

Linking Cities to Rivers in Theory and Practice: The Case of Egyptian River Cities

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Abstract The linkage of cities and rivers is a historic phenomenon that persists to this day. Urbanization historically began to appear on river sides and evolved along with the development of cities. The connection is represented in the linkage of the fabric of urbanism, and people, to rivers. There exists a global interest in the linkage of cities with rivers. In an interest to achieve ecological goals and communal, cultural, and economical conservation, processes have risen that value the connection of cities to rivers. The most notable of these global interests are greenways that have been implemented in multiple nations. They have become a global movement as a planning and designing tool that attains an established organizational, well-funded, and legalized structure that also strives for global inclusion in sustainable development, under which falls the linkage of cities with rivers. The Egyptian case, unfortunately, neglects river cities, despite the origination of the phenomenon in the country thousands of years ago, despite what the nation attains in cultural and natural heritage, and the fact that Egyptian river cities comprise 70% of Egyptian cities. We find that local studies that have covered river cities did not go beyond theoretical analysis, which presents a difficulty in execution due to shortcomings in planning processes, thus, this study takes steps to ensure ease of practical implementation. The study focuses on the city of Cairo as an exemplar of Egyptian riverside cities as a whole. This was done due to the extensive history the city attains of the relationship between urbanization, people, and the river. The current situation was monitored, and institutional and urban problems that contributed to the separation of

Egyptian cities from the river were identified. Analysis of a group of global experiments in greenways based on: (i) The planning process. (ii) The basis and criteria of design. (iii) Organizational structures. The study aims to learn from previous successes to reform the processes responsible for the development of Egyptian river cities. Results have been reached that shape a complete and effective integrated framework has been developed to link the city with the river at the local level that can be applied to the Egyptian case, and in turn, emphasizes the role of landscape planning and design in reconnecting the city with the river.

Keywords Urban Process, Urban Development, Greenways, Urban Rivers, Urban Planning, Landscape, Sustainable Development

1. Introduction

Urbanization has been linked to the river Nile since thousands of years ago. The city of Memphis was the first city on Egyptian land, and urbanization on riversides has propagated from the city ever since [1]. Through studying Cairo over the ages, it was found that several factors have affected the relationship between urban development, people, and the river Nile. Firstly, established during the period of Islamic conquest, through the Middle Ages [2], and then in the modern era in a strong form, and ending in the first half of the 20th century [3], due to the separation of social demographics as a result of transformations of

royal palaces and public gardens to touristic attractions and leisurely landscapes [4].

The situation continually deteriorated in the 2nd half of the 20th century. A sharp increase in modernization and population density caused social and environmental problems that in turn resulted in the deterioration in the quality of urban development [5]. The deterioration is attributed to a lack of presence of a governmental structure that is situated to appropriately solve a multitude of problems [6], and administrative shortcomings [5]. Local studies have been conducted to solve problems that occurred as a consequence of the separation of residents and rivers; however, they are merely theoretical interpretations that are difficult to practically implement.

As a result of global interest in river cities, several methodologies/techniques have emerged to link cities with rivers. They include the goal of conservation of natural, cultural, and historical heritage for the river only, however [7], without factoring in other elements of the city. They also include the goal of developing only coastal areas [8], [9], without due attention to the meaningful urban development of cities. Additionally, they strive for public involvement and coordination between the authorities and weak design/organization [10].

Greenways come across as one of the most successful movements, they attain all of the goals that other initiatives strive for [11], and several studies support this claim [12], [13]. Development projects that transformed from utilizing [19], the concept of coastal development to greenways that resulted in river cities such as Hudson, USA [15] have spread in multiple nations around the world, and an authoritative figure has been built for them, as well as practical implementation and execution.

The problem that the study tackles is that despite the importance of the connection, and its origination in Egyptian history, there exists no complete local urban discipline that aims to link cities with rivers. Therefore, the study aims to reach for a complete, local solution, by restructuring the responsible process of Egyptian urban development and redirecting it toward linking cities and rivers, through a thorough analysis of previous experimentations of greenways.

To reach this goal, a few questions need to be raised and answered:

- What is the current process that is responsible for the separation, and its forming factors?
- How receptive are riverside cities to the linkage process to rivers?
- What are the necessary, effective, local, methodologies that can implement a redirection toward relinking cities to rivers?

The methodology of the study is structured toward the following to answer these raised questions above.

- 1) A review of theoretical studies, that attain a historical background of the linkage of urban development, and people, to rivers, and current problems, local studies that attain an interest in linking cities with rivers, and greenways as a design strategy.
- 2) The methods of analysis in reviewing previous global experiences.
- 3) The extracted results are a complete framework that is practical, and implementable in the Egyptian context.

2. Literature Review

2.1. Historical Background

Urban development along the river Nile was first established in the pre-dynastic era. The relationship of the city with the river is represented in the connection of the urban fabric, the people, and the river. To gain a complete understanding of the relationship, the urban development process concerning the city and the river was studied (Fig. 1). It was better understood by studying the forming factors, and the institutional framework that contributed to the connection, or the separation of rivers and cities, in various periods.

The selection of Cairo as a model for river cities and studying it historically from the period of the Islamic conquest to this day was done for the following reasons:

1. All previous capitals of Egypt in previous eras were established in the current location of Cairo [16].
2. It is the hub of governance, rule, and commerce in Egypt [2].
3. The presence of a copious number of studies on the city of Cairo.

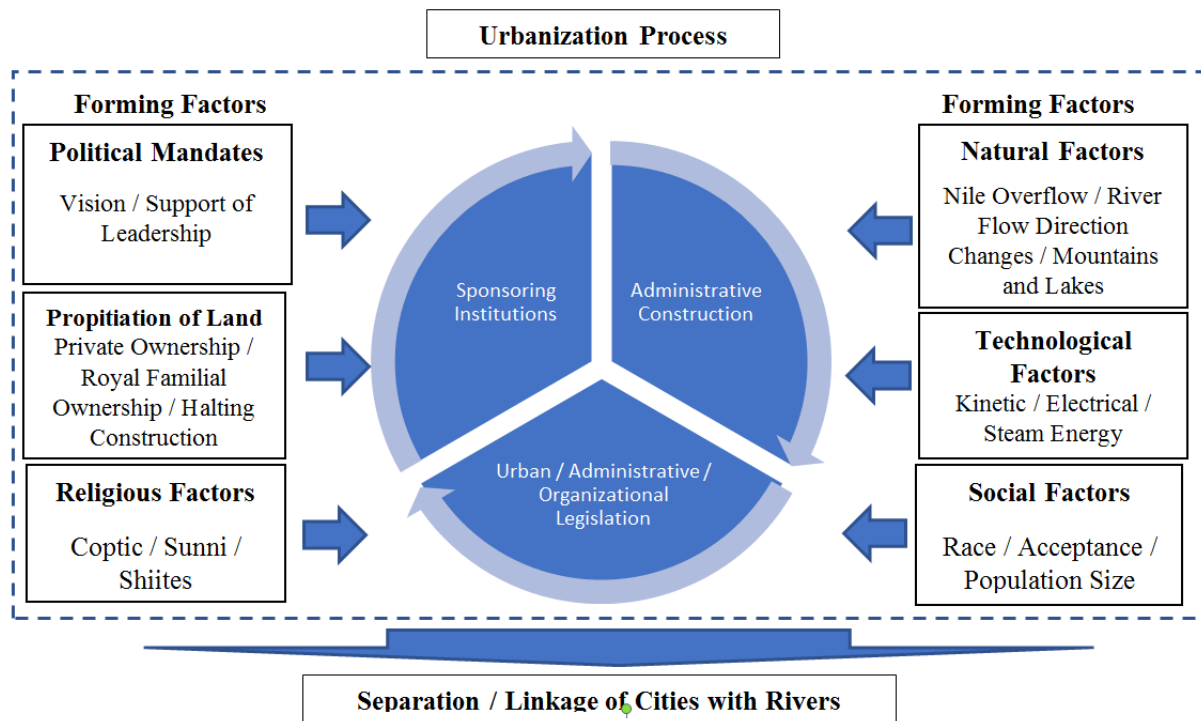


Figure 1. Elaborates Upon the Factors of Urbanization that are Responsible for Linking or Separating Cities and Rivers [1], [4], [5].

2.1.1. The Islamic Conquest (Al-Fustat / Al-Askar / Al-Al-Qataa'i) 639 AD to 868 AD

Formation of the city (Fig. 2)

The city of Al-Fustat was formed through the construction of the mosque of "Amr ibn Al-A'as," north of the palace of Wax [1]. There were no obstacles between the mosque and the river [3]. The Arab tribes then skipped around the mosque on sloping levels toward the east and divided neighbourhoods according to race and clan [4]. There was a transitional zone surrounding the mosque with a commercial and administrative area [17]. The caliphate then changed to the Abbasids, and the Emirate of Al-Askar was built, and its buildings were linked to Al-Fustat [4]. Ahmed bin Tulun established the building of Al-Qataa'i, the construction of a university on mount Yoshkar [1], and its buildings were linked to Al-Askar. The river's water receded, leaving lands in which Muslims built neighbourhoods and a port, and the mosque

became the centre of the city [2].

Axes connecting people to the river:

- 1) The axis of the river Nile. A narrow coast with a waterfront, commercial shops, buildings, and orchards [1]. The urban depth of the façade and neighbourhoods overlooking the river turned into markets due to the presence of the port, the natural areas of the river, the Nile branch, and an island that was a park for the capital [3], as well as wooden bridges that linked Al-Fustat to the island in Giza [1].
- 2) Commercial axes. The spread of shops in the glowing streets that led to the mosque [4].
- 3) Linking axes. A commercial street that started at the mosque in Al-Fustat headed north to the Al-Askar market on the lake of Qarun and ended at the Ibn Tulun Mosque in Al-Qataai [1]. A network of commercial pathways and spaces linked the city's fabric of important uses with the river.

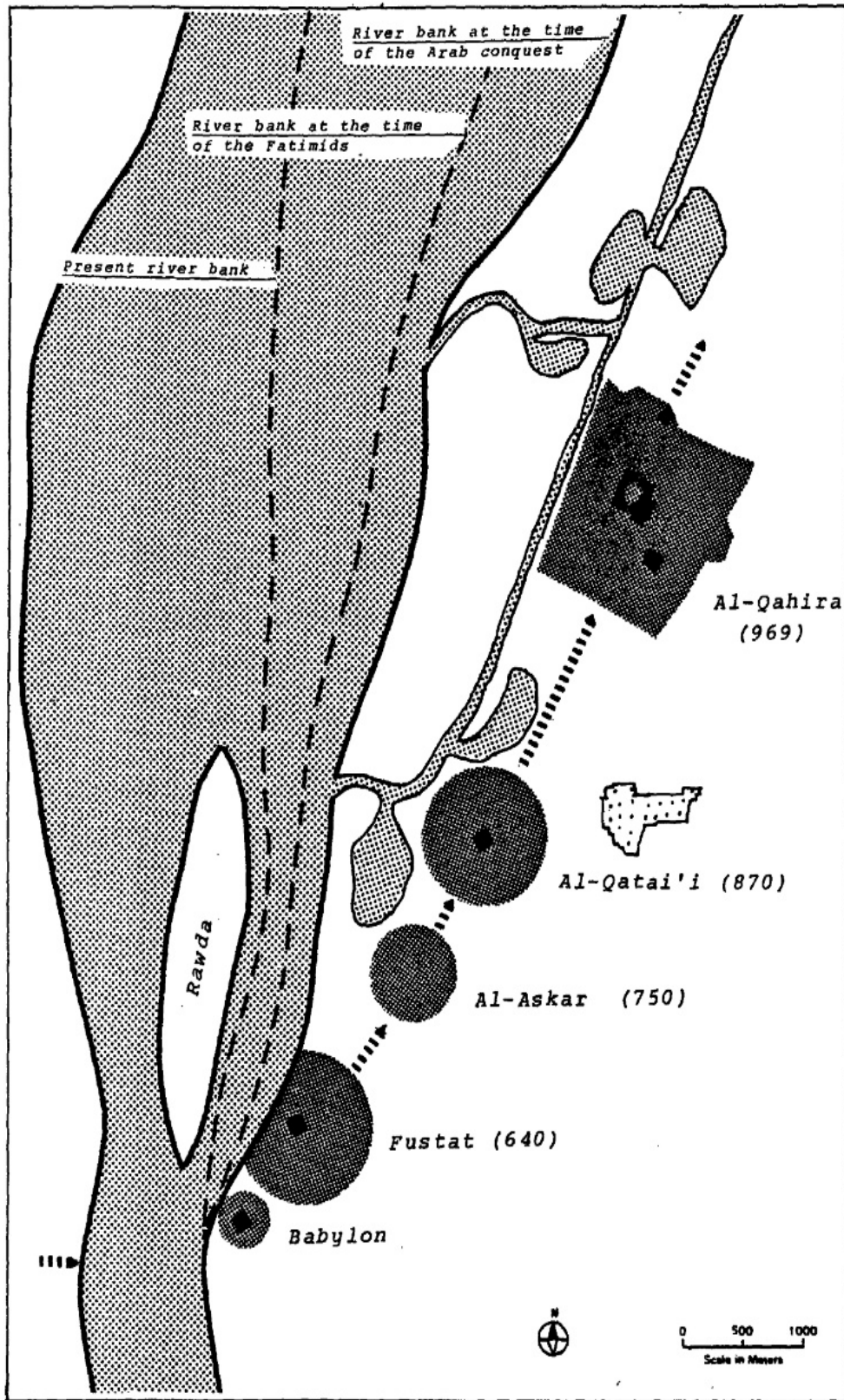


Figure 2. Displays the location of Old Egyptian cities and their Linkages with the Nile River [54]

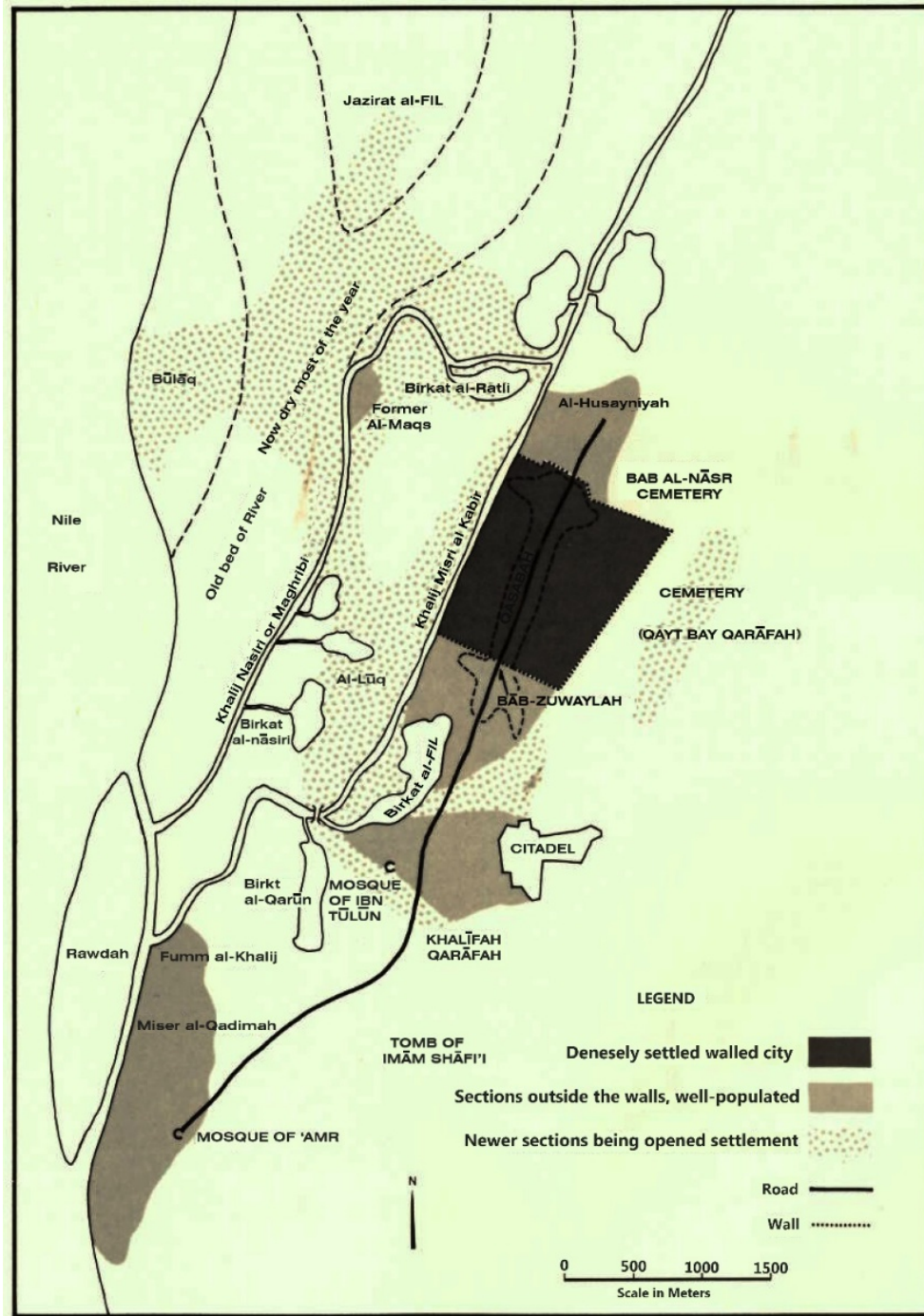


Figure 3. Cairo in the Middle Ages [4].

2.1.2. The Middle Ages (Fatimid / Ayyubid / Mamluk Cairo) 969 AD to 1517 AD

Formation of the city (Fig. 3)

The Fatimids entered Egypt as a result of the resentment of Egyptians toward the Ikhshidids [8], for they imposed a rigid and pre-defined dimensional scheme at the core [4]. Fatimid Cairo was constructed north of Al-Fustat in a sandy area [1], in front of the Al-Maqs port [4], and its lands contained an orchard and a well [1].

They paid attention to holidays and occasions to attract Egyptians, and constructed orchards and vistas to oversee events. Salah Al Din declared the end of the Fatimids and constructed the castle of the mountain, far away from air and water pollution [19]. The Ayyubid state faltered and power passed to the Mamluks, and Cairo expanded to nearly five times the size of the original city [4]. They paid attention to the development of gulfs, lakes, and river coasts [3].

Axes connecting people to the river:

- 1) The axis of the river Nile. Two sectors, the first one parallel to old Egypt, commercial, and leisurely. The second one, parallel to Cairo Al-Moez, consisted of orchards that were open to the public and transformed into liveable areas and a large port where princes resided [3].
- 2) Al-Kasbah, from Bab Al-Futuh to Bab Zuweila contained 12,000 shops [4]. (Fig. 4)
- 3) Internal water axes. They paid attention to the development of bays, and it was allowed to stroll and ride boats [3]. (Fig. 5)
- 4) Lakes. Maintenance of natural lakes, and the development of artificial lakes, upon which orchards and buildings were established, allowed for leisurely walks and boat riding [3], [19]. (Fig. 6 & 7)

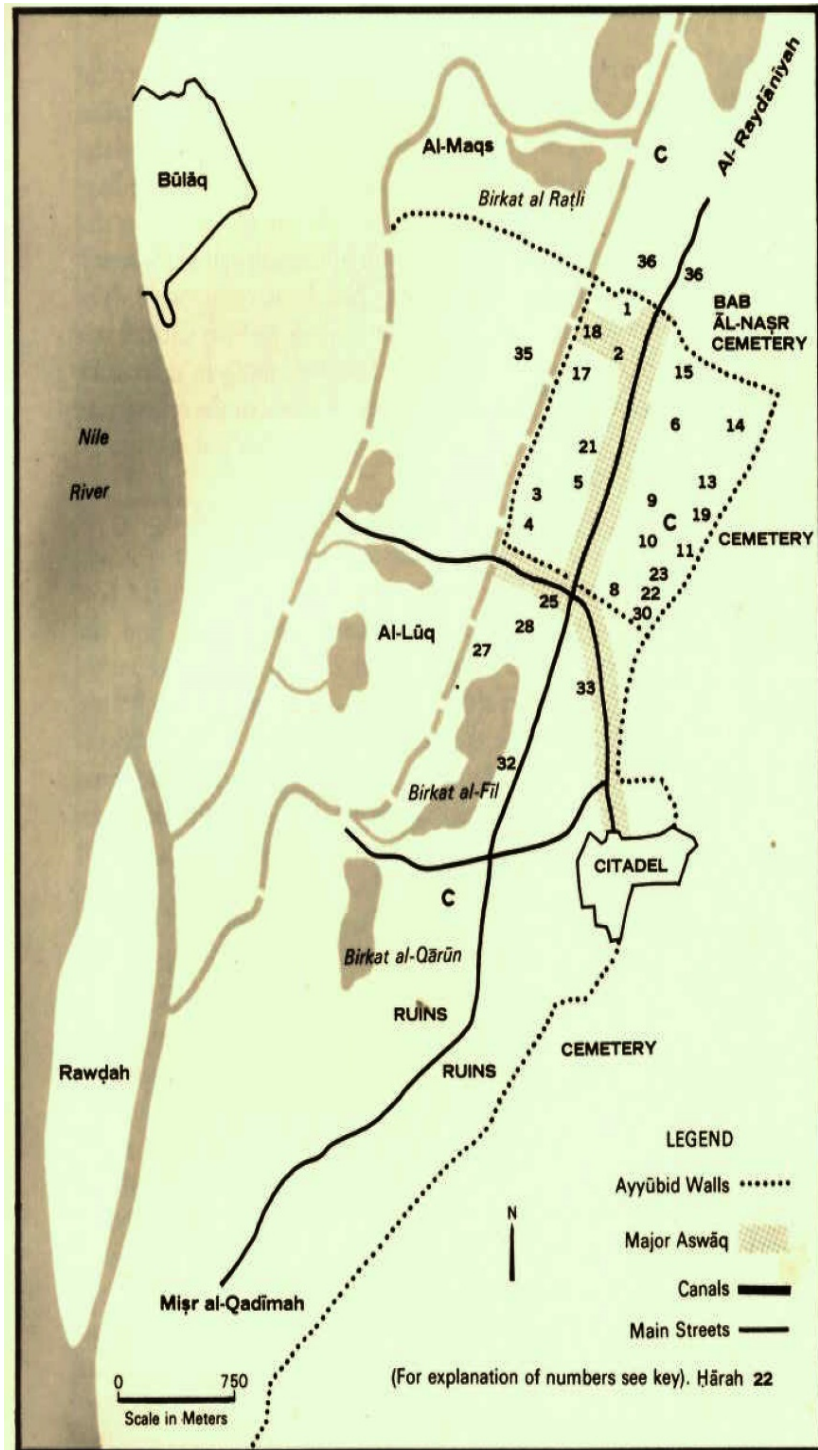


Figure 4. Commercial Pathways [2].

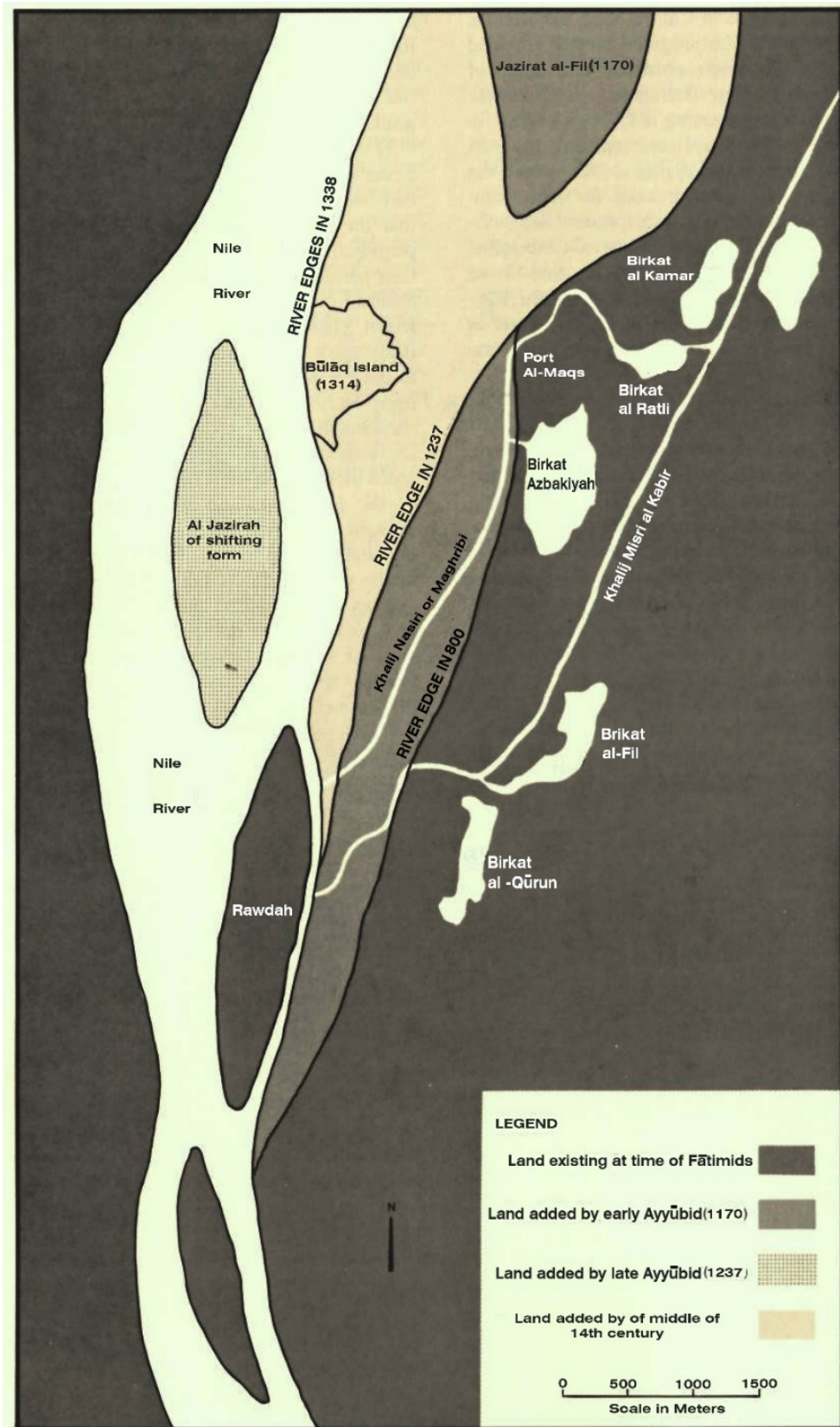


Figure 5. The Nile River and its Waterways [2].



Figure 6. Al-Fil Lake performing celebrations and boat riding activities [16]



Figure 7. Shows El-Azbakeya Lake [2].

2.1.3. The Modern Age (Mohammed Ali / British Occupation) 1805 AD to 1882 AD

Formation of the city (Fig. 8)

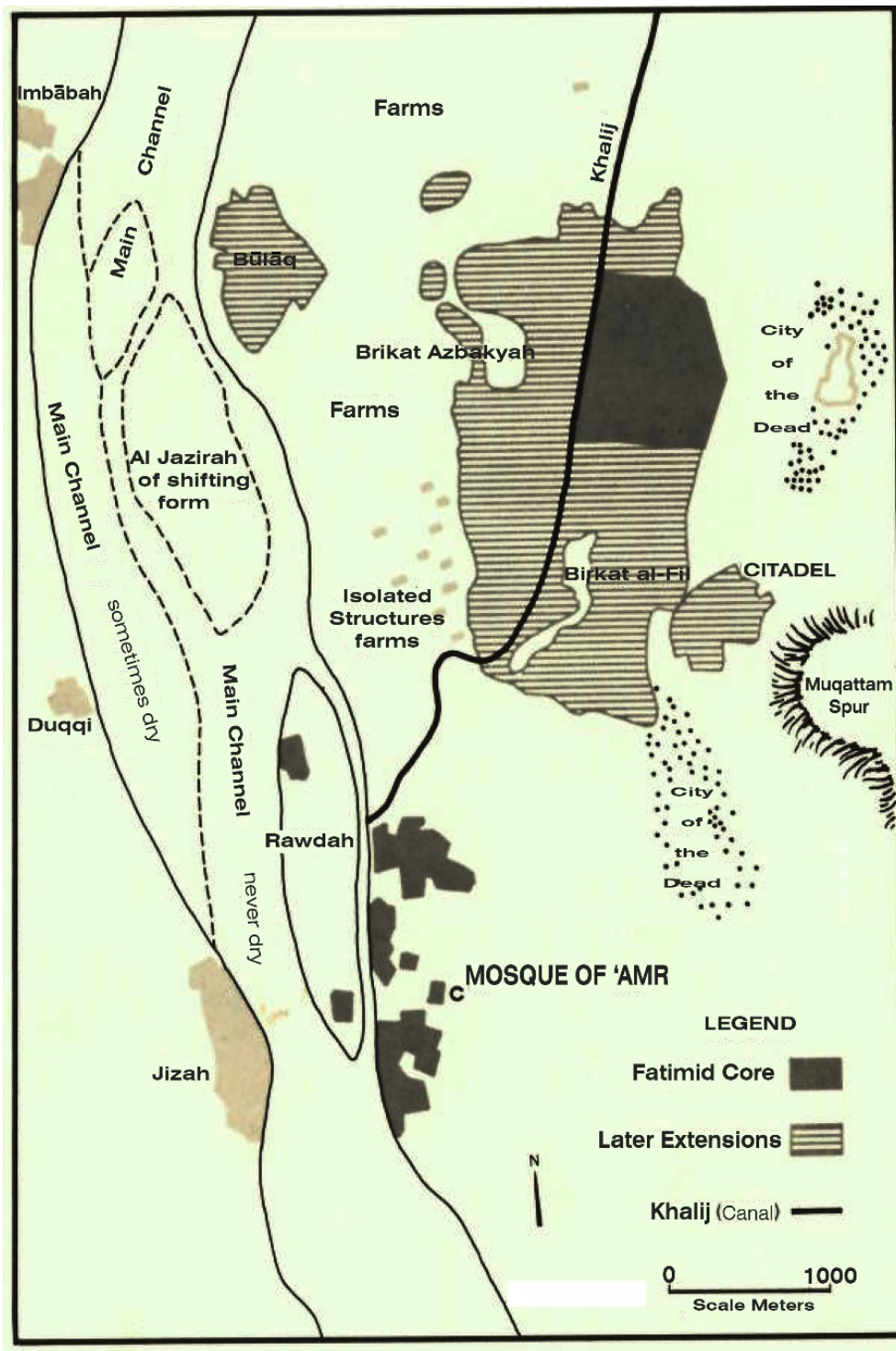


Figure 8. Cairo in the Modern Age [2]

Following the Mamluk period, is the Turkish invasion. Cairo deteriorated but remained stable up until the French campaign in 1798 AD. New Cairo was established under the governance of Mohammed Ali, who built palaces, and

wide gardens in Shubra, which encouraged the elite to build between Qasra and Bulaq and then moved into their castles. The first half of Mohammed Ali's rule saw the removal of garbage that filled the lakes, and the

preparedness of lands for urban expansion on the coast of the Nile. In the second half, he paid attention to the inner city and performed expansions on the streets, as well as establishing new ones. Following his rule, was the Khedive Ismail, who dug the Ismailia Canal, and established the Ismailia and the Fagalah district, as well as developing the Al Azbakeya district, and official gardens on the coast of the Nile [4]. He restructured historic Cairo by developing wide streets in the ancient fabric. He then planned Khedivial Cairo's streets in a form that is perpendicular to the Nile, which increased the city's connection to the rivers by emptying important buildings and gardens and using the river in popular celebrations [20].

Axes connecting people to the river:

- 1) Axes of the Nile River extend on the east and west coast of the river to include formal gardens and palaces of the royal families, and are open to people for leisurely strolls.
- 2) Bridges that connect the east and west banks by means of an island.
- 3) Axes of roads for vehicles with wide sidewalks [4], [20].

2.1.4. Contemporary Cairo (From the British Occupation Until Current Day) 1882 AD to the current period.

Formation of the city

In the first half of the 20th century, Cairo expanded 12 times as a result of a massive increase in population, the inclusion of electric trams, the building of bridges, and the moving of manufacturing industries from Bolaq to Rod al Faraj. Royal palaces and formal gardens turned into touristic attractions and entrepreneurial opportunities (Fig. 9), and the villa areas in Khedivial Cairo became highly dense housing and residential areas [4].

This period marks the beginning of the accumulation of societal, economical, and administrative problems [4]. The second half of the 20th century saw a sharp increase in population density, a technological revolution, and an urban and human revolution [21]. A shortage of competent local managerial and administrative systems was proven, for the development process worsened as a result [5]. The population separated from the river, and the river coast became only accessible to specific segments of society (Fig. 10, 11 & 12). Social and environmental problems occurred, and local research appeared to attempt to solve these problems and attempt to re-link the city to the river, and they will be represented hereafter.

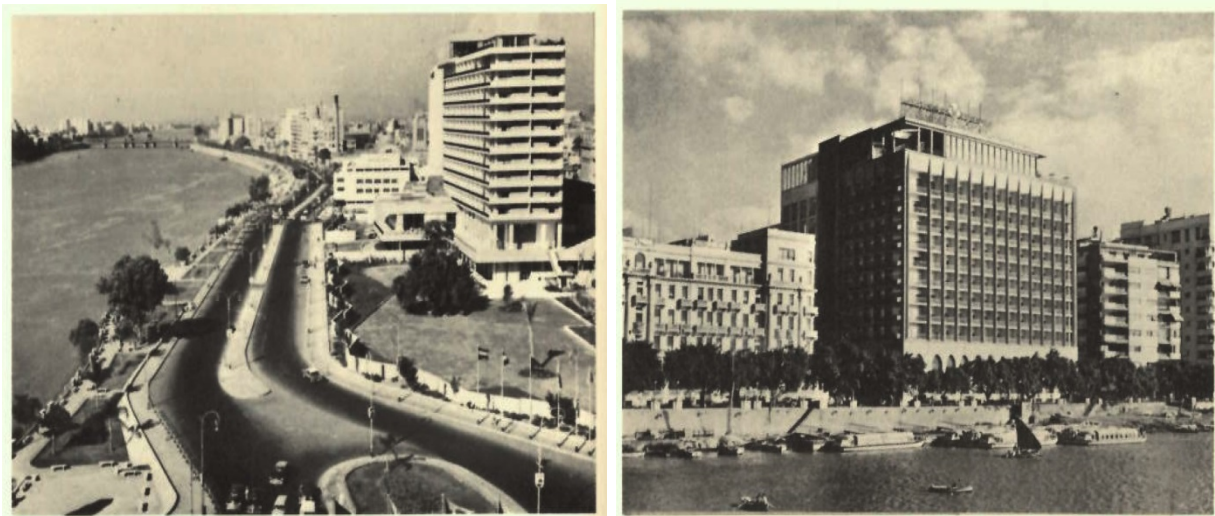


Figure 9. The Encroachment and Increasing control and grasp of Touristic Constructions on the Nile River Coast The new Hilton Hotel & Fourth Sheppard's Hotel [2].

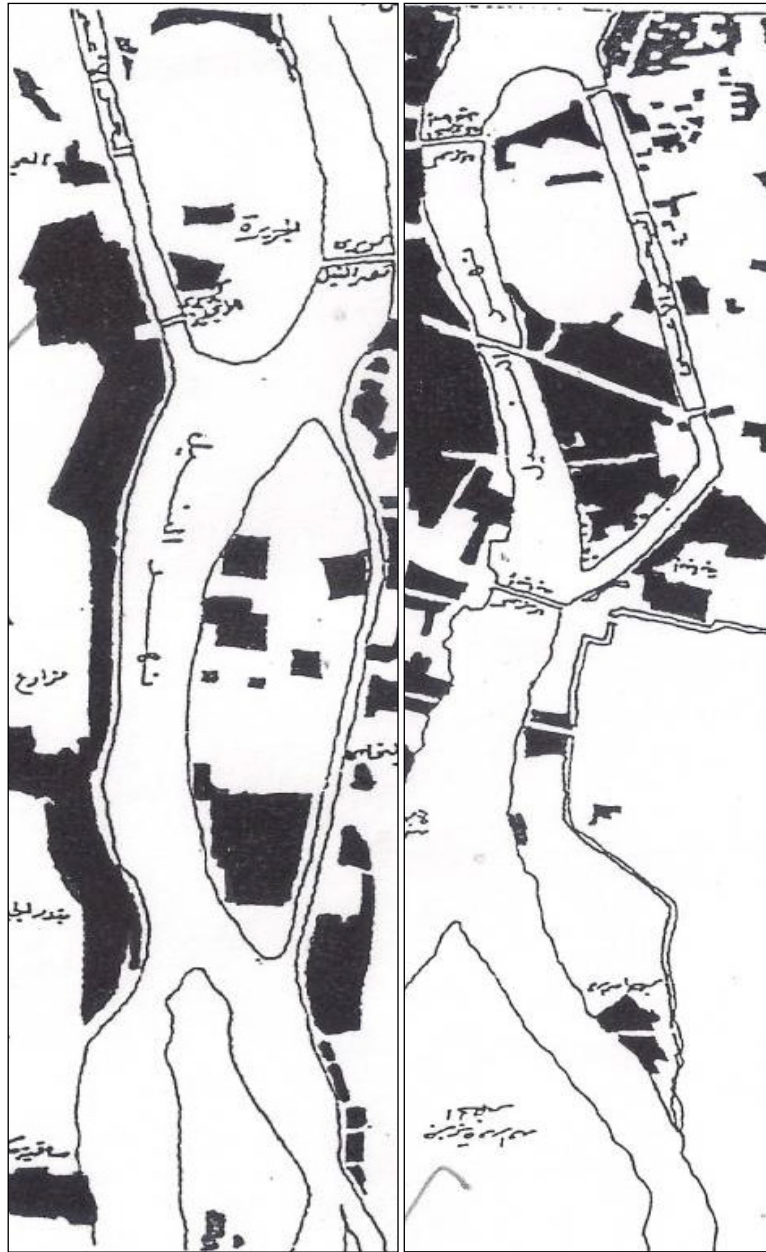


Figure 10. Cairo, Years 1900 – 1925[31].

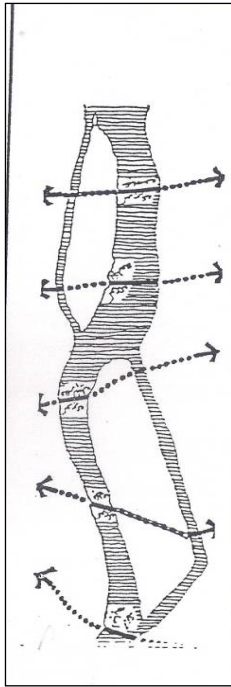


Figure 11. Cairo, 1925 – 1950. The advancement of Bridges and Street Networks [31].



Figure 12. Cairo, 1950 – Present. An increase in the density of construction alongside the Nile River [31]

2.2. The Current Situation: Local Problems, and Research Connecting the City to the River

2.2.1. Problems Represented in the Separation of the City from the River

(1) Problems in Institutional Frameworks

Traditional design methodologies have transformed the city into separate points [22] that are unliveable on the human level [23]. The shortages of executive institutional frameworks affect the implementation of final design prioritizations [24]. The lack of institutional coordination between governmental agencies contributes to this effect, as well as shortcomings in urban legislation, and a lack of adherence to said legislation by individuals [25]. Urban legislation laws were not exposed to any comprehensive planning methodology, and all that it stipulates from appropriate land division and set requirements [26]. There exists a lack of contribution from the public and private sectors [24], and a lack of an investment incentivization plan which results in a lack of resources and financial developments [25].

(2) Urban Problems

This problem is represented by a sharp increase in construction density, and a lack of green spaces, resulting in poor public spaces and services [27], [28]. The problem continues in the lack of open spaces, and streets that prioritize the pedestrian and encourage cycling and other methods of sustainable transport, and leisurely activity [29]. The disintegration or disappearance of cultural and natural heritage is a result of a poor vision and planning methodology that preserves these heritages [30]. The city's lack of interaction with its historical natural and cultural heritage, and the community's lack of a sense of purpose. The erosion of the Nile River's role in creating a corniche and developing a stable riverfront [31].

2.2.2. Local Studies Concerned with the Linkage of Cities and Rivers

On the City Level

The linkage of urban fabrics with spaces, mechanical and pedestrian movements, and the density and quality of uses of lands located on the shores of the river as an open corridor [32]. Planning and design processes still ignore the role of landscape planning and design in urban planning [30].

On the Level of Natural Phenomena of the River

Cairo attains a chance to restore the connection of its nation with the river, which attains a historical connection in their hearts, extensively improving the riverfronts [33]. The "Ahl Masr" walkway encourages physical exercise such as walking and jogging [29].

On the Level of Heritage Preservation

Extensive preservation of historically significant

buildings through renovation, followed by its closure contradicts the necessity of interaction between the city and its heritage [23]. Heritage sites, archaeological lands, and buildings of historical interest must be taken into account when planning changes within the city and urban areas [17].

2.3. Greenways as a Planning Strategy

The principle of greenways dates back to 3000 years ago, and can be observed in ancient civilizations [34], it is a natural reaction that addresses human needs [35]. They aim to address leisure, and the conservation of spaces, and habitats [36]. They attain environmental, social, and economic advantages [37], [38]. They are identified as an effective strategy for the preservation of land, and its management [39]. They adapt accordingly to contemporary needs. The first generation began before the 7th century, and up to 1960. These were formal/ceremonial themes, inherited through generations, and their main duty was to facilitate movement and beauty. The second generation (1960-1985) attained a leisurely focus and had the goal of integrating nature into construction, in addition to reaching beauty, and leisurely standards. The third generation (1985 onwards) is versatile in methodology. It aims to conserve heritage and attain several goals in natural and social dimensions [37], [40]. The advent of the current century relied on a new planning strategy [34], [35], [41]. As a result of expedient urbanization, it has joined between all-encompassing landscape planning and urban development, a complete discipline for sustainable development, that conserves heritage, and is concerned with social and economic issues [35], [36]. It has become a global movement, for enhancing urban environments [42, 43]. It is affected by geographic, economic, cultural, and social aspects [44]. These factors affect it based on spatiality, but greenways adapt to them.

In America, Greenways are consistent of long open spaces, striped gardens and natural pathways [46]. They have become a national movement that attains important environmental, cultural, historical, and recreational significance that is planned, designed and managed through the concept of sustainable land use [35]. In Europe, greenways have evolved in two ways: (1) The preservation of green infrastructure by integrating it into ecological networks [48]. (2) Availability of pathways for transportation, partially, or completely through sustainable transit, through gardens, public open spaces, and streets [49]. In Asia, there exist multiple experiments, for example, in China, greenways are represented in natural landscapes that serve several purposes, and they include the provision of shade in public walkways, the beautification of urban areas, and the protection of land [34]. This is implemented alongside rivers, water canals, transport corridors, and parallel roads along farmland [50].

2.3.1. The Definition of Greenways

They are embodied in open and interconnected spaces. They have been defined by what they attain in advantages, and so, they take on several pathways in the eyes of analysts. Some of them have defined greenways on a basis of size and volume [49], and others have done so from a point of view of entertainment and recreation [51], conservation efforts for plants and land life [37], and others yet, from a more comprehensive and all-encompassing perspective [35], [46]. All definitions agree on three main points: (1) A comprehensive network consisting of land for public use and attains biodiversity, natural environments, and recreational, and agricultural aspects. (2) Boons that spring as a result of interactivity through spatial linkage. (3) An extensive plan to comprehend several uses of the space, and moves to achieve its goals [52].

2.3.2. The Types and Objectives of Greenways

They are divided into (1) Conservational axes or natural and ecological axes, and they are axes of vegetation, and land and marine life [41], [46], [53]. (2) Recreational/cultural, and historical/cultural axes [46], [47], [53]. (3) Multipurpose axes, they are consistent with: (1) Longitudinal axes (2) Connectivity (3) Multifunctional [11].

3. Methods for Greenway Planning

3.1. Study Locations

Identification of experiences at the global level, taking into account that they are in an administrative, social, economic, cultural, environmental, and urban context. The goals are to (1) Identify various administrative disciplines (2) Identify experiments that have been implemented, others that are ongoing, and others that are yet to be studied in their respective processes (3) Interact with heritage in its various types and levels. Despite this difference, there is a similarity in the conservation of resources as a result of the awareness of the people.

3.2. Study Analyses

A selection was performed on a group of experiments that underwent various planning disciplines, and they have been dissected through three primary axes: (1) planning methodology (2) foundations/criteria for planning and design (3) planning/design process.

3.2.1. Planning Methodology

(1) After discerning primary elements, greenways adopt more than one element in one experiment as presented in Table 1.

Table 1. Primary Greenway Elements

Economic Factors	Reducing the contrast between urban and rural environments [34].
	Increasing the value of the land to double, and utilizing it in more than one form as a result of the scarcity of available land [55].
Cultural and Historical Heritage Preservation	Preservation of manufacturing sectors, factories, canals, and old corridors to link the past and the present [56].
	Preserving historical buildings, and linking them with green spaces [57].
	Promoting accessibility and ease of access to historical landmarks [58].
	Transforming the city to a cultural hub [59].
	Preservation of natural and cultural factors [60].
Environmental Factors	Preservation of environmental coastal systems by preserving wetlands and linking them [61].
	Raising public awareness about the importance of environmental systems concerned with rivers, while linking current and prospective natural environments [62], [63], [64].
	Preservation of natural landscapes concerned with the river [65].
Social Factors	Promotion of recreational aspects within the city [66].
	Enhancing health and well-being and making cities more livable [67].

(2) Defining the Vision

The vision is integrated on the level of smaller areas, then the city, then the larger region, and then at the national level. Singapore's experiment, for example, [55] employed the general vision of balancing the usage of land for economic growth. Employing the vision on the level of the city utilizes the usage of gardens, and open spaces to mitigate the effects of population density. On a sectoral level, a vision of multipurpose land can be employed in undeveloped areas.

(3) Defining Goals

By collaborating, and incorporating multiple, defined viewpoints that are practical and implementable, goals can be reached. The experiment that took place alongside the Brill Delta

River in China achieved the primary goal of urban-rural balance. It also achieved sub-goals of creating economic activities in the countryside to attract tourists, while establishing local services to satisfy the public, and preserving natural resources [34].

(4) Studying the River as a Complete and Integrated Ecosystem

Firstly: The Characteristics of the river and its biological diversity is to be considered [62], [65]. Secondly: A comprehensive study of urban communities has to be undertaken, with elements such as their classification, functional roles, and areas of historical nature and cultural elements taken into account. Such methods appear in the Schuylkill, Pennsylvania, River Experiment [56].

(5) Monitoring and Analysis of Cities Alongside Rivers

Certain Methodologies are to be implemented, and they

are: (a) Socio-economic studies (land use, land value, urban and functional formation of the city, movement networks, visual formations specific to coastal areas, and social/economic data) [55], [57], [60]. (b) Biological studies (rainfall, land slopes, biological formations, biodiversity, soil, and water movement) [62], [63], [64]. (c) Heritage studies (identifying areas of natural and cultural heritage, history, monitoring, and classification) [56], [57], [58], [60]. Following the aforementioned, analyses and studies should be performed to come up with categories and boundaries for regions [60], and categorize them as hubs (sites, and linking paths) [30].

(6) Determining the Components of Green hubs/Greenway Networks

This has been undertaken by identifying the available capabilities and problems facing the components of green hub networks, while developing solutions [57].

(7) Alternatives to Greenway Networks

This is done by coming up with alternatives after solving current problems, and utilizing possibilities, while coming up with optimal alternatives.

(8) Dividing the City into Longitudinal Bands or Solving Problems Completely

In some experiments, the city has been divided into longitudinal bands that are parallel to the river, while dealing with each band and its greenways separately [56], [65]. The depth of each zone is determined as a result of the natural and urban elements possessed by these zones.

Proposed Projects

These projects envelop expedient projects of both, a short-term nature, and a long-term nature [55], [56], [57]. The aim of this classification is to enhance greenway

networks by monitoring the public's interactivity with these projects while diminishing negative interactions [55].

3.2.2. Foundations / Criteria of Greenway Design

In this section, the main criteria and foundations that constitute sustainable greenway design will be discussed within the following points:

(1) On the Regional Level

Governmental construction of greenway disciplines on an official level, as well as renewing designs in urbanism to accommodate greenway disciplines [34], [56].

(2) On the Design Level

Linkage of natural resources outside of the urban fabric with the city to represent new open spaces, and direct urban development away from natural resources. Independence of green spaces from governmental bodies, and dealing with them as developmental projects to eventually become public property [58]. Acquisition of land (by means of purchase/rental) around active open spaces to increase and promote the variety of recreational areas [57].

(3) On the Urban Level

A vision that encapsulates the river as a necessary element in ecological, and landscape preservation [56], Implementation of biologically diverse engineering and developmental projects on the banks of the river to support its ecological functions [68], linkage of river banks, construction of pathways and general entryways for the public, opening visual and movement-based elements in the coastal sense to link urban depth to the river, and linking landscape elements with urban design in the city [65], [68], development of green spaces within the city, and linking them with the river, empowering commercial, recreational, cultural and historical hubs, where a greenway can be formed in a complete and comprehensive sense to interconnect a city [57], [58]. These aforementioned elements, as well as utilizing protected spaces (Schools/clubs) in a sustainable sense, and ensuring the continuation of green networks establish sustainable greenways on an urban level [58].

(4) On a Transit Network and Transportation Level

Intertwining a reliable transit system within the discipline of greenways, and establishing a network that encourages the inclusion of pedestrians, cyclists for the present, and the foreseeable future [34], [55].

3.2.3. The Planning/Design Process

It is crucial for the planning/design process to accommodate the ease of transformation from theory to practice and ease of practical implementation. This can be done by incorporating the following four frameworks:

(1) Institutional Frameworks

- (a) Institutional Levels: They are the levels within which the planning level is executed, and they are split into multiple geographic/management limits. Most reviews have agreed on the presence of three legal levels to facilitate linking the city to the river, and they are: Local, Regional, and National [35], [57], [58]. There have also been experiments that relied on geographical limits [34], [56]. A strong central administration, and cooperation between managing bodies are crucial to acquire lands and funding. The cooperation aspect has been represented in Asian experiments [34], and European experiments [67]. The American experiment, along with some European ones, has relied on de-centralization. The local level is the smallest planning unit with legal powers [56]. Additional tasks are assigned to small local administrations, investors, developers, implementors, and maintenance managers, in addition to their administrative roles. The regional level is defined differently, for example, in the American experiment, urban communities along the river were classified at the regional level into urban, semi-urban, and rural levels based on social and economic characteristics, setting foundations and criteria for dealing with each community separately [56]. Regarding the National level, territories were divided into three longitudinal bands parallel to the river, with the aim of simplifying complications around the proposed design [56], [65]. In the Asian experiment, the territory was divided into urban and rural communities based on factors such as land ownership and economic disparities. Each level of the institutional structure is matched by official planning entities that perform the tasks of their corresponding level, and they establish planning departments and councils that consist of elected officials and presidents. The greenway institutions aim to coordinate and supervise these developments [34].
- (b) Collaborating Parties: Institutional frameworks must support democratic participation to protect greenways, (elected members, stakeholders, experts) [69]. In the European/American experiments, stakeholders are partners in planning, execution, and promotion, and they participate in the goals of set designs, development projects, and event selection [57], [59]. The Asian experiment attempts to contact stakeholder groups and gives them grants and services to encourage working within greenway designs. They utilized the aid of elected members and representatives from the population to monitor public needs and satisfaction, with the goal of improving networks in current and future projects. They also utilized experts to design from within [34], [55], [70].

(2) Land Tenure

This aspect is a main determinant in the success or failure of greenway projects in America/Europe. The difficulty of obtaining lands due to conflicts between public and private interests constitutes an objective difficulty [46]. On the other hand, in Asia, specifically in rural China, there is an observable difficulty in obtaining land, due to it being collective property. Contrastingly, in urban areas, it is easy to obtain land due to it being at the disposal of the central government [34], therefore, in America, Europe, and some Asian countries, lands are utilized on both sides of the river, railways, drainage channels, and streets, to develop greenways [55].

(3) Tools and Mechanisms of Implementing Design

(a) Legal Mechanisms: Admittance of the river as a

national heritage site [56], [57], and transfer of ownership of open spaces to conservational organisations, or organizations for public use and sustainable development [58], [57]. Owning public roads through purchase or donation efforts, afterward, attaining financing tools, human resources, grants, and financial support from the state, applying for low-interest loan programs through local banks, and working on creating a database for lands utilizing greenways, and volunteers [34].

(4) Monitoring and Review (Network Optimization)

This can be implemented using traditional social surveys [34], [55], [70] (Fig. 13), or by using GIS programs [71]. (Fig. 14)

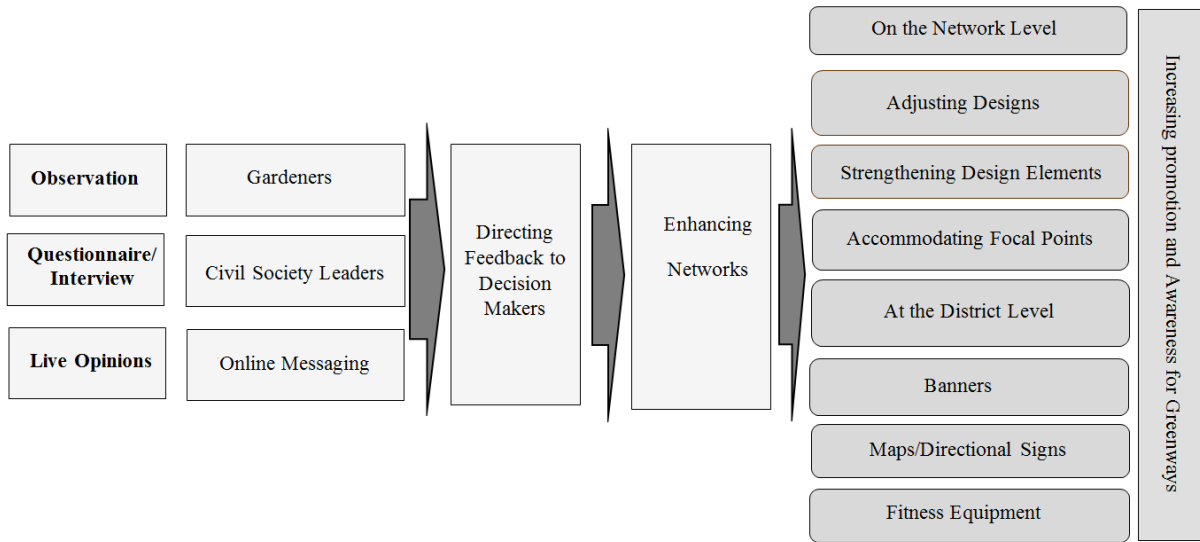


Figure 13. Utilizing Traditional Social Surveys to Enhance the Network [34], [55], [70]

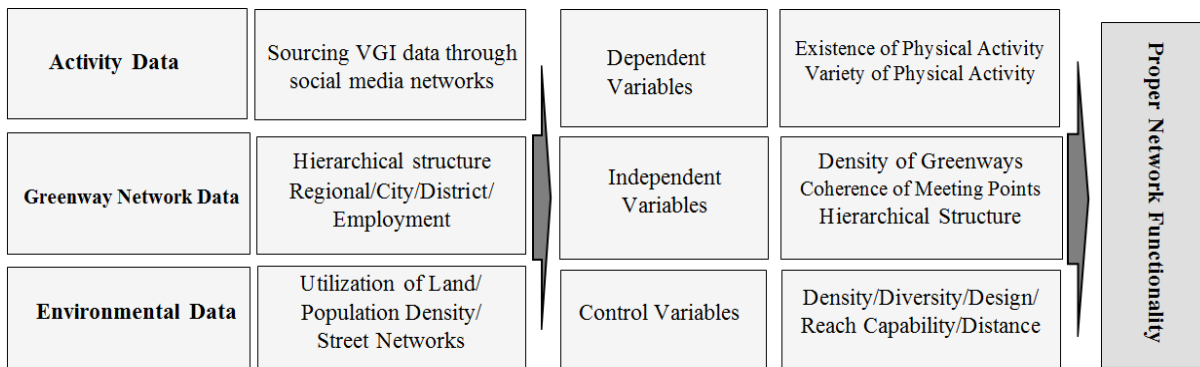


Figure 14. Utilizing Traditional Social Surveys to Enhance the Network [71]

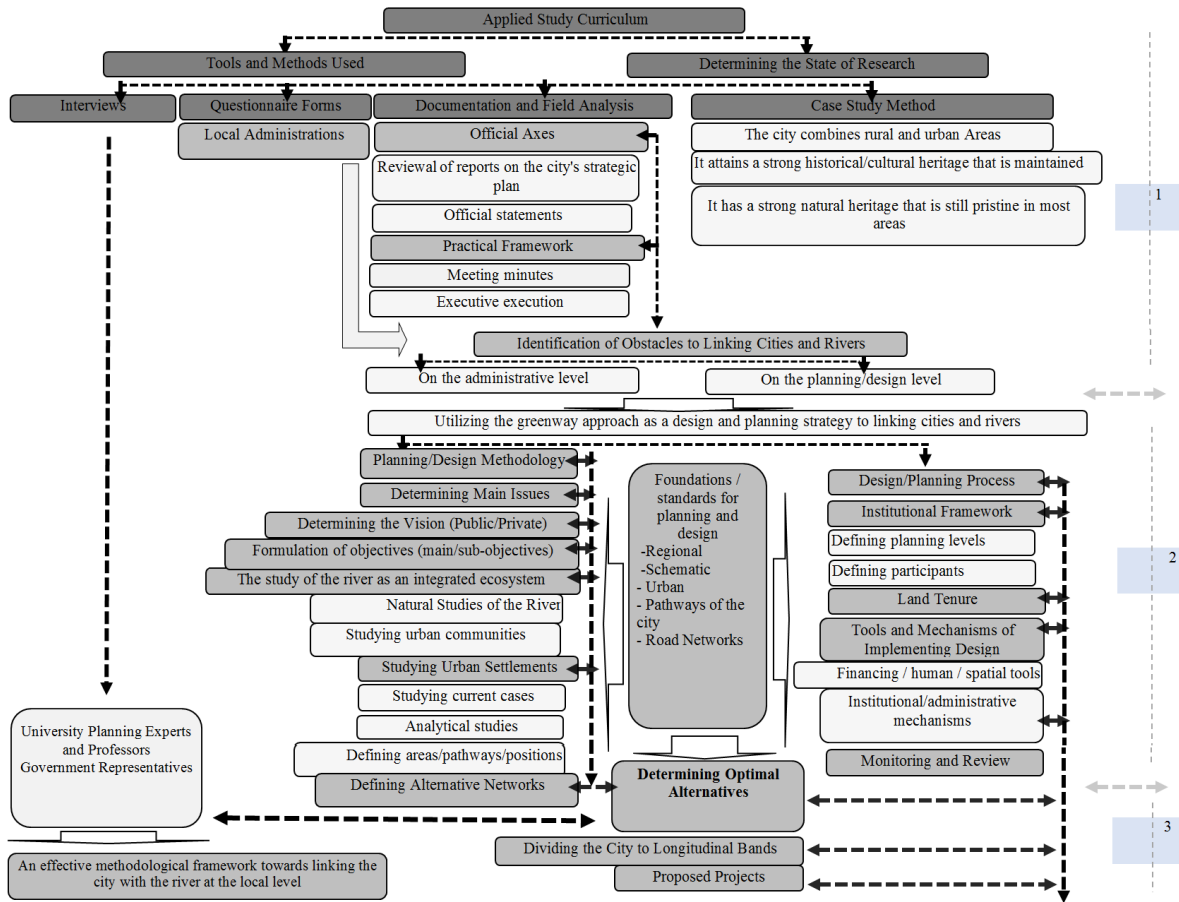


Figure 15. Compiling Results and Methodologies in Effectively Establishing Greenways

4. Results

By analysing previous experiments and experiences, an answer to questions previously raised was found, and a complete and effective integrated framework has been developed to link the city with the river at the local level that can be applied to the Egyptian case. The developed framework can be seen in Fig. 15.

5. Conclusions

The study elaborates on an important topic, and it encircles re-linking the city to the river from an Egyptian perspective. Egyptian Riverside cities attain a long history of a strong relationship between urbanization, people, and the River Nile. As a result of institutional and urban problems that appeared in the mid-20th century, the river became for a specific class of citizens, and most of the public moved away from the river. The philosophy and discipline of greenways have been adopted as a successful planning strategy to link the city to the river, due to its visible success in various nations around the world. Several trials and experiments were studied, and this study has focused on a methodology to transform visions

and theories into a practical method that can be implemented.

The study has thus reached a main result (framework) that is built upon a group of secondary results that have been expressed in the form of a diagram, the goal of which is to clearly illustrate the hierarchy and relationship between its respective elements in an easy, comprehensive, and implementable manner. The results and diagram fall under three parts.

1. Determining and studying the Egyptian riverside city (one that attains natural, cultural, and historic heritage), and analysing it extensively to find the obstacles to linking the city with the river.
2. This part is the most important, as it is structured around 3 main axes that have been extracted from previous studies that represent the following:
 - (a) A planning and design methodology.
 - (b) Foundation/standards for planning and design.
 - (c) The planning and design process, where the complete integration of these three axes is considered a guarantee of the implementation process and the benefits from them restructuring the responsible process of Egyptian urban development and redirecting it toward linking cities and rivers.

3. Extracting a group of alternatives/an ideal alternative, after which, it will be proposed to experts, specialized university professors, and governmental representatives, to effectively identify a complete and effective integrated framework has been developed to link the city with the river at the local level that can be applied to the Egyptian Riverside cities.

The study recommends the possibility of using the extracted theoretical framework as a study of the Egyptian case represented in the city of Rashid, which is located on the Nile River in northern Egypt, due to its natural, cultural, and historical heritage. By applying this methodology at the local level, it is possible to come up with an effective integrated framework that is capable of transforming ideas and visions into easily applicable reality that applies to Egyptian cities adjacent to the Nile River.

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