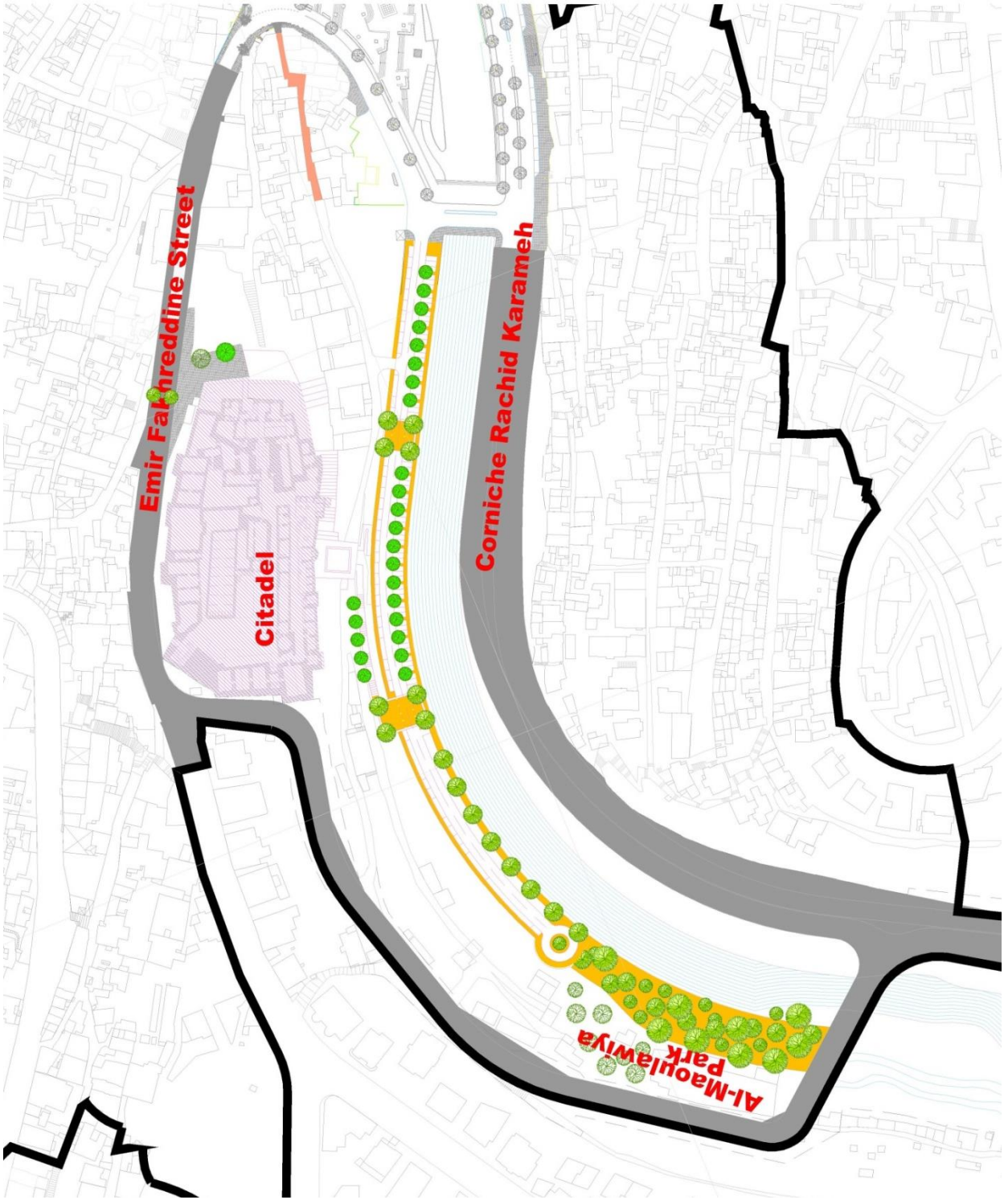


Figure44 : Circulation and landscaping around the St.Gilles Citadel

Source: Tabet and Debes , 2002

The CHUD project addressed the built heritage and prioritized public spaces, parking, and facades. In my project I would like to add another layer to cultural heritage works and complement the CHUD project by addressing the Abu Ali River as an additional main asset of cultural heritage and revise some of the applied as well as proposed interventions along the river.

4.5 Assessment

Going through the different periods of the city, and detecting the different projects and master plans applied in the city clarified the processes of change in the historic core and the Abu Ali River and the impact of these changes on typologies of connections between the river and the city fabric, and on the cultural relation between the river and the residents.

What had major impacts on the river's edge are mainly the infrastructural projects applied in the early twentieth century. Pedestrian connections have been replaces by through traffic arteries and the river corridor has been transformed from a public space for cultural interaction with the natural environment into an infrastructural corridor (Figure 45).This infrastructural corridor has been transformed during the civil war by informal street vendors into a market hub. However, according to the residents (personal interviews) this market is harming the image of the city, and polluting the river and the city.

Eventually, the current condition of the Abu Ali River is the outcome of successive social, economic, political, and cultural forces. Accordingly, the revitalization of the riverfront proposes an urban design intervention that do not imply a thematic recreation of the past but whose authenticity is derived from engagement

with the ongoing trajectory of change in the city. Therefore, it proposes the provision of new typologies of open spaces and connections to re-integrate the river as a green corridor in the city.

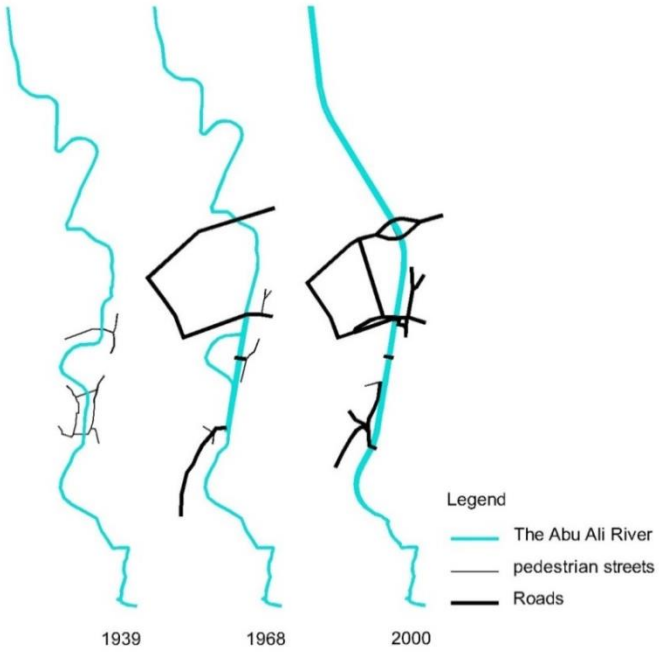


Figure45 : Changes in the flood plain of the Abu Ali River and in the typology of physical connections between the western and eastern Bank

4.6 Context Appraisal

The theoretical analysis led to the extraction of six cross cutting themes across urban design and landscape ecology. The themes are hierarchy, heterogeneity, spatial structure, type/typomorphology, layers, connectivity, and time/process. These themes are going to be applied in this section as analytical tools for documenting the site, and in the urban design strategy and intervention as concepts for achieving the research goals and objectives.

Defining a scale of investigation in my project context requires me to look at the larger scale then narrow down. Accordingly, I will apply the concept of hierarchy and investigate the site at three scales: the landscape, the urban, and the site scale.

4.6.1 Documentation on the landscape scale

Abu Ali River is 44.5 km-long. Its basin covers approximately 236 towns and villages distributed among several administrative districts (Figure 46) with 484 Km^2 estimated basin area which 97 percent is mountainous, and around 600,000 inhabitants live in its catchment (Massoud et al. , 2004). The river's source is at Bcharre at an elevation of 1,850 m and the river falls to nearly sea level passing through Tripoli on the flat coastal plain where 2.5 km of the river has been channelized. The river basin and its coastal area are characterized by a Mediterranean climate with moderately warm dry summer and autumn, and moderately cold, windy, and wet winter (Massoud et al. , 2004).

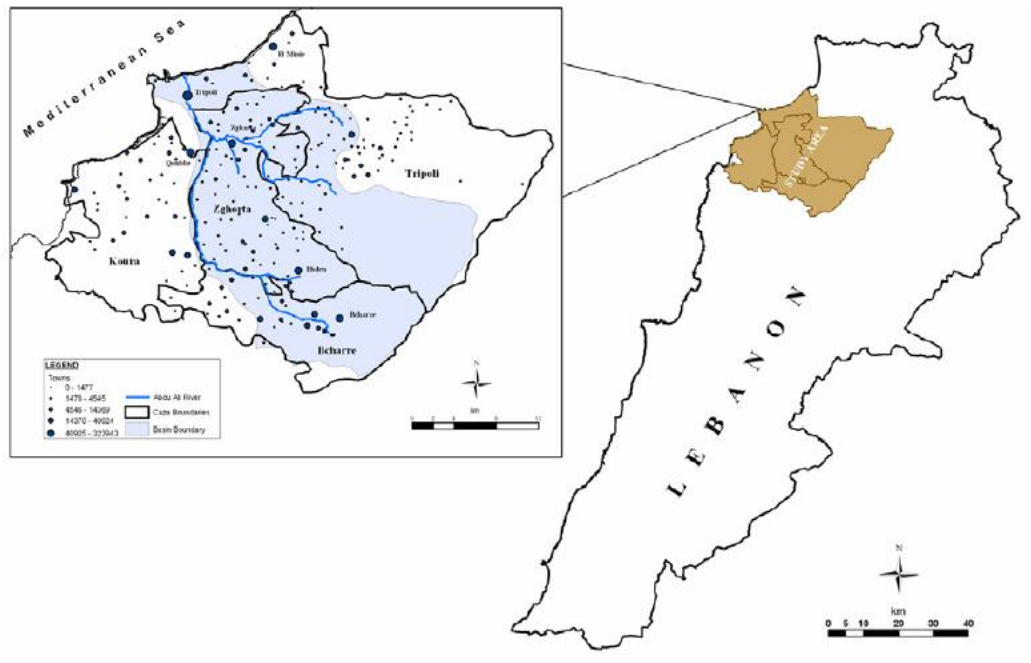


Figure 46: Administrative boundaries of Abou Ali River with its major towns
Source: Massoud et al., 2004.

The Abou Ali river basin is characterized with a complex catchment of mountain ranges, valleys, side streams, and small and large tributaries that join the main channel. Along its channel, the river is characterized by different hydrologic and topographic properties, as well as land use patterns. Accordingly, Massoud et al., 2004 have divided the river into 3 sub-catchment. General characteristics of sub-catchment have been identified through nineteen sampling sites (Figure 47 & 48). Sub-catchment I is predominantly rural agricultural. Sub-catchment II is largely a mountainous rural region at the upper reaches, with some urban influence at the lower reaches. Sub-catchment III is entirely urbanized predominantly residential. These land use patterns were used by Massoud et al., 2004 to assess the impact of land use on water quality in the Abu Ali River Basin. The study has concluded that the river estuary (encompassing the historic core in Tripoli) is the most polluted and endangered area because of the flood channel and human waste. This study on the landscape scale is of use to my research because on the first hand, it reveals the location of different recreational areas and touristic sites along the river so I can link my project on the site scale to its larger context providing opportunities for eco trail along the river. On the second hand, it shows the degree of pollution of the river and causes behind these pollution. This information can help me address the issue of pollution to some extent in my project. However, my proposals will be punctual with minor impacts because the issue of pollution needs specialist to conduct a deeper investigation and propose a strategy that covers different subjects such as sewage, waste collection, cleaning the water….

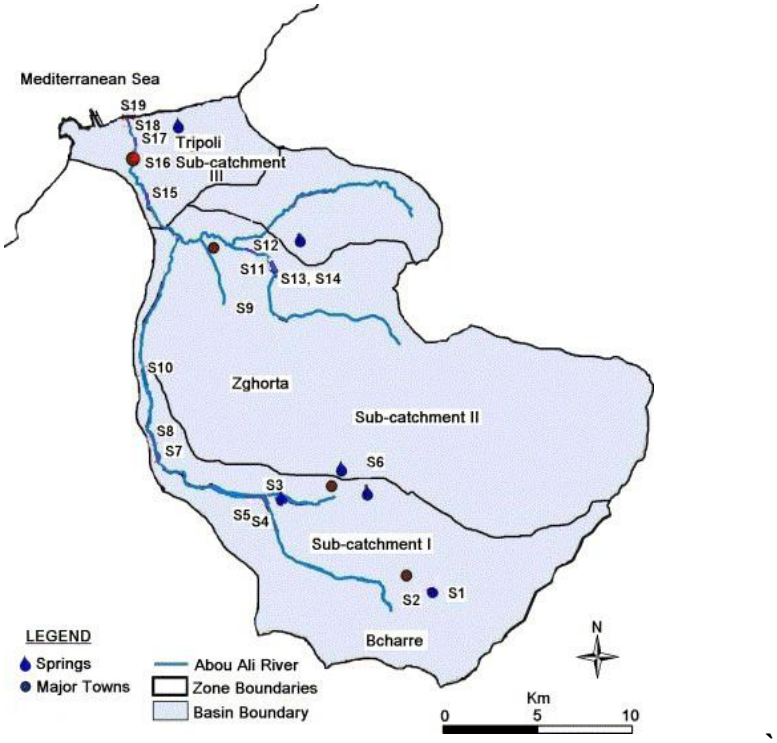


Figure47 : Characteristics of the three sub-catchments

Source: Massoud et.al, 2004

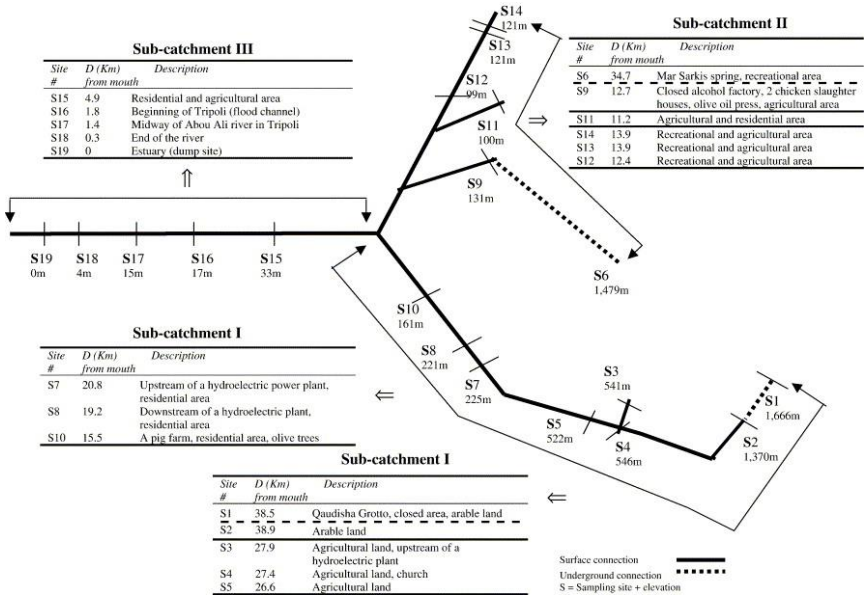


Figure48 : Characteristics of the three sub-catchments

Source: Massoud et.al, 2004

4.6.2 Documentation on the urban scale

Earlier documentation showed that the landscape area along the Abu Ali River is a mix of urban, recreational, and industrial patches within agricultural matrix. In this section I intend to zoom on the river estuary and have a more detailed figure of how the spatial characteristics of the river change along its course.

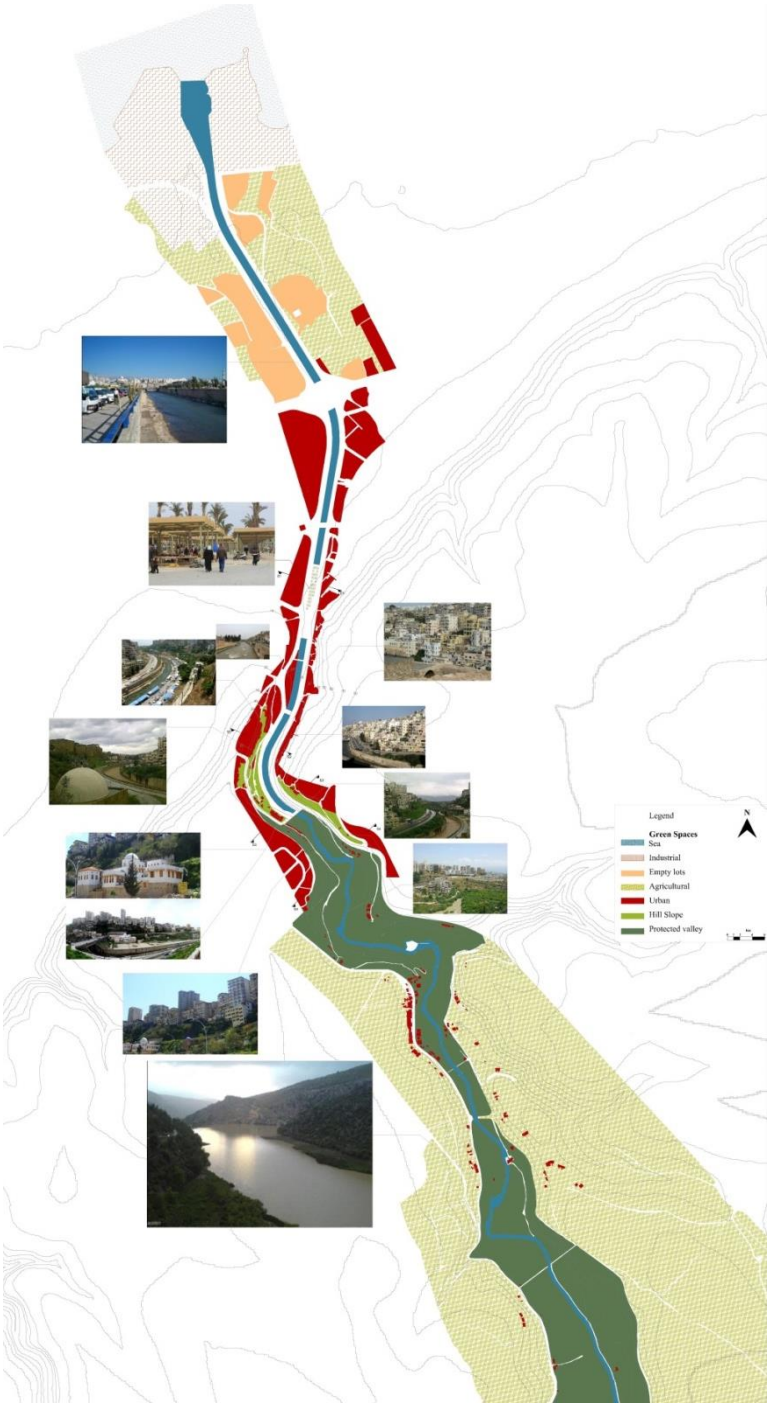


Figure49 : Different patches along the Abu Ali River

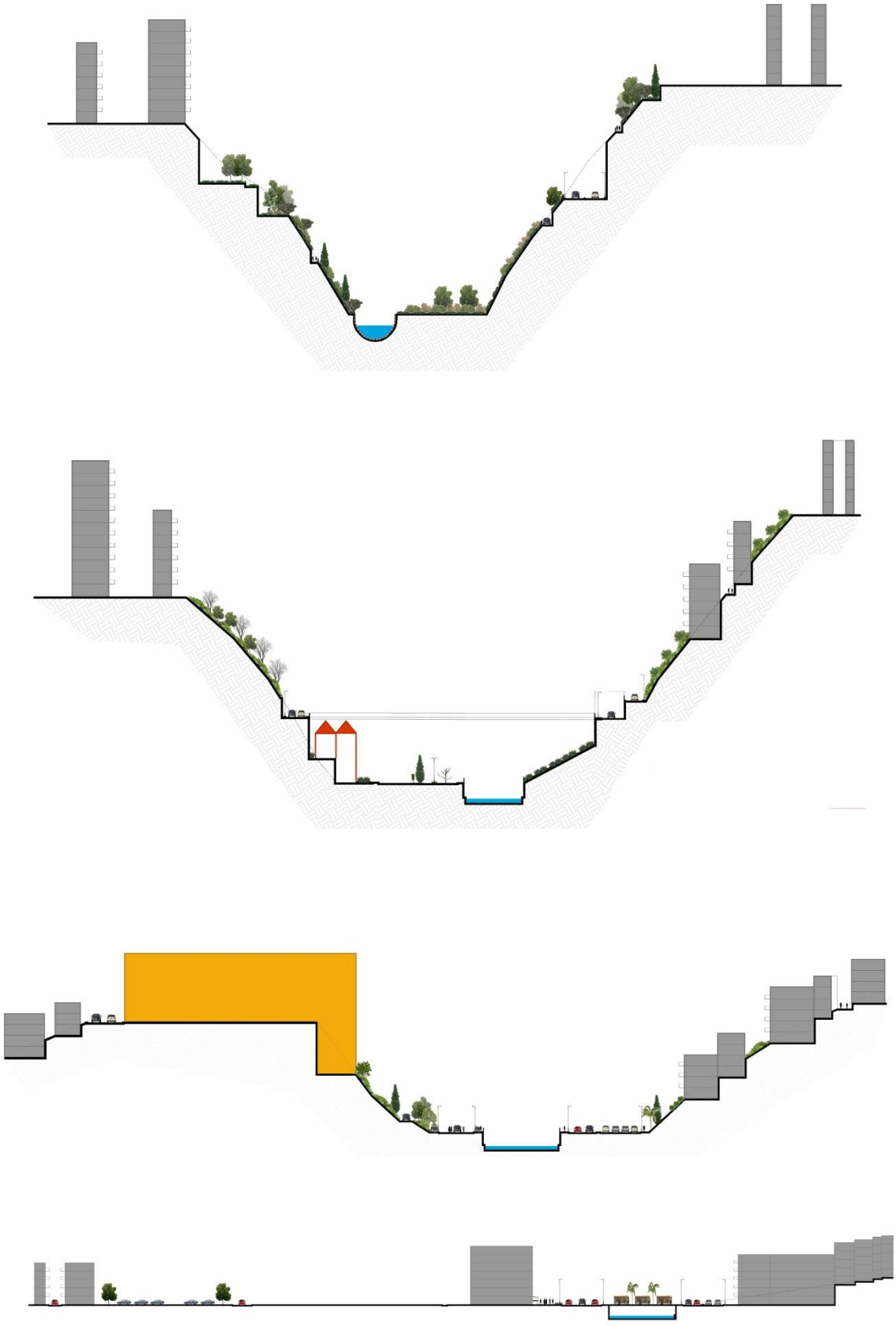


Figure50 : Abu Ali River cross sections

These cross sections along the river show how the character of the river's edge changes gradually from being defined by natural edges and surrounded by vegetated hillslope and agricultural fields to being defined by built edges and surrounded by buildings. The topography of the site changes as well gradually from hilly to flat land.

4.6.3Documentation and analysis on the site scale

4.6.3.1 Spatial Structure

The Nolli map helps to better understand the urban form through understanding the relationship between building mass and open spaces, and to reveal connections between public and private spaces. In Tripoli, the Nolli map shows different typoligical patterns of solids and voids.

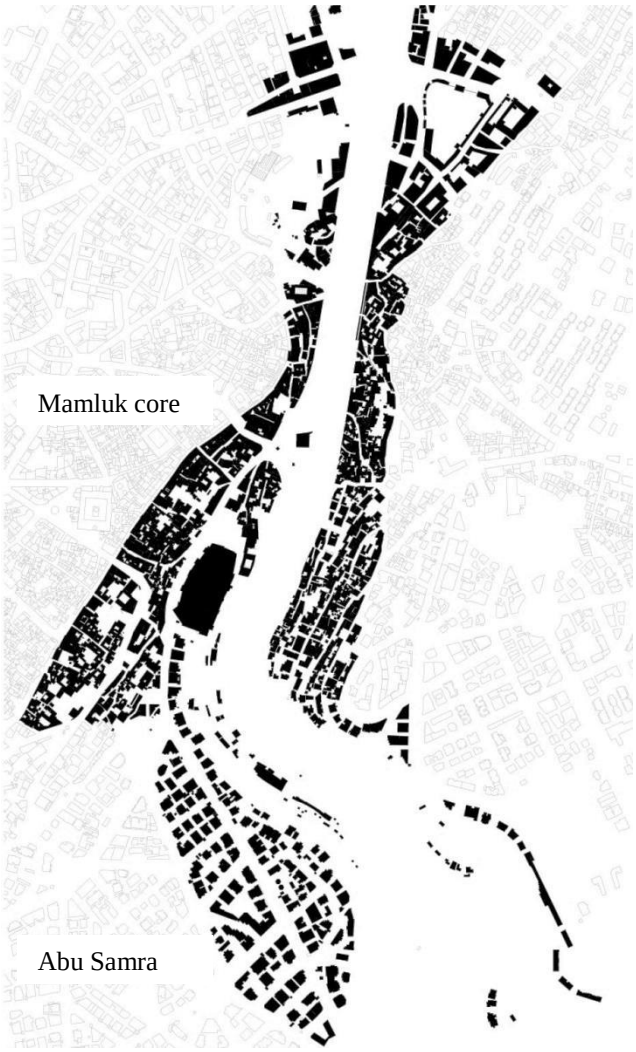


Figure51 : Nolli Map of the study area

In the historic core the open space is carved out of the building mass as a continuous flow linking public and private spaces with an angular typological pattern of solids and voids. In an organic grid, the structure of the space is ‘deformed’ in two ways. First the shaping and alignment of urban blocks meaning that sight lines do not continue right through the grid from one side to the other. Second, along the streets spaces vary in width.

In Abu Samra, an early modern urban development, the typological pattern of solids and voids takes a grid shape with wide streets and freestanding buildings where the street pattern identifies the blocks and the interface between public, semipublic, and private spaces.

Along the river, buildings are defined by the open space to the north forming a continuous buildings edge. However, the linearity of riverside takes a curvilinear shape to the south. Moreover, there is a loss of buildings edge as well as of a clear physical connection between buildings and open spaces on the southern edge of the river , and the typological pattern of solids and voids becomes curvilinear and organic.

What was presented above is a general conceptualization of the difefrent textures and patterns of the urban fabric through looking at the nolli map.However, the voids presented as positive spaces in the map are more than public or private open spaces. These are of different typologies and landuses. They could be nodes, corridors, civic spaces…Accordingly, to achieve a better understanding of the physical spatial structure of the urban landscape and the relation between buildings and open spaces I decided to look at the different typologies of open spaces existing in the city and along the river.

4.6.3.2 Typologies of open spaces

Before going into a detailed analysis of the different typologies of open spaces it is important to have a general characterization of the primary urban landscape components - plots, streets, constructed spaces, and open spaces[4]– into a diagram of solid and void. Therefore, I developed a Figure Ground Diagram, which represents buildings in white and open spaces in black to focus the perception upon the ground plan, meaning open spaces, and emphasize on the structure of the urban space and illustrate linkages between its different elements.

Figure52 : Figure Ground Diagram of the study area

[4] Levy, 1999

The Figure Ground Diagram shows that in the study area open space is greater than building mass, and that voids in the city and along the river have clear spatial definition except the southern edge of the river .Moreover, the map shows an emphasis on north south connections in the city mostly because of the topography . Accordingly, I divided the Figure Ground Map into two illustrations. The first shows typologies of spaces and the second shows typologies of corridors.

4.6.3.2.1 Typologies of spaces

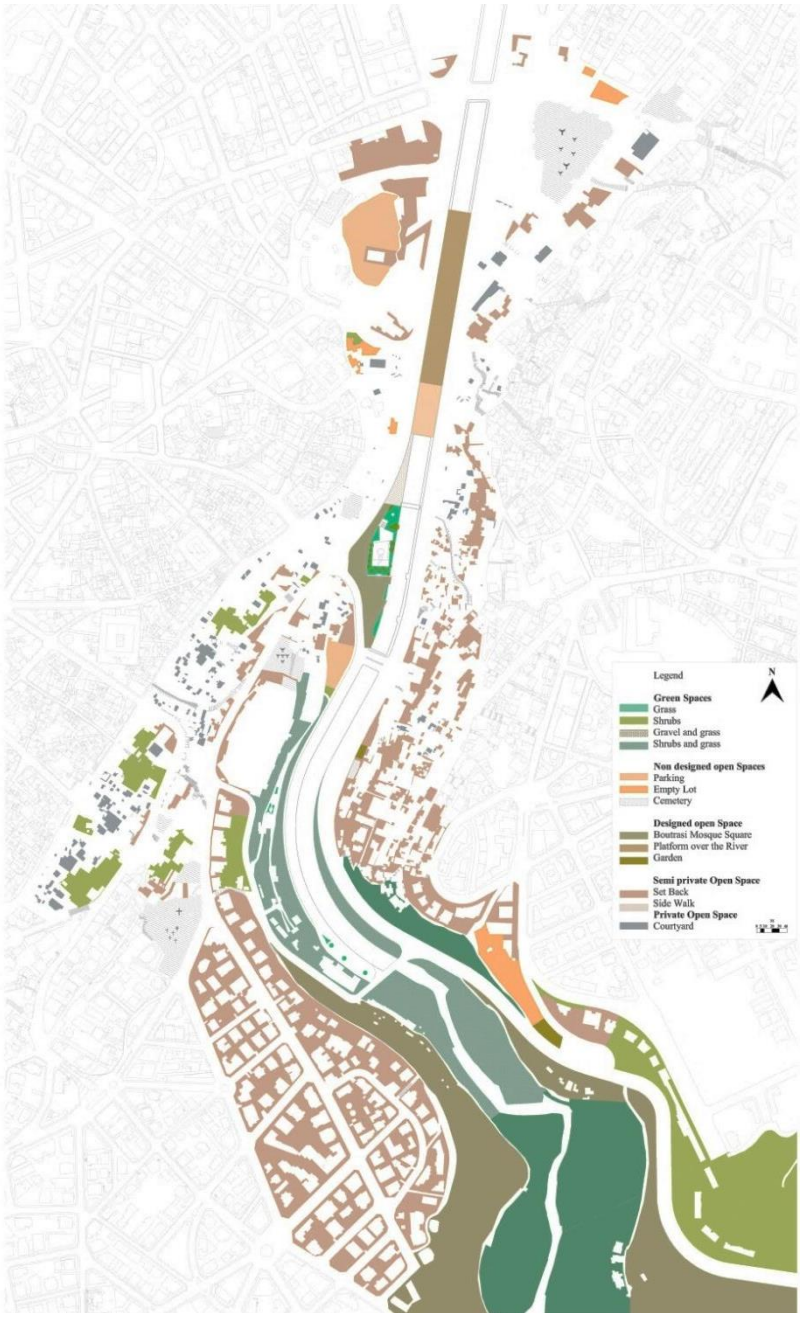


Figure53 : Typologies of open spaces in the study area

There is a spatial heteregoeinity in the study area. It contains a vareity of open spaces, including green fields, agricultural lands, gated planted areas, designed public squares,cemeteries, empty lots, set backs , and courtyards .These diverse types of open spaces are being used differently by the residents. Theses spaces could be divides into different types of practices:

1- Open space for outdoor recreation: This type includes designed open spacs, such as el kobbeh garden, and the platfom above the river, and the setbacks on the east bank of the river. These common areas between dwellings are being used for gathering and playing. However, on the west bank of the river setbacks between buildings are mainly being used as parking .
2- Open space for aesthetic, and cultural purposes: This type describes areas of the city that provide scenic value, such as the Bourtasi square, and the natural hillslope between the citadel and the Mawlawiya.
3- Open Space for the preservation of natural resources: This type includes natural landscape areas that have been set aside from future development.
4- Vacant open paces

These different open spaces dot not only have different uses and categories, but they also have different spatial structures. The following figure illustrates the physical characteristics of open spaces in the city (Figure 54). I have also developed a visual survey of open spaces along the river to illustrate their different characterisctics in a realistic representation (Figure 55).

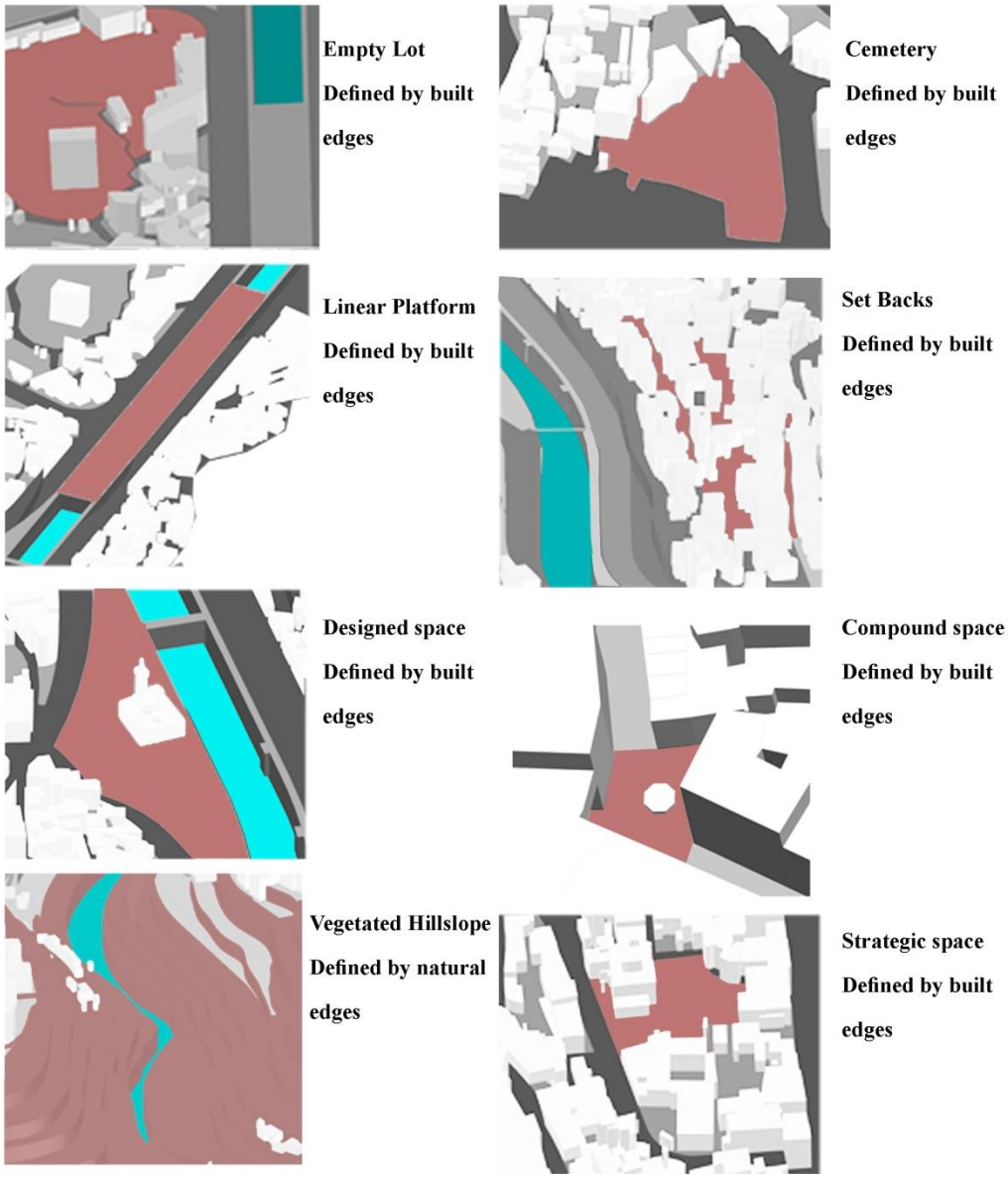


Figure54 : Physical characteristics of open spaces

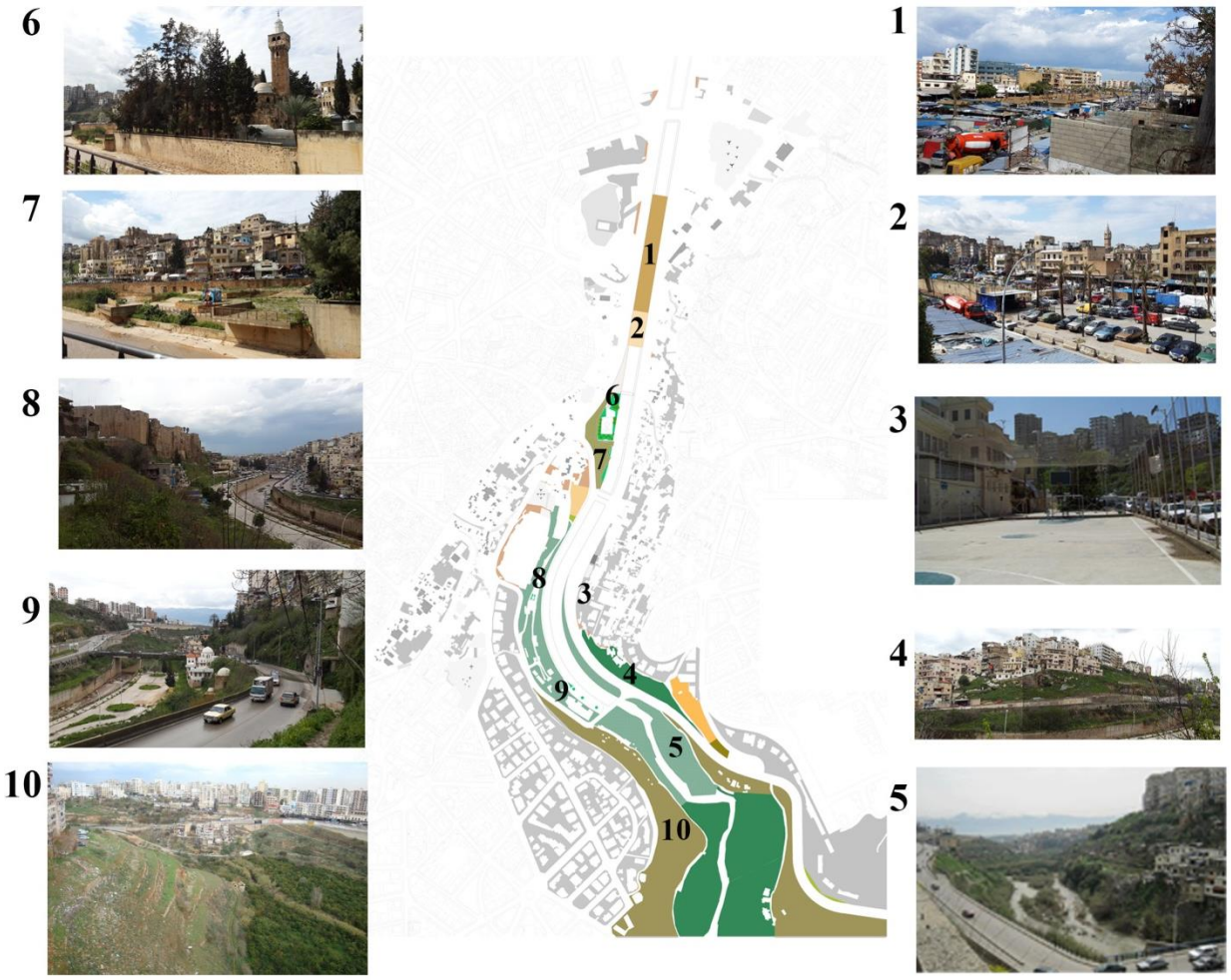


Figure55 : Visual survey showing the different typologies of open along the river

4.6.3.2.2 Typologies of Corridors

Corridors also fall under the category of open spaces. In tripoli, corridors include the river corridor, roads, pedestrian streets, and stairs. Corridors may function as connectors and/or barriers:

- The natural river corridor functions as a connector for wildlife habitat.
- The channelized river corridor acts as a barrier because it significantly interrupts species circulation and disconnect them from the sea.
- Roads along the river and in the old city operate as connectors for vehicular through traffic and as barriers for pedestrians.

- Pedestrain streets other than their main objective of circulation, they also serve many urban activities, like open markets “souks” and spaces for public assembly.
- Stairs function as east west pedestrian connectors.

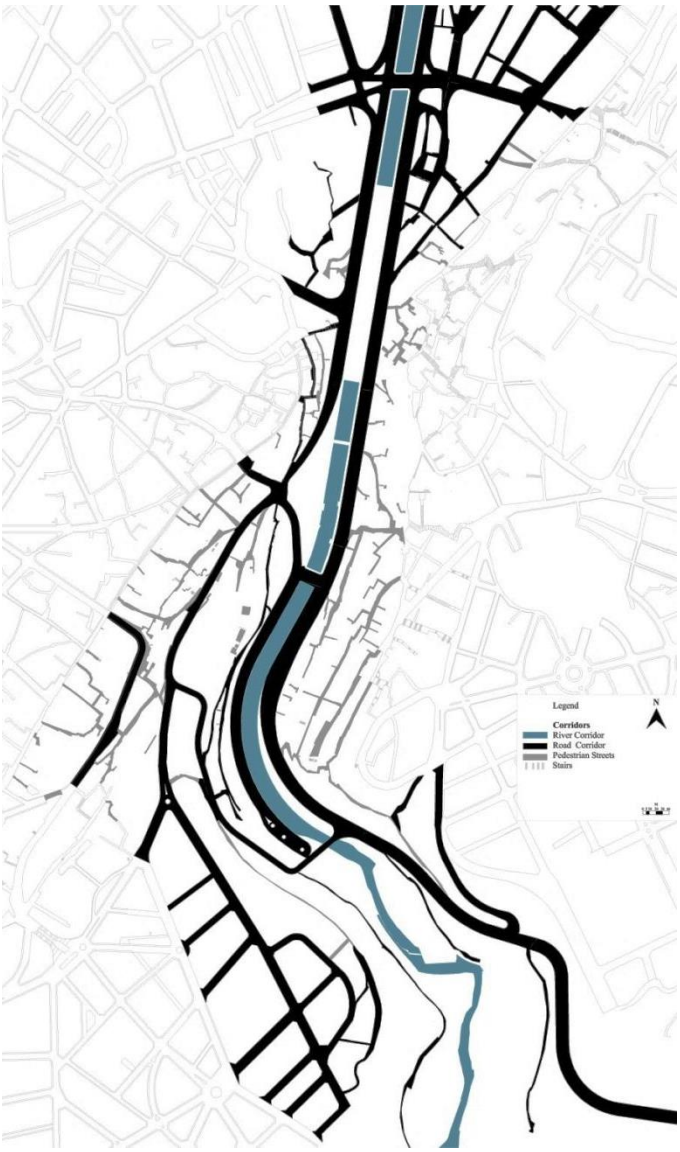


Figure56 : Corridors Network

Corridors in the city have different physical characteristics. The river changes gradually from a narrow corridor defined by natural edges and surrounded by green fields to a wide built corridor defined by infrastructural edges. Alleys and stairs in the

city also range in size and shape but they all have human –scale (Figure 57). Roads vary from primary, seconday, tertiary, and one unused road (Figure 58), which is the one that stretches from the citadel to the Mawlawiya along the river. This road provides opportunities for urban voids revitalization.

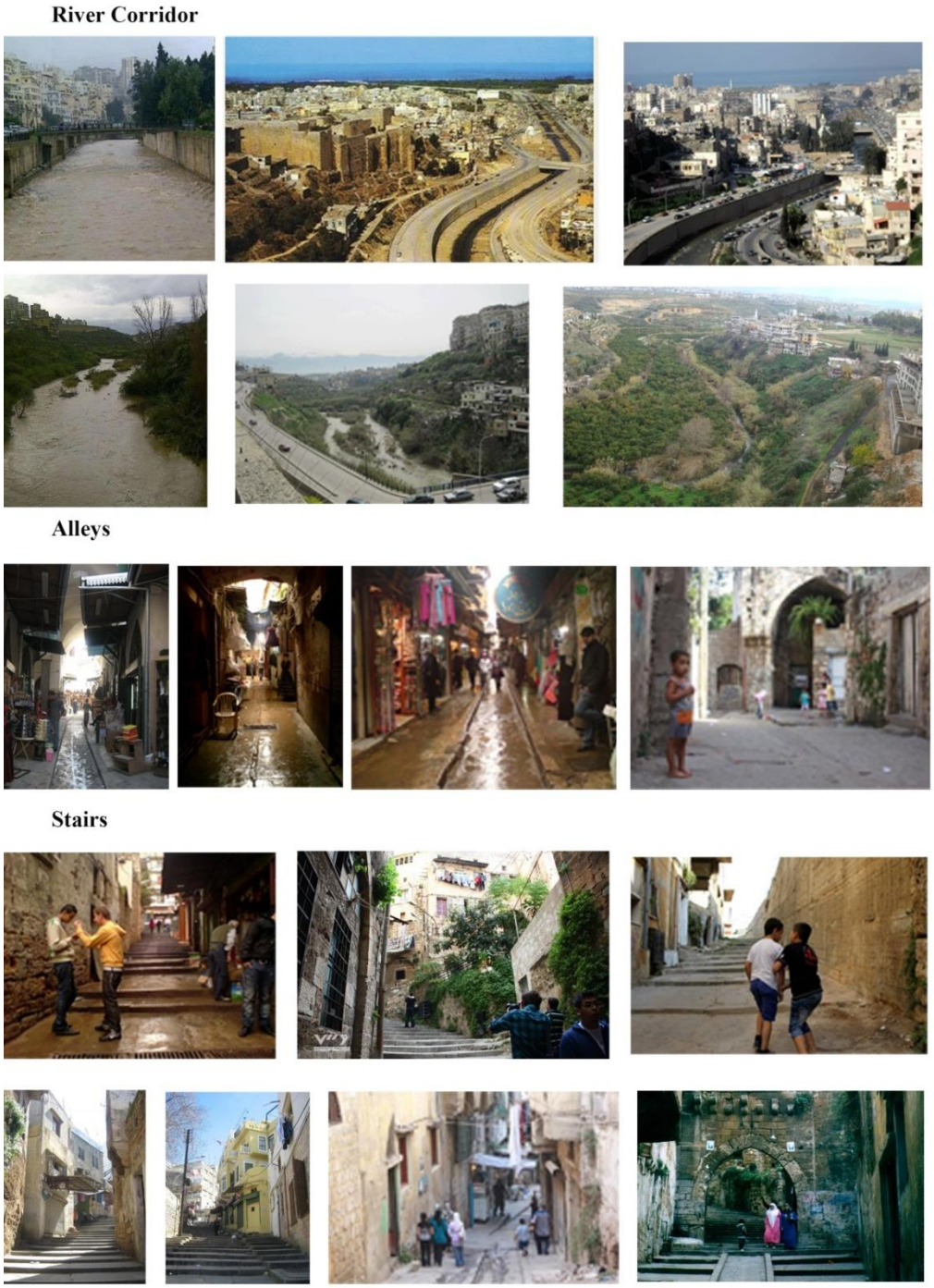


Figure57 : Visual survey of corridors in the city

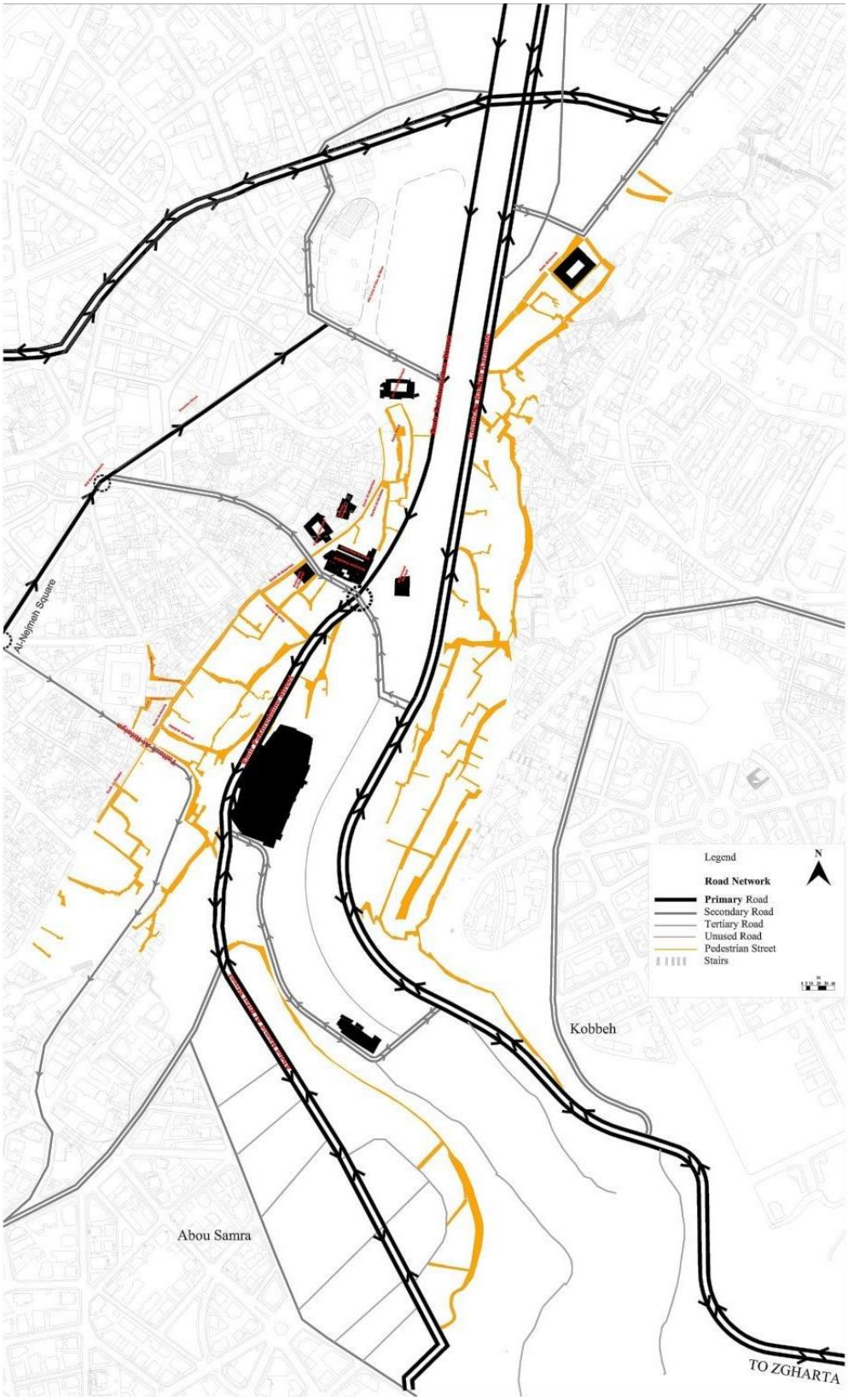


Figure58 : Streets Pattern

4.6.3.3 Massing , building conditions, and building uses

The physical evaluation includes a study of buildings heights, topography, land uses, building conditions, and building dates. The built environment was surveyed according to visual observation and GIS topographical and building heights maps.

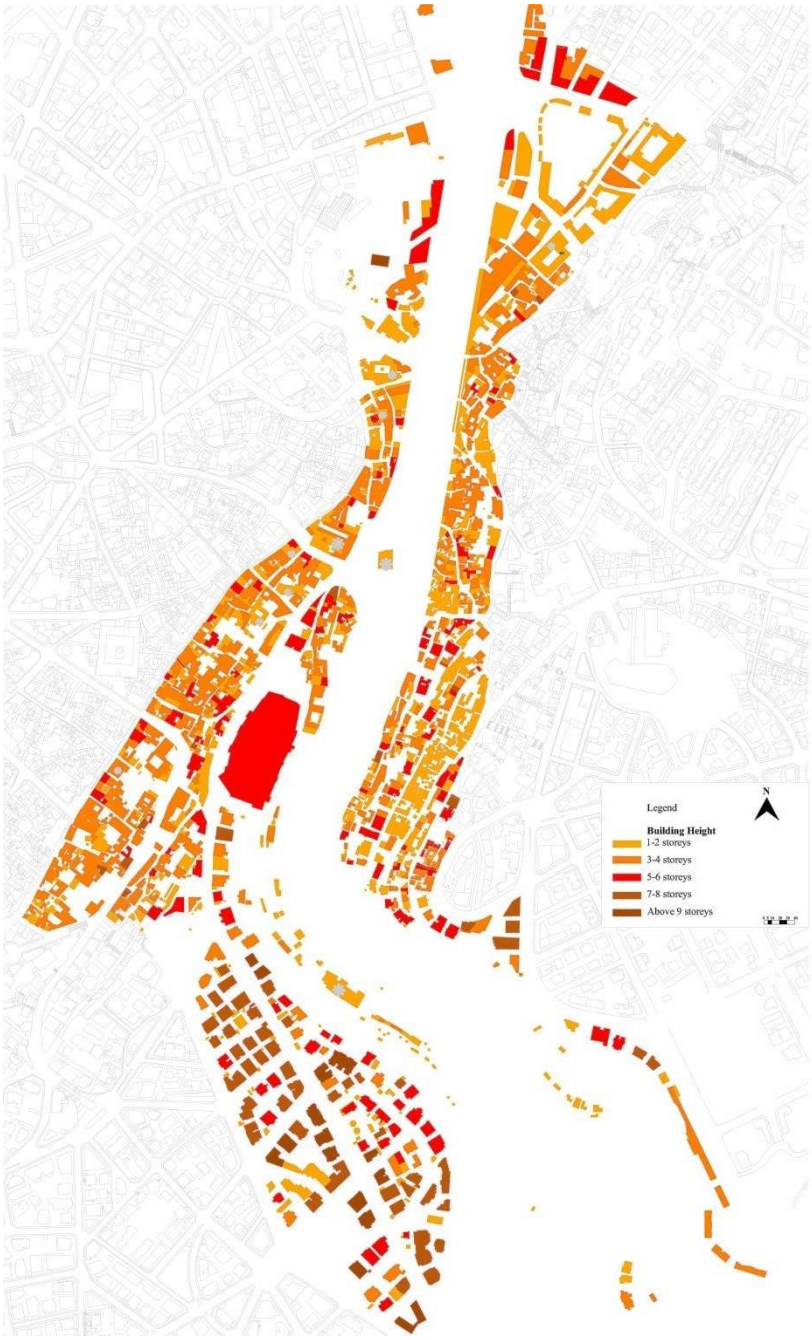


Figure59 : Building Heights

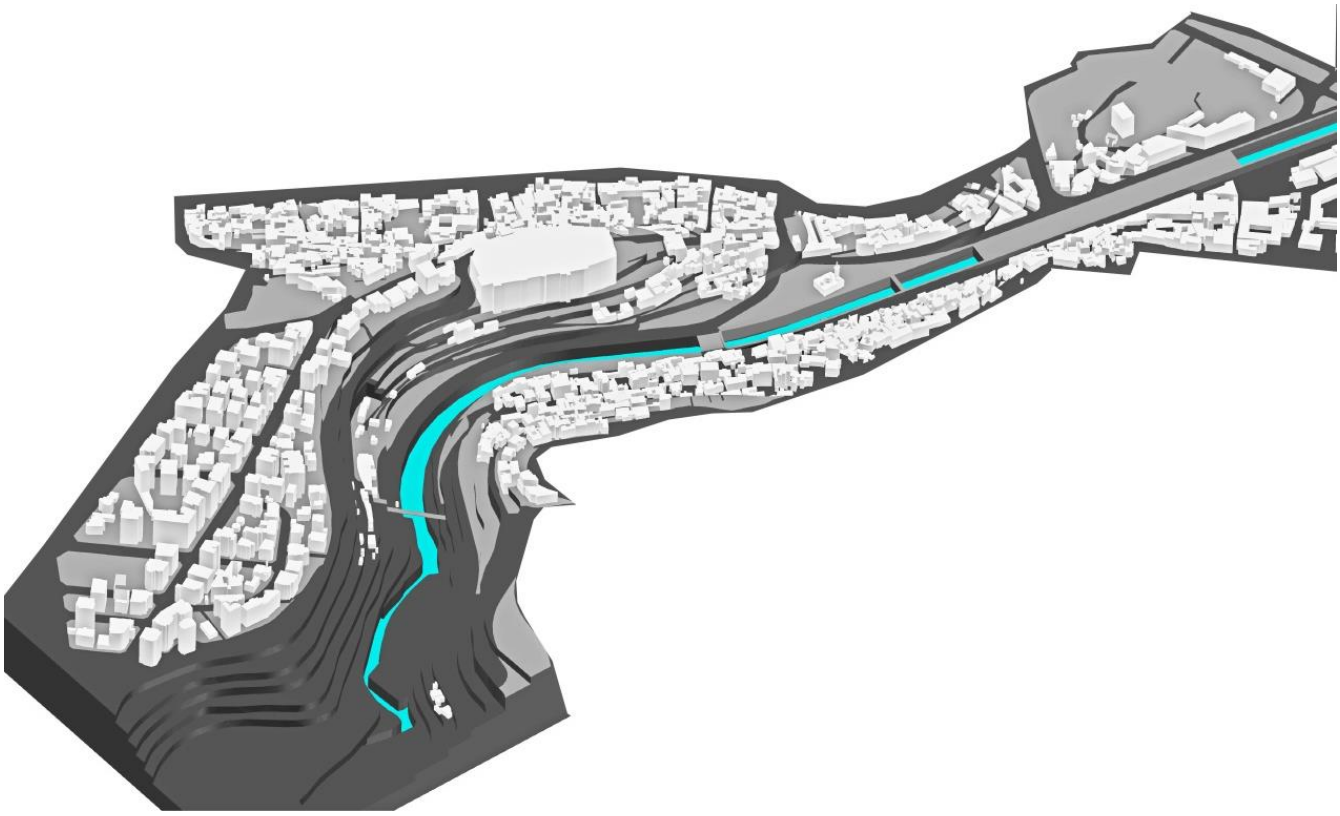


Figure60 : 3D representation for the study area

The complex topographic charactiristics of the site has a big influence on the visual connection between the city and the river**.** The old city consists mostly of two to three storeys buildings. It lies on falt land which disconnect it visually from the river. Moreover, there are no visual corridors that link the historic core to the river. Abu Samra, El Kobbeh , and Daher El Megher are located in the hills along the river ,which are some 80 m above sea level. Consequently, these districts have visual connections to the Abu Ali River.

In terms of land use , the study area is mostly residential with commercial activities on the ground floor . The old city is residential/ touristic, the west bank of the river is mostly touristic/commercial, and the east bank of the river is residential/commercial.

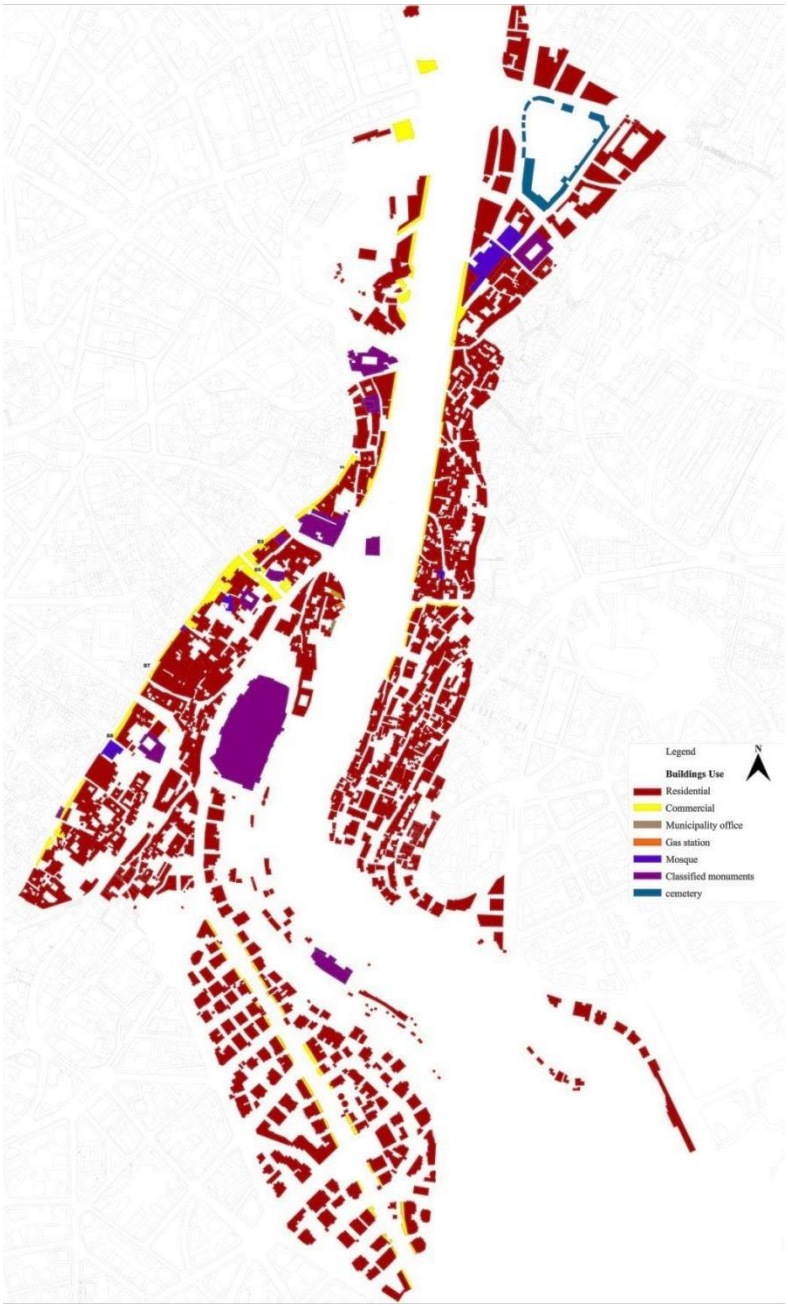


Figure61 : Building Uses

The urban river edge houses a wide range of buildings styles; from Mamluk to Ottoman to Contemporary buildings. This diversity gives the river's edges different characteristics and reflects the history of urban development in the city. For instance, classified monuments along the river give the latter a cultural dimension, when modern buildings show patterns of urban development outside the historic core.

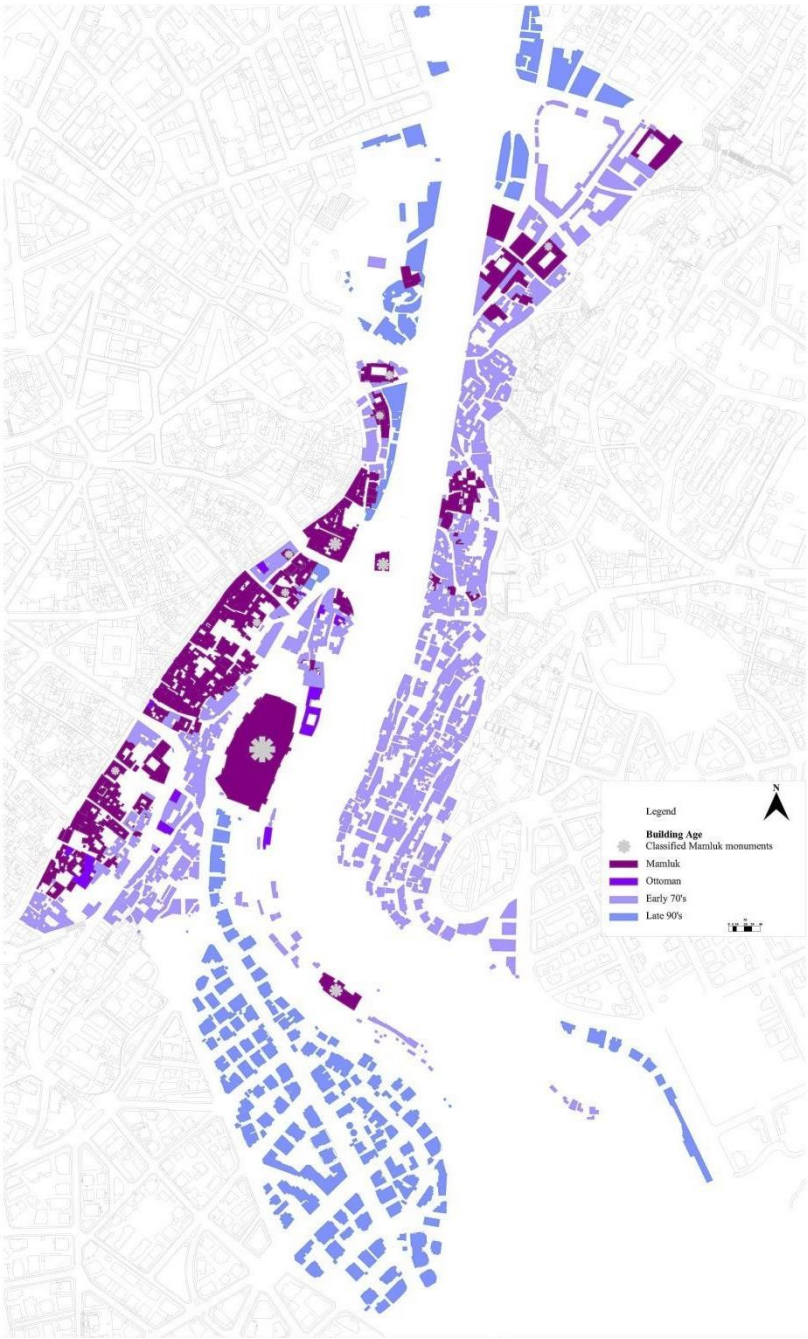
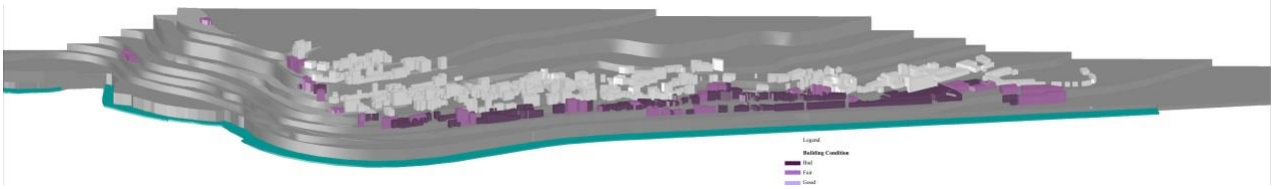


Figure62 : Building age

Most of the buildings along the river are in bad condition. This fact reduces visual aesthetics and undermine the quality of the public space.

Figure63 : Buildings along the Abu Ali River

The east bank of the Abu Ali River



The west bank of the Abu Ali River

Figure64 : Building conditions along the Abu Ali River

4.6.3.4 The image of the city

People approach cities in a different way than designers. As users, they formulate their own perception of city structure according to their personal experience. Terefore, it is crucial to form a general conceptualization of how people in Tripoli perceive the study area. Accordinly, I conducted a structured questionnaire that targeted about seventy persons. However, only fifty drew their image of the city. The procedure went as follows:

1- I clarified to every interviewee that the questionnaire is divided into two parts, and that the outcomes of the interview will be used for intellectual purposes
2- I explained what is the concept behind the mental image and what are its components.
3- I asked the interviewees to draw their mental image of *El Jessr* . According to the residents' terminology the study area is called *El Jessr*.
4- Once the interviewee drew the mental image, I asked him/her to answer the following question : do you think that funds for heritage preservation should address the architectural monuments such as the citadel or the Abu Ali River and why?

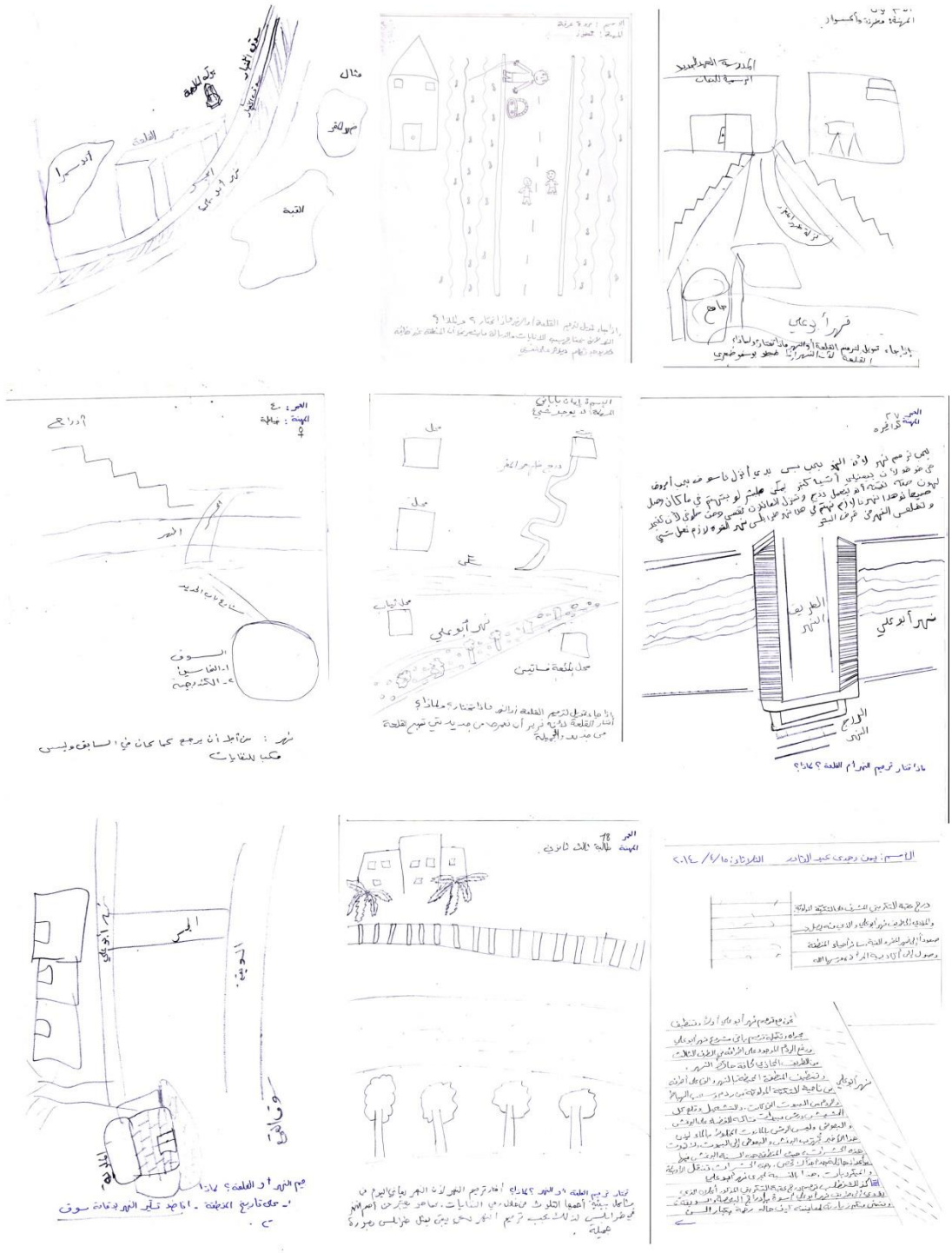


Figure65 : People's mental image

Figure66 : People's mental image

Figure67 : People’s mental image

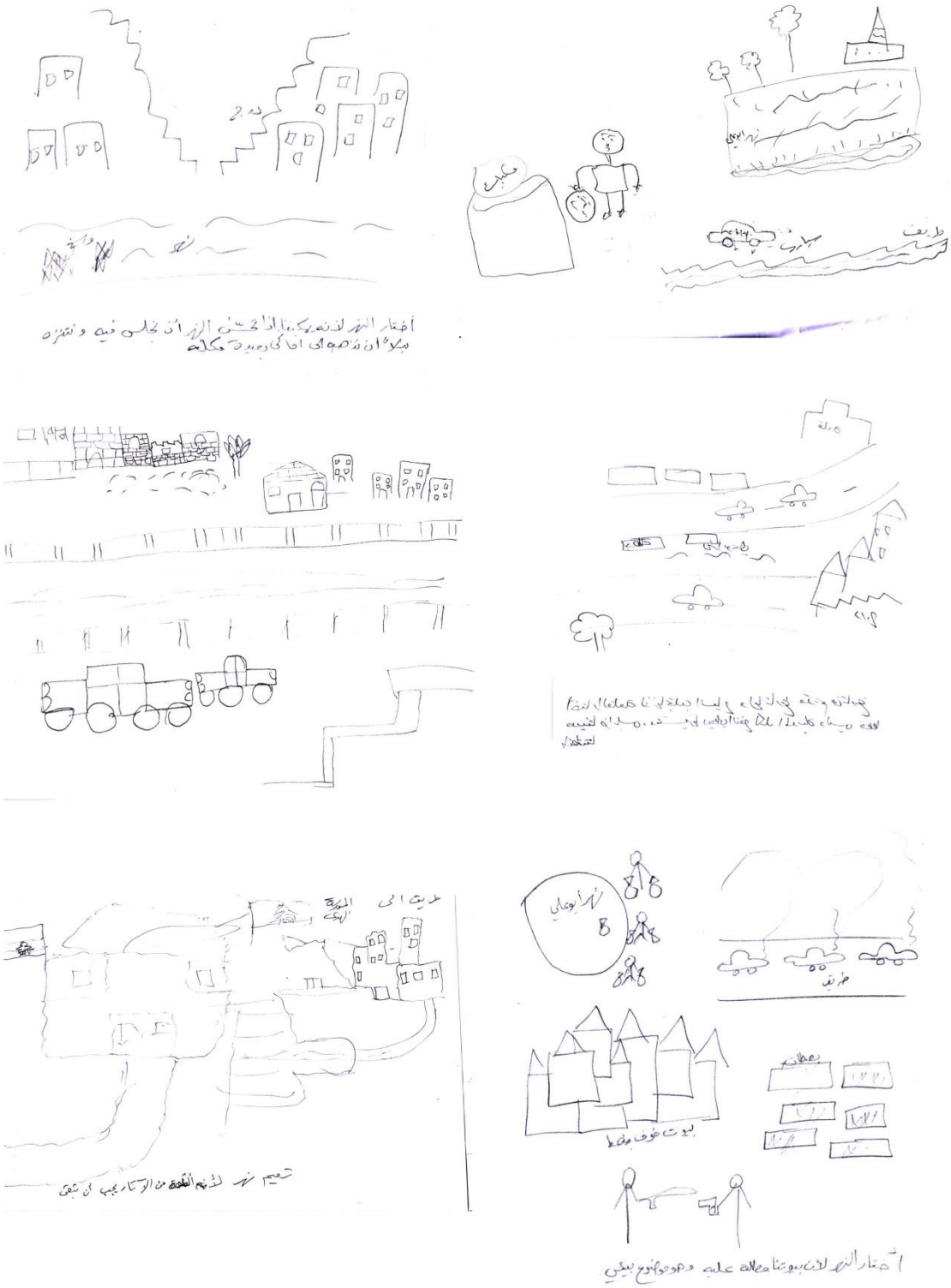


Figure68 : People's mental image

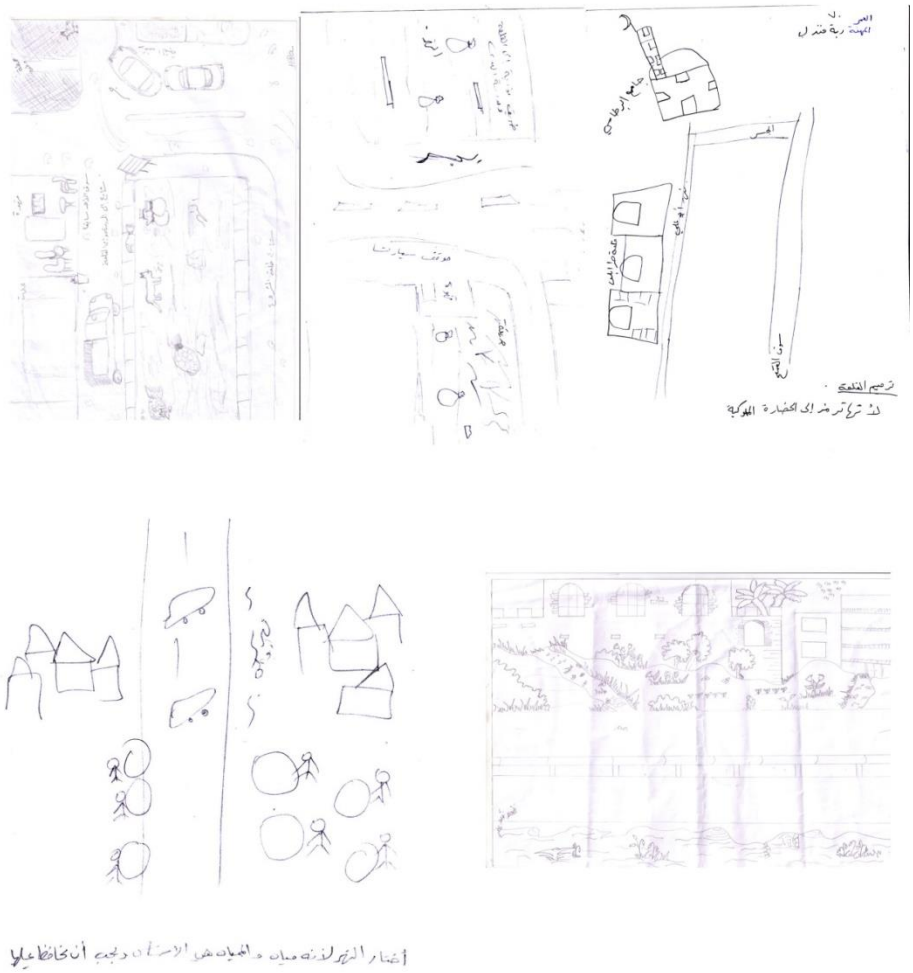


Figure69 : People's mental image

4.6.3.4.1 Outcomes

The elements that have been represented in the mental maps are listed from the most to the least repeated: the river, the citadel, the bridge, the stairs,Rachid Karameh boulevard, Takiya Mawlawiya, Bab el hadid, Bourtasi Mosque, el Kobbeh, Abu Samra, edges of buildings and shops along the river, and Daher el Megher. Most interviewees didn't symbolize all the study area. Instead, they drew a small section of it according to their personal experience and reflections.

Even though the river was represented in all the maps, 80% of the interviewees have symbolized the river as a garbage dump. Moreover, 85% of the interviewees

have chosen the revitalization of the river instead of the citadel because in their opinion, the river reflects the identity of the historic core; and its pollution is affecting livability in the city. Most of the interviewees have also mentioned that their houses overlook the river and its degradation is affecting visual aesthetics.

Based on the maps and different answers, I developed a map that reflects people's perception of the city and existing relations between the city and the river.

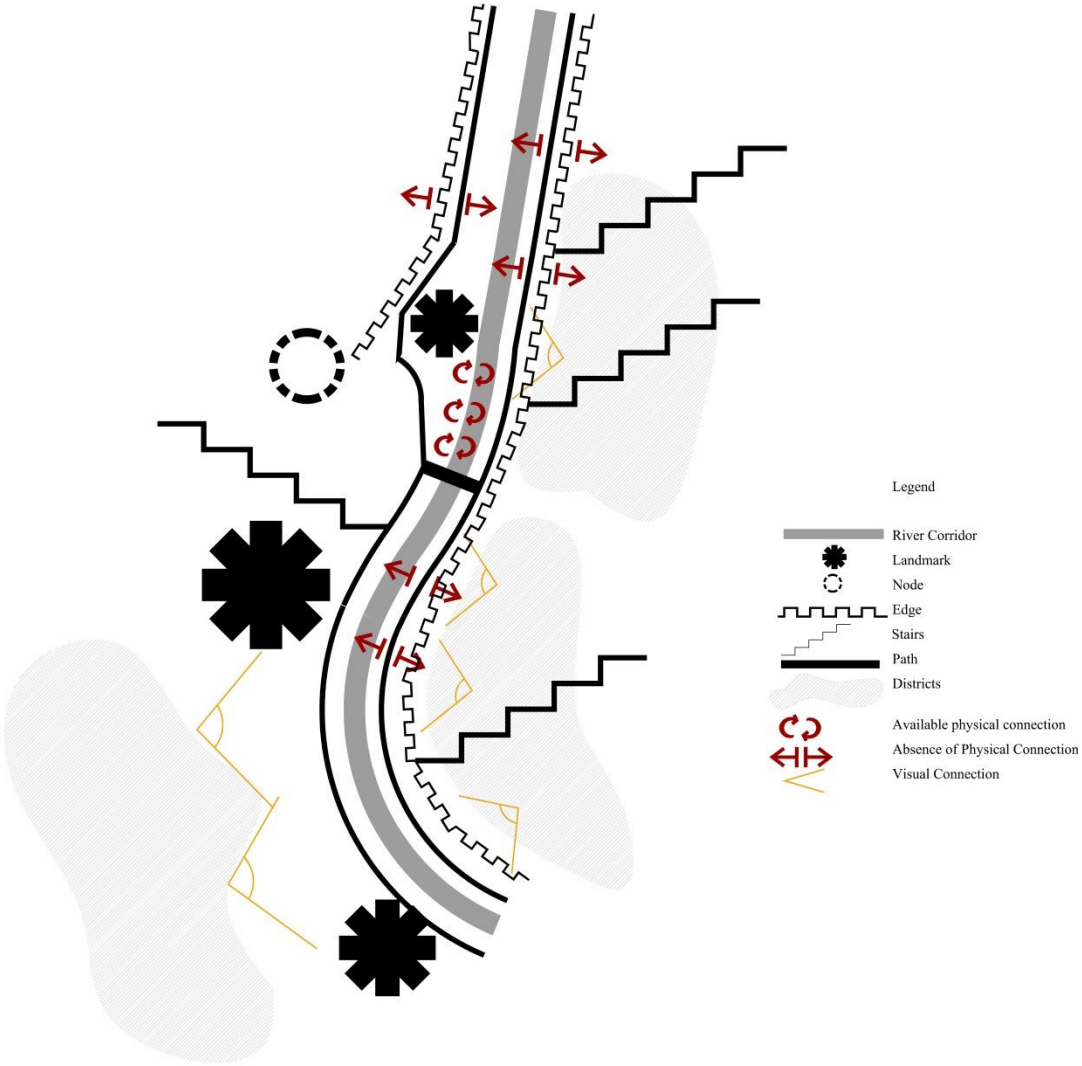


Figure70 : The image of the city

4.6.3.5 City Layers

As shown in the previous documentation, the city is composed of diverse superimposed layers. These layers create a complexity of urban fabric and heterogeneity. overlayed the different physical components of the city to formulate a general perception of the study area.

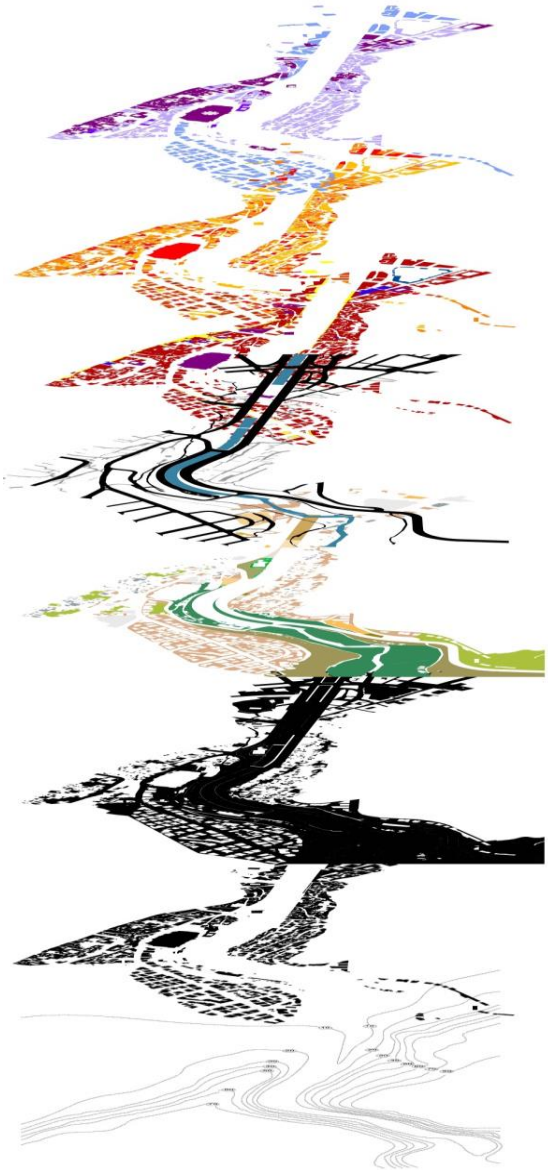


Figure71 : City Layers

I have envisioned different character zones in the study area with different edges along the river . these zones change gradually from dense urban quarters with building edges along the river and infrastructural river corridor, to a transitional zone with also dense urban quarters but clusters of buldings and vegetated hillslopes along the channelized river , and to a zone with more ecological values and it is characterized by fragmented smallsized urban patches along a natural river corridor in agricutural and green fields matrix. The infrastructural river edge although it lacks any ecological value because of the degradaded condition of the river and its poluution, it has a cultural value because of the existing monuments as wells an an economic one because of the hybrid commercial activities. Since the river corridor and its edges have different characters, the urban design strategy should address every zone in a different way.

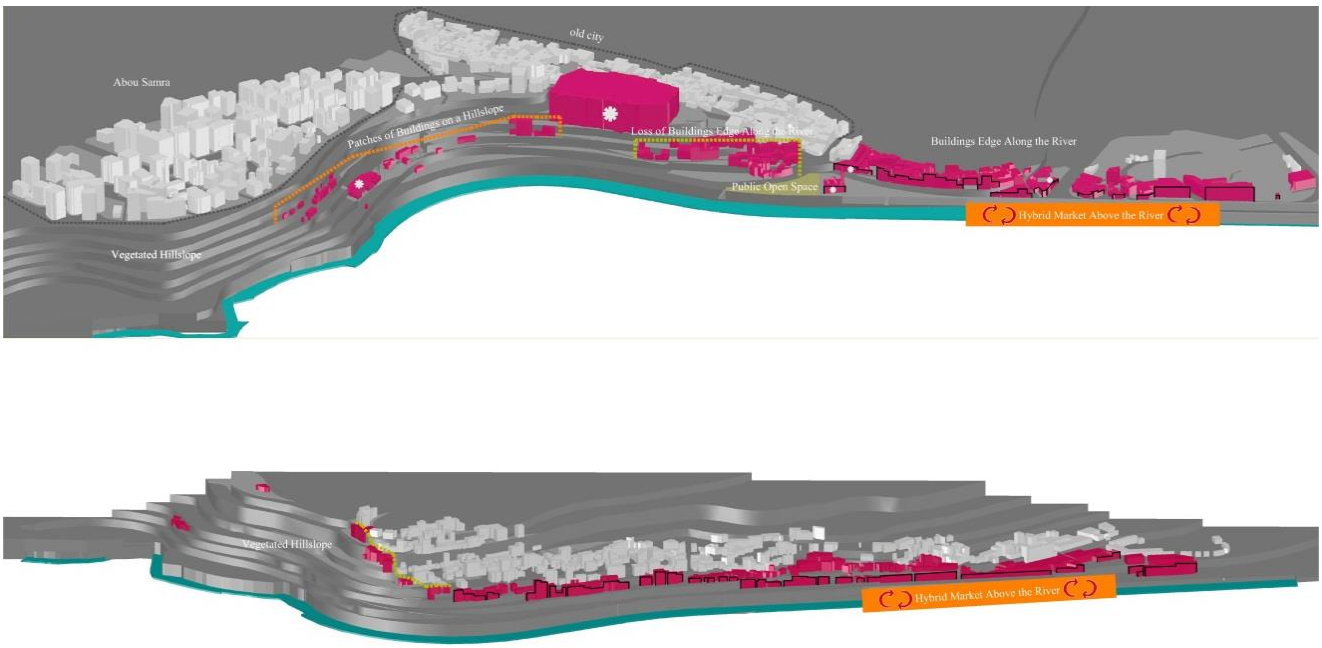


Figure72 : Envisioned character zones

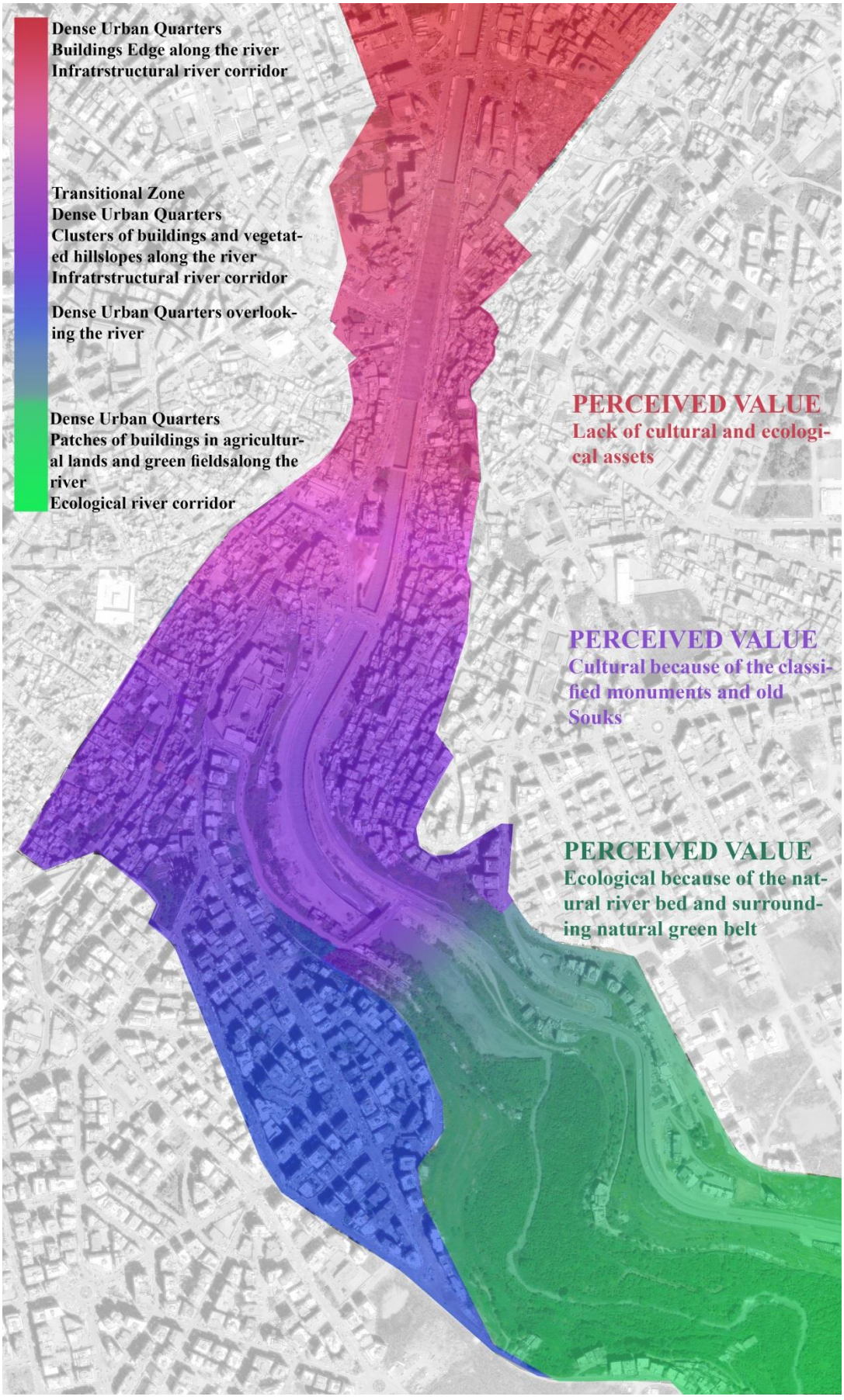


Figure73 : Character zones and perceived value in the study area

CHAPTER 5

URBAN DESIGN STRATEGY AND INTERVENTION

5.1 Urban Design Strategy

In this section I propose an urban design strategy that provides design solutions that are specific to each character zone. These solutions aim to provide east west connections between the river and surrounding neighborhoods on one hand, and to address the ecological value of the river corridor on the other hand.

I have analyzed earlier the different typologies of open spaces existing in the city and along the river. These spaces offer a unique opportunity for providing a connectivity plan of nodes and corridors that would restore the relationship between the river and the city. Furthermore, the wide boulevards along the river provide the opportunity of creating a river greenway that would act as a public amenity and a promenade for the dwellers on one hand, and as a buffer zone between the dense urban fabric and the river on the other.

The degree of restoration of the ecological value of the river changes along its course. In the stretches with built edges the ecological functions of the river could be restored to some extent by cutting through the concrete channel and filling the holes with stone. Such interventions help restoring the flow of the water through slowing down its velocity, filtering the water, and providing habitat diversity.

In the transitional zone that stretches from the St Gille citadel to the Mawlawiya, the design strategy propose the gradual transformation of the river from an infrastructural to ecological corridor through the removal of the concrete channel and the use of stone riprap and deep rooted planting to stabilize banks and to enhance aquatic habitat. These changes along with a water pollution treatment plan provide the

opportunity of recovering the use of the river from a garbage dump to a public amenity.

Finally, the design strategy aims to maintain the character of the natural river zone and enhance its recreational value.

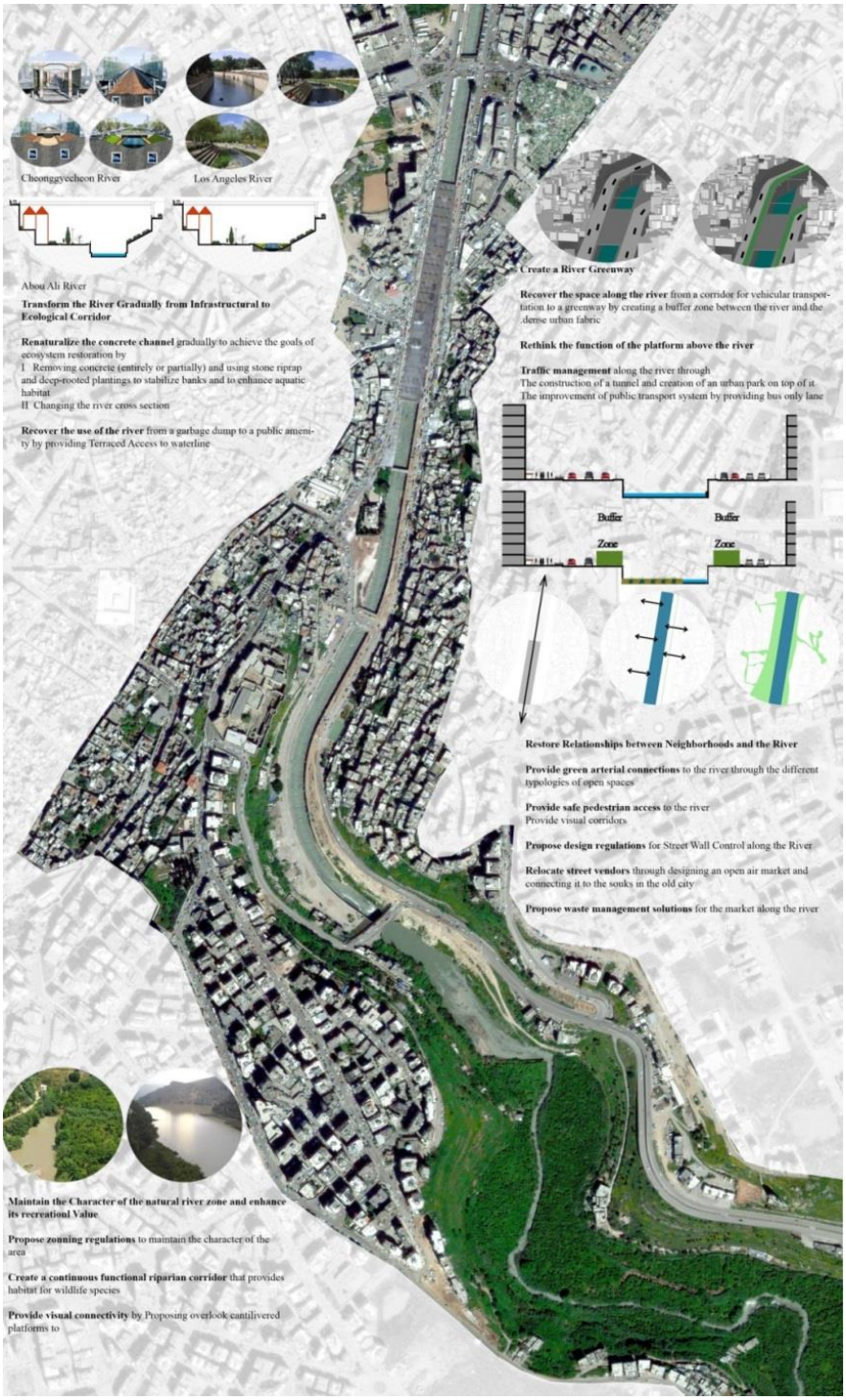


Figure74 : Urban design strategy

5.2 Ecological Urban Design Intervention

The Design intervention is divided into three phases (Figure 75). The first phase addresses east west connections, the second phase addresses the open space along the river, and the third intervenes on the river.

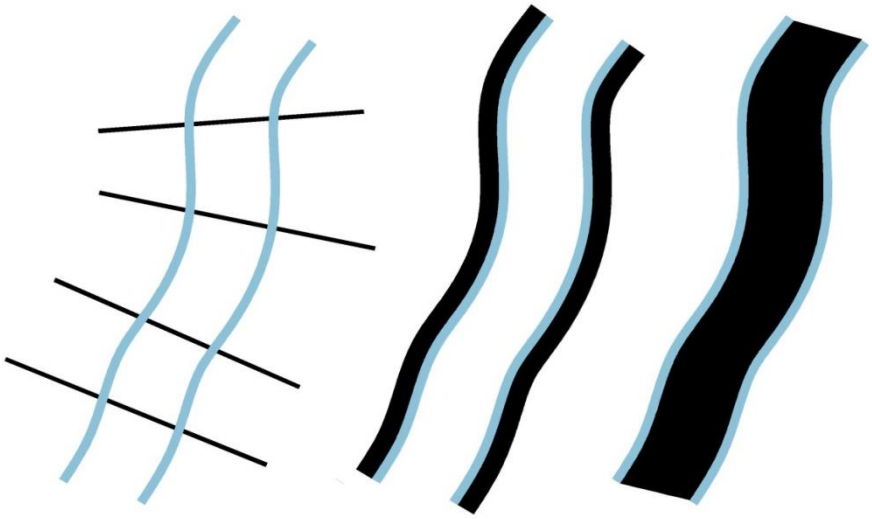


Figure75 : Design intervention phases

5.2.1 Phase One

In the first phase of the intervention I seek to provide a network of pedestrian arterial connections from neighborhoods to the river. These connections have different typologies of nodes and corridors:

- Pedestrian ramps that link the historic souks in the Mamluk core to the river
- Pedestrian streets and ramps that link monuments such as the citadel, the Mawlawiya, and Khan Al Arasat to the river
- Arterial connections from residential neighborhoods to the river.

Moreover, in this phase I propose the (a) provision of underground parking to recover the use of street parking along the river in phase two; (b) the relocation of the

vegetable market to reduce traffic congestion as well as the pollution it causes to the river; and (c) the preservation of the vegetated hill slopes and agricultural fields along the river and the provision of a pedestrian promenade that links the site to other recreational site along the river which could provide the opportunity of future eco-tourism plan .

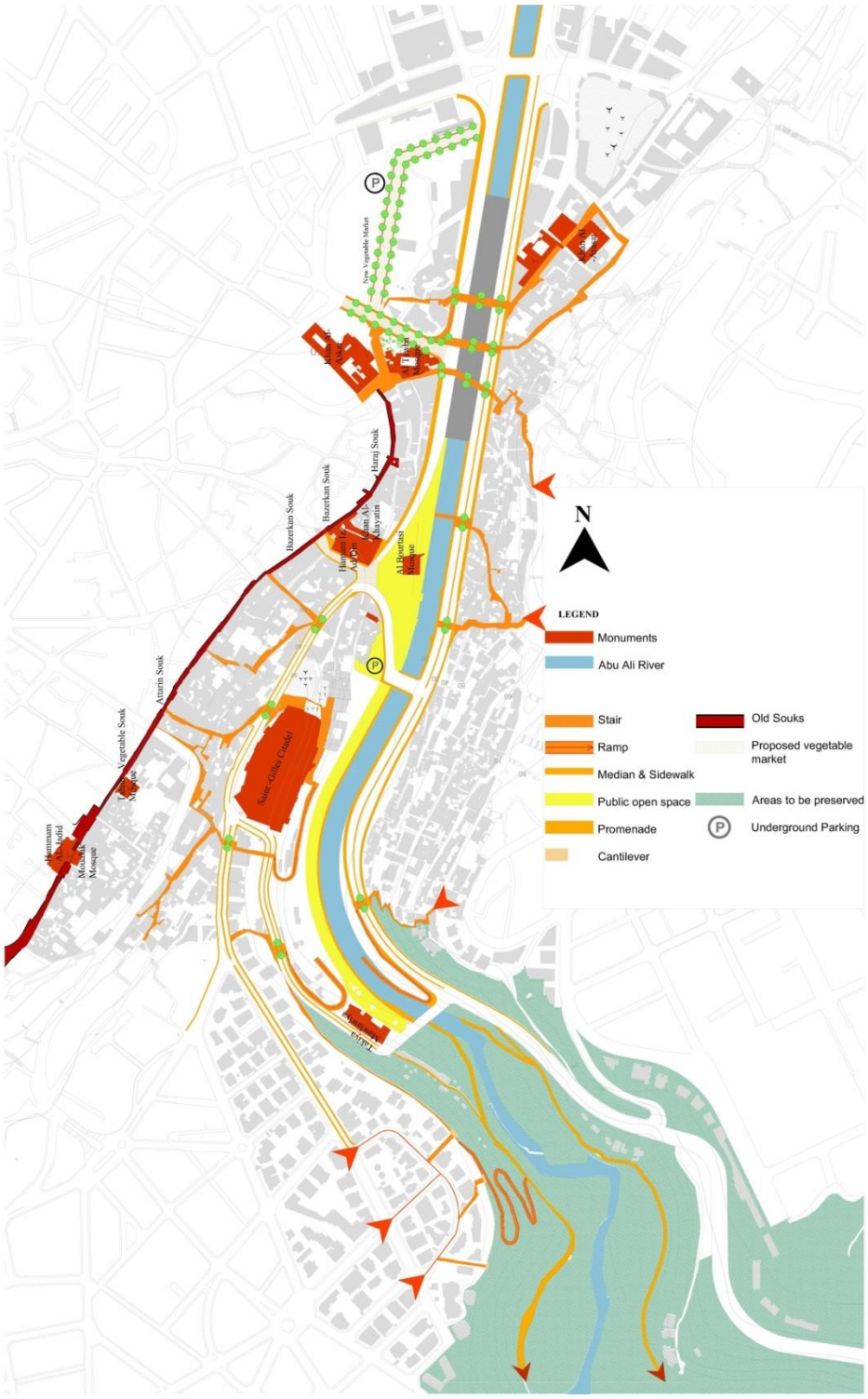


Figure76 : Proposed master plan in phase one

The different typologies of corridors show better in the sections. The first section shows the connection between the old souks and the river. The second one shows the connection between the historic core, the citadel, and the river. The third section shows the connection between neighborhoods, the green fields, and the river.

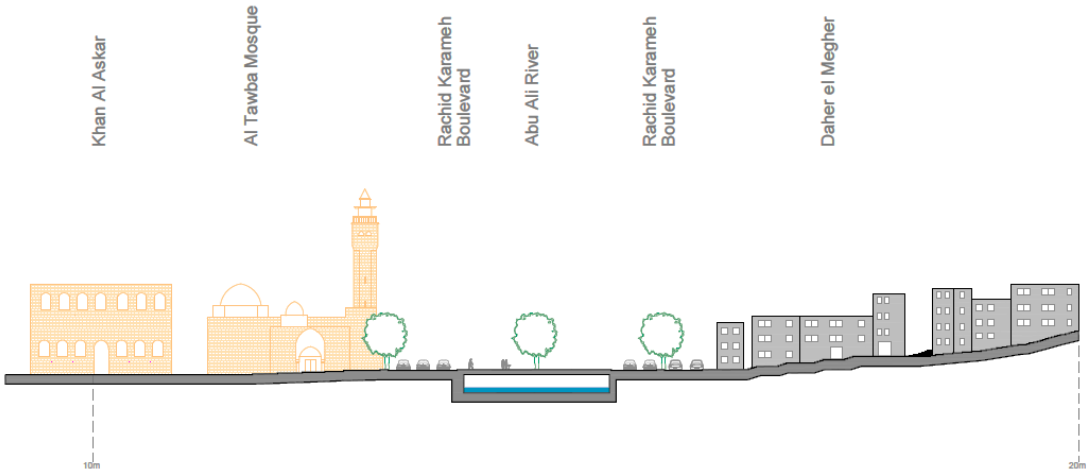


Figure 778: Section one

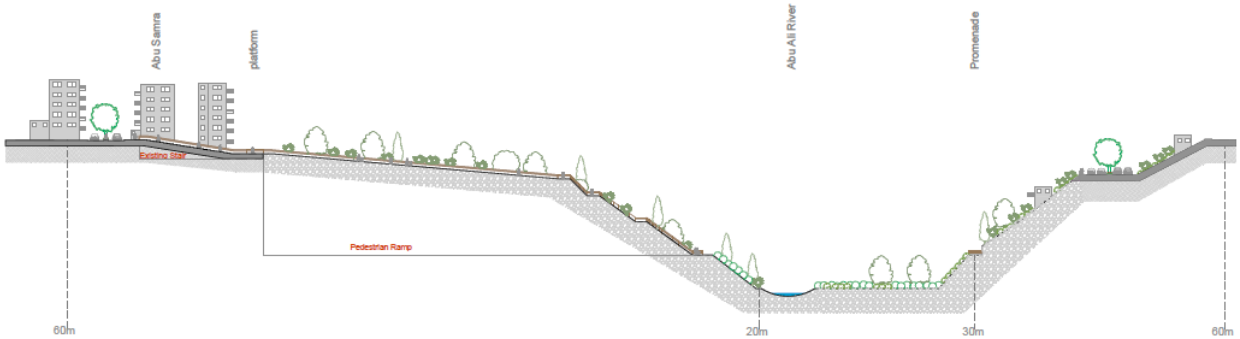


Figure77 : Section two

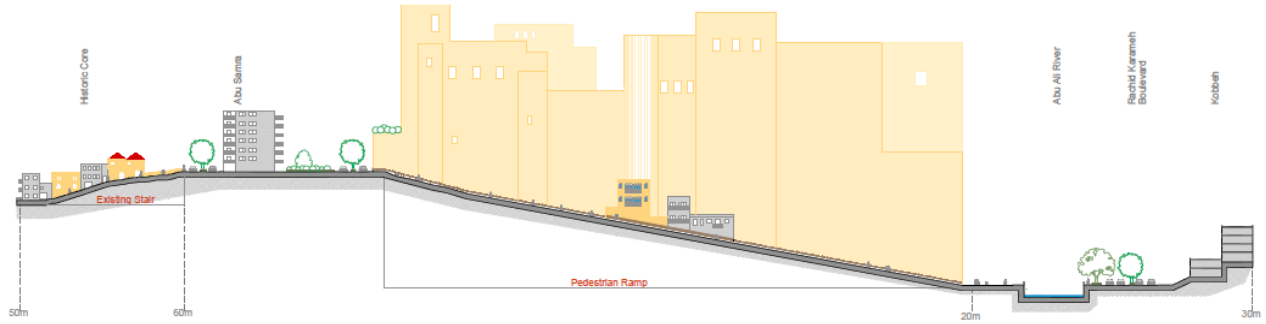


Figure 79: Section three

5.2.2 Phase Two

In the second phase I aim to establish a greenway along the river that acts as a buffer zone between the river and through traffic arteries and transform the platform above the river from a market to a recreational space.

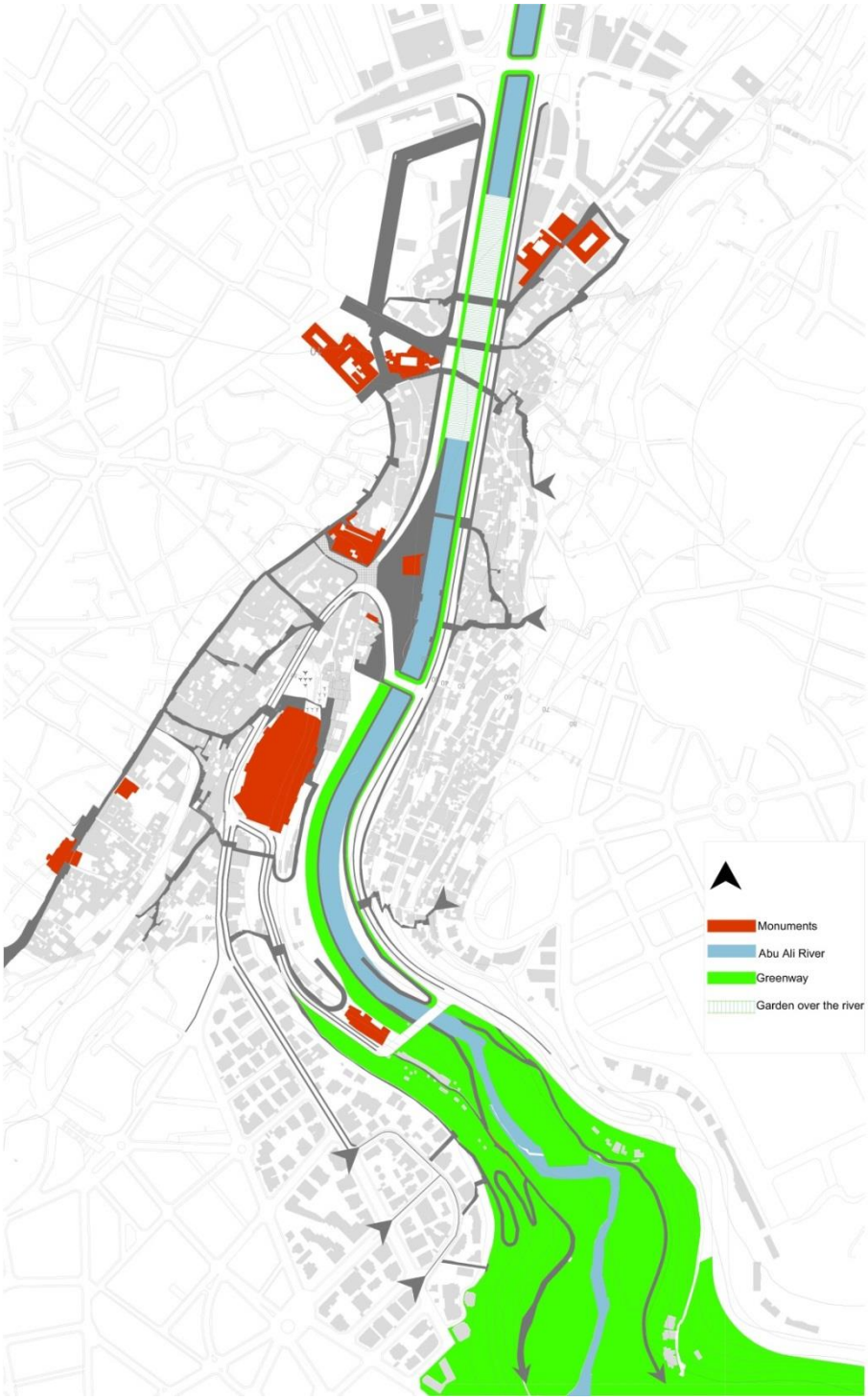


Figure79 : Proposed master plan in phase two

According to my design intervention, the typical cross section of Rashid Karameh Boulevard consists of 3m sidewalk and 5 m green buffer zone along the river then come the vehicular lanes.

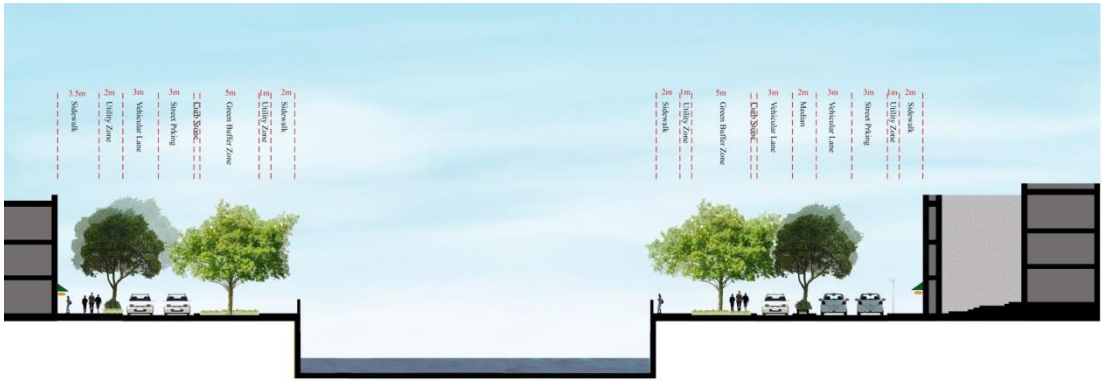


Figure80 : Typical cross section across the river

Figure81 : Typical cross section across the platform

5.2.3 Phase Three

In the third phase I seek to restore gradually the river's ecological and hydrological functioning through (a)the removal of the concrete walls where feasible; (b) the re-naturalization of the river banks where feasible, (c) and cutting into the concrete channel and filling it with sand and gravel where possible. Additionally, I propose the provision of terraced access to the river for people in the restored sections of it. Accordingly I zoomed on what I have identified earlier as a transitional zone

because this stretch of the river is the most feasible for channel restoration and because of the cultural value that the citadel and the Mawlawiya add to the river.

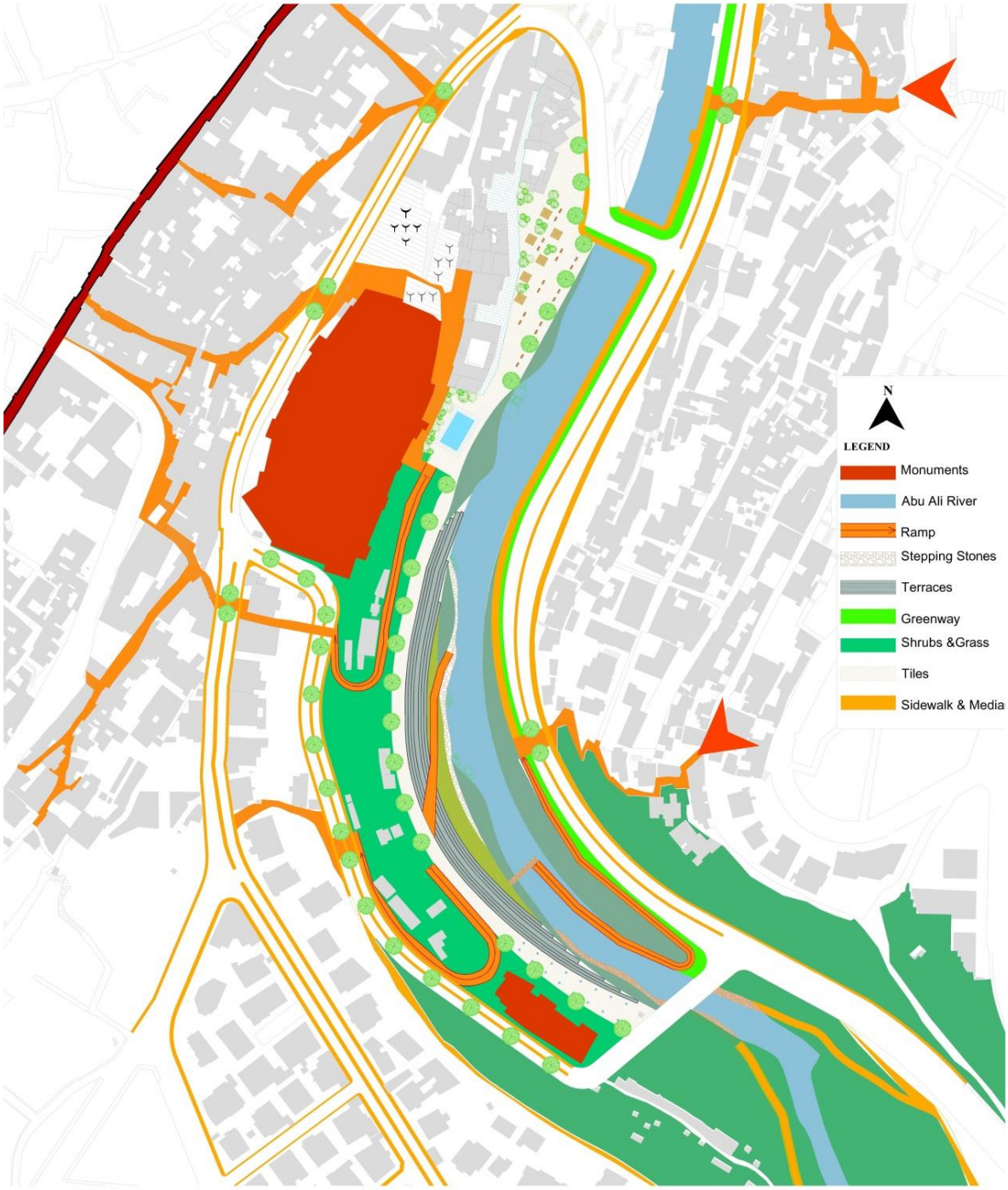


Figure82 : Proposed master plan in phase three

Figure84 : Cross section along Al Mawlawiya and the river

Figure84 :3D representation of the site according to the three phases of the design intervention

CHAPTER 6

CONCLUSION

In this section I will summarize the findings of the thesis and outline the limitations of the study through discussing the drawbacks to the scope and the method applied to help shape the future research. In the end I will discuss the need to integrate multiple disciplinary approaches to ensure an urban design strategy that address the complexity of cities.

6.1 Research Findings

The literature review and the case studies analysis and the analysis of the study area revealed that completely restoring an urban river is not feasible given dense urban fabric and flood control requirements. I concluded that the river channel could be naturalized in the transition zone between the agricultural fields and the historic core. However, in the other stretches punctual interventions could be applied to revitalize some of the river's ecological functions. Such interventions include removing part of the concrete wall, cutting into the concrete channel, and filling the channel with gravel.

The site analysis, urban design strategy and master plans showed that ecological and landscape approaches could be easily incorporated in urban master plans. It also showed that to better address natural systems in urban contexts it is important to approach these systems from an ecological perspective, and to elaborate a multiple scale analysis to understand the landscape mosaic and the complex relationship between urban and natural systems.

6.2 Research Limitations

The analysis on the landscape and urban scale was very general and did not address in detail the different characteristics of the river including the watershed, the channel, the river's bank, the floodplain, vegetation, wildlife habitat, and more important the pollution of the river. All these features were briefly discussed in the literature review. However, the detailed analysis in this research did not focus on the river itself but on the urban context of the river, and on relations between the river and the built environment because an in depth analysis that can lead to a comprehensive understanding of the river's structure needs collaboration between urban designers, landscape ecologists, potamologists[5] , and geologists.

Moreover, the characterization of the site that eventually led to the design intervention was based on personal perceptions and assumptions. The different character zones are the outcome of the analysis I conducted. Accordingly, if other layers of investigations are to be added in any future research most probably different classification zones will be identified.

Finally, the proposed interventions should be supported by an implementation plan along with an organizational committee that monitors and controls the implementation of the project and follows up on its maintenance after execution. The organization responsible of supervising the project should ensure the participation of different stakeholders, including local political parties, local NGOs, the municipalities, and the community. This participatory approach is paramount to the success of the project given the complex as well as depressed social and economic condition of the area.

[5] Potamologist is s scientists who studies rivers

The project focused on approaching the river as a cultural landscape and re-integrating it into the city as a public amenity for the residents. However, to ensure local support and participation attention must be directed to the project's benefits related to economic regeneration and the daily life of the community.

6.3 Integration of multiple disciplinary approaches

Albert Einstein once said that "we cannot solve our problems with the same thinking we used when we created them[6]." The structure of most urban areas today is the result of successive approaches to urban development applied in cities. This research emphasize on the need of developing integrative approaches through common language and method between disciplines concerned with the planning, design , and management of urban landscape systems. The framework proposed by this research acknowledges the complexity of urban areas that results from their spatial heterogeneity and the integration of social, economic, cultural, and ecological processes, and emphasizes on the integration of multiple disciplinary approaches to reach a strategy that balances multiple considerations. It brings the scientific effectiveness of ecological research to the analysis, planning, and design of urban landscape systems. It is expected that the proposed framework can be integrated within current design and planning methodologies and provide opportunities for further academic research.

[6] http://www.quoteopia.com/famous.php?quotesby=alberteinstein

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