



# A Proposal to Renovate the Priority Historical Garden Applied to the Gardens Returns to the Period of Khedives Ismail and Tawfik

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## Abstract

Valuable historical gardens make a significant proportion of the peoples' urban heritage that must be protected and conserved like heritage buildings, due to the deterioration, transgression, and damage these gardens suffer in different proportions. Each country has its own criteria for inventorying its heritage historical gardens. The ultimate purpose is to observe, list, and determine the priorities of conservation and renovation. Therefore, the researchers found it necessary to set a model for selecting priority historical garden for conservation of such gardens as well as their heritage surroundings according to general, inclusive evaluation criteria. This model will be applied to some selected historical gardens from the period of Khedives Ismail and Tawfik, four gardens, to determine the priority garden for renovation. It showed the priority of Azbakeya Garden for renovation. It was followed by adopting the results of previous study. It has assessed four projects proposed for renovating Azbakeya Garden. These results showed the strengths and weaknesses of each project. The researchers used the evaluation to set a model design for Azbakeya renovation by specifying the ideal tools for conserving the garden and its heritage surroundings based on the results of the above study and taking into consideration the current site design determinants, as well as respect for contemporary activities to set design ideas for the garden design proposal. Then, the researchers measured the extent to which The Azbakeya Garden renovation design proposal achieves conservation principles using the previous model through a survey introduced to experts. Results showed the model has achieved a high percentage of conservation principles. This implies the possibility of applying the same to other heritage gardens.

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## 1. INTRODUCTION AND PROBLEM STATEMENT:

Historical gardens play a significant role in shaping the character of heritage cities, reflecting the time periods in which they were planned and carrying the society's collective memory of various aspects of life [10]. Egypt is home to numerous historical gardens, representing a vast heritage whose planning started in old times. But, they flourished during the reign of Khedives Ismail and Tawfik, who focused on building huge gardens in European styles. However, these gardens have faced distortion and destruction, losing their aesthetic features and visual appeal, suffering from population growth and chaotic urbanization [9]. Issues include the lack of clear priorities for conservation projects, the absence of a comprehensive vision for garden and its surrounding urban settings conservation, a focus on historical buildings rather than the historical gardens, and renovating garden elements without consideration for their historical value and design originality [8]. Other issues include the detachment between renovation projects and their heritage surroundings, taking into consideration changing land uses, change in road networks, national projects, and hosting activities which do not suit their history [9] ... and other factors which led to a significant decrease in gardens area, the deterioration of their structures, the disappearance of their mental image, and the loss of their plant wealth.

The research aims to build a model for selecting the historical garden with conservation and renewal priorities, considering comprehensive assessment criteria based on their heritage value and physical condition. The model will be applied to identify the priority garden for conservation among a group of Egyptian historical gardens with heritage values. Furthermore, a design proposal for renewing the prioritized garden will be developed,

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incorporating design tools and ideas. The achievement of this proposal will be assessed digitally using the model developed by El-Miniawy et al. [8] to demonstrate its adherence to conservation principles.

As Egypt has numerous heritage gardens in various governorates, spanning different time periods, and differing in size, classification, and physical condition, the researchers found it appropriate to focus on studying general and specialized heritage gardens in Cairo during the era of Khedives Ismail and Tawfik (1863-1892) [10]. This period represents one of the peak phases of garden design in Egypt in terms of historical importance, aesthetic value, and challenges. The research also focused on the strategic and urban levels in building a design proposal for renewing the prioritized park, without delving into architectural aspects, landscaping, visualizing site Furniture elements, or studying plant life to refine the research results.

## 2. METHODOLOGY

The research methodology emphasizes the significance of heritage garden values, highlighting the importance of conserving the surrounding identity and urban culture alongside conserving the gardens themselves. The research employs inductive and deductive approaches in the theoretical aspect. The inductive approach defines and classifies historical gardens, prioritizes their conservation, and studies assessment criteria used by different countries for their historical gardens. Then, the Egyptian case will be studied by examining the history of planning historical gardens in Egypt, and previous experiences in their conservation. The deductive approach involves building a model for selecting the priority historical garden for conservation and renewal, choosing criteria through brainstorming with seven specialists. The aim will be selecting nine main criteria and thirty-six sub-criteria, selecting four historical gardens for applying the model, ending with selecting the garden with priority for renovation. This will be accomplished according to time determinants, and confirming possessing unique heritage values by gardens. adopting the survey method to confirm criteria selection and assess their relative weights. Then, a second survey will be introduced to select the historical garden with priority for conservation and renovation, from four historical gardens. The percentage of their achieving the criteria of the proposed model will be indicated. It will be checked by a survey given to twelve domestic and foreign experts with research interests in historical gardens conservation.

The practical side includes the application approach, which encompasses building a comprehensive design proposal for renovating the prioritized garden based on the optimal conservation tools according to the research results and the model of El-Miniawy et al. [8]. Design ideas for garden renovation will be given that achieve optimal conservation tools. Achievement of conservation principles by the design proposal is measured through a survey with ten experts in the field. Then, a statistical analysis is performed using SPSS and Microsoft Excel to present and discuss the results.

## 3. BACKGROUND AND RESEARCH METHODS:

### 3.1. *The Concept of Historical Gardens:*

Historical gardens are included in the concept of "Mixed Heritage" used by (UNESCO) since (1992) [14], as they are sites that contain elements of both natural and cultural significance. It contains natural features formed by physical, geological, and biological formations or collections of these formations, and may also represent habitats of endangered animal or plant species, in addition to including architectural works, sculpture, photography, inscriptions, and archaeological caves have exceptional value from the point of view of history, art, science, and anthropology [9]. Various definitions of historical gardens have emerged based on their classification. Ballard defines them as gardens that include remnants or materials connecting them to the past, possibly one or more specific historical periods, associated with famous landscape architects, or they could have been possessed by public figures or connected to famous visitors. These gardens could be linked to general, institutional, or local buildings - and may be public or private [15].

The Global classification of historical gardens within the concept of "cultural landscapes" by the "World Heritage Centre" (UNESCO) as a defined landscape designed and intentionally created by man, Organically evolved landscapes whether it is monumental or archaeological landscapes or socially active landscapes, or Associative cultural landscapes with religious, artistic or cultural associations with the natural element [16]. The National Garden Service (NPS) in the United States categorizes them as historic designed landscapes, historic vernacular landscapes, historic sites related to historic events, and ethnographic cultural landscapes [9]. The National Heritage List for England (NHLE) [18] classifies them as rural landscapes, urban landscapes, landscapes of remembrance, and institutional landscapes [9].

In Egypt, historical gardens are classified based on ownership into public and private gardens [10]. Based on specialization, they are classified into zoological, botanical, fish, and nursery gardens [7]. In terms of function, they classified into grottoes gardens, museum gardens, cemetery gardens, and street/square gardens.

3.2. Determining Conservation Priorities for Historical Gardens:

Determining conservation priorities for historical gardens and their heritage surroundings depends on the following factors:

- **The inherent heritage values in the historical garden and its heritage surroundings:** In New Zealand charter values are defined as “possessing historical, archaeological, architectural, technological, aesthetic, scientific, spiritual, social, traditional, and other aspects of uniqueness connected to human activity” [19]. Historical gardens are associated with various heritage values that can be classified according to (Diagram 1).
- **The Conservation Policy:** The approach to conservation, whether it involves retrieving the garden to its original state, rehabilitating the same to meet contemporary needs [11], renovating it, saving from deterioration and extinction, or remodeling the original garden as a symbolic form of conservation. The conservation policy influences the choice of conservation methods and priority for conserving the garden (Diagram 2).
- **The Physical Condition of the Garden and its Heritage surroundings:** This refers to the extent of deterioration in the garden's physical condition [6], the integrity of its original design, the extent of loss in its physical elements, the scale of urban modifications, and the area taken from its original area. The deterioration in the park's physical condition may increase the importance of its conservation to rescue its heritage value and uniqueness, or for the purpose of the conservation process, or both.

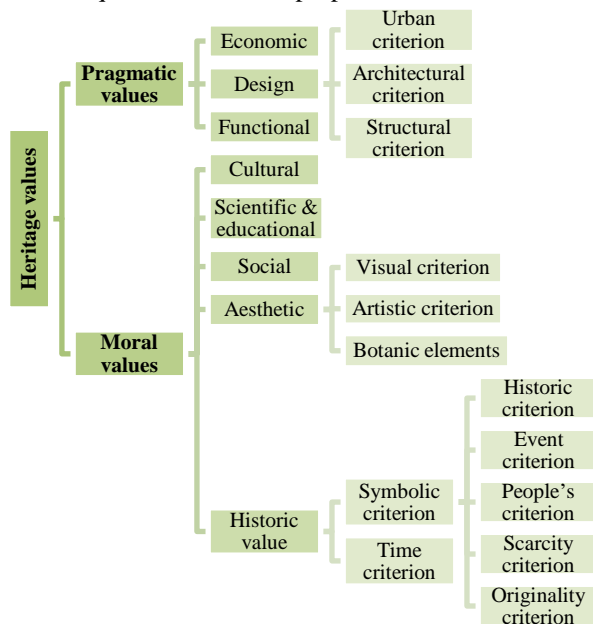


Diagram 1. Classification of heritage values for historical gardens [6] [9] [10] [12] [13] (by researchers)

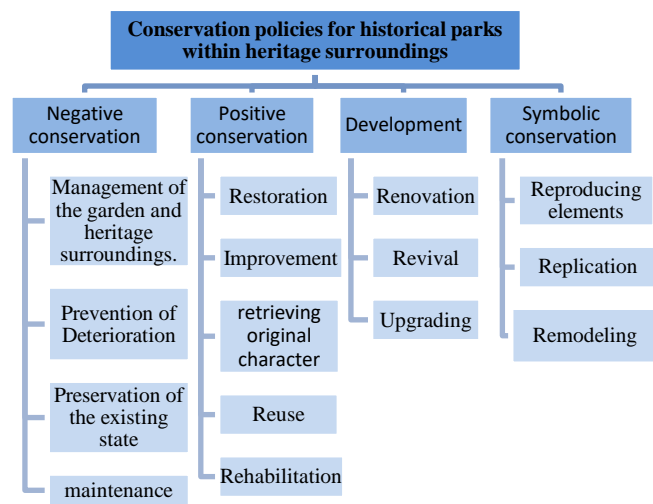


Diagram 2. Historical gardens conservation policies [6] [9] [11] (By researchers)

3.3. Assessment Criteria Used by Different Countries for Their Historical Gardens:

The importance of assessing historical gardens lies in documenting them, determining their conservation priorities. Criteria for evaluation vary between global and local sources. International criteria for assessing historical gardens are established by the World Heritage Center (WHC) [20], while local criteria are formulated by individual countries to preserve their national heritage. For instance, the National Park Service (NPS) in the United States has its own criteria, or local criteria at the state or provincial level within a country, such as those of the provinces of the United Kingdom, or countries that have more than one level of criteria depending on the importance of the historic gardens, such as Australia [10].

In Egypt, historical gardens are listed under Law No. 117 of 1983, "Antiquities Law" [21], and its subsequent amendments until the latest amendment in 2018. The law values antiquities based on their age, exceeding one hundred years. The Egyptian Ministry of Antiquities has listed some historical gardens according to this criterion, such as listing of grottoes in the Zoo and the Aquarium Grotto Garden, and listing complete heritage gardens like the Andalusian Garden in Zamalek [10]. Law No. 144 of 2006 regarding "Regulating the Demolition of Buildings and Structures Prone to Collapse and Preserving Architectural Heritage" [22] has established a committee called

"The Egyptian National Archive for Heritage Gardens" in 2019 [23]. This committee specifies the reasons for the gardens being listed in the records and prohibits their demolition. Some historical gardens, such as Al-Orman, the Zoo, Andalusian, and Aquarium Grotto Garden, have been listed in this archive [23].

The table below illustrates the evaluation criteria used by different countries (World Heritage Center) [20]—the United States of America, England [18], Australia [25], and Egypt [21, 22])—for historical gardens based on their heritage value and physical condition (Table 1).

TABLE 1: DIFFERENT CRITERIA ADOPTED BY DIFFERENT COUNTRIES FOR THE ASSESSMENT OF HISTORICAL GARDENS ACCORDING TO THEIR HERITAGE VALUES AND PHYSICAL CONDITION (BY THE RESEARCHERS)

Value	Source	Manifestations of the criterion
Historical Value (Chronological criterion)	England	- Gardens established over more than thirty years, representing a distinctive or exceptionally significant work. - Historical origin dating from the Middle Ages to the late twentieth century (Wales). * Other criteria are needed alongside the chronological one, such as: scarcity, physical condition, the ability to survive, and the functional value.
	Egypt	- Garden's age exceeds one hundred years.
Historical Value (Historical criterion)	(WHC)	- Represents the evolution of human values over time. - represents a unique/exceptional certificate of a cultural tradition, or a living/extinct civilization. - represents an outstanding example of the building type, the architectural/technological group, or landscape that illustrate and important era in human history.
	(NPS)	- Heritage works have distinct temporal characteristics.
	Australia	- Significant importance in the context/path of natural or cultural history of Australia.
	Egypt	- Follows a specific historical era, expresses the era in which it was established, and reflects its importance.
Historical Value (Event criterion)	(WHC)	- Directly linked to events.
	(NPS)	- A heritage work is associated with a historical event or events and represents an important period in U.S. history. - Several historic events with a specific pattern, influencing social development such as historical trails, or a city center district that illustrates phases of city growth.
	England	- Gardens are associated with important national events, gaining historical significance. - Gardens that witnessed several phases of evolution, modifications, or additions according to changes in public taste; each reflecting significance and notable impact on the garden site design and relevant value.
	Egypt	- Buildings and structures associated with important historical events on a national level.
Historical Value (Person criterion)	(NPS)	- Heritage works associated with individuals contributing to local or national historical content, such as the houses of famous figures.
	England	- Gardens linked to important and influential personalities on the national level, that gained importance due to their relationship with that figure or their achievements. - The garden was design by a then public figure, or later became so.
	Australia	- Associated with the life and achievements of a person or group with historical importance.
	Egypt	- Buildings and structures associated with historical figures.
Historical Value (Scarcity criterion)	Australia	- Contains scarce, uncommon, endangered cultural or natural historical elements [25].
	Egypt	- Characterized by scarcity and uniqueness.
Historical Value (Authenticity criterion)	(NPS)	- Requires heritage works to be intact and documented by approved methods, to be listed.
	(WHC)	- Displays architectural, technological, city planning developments, or landscape design.
	(NPS)	- Heritage works include distinctive construction types and high artistic values. - expresses the design of a pioneer, whether an architect or a craftsman. - Displays heritage works as an important, unique entity such as districts.
	England	- Gardens have value not in themselves, but in their connection to important buildings, land, or sites in illustrating city planning. - Garden contributes to showing and drawing the local landscape identity. - Garden has strongly influenced and changed design trends. - Garden is an expressive/ideal model for a form/ guidelines of garden design.
Urban, Architectural, and structural Value (Design criterion)	Egypt	- Buildings and structures with distinctive architectural styles [22]. - Established according to concepts / architectural schools.
	England	- Gardens with distinctive scenic value (Scotland).
Visual Value	England	- Gardens with distinctive scenic value (Scotland).
	(WHC)	- Heritage works represent a masterpiece of human creative intelligence. - Has natural scenes and superior natural phenomena, with exceptional natural beauty and aesthetic significance.
	(NPS)	- Heritage works include high artistic values.
Artistic Value	England	- Gardens considered distinctive works of art (Scotland).

	<b>Australia</b>	- Important in displaying particular aesthetic characteristics. - The Gardens illustrating a high level of technical innovation or achievement in a specific period.
<b>Agricultural Value</b>	<b>(WHC)</b>	- Site is important in preserving biological diversity and endangered and valuable species.
	<b>England</b>	- Gardens with horticultural, arboricultural, or silvicultural value (Scotland & Northern Ireland).
<b>Natural Value</b>	<b>World Heritage Center</b>	- Represents prominent examples of important environmental and biological processes for developing earth ecological systems, potable water, marine and coastal environments, and fauna/flora. - A prominent example of the main phases of earth history, and important geological processes for evolving terrestrial formations, as well as important geomorphic/physiographic features.
	<b>England</b>	- Gardens with nature conservation systems (Scotland).
<b>Functional Value</b>	<b>England</b>	- Gardens with significant recreational opportunities (Northern Ireland).
	<b>Egypt</b>	- Establishments considered tourist attractions.
<b>Social Value</b>	<b>Australia</b>	- Strongly connected to society for social, cultural, or spiritual reasons. -The importance of heritage work for local people as part of their cultural customs is ongoing and evolving over time.
	<b>Egypt</b>	- Local environmental architecture.
<b>Scientific and Educational Value</b>	<b>(NPS)</b>	- Heritage works provide important information for understanding human history.
	<b>England</b>	- Gardens serve as a source of documenting historical information contributing to the understanding of the site and emphasizing its importance.
	<b>Australia</b>	- Provides information contributing to the understanding of natural and cultural history in Australia.
<b>Cultural Value</b>	<b>(WHC)</b>	- Associated with living traditions, ideas, and beliefs. - Associated with artistic/literary works of distinctive global value. - A unique example of traditional human settlement, land uses, and represents peoples' culture or man's interaction with, and influence, the environment.
	<b>England</b>	- Gardens influence the development of public taste, gaining significance through literary works and readings.
	<b>Australia</b>	- has an important role in explaining the main characteristics of a class of places, cultural or natural environments.
<b>Physical condition</b>	<b>England</b>	- Gardens in good physical condition and able to survive. - Virgin gardens not distorted or changed, even if in relatively poor physical condition.

### 3.4. Study of the Egyptian Case in Historical Gardens Conservation:

#### 3.4.1. History of Planning Historical Gardens in Egypt:

The planning of gardens in Egypt dates back to the Old Dynasty, characterized by geometric layouts in both private and public gardens, such as the "Amun" garden [7] (Figure 1). The planning of gardens developed during the Islamic rule, whether in independent orchard gardens or within courtyards inside houses, maintaining a geometric pattern. The period from 1841 to 1952, during the rule of Mohammed Ali's Dynasty [10], witnessed the flourishing of garden planning. French, Italian, and Turkish engineers designed gardens resembling European ones. These gardens were adorned with rare, imported plants, grottoes, lakes, and paved pathways.

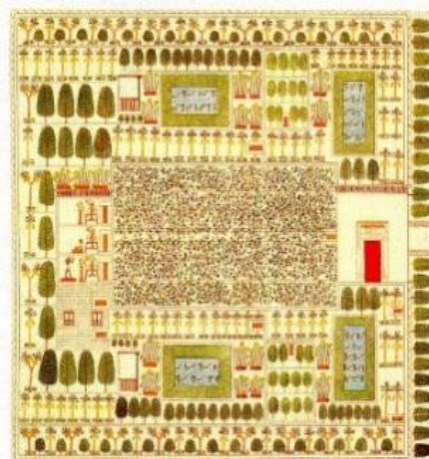


Fig. 1. God Amun garden, 1400 B.C [7].

The gardens established during the rule of Khedive Ismail and Tawfiq (1863-1892) have significant urban, historical, aesthetic, landscaping, environmental, social, and moral importance [7]. Notable public gardens during this period include Azbakya Gardens (second: 1867, and third: 1869), the Ismailiya district gardens (Tahrir Square), and Maadi district gardens. Specialized private gardens established during this period include those in "Gizirah" palace, featuring the "Zohriya" Garden, the Rock Garden, the Aquarium Grotto Garden, the Liberty

Garden, and the “Rodat alzhohor” Garden (1863: 1868), Giza palace Garden with two gardens: Al-Orman (1873) and the Zoo (1891) (Figure 2). There were also gardens in Ismailia palace, Abdin palace (1863), “Zaafarana” Palace Gardens (currently Ain-Shams University campus) (1864), The Pyramids rest house (Mina-House) Garden, The Khedival Dome Palace Garden, Prince Hussein Kamel Basha Garden in Giza (1873), Prince Omar Tousson Pasha & Gamil Pasha Garden (1872), Helwan Palace Garden, and the Agricultural College of Cairo University Garden [10].



Fig. 2. Giza palace garden, 1874 A.D. [7].

Public gardens planning continued during the reign of Mohammed Ali’s Dynasty. Under the reign of Khedive Abbas Helmy II, Montazah Palace gardens were planned. Under the reign of Sultan "Hussein Kamel" Baron "Empain" Palace Gardens were planned. During the rule of King Fouad I, the Japanese garden, "Andalus" garden, Maryland garden, and the Botanic Island in Aswan were planned. Under the reign of King "Farouk", the Botanic Garden (Faculty of Science, Alexandria University) was planned.

#### 3.4.2. Previous Experiences in the conservation of Historical Gardens in Egypt:

Conservation projects for historical gardens in Egypt are carried out in an unorganized manner, lacking clear priorities of intervention for conservation. These projects often result from political directions, the need to save the physical condition of deteriorating gardens, or comprehensive conservation initiatives covering both the heritage garden and its urban surroundings. Some of these projects include:

- **Al-Orman Garden Development Project (2006):** The aim was to restore and improve the physical condition and services of the garden. The project included updating the irrigation network, defining green areas, restoring the old bridge, constructing a new one over the pond, developing services, planting new types of plants, constructing a cafeteria for visitors, developing plant propagation nurseries, renewing the garden's fence, and guide signs for plant species of the garden (Fig. 3) [1]. One of the drawbacks of the development project was the lack of documented architectural studies or detailed documentation of the garden elements through photography or historical references, as well as the absence of an organized development plan [1].



Fig. 3. Al-Orman garden, after development [3]

- Andalus Garden Restoration and Development Project in Zamalek (2016):** The objective was to restore and improve the physical condition of the garden while introducing some replacement and maintenance works. The project included the restoration of the kiosk building, the restoration of mosaic units in the steps, seating benches, planting basins, and walls. It also involved the removal of dilapidated service rooms and the construction of a new service building, fixing, and completing marble floors, renovating insulation of flowerbeds in the steps (Fig. 4), constructing control rooms for fountains, and controlling the roots of Ficus trees. The project also involved the removal of non-historical dilapidated pergolas and their replacement with new ones, and the maintenance of heritage crops, along with creating an agricultural drainage network for the garden and steps and renewing the electricity network in the garden [1]. One of the advantages of this project was its reliance on architectural studies, analyses, and samples to find the best ways to conserve the garden's elements. It also involved documentation of the site through photography, architecture, and imaging some elements with ultraviolet rays and macro lenses to determine the history of different color layers on the elements [1].



Fig. 4. Renovation and isolation of flower beds in the steps [1, 2].

- Aquarium Grotto Garden Renovation Project in Zamalek (since 2017):** The goal was to maintain, restore, and improve the physical elements of the garden and revive its original function and retrieve the fish life in it, including the restoration of the breeding and nursery unit and the hatchery lab (Fig 5) [26]. The project covered the cleaning, development, and renovation of the pond, the restoration of heritage parts, the renewal of the drainage system and the heritage floors, tree care, and garden cleaning.



Fig. 5. Hatch pool after reoperation.

- Maryland Garden Renovation Project in Heliopolis (first phase opened in 2018):** The objective was to revive the garden, renew the infrastructure networks, increase services, and introduce new activities. The first phase covers 16 acres out of 45. The first phase included landscaping the entire green area of the garden, increasing its area, constructing marble and wooden seats, constructing marble walkways (Figure 6), and a running track. Other aspects involved constructing pergolas, fountains, restrooms, service rooms, vending outlets, and visitor services. Additionally, it included the creation and replacement of electrical and water facilities, upgrading the infrastructure, creating an underground water tank, and preserving the natural heritage buildings [27]. The project also included the construction of some restaurants and cafeterias and the addition of recreational activities such as dolphin shows and ice skating [28].



Fig. 6. Maryland garden Heliopolis, after renovation.

- It is worth mentioning that a project to renovate Al-Orman and the Giza Zoo Garden is scheduled to start soon, according to the Minister of warfare production. The project is considering the environmental, animal, plant, and archaeological aspects of the garden and aiming to reintegrate the zoo into the World Association of Zoos and Aquariums (WAZA)[29].

#### 4. RENOVATION PROPOSAL FOR THE EGYPTIAN HISTORICAL GARDEN PRIORITIZED FOR CONSERVATION:

##### 4.1. The Methodology of building the Proposed Model for Prioritizing Conservation of Egyptian Historical Gardens:

The importance of this model lies in selecting criteria determining the priority of conserving Egyptian historical gardens. This selection is based on the cumulative cultural values, and their current physical condition. The researchers opted to unify the purpose of their conservation by renovating them. This aims to ensure the comprehensiveness of conservation projects, provide for both current and future requirements, restore deteriorated parts, preserve the unique character of the heritage urban surroundings, restoring original activities, rehabilitating them for contemporary use, and renewing movement, facilities, and services networks. This is crucial for ensuring the neutrality of the proposed model's results for different selected historical gardens, considering their varied cultural values and physical conditions.

To build the model, a literature analysis was conducted, for finding global evaluation criteria set by the World Heritage Center, as well as criteria used by different countries for their historical gardens based on historical values and physical conditions [10, 18, 20, 25]. The study also considered international charters, recommendations of international conferences [14, 19, 30, 31], national laws [21] [22], guiding manuals [9] [32], and scientific theses and researchers [10] [33, 34]. The researchers employed brainstorming to choose model criteria; by engaging a group of seven specialists in historical garden conservation who selected nine main criteria and thirty-six sub-criteria.

Hence, the survey approach using the "Likert tri-scale" was utilized to confirm the chosen model criteria and estimate their relative weights. A group of twelve local and international experts, with research interests in historical garden conservation, participated in the survey. The analysis of the survey results was statistically conducted using "SPSS" and "Microsoft Excel" to present the outcomes. The analysis relied on the arithmetic mean method and the materiality statistically to find the specialists' assessment of the model criteria and estimate their relative weights according to the following equations:

Arithmetic mean **for each criterion survey** = (Number of Confirmers\* 3 + Number of Neutral \* 2 + Number of Disapprovals\*1) / Total number of experts

**Relative weight of the criterion in the model** = (arithmetic mean for the criterion / Total arithmetic mean for all criteria) \* 100 (Table 2)

##### 4.2. Introduction to the Historical Gardens under Study:

The study is limited to identifying four historical gardens established during the reigns of Khedives Ismail and Tawfiq in Cairo to determine the prioritize conservation garden based on the specialists' opinions during a brainstorming session. These gardens include:

###### 4.2.1. Giza Palace Gardens (Zoo – Orman):

Designed by the engineer "Barillet Deschamps" in 1873 by commission for Khedive Ismail, the gardens cover an area of 225 acres as an annex to "Giza palace" divided into three parts: Salamlak, Haremlek, and Fruits. Approximately 28 acres in the south were allocated as open space, and during Khedive Tawfiq's era in 1890, 50 acres were transformed into the "Zoo" garden and redesigned, and opened in 1891. The remaining area (northern part) became the "Orman" garden as a botanical garden, was opened to the public in 1910, with about 157 acres remaining. Parts were allocated for the establishment of King Fuad University in 1925. In 1934, a street known as "University Street" separated the two gardens completely.

- **The Zoo:**

This is a specialized animal garden with a general layout following natural patterns, covering 80 acres (Figure 7). It features wrought-iron fences, massive gates, five grottoes penetrated by waterfalls [35], and a water stream along the zoo with some ponds within. Pedestrian wooden and steel bridges cross water streams and various historical and modern structures, such as: animal cages, the music kiosk, royal rest areas, the zoo museum, administrative buildings, and the Japanese kiosk. There are historic walkways decorated with coloured



cobblestones and sandstones, and modern ones covered with coloured cement tiles and asphalt. Historical and modern architectural styles coexist in the garden, representing Pharaonic, African, Indian, Japanese, Arabic, and modern styles [7]. The garden houses rare and perennial plant species, using manual irrigation and sprinklers.

The zoo garden possesses numerous historical values with archaeological structures, aesthetic values represented in plant and sculptural formations (grottoes), and their relationships with green and water areas. Sculptural works include statues, prominent sculptures at the main entrances, royal grotto, and the Candlestick grotto. Landmarks include the Pharaonic obelisk, grottoes, and monumental suspended bridge. In addition, features include the environmental value represented in the large green spaces, and a functional value as a recreational garden, and as a place to rest and wait. There is an economic value in attracting people to live next to the garden, so public and private establishments, palaces of princes and the public, and foreign consulates were built on its borders. Cultural and scientific values for what the garden offers to the general and specialized in zoology, and for its popularity in cinematic films.



Fig. 7. The current design of Saray Giza Gardens (1) Orman (2) The Zoo [7] (adapted).

The garden faces environmental challenges due to both external and internal pollution from air and solid waste generated by animals and visitors due to lack of awareness. Landscaping elements reflect the need for renewal and increased such as lighting units, seating, drinking fountains, and services (water closets). In addition to not fitting in with the overall character of the garden. Additionally, some historical structures require restoration and maintenance, and improvements and increased services within the garden are essential.

- **Orman Park:**

Classified as a specialized botanical garden, Orman covers an area of approximately 28 acres after deductions [7] (Figure 7). It is surrounded by wrought iron external fences, featuring a classic main gate as a landmark. Its original design combines natural and geometric patterns, with asphalt, concrete, and marble pathways all over. Wooden benches and shades are found, along with artificial water features, including a portion of a waterway, a large water pond, and three pedestrian bridges crossing the water passage and pond. Further, the garden includes kiosks and buildings. The garden has a range of service facilities of different styles, most of which are in poor condition and need maintenance. It contains distinctive and rare plant species, as well as perennial trees [36]. Manual and sprinkler irrigation systems are used.

The plant element in the garden has an environmental value, functional value in defining some pathways, aesthetic value as a landmark with the different plant formations. The garden has a functional recreational value,

and economic value in attracting urban development and hosting annual plant exhibitions. It also has cultural and scientific values for botanical and agricultural research in the Herbaria building dating back to the era of Khedive Ismail. The garden has gained fame in cinema.

The garden lacks sculptural elements, and the site landscape elements are not suitable for the garden's style. Issues include lack of services (water closets), environmental problems from external and internal pollution (air and visual pollution from surrounding buildings styles), solid waste from visitors, and currently waterway and pond are drying up.

#### 4.2.2. Al Gezira palace Gardens:

Established during the reign of Khedive Ismail in the period from 1863 to 1868, covering an area of 9.5 acres. It was attached to the "Al Gezira" palace on the island of "Zamalek." Khedive Ismail assigned the engineer "Barillet Deschamps" to transform parts of the "Gezira" lands into gardens and large parks. It is divided into six sections (Rock Gardens, Grotto Garden (Aquarium), Khedival Garden, island's Greenhouses "Zohriya" Garden, "Rodat alzhohor" Garden, and Old Khedivial Garden (Liberty)).

##### • The Aquarium Grotto Garden:

Originally a specialized fish garden, it was transformed into a public garden and opened to the public in 1902. Designed in a natural pattern (Figure 8) by "Monsieur Compas" and "Monsieur Meliou" [1]. The garden features a distinctive main entrance with gypsum murals. It has a renovated lake with ceramic cover, grotto with glass tanks for fish display, artificial water elements, historical pathways treated with coloured pebbles, and others newel with cement tiles, natural stones, and bricks. The garden includes seats, shades, traditional and modern bridges, administrative buildings, fish tank facilities building, a cafeteria, water closets, and a prayer room, each with different architectural styles (Indian for the grotto, classic for the gate, Arabic for the prayer room, and modern for the cafeteria). The garden contains local and imported perennial and rare plant species, with manual and sprinkler irrigation. However, rare fish species have disappeared.



Fig. 8. The current Aquarium Grotto Garden [7] (Adapted).

The garden has a historical value due to listing the grotto as a monument in 2010 and to retain its original boundaries [7]. It has an aesthetic value with sculptural elements in the grotto and the main gate, landmarks in plant and sculptural formations, and their relationship with green areas. It has a recreational functional value as a major city garden, educational value for specialized in studying aquatic life and fish, economic value for hosting exhibitions and celebrations as well as being a magnet for urbanization, and cultural value for its popularity in movies.

The garden faces environmental challenges from external and internal pollution from air pollution and the smells from cleanliness issues in the grotto, and the spread of bats. Additionally, it suffers from visual pollution from surrounding buildings forms and styles, a lack of services (restrooms, seating areas, and cafeterias), deteriorating building conditions, the need for lighting studies in the grotto, and the revival of fish life and rare fish species.

#### 4.2.3. Azbakya Garden:

A specialized botanical garden, dating back to the Mamluk era when Mamluk Prince "Saif al-Din Azbake" dug a lake and established a park on an area of 60 acres. In 1839, "Mohammed Ali Pasha" established a public garden with a geometric planning on 40 acres (Azbakya First garden). In 1868, "Ismail Pasha" reconstructed the garden (Azbakya Second garden) on 7.7 hectares. In 1872, "Ismail Pasha" redesigned it again (Azbakya Third garden)

[8] On an area of 20 acres [7] on a natural planning, including curved paved pathways, shaded areas, small bridges crossing ponds and water channels, industrial fountains (Figure 9), waterfalls descending from the fountains into a water passage leading to the pond, shooting areas, and children's playgrounds. The garden also featured two music kiosks, a restaurant, a Chinese-style cottage near the pond, a marble fountain, and selling kiosks. The garden housed rare, imported plants, and in its southern part, there was the Comédie-Française theater and the Khedivial Opera House (outside the garden boundaries).



Fig. 9. The Third Azbakeya garden, Khedive Ismail era (1869) [7] (adapted).

The garden underwent successive changes, including the construction of the National Theater, the filling and transformation of the pond into a skating area, then a swimming pool, and finally a tennis court. The Egyptian Arms Club was established, and the garden was divided into two halves by the penetration of “July 26th Street” after the 1952 fire. The Azbakya fences market for book was established along the north outer fence, and the “Opera” Communications Center building, the “Ataba” Garage, and the Cairo Traffic Administration buildings were built within the garden in the 1970s. Later, the National Puppet Theater and “Al-Taleea” Theater were established. The garden's pathways were modified, the music kiosk was removed, and changes were made to the grotto and the industrial waterway, and the waterfalls were removed [8]. In 2007, the construction of two metro stations beneath the garden began, leading to a significant reduction in its area, to be utilized by the General Authority of Subway to store equipment. The current constructions within the garden include the grotto, the historical marble fountain, the Crown Dome. The architectural styles of structures are diverse such as the European-style of the fountain, the Arabic-style of the Book Market, the modern-style of the mosque, and the Arabic-style of the second mosque, in addition to the modern structures of the “Ataba” Garage and the “Opera” Communications Center.

The garden has various heritage values, including historical significance due to age, its connection to national historical events, and its hosting of royal celebrations. It has an artistic value in hosting famous artistic and musical concerts and has landmarks such as the statue of “Ibrahim Pasha” in “Opera Square”, the National Theater building, the heritage Azbakya Fountain and Grotto, and the Crown Dome. The garden has an urban value as it connects Khedivial and Islamic Cairo [7], in addition to being home to listed monuments, including the marble fountain since 1986 and the National Theater since 2020. It has a cultural value through the National Theater and the Book Market. However, its current functional value is low as it is closed, despite its previous crucial role as a central garden in the city center.

The current physical condition of the garden is deteriorating, with only three and a half acres of green space remaining. The main entrance is not clearly visible, and a large number of perennial trees were cut down for the metro project. The remaining greenery is also suffering from deterioration. The garden has no services, and pathways and furniture elements have disappeared. It faces air pollution due to vehicle emissions in the surrounding congested area, visual pollution altering the garden's skyline, and the presence of a deteriorated urban area adjacent to it. Some modern buildings within the garden deviate from the heritage context, and manual irrigation methods are still used. Conservation and saving efforts are necessary to restore its functional, historical, and aesthetic roles, as well as its visual image.

#### 4.3. Selection of the Historical Garden Prioritized for Conservation:

To determine the priority of conservation for the gardens selected in the study, a second survey was used, employing the “Likert Triad” scale. Twelve local and international experts with research interests in historical gardens conservation were surveyed to assess the selected gardens according to the proposed model. The survey

results were statistically analyzed using SPSS and Microsoft Excel to show the outcomes. The analysis relied on the arithmetic mean method, percentage, and the materiality to evaluate the experts' assessment of achieving the model criteria in the four selected historical gardens. The total relative weight was then calculated to indicate the priority of conservation for the four chosen gardens.

**The experts' assessment of the four historical gardens was based on the following equation:**

**The arithmetic mean of achieving each criterion in the garden=** (Number of achieved \* 3 + Number of neutral \* 2 + Number of not achieved \* 1) / Total number of experts

**The percentage of achieving the criterion in the garden=** (The arithmetic mean of achieving the criterion in the garden/ Maximum estimated scale (3)) \* 100

**The relative weight of achieving the criterion in the garden=** The percentage of achieving the criterion in the garden\* The relative weight of the criterion in the model (Table 2)

The following table illustrates the evaluation of the selected historical gardens to determine their conservation priorities based on the proposed model (Table 2).

TABLE 2: THE PROPOSED MODEL FOR IDENTIFYING PRIORITIES OF CONSERVATION FOR HISTORICAL GARDENS, AND EXPERTS' EVALUATION OF THE SELECTED HISTORICAL GARDENS (BY THE AUTHORS)

Value	Criteria	Arithmetic mean of criterion confirmation	Relative weight of criterion in the model	Orman Garden, Giza		Zoo Garden, Giza		Aquarium Grotto Garden, Zamalek		Azbakya Garden		
				Arithmetic mean of criterion achievement	Relative weight was achieved of the criterion in the garden	Arithmetic mean of criterion achievement	Relative weight was achieved of the criterion in the garden	Arithmetic mean of criterion achievement	Relative weight was achieved of the criterion in the garden	Arithmetic mean of criterion achievement	Relative weight was achieved of the criterion in the garden	
Historical values	<b>Time criterion</b>											
	C1	Date of garden planning & establishment	2.67	3.32	2.83	3.13	2.41	2.67	2.83	3.13	2.83	3.13
	<b>Historical criterion</b>											
	C2	The garden dates back to an important era	2.58	3.21	2.83	3.03	2.83	3.03	2.83	3.03	2.92	3.12
	C3	The garden expresses the era of its establishment	2.5	3.11	2.75	2.85	2.75	2.85	2.75	2.85	2.75	2.85
	C4	The garden historicization a living/ ended civilization	2.5	3.11	2.83	2.93	2.83	2.93	2.83	2.93	2.83	2.93
	<b>Event criterion</b>											
	C5	The garden is associated with an important historical event	2.58	3.21	1.00	1.07	1.17	1.25	1.17	1.25	2.92	3.12
	<b>People's criterion</b>											
	C6	Associated with a known designer	2.58	3.21	2.83	3.03	2.83	3.03	2.83	3.03	2.83	3.03
	C7	Associated with historical figures	2.58	3.21	1.75	1.87	1.75	1.87	2.00	2.14	2.92	3.12
	<b>Scarcity criterion</b>											
	C8	The garden represents a rare/ uncommon work	1.17	1.45	2.00	0.97	3.00	1.45	3.00	1.45	2.00	0.97
	<b>Originality criterion</b>											
C9	The garden retains its integrity and original design	2	2.49	1.75	1.45	1.75	1.45	2.00	1.66	1.17	0.97	
<b>Total relative weight of the historical values criterion</b>		26.32		20.33		20.53		21.47		23.24		
<b>Percentage of achieving the historical values criterion in the garden</b>		100%		77.24%		78.00%		81.57%		88.30%		
Design values	<b>Urban criterion</b>											
	C10	The garden is part of the urban formation of the area	2.67	3.32	2.75	3.04	2.75	3.04	2.25	2.49	2.75	3.04
	C11	The garden is located in main squares/roads	2.5	3.11	2.83	2.93	2.83	2.93	2.75	2.85	2.83	2.93
	<b>Architectural criterion</b>											
	C12	The garden has buildings with an exceptional style	2.67	3.32	1.17	1.29	2.75	3.04	2.41	2.67	2.75	3.04
	C13	The garden has monuments	2.75	3.42	1.17	1.33	2.83	3.23	2.83	3.23	2.83	3.23
<b>Structural criterion</b>												
C14	The garden has exceptional	2.67	3.32	1.08	1.20	2.83	3.13	2.83	3.13	2.41	2.67	

		structurals										
	C15	Building materials from the environment are used	2.67	3.32	1.17	1.29	2.83	3.13	2.83	3.13	2.25	2.49
	C16	Few modern structural interventions	2.48	3.08	1.75	1.80	1.75	1.80	1.75	1.80	2.00	2.05
	<b>Total relative weight of the design values criterion</b>		22.89		12.88		20.30		19.30		19.45	
	<b>Percentage of achieving the design values criterion in the garden</b>		100%		56.27%		88.69%		84.32%		84.97%	
Aesthetic values	<b>Visual criterion</b>											
	C17	The garden has a visually and mentally distinctive, beautiful image	2.5	3.11	2.00	2.07	2.83	2.93	2.83	2.93	1.75	1.81
	C18	The garden has visual landmarks	2.48	3.08	1.75	1.80	2.75	2.82	2.75	2.82	2.75	2.82
	<b>Artistic criterion</b>											
	C19	The garden reflects features of local landscapes	1.17	1.45	2.00	0.97	2.41	1.16	2.41	1.16	2.41	1.16
	C20	The garden was a work of art in the time when it was established	2.5	3.11	2.75	2.85	2.75	2.85	2.75	2.85	2.83	2.93
	C21	The garden reflect important design development steps	2.58	3.21	2.00	2.14	2.01	2.15	2.25	2.41	2.41	2.58
	C22	The garden is a good example of the thought that it was designed with	2.33	2.90	2.75	2.66	2.83	2.74	2.83	2.74	2.83	2.74
	<b>Plant elements criterion</b>											
	C23	The garden has rare, perennial, overgrown plants	2.5	3.11	2.83	2.93	2.83	2.93	2.83	2.93	2.83	2.93
	<b>Total relative weight of the aesthetic values criterion</b>		19.97		15.42		17.58		17.84		16.97	
<b>Percentage of achieving the aesthetic values criterion in the garden</b>		100%		77.22%		88.03%		89.33%		84.98%		
Functional value	C24	The garden performs its entertainment and social role towards the community (positive – inactive)	1.17	1.45	2.75	1.33	2.83	1.37	2.75	1.33	1.00	0.48
	C25	The convenient to which current activities match the garden history	1.17	1.45	2.25	1.09	2.3	1.11	2.25	1.09	1.00	0.48
	<b>Total relative weight of the functional value criterion</b>		2.90		2.42		2.48		2.42		0.96	
	<b>Percentage of achieving the functional value criterion in the garden</b>		100%		83.45%		85.52%		83.45%		33.10%	
Social value	C26	The garden is part of the community's memory	2.5	3.11	2.25	2.33	2.83	2.93	2.83	2.93	2.83	2.93
	<b>Total relative weight of the social value criterion</b>		3.11		2.33		2.93		2.93		2.93	
	<b>Percentage of achieving the social value criterion in the garden</b>		100%		74.92%		94.21%		94.21%		94.21%	
Scientific & educational value	C27	The garden is a source for documenting historic information	2.58	3.21	1.75	1.87	2.25	2.41	2.25	2.41	2.41	2.58
	C28	The garden is important in preserving animal and plant life, especially endangered species	2.25	2.80	2.41	2.25	2.75	2.57	2.75	2.57	2.75	2.57
	<b>Total relative weight of the Scientific &amp; educational value criterion</b>		6.01		4.12		4.98		4.98		5.15	
	<b>Percentage of achieving the Scientific &amp; educational value criterion in the garden</b>		100%		68.55%		82.86%		82.86%		85.69%	
Cultural value	C29	It has a role in educating and introducing the community about their civilization	2.33	2.90	2.30	2.22	2.41	2.33	2.25	2.18	2.41	2.33
	C30	The garden fame in novels and beyond.	1.17	1.45	2.30	1.11	2.75	1.33	2.83	1.37	2.83	1.37
	<b>Total relative weight of the cultural value criterion</b>		4.35		3.33		3.66		3.55		3.70	
	<b>Percentage of achieving the cultural value criterion in the garden</b>		100%		76.55%		84.14%		81.61%		85.06%	
Economic value	C31	The garden makes direct profits	1.5	1.86	2.75	1.71	2.83	1.75	2.75	1.71	1.00	0.62
	C32	The garden makes indirect profits	1.17	1.45	2.41	1.16	2.41	1.16	2.41	1.16	2.41	1.16
	<b>Total relative weight of the economic value criterion</b>		3.31		2.87		2.91		2.87		1.78	
	<b>Percentage of achieving the economic value criterion in the garden</b>		100%		86.71%		87.92%		86.71%		53.78%	
Physical condition	C33	The physical condition of the garden is good and can survive.	1.17	1.45	2.41	1.16	2.41	1.16	2.41	1.16	1.00	0.48
	C34	No urban modification/deductions	2.48	3.08	2.41	2.47	2.00	2.05	2.41	2.47	1.75	1.80

		from the garden area										
	C35	The extent to which the garden needs to be restored to its original integrity and design	2.58	3.21	1.75	1.87	1.75	1.87	1.75	1.87	3.00	3.21
	C36	The extent to which the historical garden needs to be saved	2.75	3.42	1.17	1.33	1.17	1.33	1.17	1.33	3.00	3.42
	<b>Total relative weight of the physical condition criterion</b>		11.16		6.83		6.41		6.83		8.91	
	<b>Percentage of achieving the physical condition criterion in the garden</b>		100%		61.20%		57.44%		61.20%		79.84%	
<b>Total relative weight of criteria</b>			100		70.56		81.82		82.20		83.13	
<b>Percentage of total achieving the criteria in the garden</b>			100%		70.56%		81.82%		82.20%		83.13%	

From the table above, it can be deduced that priorities of conservation for the historical gardens under study were: Azbakya Garden (83.13%), Aquarium Grotto Garden (82.20%), The Zoo (81.82%) and, last, Orman Garden (70.56%).

#### 4.4. Azbakya Garden renovation proposal:

##### 4.4.1. Overview of previous Proposed Renovation Projects for Azbakya garden:

The government has shown interest in conserving and Renovating Azbakya Garden and its heritage urban surroundings. The National Organization for Urban Harmony (NOUH) held an international urban design and cultural landscaping competition to preserve the historical value of the “Opera” and “Ataba” squares in Cairo, Egypt, from June 2010 to February 2011 (Figure 10). Additionally, the General Authority for Urban Planning held a competition for the revival and development of the heart of Khedivial Cairo in 2010 (Figure 11) [8]. Currently, the Ministry of Housing, Utilities, and Urban Communities is implementing a conservation project for the garden, led by the consulting company Sites International, covering approximately 11.5 acres of the garden's original area [2] (Figure 12), without reclaiming the rest of the garden's extracted area.

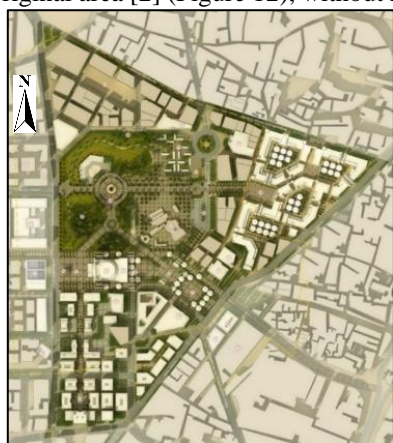


Fig. 10. The winning project, Opera &Ataba urban development competition [5].



Fig. 11. Azbakya garden Planning Project [8].



Fig. 12. Azbakeya Garden renovating Project currently in process [2].

##### 4.4.2. Design Proposal Methodology for Azbakya Park:

The study by “El-Miniawy” et al. [8] analysed four previously proposed projects to conserve Azbakya Garden and its heritage urban surroundings using the "Evaluating and Measurement of Historical Garden Renovation Projects According to Conservation Principles" model. The study results included identifying conservation approaches, preference ranking of projects in terms of achieving conservation principles, and determined their strengths and weaknesses based on the model's criteria.

To build a new design proposal for garden renovation comprehends all conservation approaches, the authors suggested utilizing the strengths and addressing the weaknesses found in the conservation evaluation criteria of the previous proposed projects. This process aimed to identify optimal conservation tools for the garden according to the "Assessment and measurement of historical garden renovation projects" according to “El-Miniawy” et al. model [8]. Subsequently, design ideas to achieve that tool while considering the current design limitations of the site.

##### 4.4.3. Analysis of the garden's Site and Design Constraints for Its Renovation:

**From an urban perspective**, the garden is located north of “Opera” and “Ataba” squares, with major traffic paths passing around, such as the “Al-Azhar” Bridge, “Al-Azhar” Tunnel, and “Al-Gomhoriah” Street, creating

high traffic density in the central Cairo area. The region hosts various intensive activities, including commercial, administrative, and cultural, leading to the construction of fences defining pedestrian movement in the area and the creation of pedestrian tunnels for crossing major roads. **From an architectural perspective**, the garden currently has only one entrance on the west side, and the topography of the land is generally flat except for the historical Grotto area. The garden still features some distinctive visual elements: the marble fountain (listed as a monument) and the Crown Dome [8].

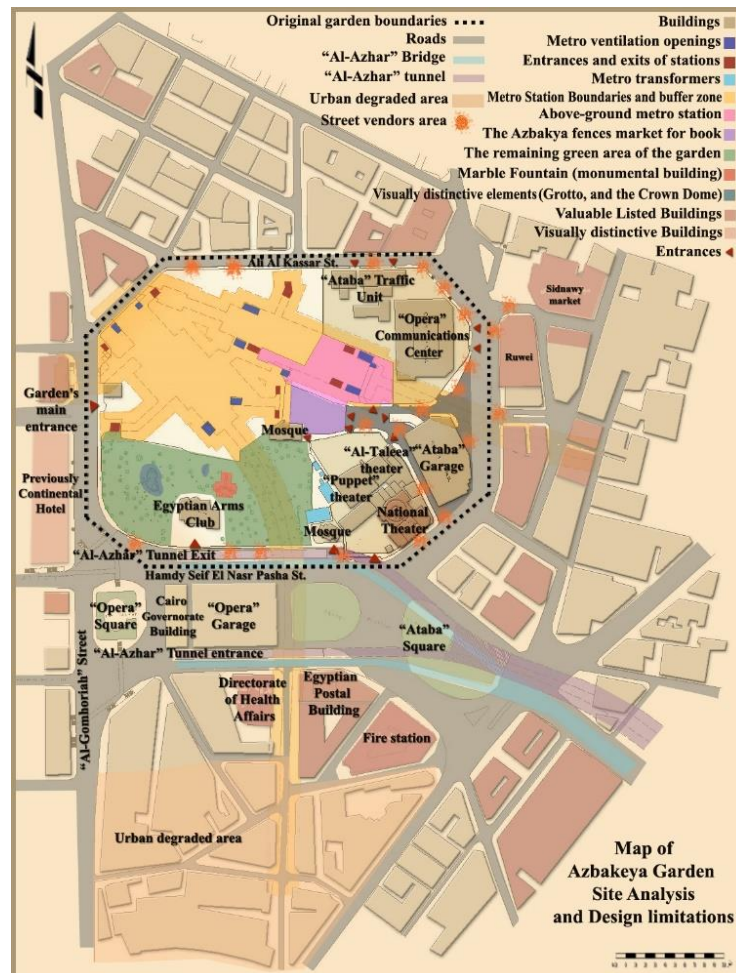


Fig. 13. Analyzing the garden's site and design limitations for its renovation [3] [2]. (By the Researchers).

**The design limitations for garden renovation include** (Figure 13):

- A large area of the original garden area was deducted for building the “Al-Taleea” and “Puppet” theaters, “Ataba” Garage, “Opera” Communications Center, “Ataba” Traffic Unit, two mosques, the National Theater, and the Egyptian Arms Club.
- Most of the plant life in the garden has been significantly destroyed, with most historical trees lost, and the remaining vegetation is in a very bad condition [2].
- The garden lost its pathways, furniture and lighting elements, and architectural design, including some architectural elements like the music kiosk.
- About 14,000 m<sup>2</sup> of the garden's area intersect with metro tunnels and stations, making it challenging to plant certain types of vegetation on top of them [2].
- The National Authority for Tunnels (NAT) imposed a 10-meter buffer zone around the station boundaries, prohibiting the construction of buildings above. (NAT) also specified the maximum loads on the station roof at 2 tons/m<sup>2</sup> and allowed only the placement of lightweight elements such as pergolas and kiosks [2].
- Metro ventilation openings and transformers are distributed throughout the garden, with nine entrances and exits to stations in various locations within and on the garden's boundaries [2].
- The Azbakya fences market for book is currently located in the center of the garden's site.

- Informal street vendors are abundant in the area between the “Al-Taleea” Theater and “Ataba” Metro Station, as well as the entrances to that area from the main roads.
- Consideration of listed historical buildings and visually distinctive buildings in terms of design.
- Insufficient parking spaces in the area [37].
- Lack of green spaces in the Khedivial Cairo area [37] compared to design standards.
- Few seating, waiting, and relaxation stops in the area.

4.4.4. *Building a design proposal for Azbakya Garden renovation:*

To renovate the garden and return its origin as a recreational and open space in the city center while preserving the heritage values of the area, the current conditions, and adapting to modern requirements. Due to the impossibility of ideal revival, it is important to rehabilitate buildings and functions with the garden. Conversely, adapting the garden to contemporary times, and its original purposes to achieve harmony and mutual respect between them. The garden should be returned to its historical design with its rare trees and plants, and should play its artistic and cultural role. There is an environmental, social, economic, and cultural need for the garden.

The table below illustrates the conservation tools targeted based on “El-Miniawy” et al. study [8] and the proposed design ideas to achieve this conservation tools according to “El-Miniawy” et al. model to reach a comprehensive design proposal for the garden that achieves the highest rates of conservation principals (Table 3).

El-Miniawy et al. model [8] was used to evaluate the design proposal for the garden because it is a comprehensive model that analyses historical garden conservation projects evaluation criteria from all approaches, as well as conservation policies. The model balances all criteria and urban, architectural, functional, aesthetic, heritage surroundings criteria. Meanwhile, the model activates modern uses, connects the garden to heritage trails, and respects contemporary interventions for achieving sustainability.

TABLE 3: CONSERVATION TOOLS TARGETED FOR THE RENOVATION OF AZBAKYA GARDEN, DESIRED TO BE ACHIEVED IN THE NEW DESIGN PROPOSAL, AND DESIGN IDEAS PROPOSED FOR ACHIEVING TARGETED CONSERVATION TOOLS ACCORDING TO EL-MINIAWY ET AL. MODEL (BY THE AUTHORS).

Project evaluation criteria	Conservation Tools targeted to be achieved in the Proposed Design	Proposed Design Ideas that Achieve the Targeted Conservation Tools for Azbakya garden (fig 14,15)
<b>Conservation Indicators</b>	<b>Identifying the Purpose of the Conservation Project</b>	Preserving the Urban and Architectural Character of the Heritage surroundings and Renovating Azbakya garden
	<b>Preserving Identity</b>	Referring to the Design of the Garden during the Ismail Pasha Period
	<b>Preserving heritage values</b>	Preserving the Historical and Heritage Values of the Garden and the Urban, including Historical Elements such as the monumental Fountain, the grotto, and the Crown Dome
	<b>Preserving the Urban Character of the surrounding urban</b>	Returning to the original boundaries of the garden, planning deteriorating areas of the urban fabric, organizing street networks and pedestrian walkways, and attempting to retrieve the skyline of the historical area.
	<b>Preserving the Architectural Character</b>	Preserving heritage buildings in the garden and the urban surroundings, and constructing new service buildings in the garden in a heritage style
	<b>Originality of Design</b>	Planning pedestrian walkways and water features according to the original design of the garden, and retrieving the khedivial opera house



			2-Planning garden entrances, walkways, pond locations, and their original formations while considering contemporary design limitations.
	<b>Preserving Heritage Elements</b>	Preserving the Heritage Fountain, the grotto, Crown Dome, and Heritage Plants.	Achieving the targeted tools by restoring the historical elements of the garden and importing plant species matching those historically present in the garden, based on historical sources and scientific research.
Urban Indicators	<b>Connecting the Garden to the Heritage surrounding urban</b>	Defining the garden with fences and retrieving its original entrances, landscaping a pedestrian square between Opera and Ataba squares.	Achieving the Targeted Tools by reconstructing the garden fences with their original design, connecting the garden to the heritage surroundings with four entrances from all directions, and connecting the southern entrance of the garden to a large pedestrian square in the locations of "Opera" and "Al-Ataba" squares.
	<b>Connecting the Garden to Heritage trails</b>	Connecting the Garden to Heritage trails.	Achieving the Targeted Tools by connecting the garden to heritage trails within the Khedivial Cairo area (commercial and entertainment path, Urban architectural and entertainment path, comprehensive museum path) designed in a previous study [37], representing the garden as a waiting and rest area in the heritage site.
	<b>Urban upgrading and Facade Improvement</b>	Upgrading the deteriorating urban area south of opera square and replanning the east area of Azbakya garden.	Achieving the Targeted Tools by re-planning the deteriorated urban area south of "Opera" Square as commercial and administrative buildings, re-planning the southeast area of the National Theater, and rehabilitating the "Tiring" building as a hotel residence.
	<b>Prevention the Random Growth of the surrounding urban</b>	Upgrading the deteriorated urban areas in the urban surroundings, to prevent their expansion.	Achieving the targeted tools through replanning the informal area south of "Opera" Square as commercial and administrative buildings and rehabilitating a public library therein. In the eastern area of the garden, constructing "Al-Ruwai" Market, landscaping a small square in front of the "Tiring" building, and rehabilitating "Tiring" building and the two adjacent buildings as hotel apartments and an Artistic creativity Center.
	<b>Retrieving the garden area</b>	Retrieving the entire garden area.	Achieving the targeted tools by removing the Puppet and "Al-Talea" Theaters, "Al-Azhar traffic Unit, "Opera" Communications Center, "Al-Ataba" Garage, and two modern mosques.
	<b>Respecting Modern Developments in the Garden and the Heritage surroundings</b>	Considering organizing pedestrian movement at the entrances and exits of metro stations, avoiding constructing buildings above the metro station and its buffer zone by the Cairo Metro Authority.	Achieving the targeted tools by: 1- Designing green areas and walkways as close as possible to the original design while accommodating the contemporary design limitations to fit the entrances and exits of Metro stations with retaining the organic design, general form, and previous concept. 2- The depth of the artificial pond does not exceed 1.75 m, planning it in an area that does not intersect with Metro stations and their buffer zone. 3- Relocating all metro station transformers near the National Theater. 4- Considering the entrances, exits, ventilation openings, and transformer locations for the metro stations in the design.
	<b>Achieving accessibility and Entrance Organization</b>	Constructing fences for the garden and four main gates, opening onto a large pedestrian square between "Opera" and "Ataba" squares.	Achieving all targeted tools while relocating "Al-Ataba" bus stop (under "Al-Ataba" garage) to a space northwest of the garden.
	<b>Improving Services</b>	Improving services within the garden and the heritage urban surroundings	Achieving the targeted tools by creating new services (water closets) in various areas in the garden, in addition to constructing a restaurant and cafeteria inside the garden.
	<b>Solving traffic issues</b>	Planning a main circular traffic path with a width of 4 traffic lanes around the heritage area. Relocating "Al-Azhar" Bridge to "Al-Azhar" Street and modifying the path of "Al-Azhar" Tunnel.	Achieving all targeted tools.
	<b>Providing Parking Spaces.</b>	Providing underground garages in the urban surroundings.	Achieving the targeted tools by providing new car parking areas by constructing a multi-level garage below "Opera" and "Al-Ataba" squares, its entrance near the western entrance of the garden. This is to accommodate the heritage area need for parking and compensate for the removal of "Opera" and "Al-Ataba" garages. The current "Opera" garage is 5550 m <sup>2</sup> and can accommodate 1130 cars in 6 floors, and "Al-Ataba" garage is five floors, with a capacity of 650 cars over 3130 m <sup>2</sup> . The proposed garage is 18,000 m <sup>2</sup> , with a depth of four levels to accommodate approximately 3,000 cars, an increase of about 1,220 cars compared to the current parking areas.
	<b>Facilitating Pedestrian Movement</b>	Designate the heritage surroundings as a pedestrian-only zone.	Achieving the targeted tools by landscaping the squares of "Opera" and "Al-Ataba", expanding the same by removing the "Opera" garage and the Cairo Governorate building, to be converted into pedestrian-only squares, and rebuilding the Khedivial Opera House.
	<b>Providing Shaded Areas</b>	Providing shaded areas inside the garden and in the squares of the heritage urban surroundings.	Achieving the targeted tools by providing shaded rest and waiting areas inside the garden as shaded seats, pergolas, a cafeteria, a restaurant, as well as providing shaded areas in the plazas of the heritage surroundings.
<b>A r</b>	<b>Respecting Historical</b>	Determine the design of the garden in the "Ismail Pasha" period as a	Achieving the targeted tools by landscaping the garden to resemble the (third Azbakya Garden's) design, bringing back its personality while

	<b>Periods and Prioritizing their Display</b>	design reference.	respecting contemporary design limitations and needs.
	<b>Respecting, and attempting to revive, the original design philosophy</b>	Reintroducing recreational and cultural activities inside the garden, constructing a cultural center and library, rehabilitating the Arms Club as a cultural center for children. As for outside the garden: building a public library, rehabilitating "Ataba" Fire station as a music museum, and the Post Office building into an art museum.	Achieving all the targeted tools with the addition of the following: 1- Rebuilding the lost design elements of the garden, such as the missing music kiosk and retrieving the water pond and bridges above, and planting trees of the same extinct species. 2- Preserving the National Theater, which was built on the site of the Comédie-Française Theater built by Khedive "Ismail", to continue its cultural role and for its historical origins since as it is listed as a historical monument; connecting its entrance to the garden, which was once part of.
	<b>Preserving the original Architectural Elements of the garden.</b>	Preserving and rehabilitating the Arms building and the National Theater.	Achieving all the targeted tools, with the addition of retrieved historical character, by restoring historical monuments such as the fountain, the Crown Dome, and grotto. Rehabilitating the Arms Club as a cultural center for children to support the garden's cultural role and connect it to the garden internally.
	<b>Removing extraneous Buildings that Do Not Suit the garden and its Surroundings.</b>	Removing all extraneous buildings inside the garden and in its heritage surroundings, namely "Opera" Communications Center, "Opera" Garage, "Ataba" Garage, Cairo Governorate Building, "Ataba" Traffic Unit, and the "Al-Taleea" and Puppet Theaters.	Achieving all targeted tools except for the Arms Club building, which is integrated into the garden design and rehabilitated.
	<b>Conserving Adjacent Heritage Buildings.</b>	Maintaining the "Sidnawy" and "Al-Ruwei" buildings as commercial buildings, rehabilitating the Fire station and the Postal buildings for cultural activities, and rehabilitating the Tiring building as a hotel and the adjacent building as an artistic creativity center.	Achieving all targeted tools.
	<b>Modifying the Character of Modern Buildings</b>	Adjusting the Character of Modern Buildings	The proposed design recommends modifying the facades of modern buildings in the heritage area to match with the architectural character of the heritage area.
	<b>Retrieving Valuable Elements</b>	Retrieving the water pond and the music kiosk.	Achieving all targeted tools, with rebuilding the "Continental" Hotel in its original architectural style and its original function.
	<b>Choosing Building and Finishing Materials Suitable for the garden Character.</b>	Using heritage construction and finishing materials that preserve the architectural character of the heritage surroundings.	The proposed design recommends ensuring that the architectural character of modern buildings (such as the Khedivial Opera House, administrative and commercial buildings in newly planned areas, the restaurant, cafeteria, and service buildings inside the garden) aligns with the architectural character of the heritage area and the use of heritage construction and finishing materials.
<b>Functional indicators</b>	<b>Preserving the Basic Activities</b>	Preserving the recreational and cultural activities in the garden.	Achieving the targeted tools by preserving the National Theater and connecting it internally to the garden. Also, replanning the Azbakia fences market for book on "Ali-Kassar" Street, and the green areas.
	<b>Introducing relevant Contemporary Activities</b>	Adding hotel accommodation, commercial, and administrative activities in the heritage surroundings.	Achieving the targeted tools by allocating a play area for children, shaded reading spaces, a celebration plaza, a restaurant, a cafeteria, and extensive green areas with seating and relaxation stops.
<b>Aesthetic indicators</b>	<b>Visual and Aesthetic Image Reimagining</b>	Retrieving the design elements of the garden, such as the water pond and music kiosk, to revive its visual and aesthetic image. Utilizing traditional architectural styles for new constructions to regain the heritage visual image of the urban surroundings.	Achieving all targeted tools, including the removal of intrusive buildings from the garden, attempting to retrieve the heritage skyline by removing modern high-rise buildings such as "Al-Ataba" & "Opera" garages, "Opera" Communications Center, Cairo Governorate Building, and relocated Al-Azhar Bridge. The design proposal recommends aligning the architectural style of modern buildings with that of the heritage area.
	<b>Visual Guidance and landmarks</b>	Designing visual guidance in plazas and within the garden, along with placing landmarks.	Achieving all targeted tools, including the installation of a landmark in the center of the garden for visual guidance and enhancing the aesthetic value of the garden.
<b>Environmental</b>	<b>Providing Green Spaces</b>	Offering large green spaces that meet the design standards in the city center urban.	Achieving all targeted tools by: 1- Raising the garden ground level in the area above the metro stations by 1.5 meters to allow for tree planting, selecting plants that don't need much water, and insulating the ground to prevent harm to underground stations.

			2- Implementing a modern and sustainable irrigation system (water recycling) for environmental protection and a better garden appearance.
	<b>Preserving the Original Biodiversity</b>	Preserving the garden original biodiversity and planting plants and trees of the same listed species.	Achieving the targeted tools through the preservation of historical trees and planting listed species based on reference backgrounds.
	<b>Protection against Pollution</b>	Increasing green areas, reducing mechanical movement in the surroundings, and promoting pedestrian movement.	Achieving all targeted tools.
<b>Social development indicators</b>	<b>Considering User Needs and Density</b>	Providing waiting and rest areas, parking spaces, planning pedestrian movement, improving services, and offering various activities.	Achieving all targeted tools.
	<b>Providing Rest and Social Gathering Places</b>	Offering shaded areas and pergolas inside the garden and in plazas within the heritage surroundings.	Achieving all targeted tools.
	<b>Providing Recreational Activities</b>	Activities for hiking and relaxation, as well as artistic and entertainment shows at the “National Theater” and “retrieved Opera”.	Achieving all targeted tools by increasing green areas and organizing artistic and entertainment activities at the open-air theater, the National Theater, the Children’s Cultural Center, the Artistic creation Center, the Art Museum, and the Opera, along with dedicating the “Al-Ataba” Square Plaza for celebrations and organizing recreational activities through tours in heritage trails.
<b>Economic development indicators</b>	<b>Utilizing Open Spaces</b>	Assigning the open spaces of the “Opera” and “Ataba” squares for pedestrian use.	Achieving all targeted tools.
	<b>Providing revenue-generating activities for the garden</b>	Activities such as the National Theater, hotel, hotel apartments, the Children’s Cultural Center, the Artistic creativity Center, the Art Museum, the Sound and Music Museum, and the Opera.	Achieving all targeted tools, along with adding the Azbakia fences market for book, a cafeteria, a restaurant, and some activities and celebrations through tours in heritage trails.
<b>Cultural development</b>	<b>Sustaining Cultural Activity of the garden</b>	Continuing the activity of the National Theater and connecting it to the garden.	Achieving all targeted tools, including relocating the Azbakia fences market for book to the external wall facing “Ali-Kassar” Street and providing shaded rest areas in the garden for reading.
	<b>Introducing New Cultural Activities</b>	Constructing an open-air theater within the garden and rehabilitating heritage buildings as museums for music and arts, an Artistic creativity Center, and a library.	Constructing an open-air theater, and a cultural and artistic square to retrieve the cultural role of the garden.

- 1- Historic Azbakeya garden
- 2- Khedival Opera
- 3- Intercontinental Hotel
- 4- “Al-Azhar” Tunnel entrance and roads underground
- 5- Underground garage entrance
- 6- Commercial & administrative buildings (recently built)
- 7- Public library (rehabilitation project)
- 8- “Opera” square plaza (for pedestrians)
- 9- “Ataba” square plaza (for pedestrians)
- 10- Sound & music museum (rehabilitation project)
- 11- Art museum (rehabilitation project)
- 12- Hotel (rehabilitation project)
- 13- Artistic creativity Center (rehabilitation project)
- 14- Hotel apartments (rehabilitation project)
- 15- “Ruwai” Market (recently built)
- 16- The main circular traffic path
- 17- Underground garage exit
- 18- “Al-Ataba” bus stop
- 19- Landmarks
- 20- Plazas
- 21- Garden entrances
- 22- The Azbakya fences market for book



Fig. 14. The design proposal for renovating Azbakya Garden and its heritage urban surroundings (By the Authors).

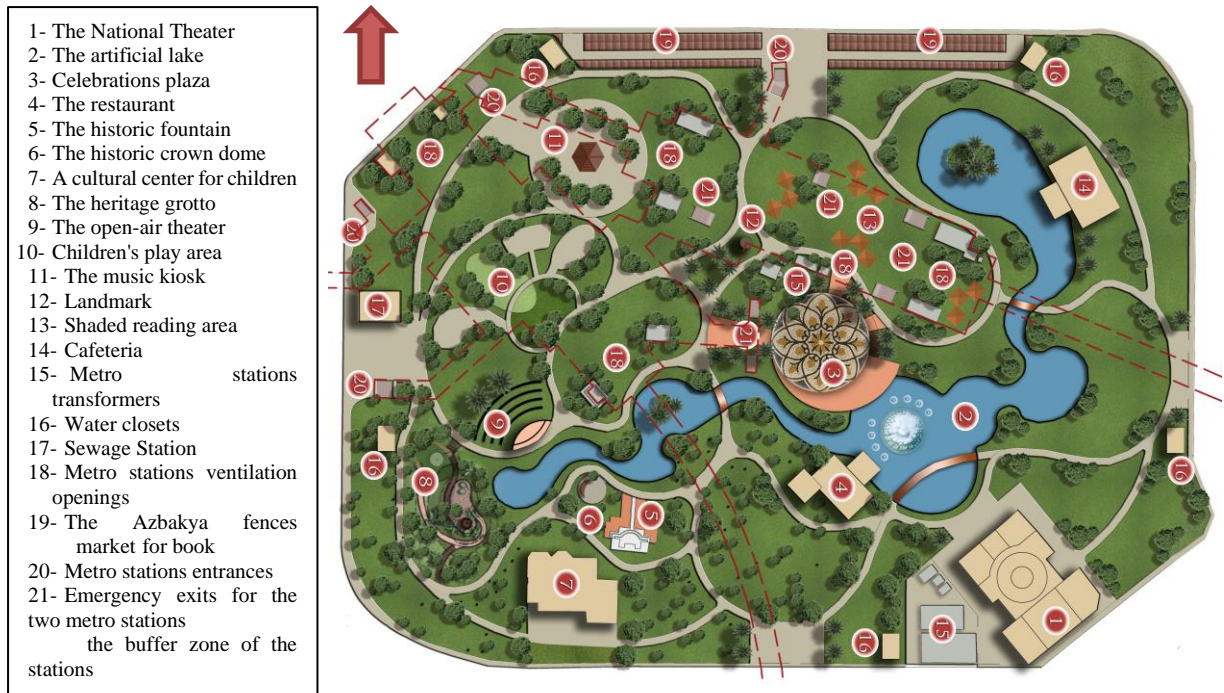


Fig. 15. The design proposal for landscaping Azbakya Garden (By the Authors).

4.5. Measuring the extent of achieving conservation principles by the Azbakya Garden design proposal:

To determine the extent of achieving conservation principles by the Azbakya Garden design proposal, the survey was used for the third time with a “Likert tri-scale” to evaluate the design proposal according to El-Miniawy et al. model [8] by engaging a group of nine experts (local and foreign) with research interests in Historic gardens conservation. A statistical analysis is performed using SPSS and Microsoft Excel to present the results. Analysis of the third survey adopted the arithmetic mean method, percentage, and the materiality for weighing specialists' assessment. Finally, the total relative weight was achieved for the model criteria was deduced for Azbakya Garden.

**The experts' evaluation of the design proposal was based on the following equation:**

**The arithmetic mean of achieving each criterion in the garden=** (Number of achieved \* 3 + Number of neutral \* 2 + Number of not achieved \* 1) / Total number of experts

**The percentage of achieving the criterion in the garden=** (The arithmetic mean of achieving the criterion in the garden/ Maximum estimated scale (3)) \* 100

**The relative weight of achieving the criterion in the garden=** The percentage of achieving the criterion in the garden\* The relative weight of the criterion in the model (Table 4)

The following table illustrates the evaluation of the extent of achieving conservation principles of the Azbakya Garden renovation design proposal (Table 4).

TABLE 4: EVALUATION AND MEASUREMENT OF THE ACHIEVEMENT OF THE PROPOSED DESIGN FOR THE RENOVATION OF THE HISTORICAL AZBAKEYA GARDEN ACCORDING TO CONSERVATION PRINCIPLES (BY THE AUTHORS).

Criteria of evaluating the design proposal (conservation objectives and indicators)		Relative weight of indicators	Arithmetic mean of expert opinions	Relative weight was achieved in the Garden
Conservation Indicators	Identifying the Purpose of the Conservation Project	1	2.67	0.89
	Preserving Identity	2.4	2.56	2.05
	Preserving heritage values	2.6	2.67	2.31
	Preserving the Urban Character of the surroundings urban	2.5	2.67	2.23
	Maintaining the Architectural Character	2.5	2.67	2.23
	Originality of Design	2.2	2.56	1.88
	Preserving Heritage Elements	2.9	2.89	2.79
<b>Total relative weights of the conservation indicators</b>		<b>16.1</b>		<b>14.38</b>

	<b>Percentage of the conservation indicators</b>	<b>16.1%</b>		<b>89.32%</b>	
Urban indicators	Connecting the Garden to the Heritage surroundings urban	1.2	2.89	1.16	
	Connecting the Garden to Heritage trails	1.4	2.89	1.35	
	Urban upgrading and Facade Improvement	1	2.56	0.85	
	Prevention the Random Growth of the surrounding urban	0.9	2.67	0.80	
	Retrieving the garden area	2.1	2.89	2.02	
	Respecting Modern Developments in the Garden and the Heritage surroundings	0.9	2.56	0.77	
	Achieving Accessibility and Entrance Organization	0.8	2.67	0.71	
	Improving Services	0.8	2.56	0.68	
	Solving traffic issues	1	2.22	0.74	
	Providing Parking Spaces.	1	2.67	0.89	
	Facilitating Pedestrian Movement	1.2	2.89	1.16	
	Providing Shaded Areas	1.1	2.56	0.94	
	<b>Total relative weights of the urban indicators</b>	<b>13.4</b>		<b>12.07</b>	
	<b>Percentage of the urban indicators</b>	<b>13.4%</b>		<b>90.07%</b>	
Architectural indicators	Respecting Historical Periods and Prioritizing their Display	1	2.22	0.74	
	Respecting, and attempting to revive, the original design philosophy	1.4	2.56	1.19	
	Preserving the original Architectural Elements of the garden.	1.5	2.78	1.39	
	Removing extraneous Buildings that Do Not Suit the Nature of the garden and its Surroundings.	2.1	2.33	1.63	
	Conserving Adjacent Heritage Buildings.	2.3	2.56	1.96	
	Modifying the Character of Modern Buildings	1.4	2.11	0.98	
	Retrieving Valuable Elements	2.7	2.78	2.5	
	Choosing Building and Finishing Materials Suitable for the garden Character.	1.1	2.22	0.81	
	<b>Total relative weights of the architectural indicators</b>	<b>13.5</b>		<b>11.20</b>	
<b>Percentage of the architectural indicators</b>	<b>13.5%</b>		<b>82.96%</b>		
Functional indicators	Preserving the Basic Activities	6.9	2.56	5.89	
	Introducing relevant Contemporary Activities	4.8	2.78	4.45	
	<b>Total relative weights of the functional indicators</b>	<b>11.7</b>		<b>10.34</b>	
<b>Percentage of the functional indicators</b>	<b>11.7%</b>		<b>88.38%</b>		
Aesthetic indicators	Visual and Aesthetic Image Reimagining	7.7	2.22	5.70	
	Visual Guidance and landmarks	6.6	2.56	5.63	
	<b>Total relative weights of the aesthetic indicators</b>	<b>14.3</b>		<b>11.33</b>	
<b>Percentage of the aesthetic indicators</b>	<b>14.3%</b>		<b>79.23%</b>		
Environmental development indicators	Providing Green Spaces	2.2	3	2.2	
	Preserving the Original Biodiversity	3.2	2.89	3.08	
	Protection against Pollution	1.8	2.67	1.60	
	<b>Total relative weights of the Environmental development indicators</b>	<b>7.2</b>		<b>6.88</b>	
<b>Percentage of the Environmental development indicators</b>	<b>7.2%</b>		<b>95.56%</b>		
Surroundings development indicators	Social development indicators	Considering User Needs and Density	2.9	2.56	2.47
		Providing Rest and Social Gathering Places	2.9	2.78	2.69
		Providing Recreational Activities	2	2.78	1.85
		<b>Total relative weights of the Social development indicators</b>	<b>7.8</b>		<b>7.01</b>
	<b>Percentage of the Social development indicators</b>	<b>7.8%</b>		<b>89.87%</b>	
	Economic development indicators	Utilizing Open Spaces	2.7	2.33	2.1
		Providing revenue-generating activities for the garden	4.9	2.78	4.54
		<b>Total relative weights of the Economic development indicators</b>	<b>7.6</b>		<b>6.64</b>
	<b>Percentage of the Economic development indicators</b>	<b>7.6%</b>		<b>87.37%</b>	
	Cultural development indicators	Sustaining Cultural Activity of the garden	4.2	2.89	4.05
		Introducing New Cultural Activities	4.2	2.89	4.05
		<b>Total relative weights of the Cultural development indicators</b>	<b>8.4</b>		<b>8.10</b>
		<b>Percentage of the Cultural development indicators</b>	<b>8.4%</b>		<b>96.43%</b>
	<b>Total relative weight of Surroundings development indicators</b>	<b>22.9</b>		<b>21.75</b>	
<b>Percentage of Surroundings development indicators</b>	<b>22.9%</b>		<b>94.98%</b>		
<b>The total relative weight of Azbakya Garden conservation project evaluation criteria</b>	<b>100</b>		<b>87.95</b>		
<b>Percentage of achieving Azbakya Garden conservation projects evaluation criteria</b>	<b>100%</b>		<b>87.95%</b>		

**5. RESULTS:**

5.1. Analysing results of the proposed model for identifying historic gardens conservation priorities, and experts' evaluation of the selected historic gardens for identifying conservation priorities, results were as follows:

- The criteria relative weights of the proposed model for identifying historic gardens conservation priorities have achieved different values, as per the following descending order: the historic value (26.32), the design values (22.89), the aesthetic values (19.97), the physical condition criterion (11.16), the scientific and educational values (6.01), the cultural value (4.35), the economic value (3.31), the social value (3.11), and the functional value (2.9). (Chart 1)
- The prioritization order for the selected historical gardens, according to expert evaluations, is close for the first three historical gardens. The first priority is given to the renovation of the Azbakeya Garden with a percentage of (83.13%), followed by the Aquarium Grotto Garden with (82.20%), then the Zoo Garden with (81.82%), and finally, the Orman Garden with (70.56%).

5.2. Analysing the results of the evaluation model and measuring the extent to which the design proposal for the renovation of Azbakeya garden fulfils the principles of conservation, we conclude the following:

- The proposed design for the renovation of Azbakeya Garden achieved an excellent percentage of accomplishment for conservation criteria and principles, estimated at (87.95%).
- The achievement percentages, of conservation indicators in the proposed design for the renovation of the historical Azbakeya garden, are ranked in descending order as follows: Cultural development indicators (96.43%), Environmental development indicators (95.56%), Urban development indicators (90.07%), Social development indicators (89.87%), Conservation indicators (89.32%), Functional indicators (88.38%), Economic development indicators (87.37%), Architectural indicators (82.96%), and Aesthetic indicators (79.23%). (Chart 2)

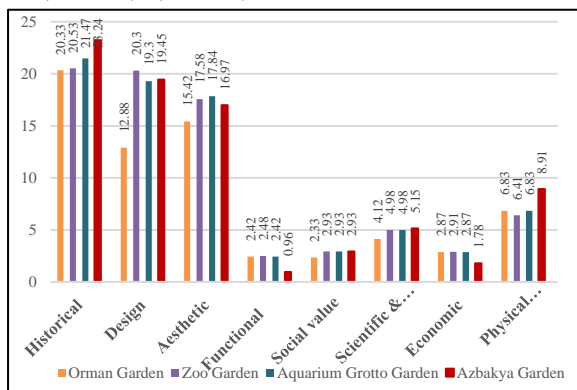


Chart 1: Values of relative weights for the selected historic Gardens evaluation criteria, for identifying their conservation (by the Authors).

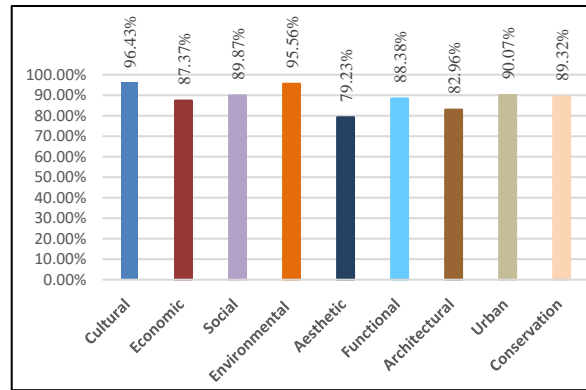


Chart 2: Values of the conservation indicators realized in the design proposal for the renovation of the Azbakeya Garden (by the Authors).

**6. DISCUSSION:**

6.1. By analysing the results of evaluating various criteria in the proposed model for prioritizing the conservation of historical gardens and assessing experts' opinions on selected historical gardens to determine priorities for their conservation, strengths and weaknesses emerged as follows:

- The **historical value** in the Azbakeya Garden scored the highest percentage of achievement among the four gardens, at (88.30%). This is because it is the oldest in planning, associated with national historical events, hosted royal celebrations, and witnessed important historical events such as the opening ceremony of the Suez Canal at the Opera.
- The **design values** in the Zoo Garden scored the highest percentage of achievement among the four gardens, estimated at (88.69%). It is a significant part of the urban fabric of the area, located on main traffic paths, and includes buildings and distinctive architectural elements with different styles such as the Pharaonic, African,

Indian, Japanese, and Arabian styles. The garden also contains monumental elements such as the suspended metal bridge, which is also structurally unique, along with grottos and paved pathways using environmentally native construction materials, with very few modern construction interventions.

- The **aesthetic values** in the Aquarium Grotto Garden scored the highest percentage of achievement among the four gardens, estimated at (89.33%). The garden has a distinctive visual image from the design of the grotto and that have aquariums resembling coral reefs. The garden has visual attractions such as the grotto, the main gate, the plant and sculptural formations, and their relationship with the green areas, making the garden an artistic work of art at the time it was established. It serves as a good model for Aquarium gardens, containing perennial and rare plants and beautiful fish species.
- The **functional values** in the Zoo Garden scored the highest percentage of achievement among the four gardens, estimated at (85.52%). It plays an excellent recreational and social role, attracting large numbers of visitors, especially during holidays and vacations, and its activities Suit the garden's history.
- The **social values** in the Zoo, Aquarium Grotto, and Azbakeya Gardens scored the highest percentage of achievement equally, estimated at (94.21%). These gardens a part of the community's memory.
- The **scientific and educational values** in the Azbakeya Garden achieved the highest percentage of achievement among the four gardens, estimated at (85.69%). It serves as a source for documenting national historical events and possesses rare and perennial plants and trees.
- The **cultural values** in the Azbakeya Garden scored the highest percentage of achievement among the four gardens, estimated at (85.06%), through the activities of the national theater in addition to the Azbakeya fences market for book.
- The **economic values** in the Zoo Garden scored the highest percentage of achievement among the four gardens, estimated at (87.92%). This is directly due to the high number of visitors and diverse activities within it, or indirectly by attracting residents to live near it, leading to the construction of public and private facilities and the palaces of princes, public, and foreign consulates on its boundaries.
- The **criterion of physical condition** in the Azbakeya Garden scored the highest percentage of achievement among the four gardens, estimated at (79.84%). This is due to the need to retrieve its integrity, original design, and saving the same, as the garden is deteriorated with a significant area of encroachments on its area. This is necessary to retrieve its functional role, historical and aesthetic value, and visual image.

6.2. *By analysing the results of the evaluation for the proposed renovation design of the historical Azbakeya Garden according to conservation principles, strengths and weaknesses emerged as follows:*

- The proposed design for the renovation of the historical Azbakeya Garden achieved percentage of (87.95%), which exceeded all previous proposed projects, with achievement percentages of (40.34%, 57%, 72.92%, 75.90%) respectively.
- The **conservation indicators** in the proposed design presented an achievement of (89.32%) for conservation principles, surpassing the highest achievement percentage in previous proposed projects, which was evaluated at (85.71%). This is due to achieving all aspects of strength in the previous proposed projects, in addition to retrieving the original boundaries of the garden, reconstructing the “Continental” Hotel with its original architectural design and original activity, attempting to retrieve the original skyline of the heritage area by demolishing the “Opera” Garage, the “Ataba” Communication center, the “Ataba” Garage, relocating “Al-Azhar” Bridge, replanning the entrances, pathways, and the location of the fountain, and shaping it as closely as possible to its original design, taking into account contemporary design limitations, and recommending the planting of plant species identical to those that existed in the garden.
- **Urban indicators** in the proposed design presented an achievement of (90.07%) for conservation principles, surpassing the highest achievement percentage in previous proposed projects, which was evaluated at (83.33%). This is due to achieving all aspects of strength in the previous proposed projects, in addition to respecting the historical periods of the garden, planning the Azbakeya fences market for book in its original location, landscaping the garden to its closest original form while respecting contemporary design limitations and modern needs, connecting the garden to heritage tourism trails within the Khedival Cairo area, providing underground parking spaces, and increasing the service buildings in the garden.
- **Architectural indicators** in the proposed design presented an achievement of (82.96%) for conservation principles, surpassing the highest achievement percentage in previous proposed projects, which was evaluated at (81.25%). This is due to achieving all aspects of strength in the previous proposed projects, in addition to rebuilding the missing design elements for the garden, such as the lost music kiosk, retrieving the water pond and the bridges above it, planting trees of the same extinct species, preserving the national theater, connecting it to the garden, recommending the necessity of architectural compatibility for modern buildings with the architectural character of the heritage area, and using traditional building and finishing materials.

- **Functional indicators** in the proposed design presented an achievement of (88.38%) for conservation principles. It achieved most aspects of strength in previous proposed projects, in addition to preserving the national theater, connecting it internally to the garden, replanning the Azbakeya fences market for book, allocating a play area for children inside the garden, shaded pergolas for reading, celebrations plaza, a restaurant, and a cafeteria. The highest achievement percentage for functional indicators in previous proposed projects was (100%), as the project rehabilitate the “Opera” Communication center building as a hotel within the garden, planned the eastern area of the garden for a group of squares surrounded by commercial buildings behind the “Ruwai” building.
- **Aesthetic indicators** in the proposed design presented an achievement of (79.23%) for conservation principles, surpassing the highest achievement percentage in previous proposed projects, which was evaluated at (75.00%). This is due to achieving all aspects of strength in the previous proposed projects, in addition to removing the encroachments from the garden, attempting to retrieve the heritage skyline by removing modern high-rise buildings and relocating “Al-Azhar” Bridge, establishing a distinctive landmark in the center of the garden for visual guidance, and recommending the necessity of architectural compatibility for modern buildings with the character of the heritage area.
- **Environmental indicators** in the proposed design presented an achievement of (95.56%) for conservation principles, surpassing the highest achievement percentage in previous proposed projects, which was evaluated at (83.33%). This is due to achieving all aspects of strength in the previous proposed projects, in addition to providing large green spaces in the proposed design that meet the design standards for green spaces on city center, planting plants, trees, and palms of the same listed species, and establishing a sustainable modern irrigation system.
- **Surroundings Development indicators** in the proposed design presented an achievement of (94.98%) for conservation principles, surpassing the highest achievement percentage in previous proposed projects, which was evaluated at (91.67%). This is due to achieving all aspects of strength in the previous proposed projects, in addition to increasing recreational, economic, and cultural activities by increasing green areas, holding artistic and entertainment activities in the open-air theater, the national theater, the Children's Cultural Center, the Arts creativity Center, the Art Museum, the Sound and Music Museum, and the Opera. The proposal also recommends allocating the “Al-Ataba Square” for celebrations, conducting recreational activities through though through heritage trails, replanning the Azbakeya fences market for book while providing shaded rest areas for reading, and establishing a restaurant and cafeteria inside the garden.

## 7. CONCLUSION:

The research introduces a proposed model for prioritizing the conservation of historical gardens based on the cultural values and their current physical condition, while unifying the purpose of conservation with renovation to ensure the comprehensiveness of conservation projects. Relative weights were assigned to the model criteria, then applied to four historical specialized public gardens belonging to the Khedive “Ismail” and “Tawfiq” eras, with the evaluation conducted by experts to determine conservation priorities. The results indicated the priority of conservation for the historical Azbakeya garden. The proposed model for prioritizing the conservation of Egyptian historical gardens can assist decision-makers in determining the conservation priorities for their historical gardens, with the possibility of adapting the same to the various types of global historical gardens.

The research then addressed the construction of a proposed design for the renovation of Azbakeya Garden and its urban surroundings, in accordance with the targeted conservation tools based on the optimal conservation criteria for historical gardens according to the model by El-Miniawy al. [8]. Taking advantage of the strengths in previous proposed projects for the garden renovation and addressing their shortcomings, design ideas were developed to achieve the targeted conservation tools, including preservation, restoration, revival, rehabilitation, and modern construction to adapt to contemporary needs while respecting contemporary design limitations. Finally, the research evaluated the extent to which the proposed design for the renovation of Azbakeya Garden achieved the principles of historical gardens conservation through expert surveys according to El-Miniawy et al. [8] model, achieving an excellent success rate of (87.95%).

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