

## Article

# The Urban Sustainability of the Egyptian Capital

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**Abstract:** In the last decade, the urban management of the Egyptian capital adopted a comprehensive vision for its urban development sectors. Sustainability indicator results issued by a number of international institutions showed that the Egyptian capital's ranking dropped after applying this vision. This proves that the capital has deviated from the path for which the vision was created. This research aims to build a general framework that supports achieving urban sustainability in the Egyptian capital, periodically assessing its urban policy, and assisting urban decision makers in correcting the course of their policies if necessary. This framework can be built by reviewing the legacy of urban development policies of the Egyptian capital and determine the urban issues the capital is still facing. This framework is also built by studying international practices of cities whose development plans were likewise based on setting a framework that enabled them to assess the success rate of the urban strategies adopted in achieving urban sustainability. From this, we can form the elements of a general framework for achieving urban sustainability of the Egyptian capital. This research identifies these elements as a group of issues, indicators, criteria, principles, and pillars. These elements observe the local context of the Egyptian capital. The selected issues are fitting to the Egyptian capital and its observance of its international responsibilities. These issues are determined by identifying a group of indicators and principles adopted by international institutions and authorities in assessing cities' progress towards achieving urban sustainability. The results of this research demonstrate how cities work on building their developmental plans, with an approach based on the exchange of knowledge pertaining to the results of different practices, as well as the principles and indicators endorsed by international institutions and authorities, ensures the achievement of urban sustainability.



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**Keywords:** the Egyptian capital; urban sustainability; urban sustainability issues; urban sustainability principles; urban sustainability pillars

## 1. Introduction

Urban sustainability is defined as “the process of developing a built environment that meets people’s needs whilst avoiding unacceptable social or environmental impacts” [1]. Meanwhile, “A sustainable city is one in which the community has agreed on a set of sustainability principles and has further agreed to pursue their attainment. These principles should provide the citizenry with a good quality of life, in a liveable city, with affordable education, healthcare, housing, and transportation” [2]. The literature indicates that, with many definitions dealing with urban sustainability, there is still a need for cities to adopt a set of basic principles. These principles should take into account local requirements and global commitments and root them in urban development plans to provide a coherent framework for human efficiency in achieving urban sustainability [3].

Many cities have adopted the concept of urban sustainability in their planning. Other cities are still working on conditioning their developmental plans to incorporate urban sustainability requirements. The challenge still lies in translating those plans into tangible procedures that take into account its local, environmental, social, cultural, and economic conditions, and limit their negative impact on its outer perimeter [4]. We can safely say that

every city is unique and that an understanding of local context is essential to accurately measure the projected sustainability level. Cities vary based on several dimensions, such as wealth, history, culture, and governance. Therefore, it is impossible to outline just one sustainability solution suitable for all cities [5]. Every city needs to find the best path for merging sustainable urban planning practices in its developmental plans [6]. Leaders and urban planners have to look into the practices of cities whose developmental plans have contributed to the achievement of their urban sustainability goals.

Since 1956 [7], urban development visions and plans of the Egyptian capital sought to manage and reorganise urban development of the Egyptian capital and to solve urban issues. However, that did not stop random expansion in all directions. This resulted in the rise in population and building density, high pollution levels, the deterioration in the condition of buildings, the decrease in the carrying capacity of road networks, and the drop in the level of available public amenities and services. Social structure suffered as the social and economic gap between the residents widened. The rate of violence and crime rose, and the general and psychological health deteriorated [8]. This motivated the Urban Administration to launch the 2050 vision to cover a more inclusive urban range for the Egyptian Capital [9]. The 2050 vision's launch was made in an attempt to plan a long-term developmental road map contributing to the achievement of urban sustainability for the Egyptian capital and maximising its competitiveness. However, the state soon implemented projects not included in the outputs of this vision.

This triggered us to investigate whether or not the Egyptian capital is on the right track. We found that the Egyptian capital's ranking is very low according to a number of international institutions. These institutions follow an established method for ranking cities by using a group of indicators to assess their urban sustainability standing. According to the "Economist Intelligence Unit", the Egyptian capital came in the 127th position in "The Liveability Index" in 2021, compared to the 121st position in 2015 [10,11]. According to the Mercer Index for the "Quality of Living", the Egyptian capital came in the 181st position in 2021, compared to the 170th position in 2015 [12,13], which confirms that the Egyptian capital has deviated from the path for which the vision was created.

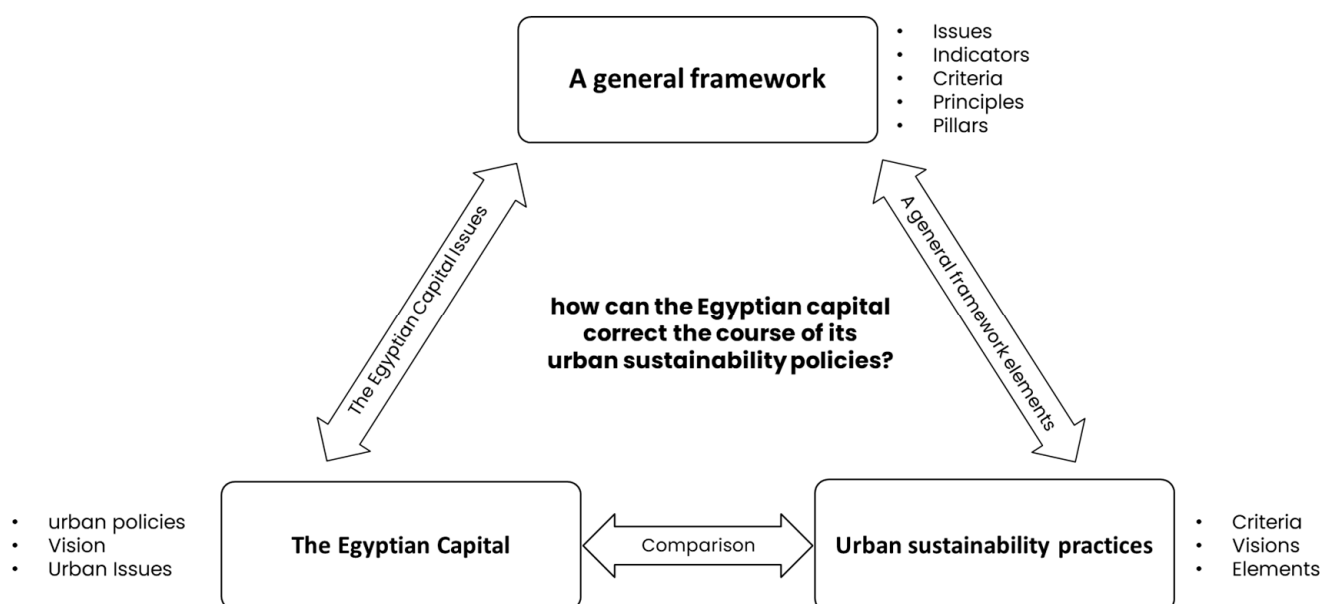
We reviewed the Egyptian capital's vision in order to identify the process used to periodically evaluate its policies and executive procedures. We found no evaluation tools that could be used to correct the course of its policies. This triggered us to search for ways for the capital to emerge from the urban state it has come to and the possibility of a sustained method for verifying its progress in the proper urban development policies. There are numerous cities around the world that built developmental plans that contributed to achieving their urban sustainability [14]. These cities share the fact that their developmental plans adopt a group of measurable urban issues. These plans use indicators that form clear criteria for the evaluation of their urban development policies, support commitment to international principles, and achieve the targeted developmental pillars. Together, these factors form a comprehensive framework for assessing urban sustainability developmental plans.

We can rely on creating a general framework for urban sustainability assessment that takes into account the elements of developmental plans adopted by international practices. These plans have contributed to achieving urban sustainability by: embracing both local context issues and global responsibilities towards achieving urban sustainability targets, building developmental plans for cities and facilitating the assessment of their progress towards their intended goals, and making the required interventions needed to correct the course of urban sustainability.

## 2. Methodology

Today, at the beginning of the third decade, how can the Egyptian capital correct the course of its urban sustainability policies? This is the question the authors seek to answer over the three parts of this research (Figure 1): first, reviewing the Egyptian capital's reality to recognise the legacy of its urban development policies, defining its main characteristics

in the “Cairo 2050” vision, and deducing the challenges and urban issues the capital is still facing. Second, analysing the experience of a number of selected cities whose visions contributed to their achieving urban sustainability, then outlining the elements of a general framework for the Egyptian capital urban sustainability. Third, building a general framework that both supports the achievement of the Egyptian capital’s urban sustainability and contributes to the periodical evaluation of the capital’s urban development works, and putting this framework in the hands of urban decision makers as one of the corrective tools for the current urban policies’ path towards achieving the capital’s urban sustainability. The framework adopts the concept of defining urban sustainability, identifying the capital’s urban sustainability issues, and taking into account its local context. It chooses a number of indicators that contribute to measuring the progress in achieving the capital’s goals, creates criteria to contribute to comparing these indicators, puts them into a simple form, and presents them to the capital’s urban decision makers. The framework adopts principles that support both the capital’s development and its fulfilment of responsibility towards international urban sustainability. It also formulates the pillars that ensure the realisation of the concept of urban sustainability. Finally, the authors’ findings are presented.



**Figure 1.** Methodology of answering the research question.

### 3. The Egyptian Capital

The Egyptian capital vision posed a number of challenges for researchers concerned with the Egyptian urban context. This is due to its social, environmental, economic, and political reality compared to Western societies. In spite of the drastic differences between the realities of these societies and that of the Egyptian capital, they are the source of the inspiration for the capital’s 2050 vision. The Egyptian capital is completely incompatible with Western models of urban management, which makes the idea of adopting their developmental models questionable in the opinion of many researchers [15]. The Egyptian capital is still facing the dangers of population pressure [16]. The residential density in some of its areas is considered among the highest in the world [17]. In our urban reality, there are some urban governance issues, such as the centralised decisions and the lack of an intermediate level between the local and the national. This has led to urban silence [18], denial of urban problems [15], and the denial of the increasing gap between urban residents’ social levels in accessing basic services. The low investment of the public authorities in poor neighbourhoods forces residents of these neighbourhoods (with the help of nongovernmental organisations) to be self-sufficient in a deteriorating environment. The political discourse still adopts demolishing and relocating. While this mission is enormous,

if not unrealistic, the legislative process results in the waste and deterioration of the urban fabric. Urban sustainability might not succeed unless there is a true political commitment to change and to strategy-based activities that reinforce the capacity of public management. Supporting the co-operation between the civil community and the authorities, as well as achieving equality between the residents of the city, is essential when it comes to the allocation of resources [19]. The Egyptian capital urban development plans sought to manage and reorganise its urban development and solve its urban issues [9]. However, the urban management has always handled these plans through partial and inconsistent solutions that do not follow a comprehensive developmental strategy, which causes more urban and environmental problems for current and future generations [20].

### *3.1. The Legacy of the Egyptian Capital's Urban Development Policies*

The effect of the capital's urban policies created what can be referred to as a chaotic urban situation. This was caused by the incompatible change in its urban policies that lacked an integral vision. These policies have always been issued by administrative bodies whose role is limited to presenting suggestions. This is often carried out without the involvement of the executive leaders knowledgeable in drawing these policies and adopting their implementation. Regarding the Egyptian capital administration, the administration, represented in The Greater Cairo Planning Commission, established in 1965, and The General Organization for Physical Planning, established in 1973, have, until now, had two separate roles. The General Organization for Physical Planning is an administration specialising in drawing visions, policies, and urban plans. It prepares studies and charts for approval and endorsement and presents them to the Supreme Council for Urban Planning. The Supreme Council for Urban Planning is headed by the Cabinet, with the membership of a number of ministries and organisations. The Greater Cairo Planning Commission is an administration specialising in the execution and follow-up of urban plans. In the Egyptian capital's case, its responsibilities are divided into two sections: (1) execution within the existing urban area, which is the responsibility of local administrations of the Cairo Governorate affiliated to the Ministry of Local Development, and (2) execution within new urban communities, which is the responsibility of administrations of cities under the New Urban Communities Authority, affiliated to The Ministry of Housing, Utilities, And Urban Communities. In order to activate the role of horizontal co-ordination within the urban range of the Egyptian capital, The General Authority For Urban Planning formed the Central Administration Of Regional Planning, to which the Egyptian capital belongs [21]. Although, by reviewing all the practices, we find it has no role or positive effect on approval or follow-up of the execution of urban policies.

Regarding the Egyptian capital's urban policies, the first plan for the capital region was issued in 1973. It suggested the optimal borders for the Egyptian capital, the containment of urban development, a limit to the encroachment on agricultural land, the construction of new urban communities as attraction poles for growth in order to provide relief for urban clusters of the capital region, and limiting construction in the old historic area. It also suggested regulating construction in other areas without causing harm to the urban structure of the capital region or its facilities [22]. In 1982, a structural plan for the capital region was prepared based on two pillars: first, economic development through the protection of agricultural land, reconsidering the policy of selecting industrial sites, raising the efficiency of transportation networks, achieving the utmost benefit of the existing infrastructure facilities, and protecting the archaeological and historical heritage; second, improving living conditions by emphasising the importance of decentralisation in limiting the conjoined extension of the capital urban mass, providing housing for the medium- and low-income residents to replace the existing random communities, raising the efficiency of public services through reorganising the urban structure, the expansion in providing houses with public utilities, restoring and rebuilding existing residential areas, water resources protection, and environmental pollution control [23]. In 1986, according to the recommendations of the structural plan of the capital region issued in 1982, an update was

made by proposing the idea of homogeneous sectors to serve as a tool for upgrading the urban fabric of the region. The main urban mass was divided into 16 homogenous sectors, each having a degree of self-sufficiency. In 1991, an update of the structural plan of the capital region of 1982 was prepared. It relied on activating two main axes: the development of desert areas and the upgrading of the existing urban structure. In 1997, the latest update was issued, aiming at achieving two main goals: supporting economic growth and upgrading and improving the urban environment. In 2008, due to the continuation of issues and problems facing the capital region, a strategy was developed for the region until 2027. This strategy was based on upgrading the urban environment, providing internationally competitive industrial and business sites, transforming and restructuring Cairo from a central structure to a polycentric urban structure by proposing three axes for development, and giving priority to achieving the sustainable development of the region [21].

From the above, it becomes clear that there has always been a lack of integral urban policies that cover social, economic, and environmental aspects in the formulation process of the Egyptian capital's urban planning. It can be argued that the Egyptian capital's issues were a result of a lack of awareness of the concepts and the dimensions of the inclusiveness of the urban system, as well as unclear roles and distribution of urban responsibilities among all parties. In addition to that, Egyptian urban management always views sustainable urban development from an extremely narrow perspective. This perspective is based on environmental considerations, without a comprehensive understanding of the strong participation of the social and economic environment and the political aspects involved in the framework of sustainable urban development. The urban administration for the capital also lacks effective capabilities in planning the capital's future, setting its implementation plans, and following up on the evaluation of those plans.

### 3.2. *The Egyptian Capital Vision*

After 50 years with no attempts to build a comprehensive vision that includes all of the aspects of the urban system, The General Organization for Physical Planning issued the developmental vision for the greater Cairo region 2050, aiming to “transform the greater Cairo region (the greater Cairo Region comprises the city of Cairo (the capital), and the urban borders of Giza and Qalyubia governorates) into a regional, and international centre for political, administrative, cultural, historical, and economic businesses” [9]. We find that the vision played a pivotal role for the Egyptian capital on the local and global levels that is based on, first, regaining its international status through its competitive assets; second, enabling all residents to obtain housing, healthcare, education, and economic opportunities and to coexist and interact with other members of the community of various social levels; and third, accelerating economic development in order to achieve social justice and provide equal local opportunities for all, giving priority to the reduction in air pollution, improving drinking water quality, and expanding green spaces. Raising the efficiency of the management of national resources and taking all the necessary urban decisions pertaining to the region, directing and managing urban decision making over the execution span, eight work axes were defined: (1) achieving social justice, (2) improving the infrastructure of the transportation network, (3) consolidating newly developed urban communities as diverse economic centres, (4) reviving the historic downtown Cairo area, (5) creating the necessary conditions and opportunities to achieve a touristic boom in the downtown Cairo area, (6) providing a competitive environment for an international knowledge-based economy, (7) adopting more eco-friendly concepts, and (8) providing development projects with an efficient management system.

### 3.3. *The Urban Issues of the Egyptian Capital*

The vision of the greater Egyptian capital region clearly identified the urban policies that the urban management has to adopt. However, it has not laid a general framework that ensures evaluating these policies and correcting them if necessary. Reviewing the results of the Global Power City Index (GPCI), which include all work axes of the capital's vision 2025



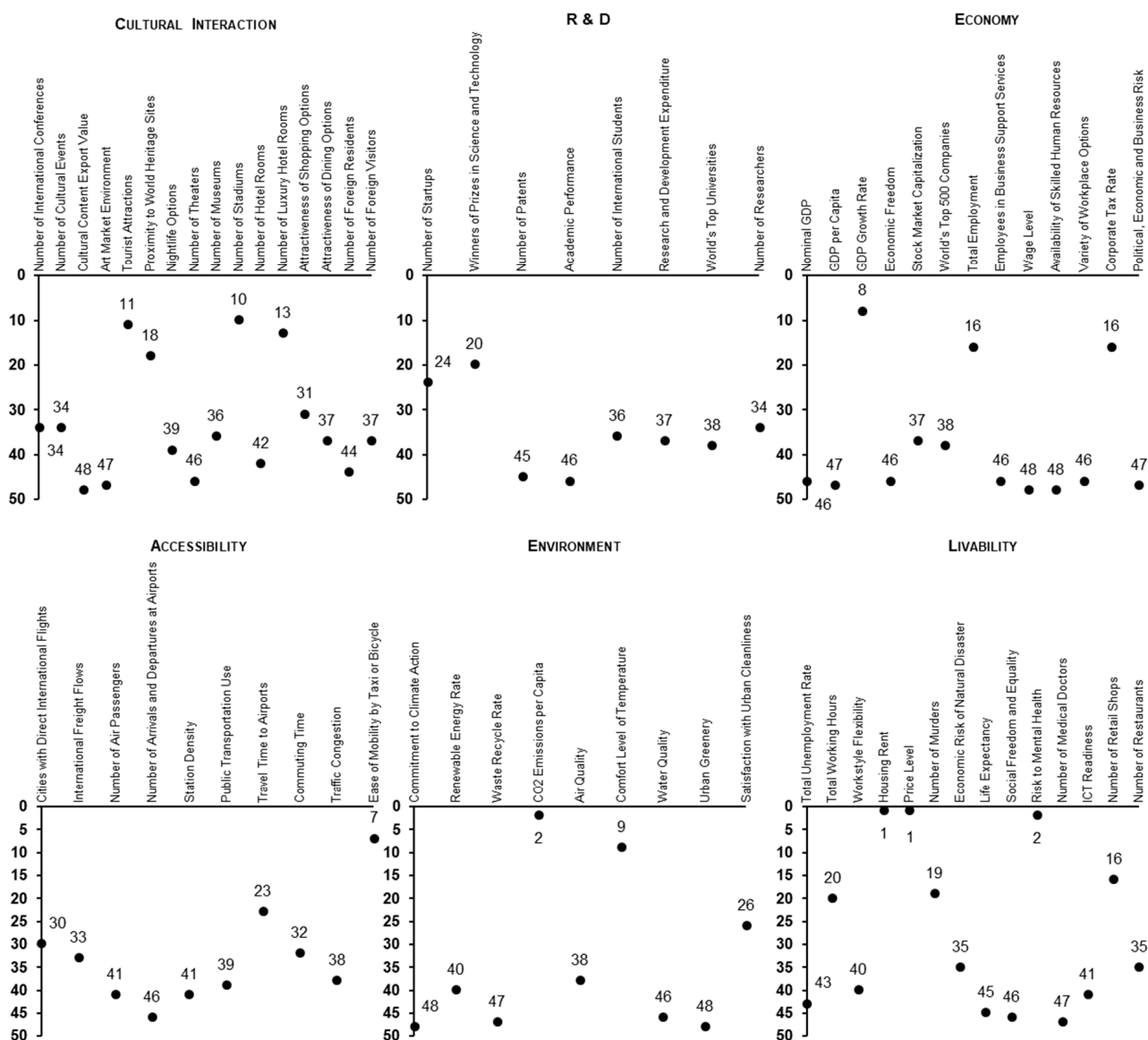
(Figure 2) [24], proves that urban development policies of this vision have not contributed to the achievement of its targeted goals. The Egyptian capital is still facing a number of urban challenges that need to be addressed in order to achieve urban sustainability. The most important challenges are (1) the overlapping of urban borders; according to article number 222 of the Egyptian Constitution, “Cairo is the capital of the Arab Republic of Egypt”. However, the current urban reality of the capital is that its urban borders cannot be clearly defined. This is due to spatial and functional urban overlapping, bearing in mind the urban cluster of the new administrative capital that was added to the urban texture of the capital. (2) Population growth, economic opportunities, and social justice; the capital needs to contain the huge population growth and create favourable conditions for sustainable economic growth that warrant achieving social justice [25]. (3) Random growth of housing and services; the legacies of which the capital has suffered as a result of random growth in the past need to be changed [26]. (4) Environmental deterioration of urban areas; the capital needs drastic solutions to stop this deterioration [27]. The aforementioned challenges resulted in a number of obstacles that hinder the achievement of urban sustainability of the capital such as:

*Inefficient urban management:* the urban management of the Egyptian capital faces different complicated challenges. Those challenges require stakeholders to give more focus to fulfilling their commitments and shouldering their urban development responsibilities [28]. The participation of numerous departments and institutions in urban management made it difficult to organise many procedures, which undermined the efficiency of those procedures. Efficient urban management and organisation requires observing the capabilities of each local authority. Local authorities vary based on man power, proficiency, and its financial capability to provide good service to its residents. There is a wide gap between the expectations of the society and the ability of local authorities to realise those expectations [29].

*Deterioration of urban quality of life:* the urban sprawl resulting from the population growth in the capital caused infringement on environmentally sensitive areas [30] and the persistence of a number of problems pertaining to it, such as environmental pollution [31], traffic congestions [32], brown field areas [33], the deterioration of infrastructure, the deterioration of social amenities, and green areas [34]. The growth in demand for employment in the Egyptian capital resulted in a rise in unemployment rates, along with a number of social issues pertaining to higher poverty, homelessness, and crime rates [23].

*The deterioration of environmental quality:* the accelerated urban expansion of the capital contributed to the deterioration of the environmental quality, particularly water quality. The quality of the main lifeline of the capital and the main source of water deteriorated due to domestic and liquid industrial pollutants [35]. Air pollution also increased as a result of automobile emissions, industrial development, and the use of non-eco-friendly fuel sources [31]. The growing human activities and the high residential density resulted in an increase in noise pollution in the capital [36].

*Low quality of living:* the declining quality of living in the capital is considered one of the main issues that is caused by the inefficient management of urban development [37]. In order for the capital to become liveable and sustainable, it is necessary to provide a supportive high-quality infrastructure and a high quality of living. This is based on providing suitable housing, entertainment, and sanitary amenities. The main issue pertaining to housing is the shortage of suitable housing for low-income residents [38]. Even though the available houses are generally higher than the actual demand, the supply of housing for low-income residents of the capital is still not enough, since the prices of those houses are not affordable for that group [39].

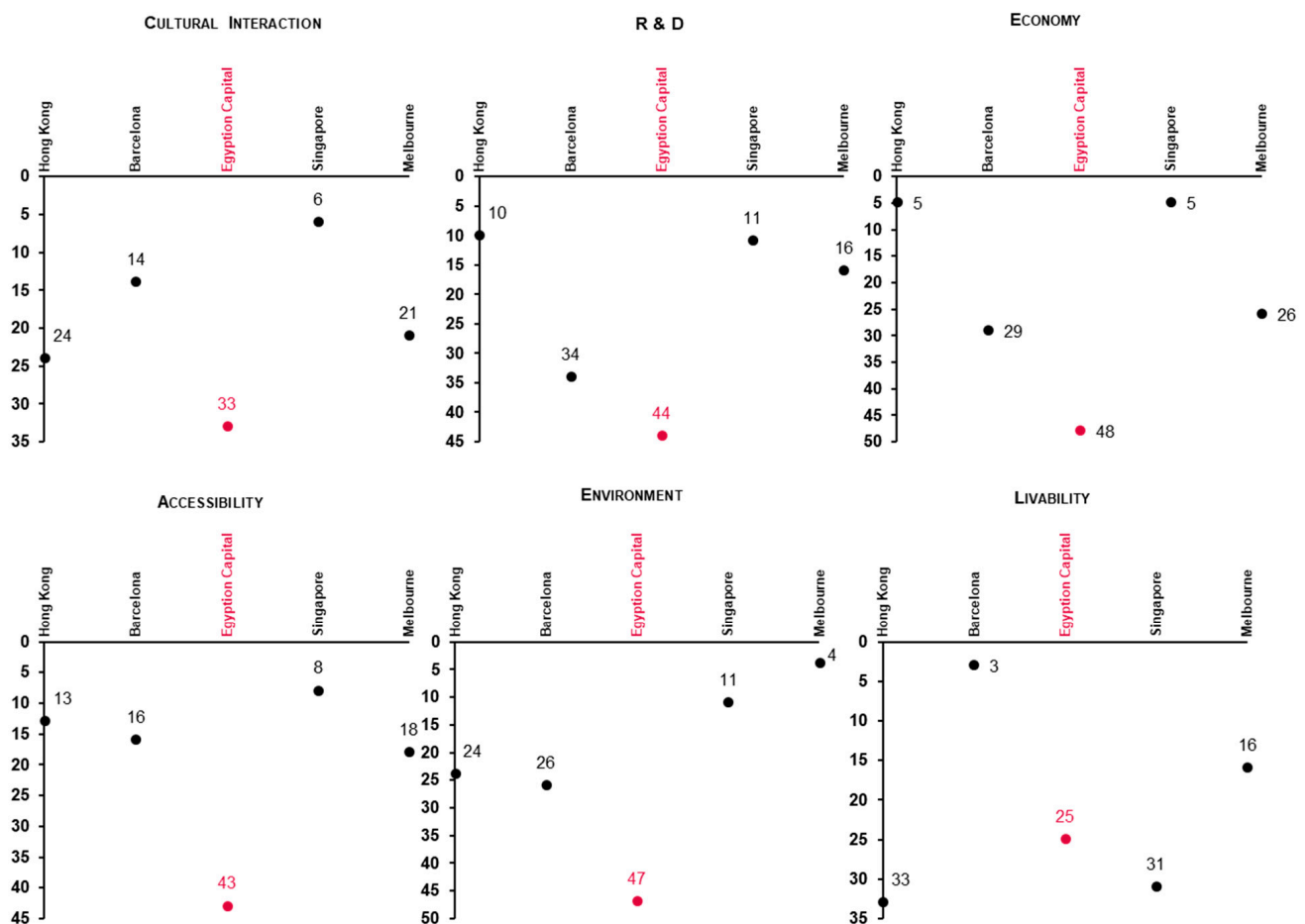


**Figure 2.** The ranking of the Egyptian capital in the Global Power City Index (GPCI) (the GPCI targets and evaluates 48 representative cities, according to (1) cities found in the top 20 of major city rankings such as Global Cities Index (GCI), Cities of Opportunity and The Global Financial Centres Index (GFICI); (2) major cities of countries which are in the top 20 in terms of competition according to widely recognised international competitiveness rankings, such as those created by the World Economic Forum and International Institute for Management Development; (3) cities which do not meet the above criteria but which are deemed appropriate for inclusion by the Executive Committee or the Working Committee).

#### 4. Urban Sustainability Practices

Many urban development plans for cities included the goal of achieving urban sustainability. Monitoring the performance of the execution of these plans provided motivation to develop a list of urban sustainability indicators and criteria for every city that enables assessment and comparison in the application of these indicators in the best possible way [14]. The research depended on selecting practices with the following criteria: (1) practices that targeted the achievement of urban sustainability in their development plans; (2) practices with development plans that adopt policies that promote advancement towards achieving its goals, including commitment to principles, criteria, and indicators supporting progress evaluation; and (3) practices that share a mechanism with the Egyptian capital that make

it possible to compare between them (Figure 3). Through these criteria, we looked into the available practices and selected four cities: Melbourne, Hong Kong, Barcelona, and Singapore. They all target achieving urban sustainability in their developmental plans and have what enables them to measure their progress. They also participate with the Egyptian capital in the Global Power City Index (GPCI), where they scored high ratings in 2021. Singapore ranked in the fifth position, Melbourne in the eleventh position, Hong Kong in the thirteenth position, and Barcelona in the eighth position, while the Egyptian capital came in the forty-sixth position [24]. The main features of sustainable urban development plans of these practices are reviewed in an attempt to identify the most important factors they are based on that have contributed to the achievement of their goals.



**Figure 3.** A comparison between the Egyptian capital and practices in the Global Power City Index.

#### 4.1. Melbourne

The city of Melbourne proposed an urban sustainability plan in 2001. It identified four strategic goals that reflect the urban sustainability aspirations of the city [40]: (1) a connected city that is easily accessed; (2) a lively innovative business city; (3) an attractive, comprehensive city; and (4) an environmentally responsible city. The city council, in partnership with a number of academic and nongovernmental organisations, developed a comprehensive work plan framework to make sure the measures, policies, and strategies of the plan help the fulfilment of the city’s vision of becoming a “flourishing sustainable city”. The city’s vision seeks to attain the three sustainability pillars: economic boom, social justice, and quality environment. The city council, in accordance with these pillars, adopted a group of indicators to measure the performance of the city’s sustainability plan [41].



#### 4.2. Hong Kong

In 2001, the government of Hong Kong adopted an urban sustainability evaluation system after conducting a comprehensive study named “Urban Sustainability For the Twenty First Century Hong Kong” [42]. The study was designed through the participation of the government, professional institutions, academic circles, and public consultations. This participation aimed at taking into consideration environmental and social interests, as well as economic aspects, when making decisions involving the future of Hong Kong. In 2007, it adopted the “Vision and Planning Strategy of 2030 Hong Kong” [43]. The outcome of the study included a series of guideline principles and pointers related to sustainable urban development issues pertaining to Hong Kong. These guidelines are used as a tool in evaluating strategies’ and project proposals’ efficiency in achieving urban sustainability. These principles are represented in economy, health, cleanliness, natural resources, society and social infrastructure, biological diversity, lively entertainment and culture, environmental quality, and transportation. The vision included three main pillars: (1) providing a quality living environment, (2) enhancing economic competitiveness, and (3) strengthening the ties with mainland China.

#### 4.3. Singapore

In 1992, The Green Singapore Plan was launched. The plan’s vision aimed to make the city a model green city by the year 2000 [44]. It discussed a number of environmental issues, the most important of which being climate change. As a result, a strong plan that is capable of facing the rising environmental challenges was formed. In 2002, a comprehensive review of Singapore’s plan was carried out [45], aiming to transcend merely becoming a clean and environmentally friendly city and striving to achieve environmental sustainability. Six main focus fields were determined: air and climate change, water, waste management, natural environment, public health, and international environmental relations. In 2009, “The Sustainable Singapore Plan” was launched as a new national framework to direct sustainable development efforts in Singapore to 2030. It included a number of new initiatives, the most important of which were introducing the minimum level of energy and water efficiency criteria for home appliances and improving the level and efficiency of public transportation [46]. In 2021, the Green Singapore 2030 plan was introduced. It defines five pillars to achieve the goals of the green state: (1) city in nature, (2) sustainable life, (3) regulating energy consumption, (4) green economy, and (5) flexible future [44].

#### 4.4. Barcelona

The Barcelona Urban Sustainability Forum adopted the “Barcelona Towards Urban Sustainability” vision as an initiative to ensure the participation of its citizens in building and shaping the city’s vision. Sustainability pointers for the city were selected based on 10 principles to establish a sustainable city in environmental, economic, and social fields, namely, the effective use of resources, avoiding endangering the residents’ health, biological diversity, diversified economy, service accessibility, preserving the variety of jobs, gender equality, employment, social work, entertainment, and forging alliances with other cities. Barcelona was a model for other Spanish cities in enforcing the application of sustainability pointers towards sustainable urban development [14].

A look into their plans for achieving urban sustainability shows that they included clear short- and medium-term visions that are periodically revised and evaluated through a group of indicators. This helps identify the ability of urban policies to handle urban issues within a framework of commitment to the vision’s principles and to achieve its goals and its pillars. That is what this research aims to identify through discussing those practices. By the end of this section, we reach the conclusion that the Egyptian capital, in its efforts to achieve urban sustainability, has to incorporate in its developmental plan, a clear framework that adopts the pillars supporting the realisation of its visions. It also has

to set a group of principles as a business charter for all and identify a group of criteria and indicators for assessing its progress in solving urban issues.

## 5. A General Framework for the Urban Sustainability of the Egyptian Capital

The literature indicates the possibility of achieving sustainable urban transformation through two dimensions [47]: first, drastic change drivers, which include governance, planning, innovation, competitive capabilities, life and consumption style. These processes combined can bring about change in urban context. Second, sustainable urban structures, including resource management, climate mitigation and adaptation, transportation and accessibility, buildings, and spatial environment and public spaces. In this section the authors discuss how to build a general framework that takes into account radical change drivers and the sustainable urban structure of the Egyptian capital and its external influences on surrounding areas. Such a framework will contribute to course correction for the Egyptian capital urban development plans. Since periodical local data that could help assess the capital urban issues were not available, the authors formed the components of the framework based on the results of urban sustainability indicators issued by a number of international institutions. These results are comparable to the urban reality of the Egyptian capital in providing periodical data for the framework. The framework will adopt an urban sustainability concept that will serve as a vision for the Egyptian capital, identify a number of urban issues that simulate the Egyptian capital's reality, and select a group of indicators to ensure those issues are addressed, for which periodical data will be available. The indicators were distributed on a group of criteria to make it easier for the public and for the urban decision makers to read and to assess the urban sustainability of the Egyptian capital. These criteria were formed into a group of principles supporting the achievement of local requirements, as well as global responsibilities, and were all formulated into three pillars.

### 5.1. Urban Sustainability

Sustainability is the starting point for concepts and strategies that lead to directive principles for urban environmental development. Urban environment is a man-made physical entity that provides the environment for human activities, such as residential neighbourhoods, transportation systems, public spaces, and infrastructures [48]. Sustainable development is the development that most likely will satisfy human needs and improve the quality of life provided using the environmental systems in ways that allow it to continue renewing itself [49]. According to a definition proposed by "The Sustainable City Convention" held in Rio de Janeiro in the year 2000, "Sustainable urban development is the ability of the urban region and its territories, to continue developing the quality of life levels the society desires, without limiting the available options for current and future generations, or causing negative effects within or outside of the urban borders" [50]. The research adopts this definition to represent the vision the Egyptian capital should adopt, as it puts the residents' quality of life as the main priority, stresses the importance of a good lifestyle, supports the balance of human and environmental welfare (built as well as natural), and takes into account the different points of view of stakeholders regarding sustainable urban development. According to urban management, this means social justice, quality of life, and financial viability, while, for urban developers, it means concentrating mainly on economic aspects. End users' understanding of sustainable urban development is driven mainly from personal interests, such as providing housing, easy access to public transportation, and other services and a healthy, comfortable environment.

### 5.2. Urban Sustainability Issues

Planning processes for the transformation towards urban sustainability of the Egyptian capital are linked to the ability to provide information on urban sustainability issues. This information contributes to evaluating current conditions and understanding future capabilities of urban systems to be able to support management and decision making. In order to be able to form a group of factors that support achieving urban sustainability

for the Egyptian capital, we reviewed numerous literature and practices. These helped to identify a number of urban sustainability issues, and compared them to the identified urban issues the Egyptian capital is still facing and those that are targeted in its vision. We identified some environmental matters [51–59], such as the use of green building design techniques to reduce energy consumption, the use of renewable energy, buildings that cater to different needs and rescue the use of resources, waste management, transportation that is connected to urban and rural areas, achieving environmental justice through public health and entertainment services, protecting and reviving the natural environment, water supply and sewage system management, and limiting dangers and disasters. Other information relates to social matters, such as achieving justice and social stability, providing easy access to local public services such as education, healthcare, amenities, and efficient transportation, building abilities and leadership capable of change, diverse local cultures that encourage social coherence and the sense of belonging to the identity of the place, strengthening healthy connection to regional, national, and international society, and suitable density and size when planning neighbourhoods to support main amenities, and reducing the use of resources. Other information is related to the economy, such as laying the foundation for green economy and clean techniques, green tax policies, green infrastructure that will contribute to providing employment opportunities, and achieving economic boom. Some information is related to lifestyle, such as the participation of the society in urban policy decisions to improve quality of life, the ability to live in a safe, healthy, local environment, public green spaces and natural environment, entertainment and recreational capability, an attractive enjoyable urban environment that preserves public spaces, and natural and cultural heritage, which residents will want to live and work in now and in the future. These issues require systematic purposeful change built on a comprehensive vision that considers all relevant factors. A vision can be designed to include flexible adaptive policies supporting co-operation between the concerned stakeholders, which merges their different points of view, as well as information and experiences.

### 5.3. Urban Sustainability Indicators

Indicators play an important role in measuring performance. In order for us to assess the urban sustainability of the Egyptian capital, there is a need to build a set of measurable indicators. They help inform urban policy makers, as well as the public, of the assessment of sustainable urban development within the Egyptian capital. They also help re-evaluate priorities and review and correct the path during execution of these policies. Sustainable urban development indicators for the Egyptian capital must be clear, applicable, and measurable. They should reflect the priorities and objectives of the Egyptian original urban environment. Urban managements face a number of challenges during the execution and merging of indicators to make urban decisions [60]: first, the method used to choose and develop indicators; second, external resistance, which makes choosing, explaining, and applying indicators a complicated and useless matter. This is manifested in information shortage, weak policies, or the unwillingness of the government to execute and use indicators, and the lack of consensus in points of views regarding what constitutes standard indicators.

Many indicators were developed to guide public policies and government institutions, but they were too complicated and numerous, making them difficult to utilise [61]. Urban sustainability indicators should be clearly linked to the urban sustainability developmental vision and its goals for them to become tools for urban managers to measure the performance progress of these policies [62]. This is the approach the research has adopted in forming groups of indicators that enable the assessment of the urban sustainability of the Egyptian capital. The first group of indicators contributes to clarifying the environmental situation and its absorptive capacity to policy makers and urban decision makers. The second group enables them to evaluate social and economic abilities. The last group evaluates the urban, environmental ability to build a sustainable lifestyle through providing services and sufficient livelihood for current and future residents as follows.

### 5.3.1. Environmental Capabilities' Evaluation Indicators

Indicators that have the greatest impact in measuring the environmental capabilities of the Egyptian capital (Table 1) have been identified within the “Low Carbon Cities Framework”. This is a system developed by “The Ministry Of Energy, Green Technology and Water of Malaysia” to assist beneficiaries, developers, local councils, urban developers, nongovernmental organisations, and residents in lowering carbon emission levels in cities in order to achieve sustainable urban development [63]. Other indicators were developed to measure resource consumption according to “The European Green Capital Award Index”, which is an initiative launched by the European Union in 2010 to enable cities to provide a better environment for their citizens and enhance experiences in light of the best practices of European cities [64]. As well as indicators to assist in environmental quality control, according to “The Green City Index” with a great contribution from Siemens, in the discussions around environmentally sustainable cities, indicators assist stakeholders in understanding their special challenges, provide them with an informed perspective of the best practices, and support their decision making [65].

**Table 1.** Indicators for assessing environmental capability.

Low Carbon Cities Framework	European Green Capital Award	Green City Index
<ul style="list-style-type: none"> <li>• Water Management</li> <li>• Switching From Private to Public Transportation</li> <li>• Traffic Management</li> <li>• Waste</li> <li>• Low Carbon Buildings</li> <li>• Green Transportation Infrastructure</li> <li>• Clean Vehicles</li> <li>• Urban Greening and Environmental Quality</li> <li>• Community Services</li> <li>• Infrastructure Provisioning</li> <li>• Selection Of Development Sites</li> <li>• Urban Form</li> </ul>	<ul style="list-style-type: none"> <li>• Water Management</li> <li>• Energy Management</li> <li>• Noise</li> <li>• Air Quality</li> <li>• Mitigation And Adaptation to Climate Change</li> <li>• Nature And Biological Diversity</li> <li>• Waste And Economic Recycling</li> <li>• Sustainable Land and Soil use</li> <li>• Sewage Water Treatment</li> <li>• Sustainable Urban Transportation</li> <li>• Green Development and Environmental Innovation</li> <li>• Environmental Governance</li> </ul>	<ul style="list-style-type: none"> <li>• Water Consumption/Waste</li> <li>• Water And Water Treatment Efficiency</li> <li>• Sewage Water Treatment</li> <li>• Energy Density/Consumption</li> <li>• Energy Consumption in Residential Buildings</li> <li>• Renewable Energy Consumption</li> <li>• Efficient Clean Energy Policies</li> <li>• Fine Particles</li> <li>• Sulphur Dioxide/Nitrogen</li> <li>• Carbon Dioxide Density/Emissions</li> <li>• Reducing Carbon Dioxide Strategy</li> <li>• Clean Air policies</li> <li>• Ozone</li> <li>• Production/Waste Recycling</li> <li>• Waste Reduction policies</li> <li>• Energy-Efficient Building Initiatives/Standards</li> <li>• Use of Transportation Other Than Cars</li> <li>• The Size of the Car Transportation Network</li> <li>• Promoting Green Transportation</li> <li>• Green Land Use Policies</li> <li>• Congestion Reduction Policies</li> <li>• Green Management/Work Plan</li> <li>• Active Participation in Green Policy</li> </ul>

### 5.3.2. Indicators for Assessing Social and Economic Environment

Indicators that contribute to providing a sound social and economic environment for the Egyptian capital (Table 2) have been identified by the Australian Conservation Foundation's Sustainable Cities Index. The Index provides an overview of comparative performance in Australia's 20 largest cities, with the aim of encouraging healthy competition, stimulating debate, and suggesting new ways of thinking about how our cities can be sustainable [66]. According to the Indicators for Sustainability Indexes, The International Sustainable Cities Organization, has selected a group of cities globally to create sustainability indicators to monitor the success of their sustainability plans [4]. Sustainable indicators are those which measure both human and natural environment according to the Healthy Cities Index of the World Health Organization. The World Health Organizations Healthy Cities Index considers health indicators to be essential measures of health and well-being; these indicators can help society determine where it is headed and how far it is from the chosen goals [67].

**Table 2.** Indicators for assessing social and economic environment.

Sustainable Cities Index	Indicators for Sustainability	Healthy Cities Index
<ul style="list-style-type: none"> <li>• Water</li> <li>• Air Quality</li> <li>• Climate Change</li> <li>• Environmental Footprint</li> <li>• Biodiversity</li> <li>• Food Production</li> <li>• Green Buildings</li> <li>• Employment</li> <li>• Household Expenses</li> <li>• Public Participation</li> <li>• Education</li> <li>• Green Action Plan</li> <li>• Green Management</li> <li>• Active Participation in Green Policy</li> </ul>	<ul style="list-style-type: none"> <li>• Air Quality</li> <li>• Greenhouse Gas Reduction/Energy Efficiency</li> <li>• Waste/Reuse/Recycle</li> <li>• Green Landscape</li> <li>• Unemployment Rates/Employment and Economic growth</li> <li>• Housing</li> <li>• Public Spaces Quality</li> <li>• Education</li> <li>• Health</li> <li>• Transportation</li> <li>• Water Quality/availability</li> <li>• Mobility</li> <li>• Sewage</li> <li>• Health</li> <li>• Density</li> <li>• Integrated Neighborhood/compact City</li> </ul>	<ul style="list-style-type: none"> <li>• Water Quality</li> <li>• Air Pollution</li> <li>• WasteWater Collection</li> <li>• Household Waste Treatment</li> <li>• Green Landscape</li> <li>• Living Space</li> <li>• Percentage of Population in Inadequate Housing</li> <li>• Homelessness</li> <li>• Unemployment</li> <li>• Poverty</li> <li>• Age of Mothers at Giving Birth</li> <li>• Miscarriage Rate</li> <li>• Employment of Disabled</li> <li>• Access/Coverage of Public Transportation</li> <li>• Mortality Causes/Rate</li> <li>• Child Care Availability</li> <li>• Low Birth Weight</li> <li>• Health Education Programs</li> <li>• Immunisation Rates</li> <li>• Population/healthcare practitioner</li> <li>• Population/Nurse</li> <li>• Percentage of Population Covered by health Insurance</li> <li>• Availability of Health Serin Foreign Languages</li> <li>• Discussing Health Indicators in The City Council</li> <li>• Abandoned Industrial Sites</li> <li>• Pedestrian/Bicycle Paths</li> <li>• Sports and Entertainment</li> </ul>

### 5.3.3. Sustainable Lifestyle Assessment Indicator

Indicators that enable building a sustainable lifestyle for the Egyptian capital (Table 3) have been identified by the Better Life Index. The Better Life Index allows the comparison of the well-being of cities based on 11 topics identified by the Organization for Economic Co-operation and Development's Livability Index [68]. Indicators that measure the availability of consumer goods and services were outlined by The Livability Index that was developed by The Economist Intelligence Unit. The Livability Index aims to measure development levels and allocate hardship allowances as a part of relocation packages to expats in International companies and institutions [69]. Indicators that support the concept of well-being and work/life balance are defined by the Mercer's Quality of Life Index. The Mercer's Quality of Life Index aims to monitor the thematic aspects of everyday life. The majority of people agree on its importance for attaining a good standard of living [70]. Indicators that measure cultural diversity and tolerance, according to Monocle Magazine's Quality Of Life Survey [71]. The Monocle Magazine's Quality of Life Survey aims to define what makes a good city extraordinary. A liveable city should generate a sense of community, provide hospitable places for everyone to develop social skills, and a sense of independence and identity.



**Table 3.** Indicators for assessing sustainable lifestyle.

Better Life Index	The Livability Index	Quality of Living Index	Quality of Life Survey
<ul style="list-style-type: none"> <li>• Water Quality</li> <li>• Air Pollution</li> <li>• Quality of Community Support Network</li> <li>• Years of Education</li> <li>• Students' Skills</li> <li>• Education Attainment</li> <li>• Community Participation in Regulation Development</li> <li>• Voter Turnout</li> <li>• Housing Expenses</li> <li>• Housing Connection to Basic Facilities</li> <li>• Housing Density Person/Room</li> <li>• Family Net Worth</li> <li>• Family Net Income</li> <li>• Safe Work</li> <li>• Personal Earning</li> <li>• Long-Term Unemployment Rate</li> <li>• Employment Rate</li> <li>• Murder/Assault Rate</li> <li>• Self-report of Health Status</li> <li>• Life Expectancy</li> <li>• Life Satisfaction</li> <li>• Time Allocated for Entertainment and Selfcare</li> <li>• Employees Overtime Work</li> </ul>	<ul style="list-style-type: none"> <li>• The Prevalence of Petty Crime and Violence</li> <li>• Threat of Terrorism</li> <li>• Threat of Military Conflicts</li> <li>• Availability/Quality Private Education</li> <li>• Public Education Indicators</li> <li>• Quality Housing Availability</li> <li>• Private Healthcare Availability</li> <li>• Availability of Narcotic Drugs</li> <li>• Public Healthcare Indicators</li> <li>• Quality of Road Networks</li> <li>• Quality of Public Transportation</li> <li>• Quality of International Ties</li> <li>• Energy Saving Quality</li> <li>• Water Saving Quality</li> <li>• Communication Quality</li> <li>• Sports Availability</li> <li>• Food and Drinks</li> <li>• Consumer Goods and Services</li> <li>• Cultural Diversity</li> <li>• Level of Corruption</li> <li>• Social and Religious Restrictions</li> </ul>	<ul style="list-style-type: none"> <li>• Sewage</li> <li>• Air Pollution</li> <li>• Climate Conditions</li> <li>• Natural Disaster Record</li> <li>• Waste Disposal</li> <li>• Political Stability</li> <li>• Crime and Law enforcement</li> <li>• Exchange Regulation</li> <li>• Banking services</li> <li>• Availability of International Standards and Schools</li> <li>• Housing Rental</li> <li>• Appliances/Home Furniture</li> <li>• Maintenance Services</li> <li>• Availability of Services and Health Care</li> <li>• Infectious Diseases</li> <li>• Electricity</li> <li>• Water</li> <li>• Public Transportation</li> <li>• Traffic Congestion</li> <li>• Theatres/Cinemas</li> <li>• Sports and Recreation</li> <li>• Restaurants</li> <li>• Food Availability and Daily Consumption</li> <li>• Availability of Media, and Censorship</li> <li>• Restrictions on Personal Freedoms</li> <li>• Censorship Level</li> </ul>	<ul style="list-style-type: none"> <li>• Weather/Sunshine</li> <li>• Environment and Nature Accessibility</li> <li>• Safety/Crime</li> <li>• Work Conditions</li> <li>• International Connectivity</li> <li>• Public Transportation</li> <li>• Healthcare</li> <li>• Proactive Policies Development</li> <li>• Urban Design</li> <li>• Architecture Quality</li> <li>• Tolerance</li> </ul>

#### 5.4. Urban Sustainability Criteria

How can we measure sustainability? This was one of the questions that resulted from urban sustainability discussions. According to the literature, indicators and criteria are two methods of measuring sustainability [72]. Criteria are the values that can be used to judge the relative sustainability of a group of options, while an indicator measures past and present values of specific criteria that can be used to measure future performance [73]. In order to define the concept of urban sustainability criteria, we can refer to the American Society of Civil Engineers (ASCE) and UNESCO's collaborative research around the development of natural resource systems' sustainability criteria. Their definition of sustainable development is "...systems designed and managed to fully contribute to the objectives of society, now and in the future, while maintaining their ecological, environmental and engineering integrity" [74], which means the participation in evaluating urban sustainability efforts to provide more efficient services that preserve public health and wellbeing, that are cost-effective, and that reduce adverse environmental effects today and in the future. Criteria are most of the time defined in urban sustainability practices' visions and plans to be sustainability goals, work procedures, or tasks that have to be performed [75]. The goal of adopting urban sustainability standards is to provide urban decision makers for the Egyptian capital with an assessment of urban development policies in the short and long term. This can help them judge those policies and decide what needs to be modified in order to achieve the urban sustainability of the capital. We can identify some basic criteria, such as the safety of the social and ecological systems, opportunities and living sufficiency, equality between generations, resources maintenance and efficiency, preserving social and environmental civilisation, democratic rule, reservation and adaptation, and immediate and long-term integration [76]. Reviewing urban sustainability practices shows that there is still room for enhancing the possibility of merging sustainability criteria with urban sustainability evaluation [77,78]. That is what we adopted when building a group of criteria that contributes to the assessment of urban sustainability and integrates urban issues and indicators mentioned in previous sections. Criteria that enable the evaluation

of environmental capabilities include water use efficiency, improving the productivity of renewable resources, preserving the natural environment, the ability to adapt to climate change, environmental safety and efficiency of transportation systems, enhancing green building concepts, waste management control, and the reduction in energy consumption. Other criteria assist in the assessment of social and economic conditions, such as the efficiency and sustainability of the local economy, the application of the concepts of urban safety, the efficiency and quality of education, maintaining public health and the quality of healthcare services, providing adequate housing and its secure possession, the quality and accessibility of urban transportation networks, the efficiency of infrastructure networks, interactive capacity of city spaces and its planning, the efficient urban management, the efficient public participation of the local community, and the application of the principles of effective, transparent, and accountable governance. There are also criteria that work towards creating a sustainable lifestyle, the diversity of entertainment and recreational capabilities, achieving work/life balance, promoting the concepts of sustainable consumption and production, and achieving the principles of social integration.

### 5.5. The Principles of Urban Sustainability

Principles are the common method of expressing commitment to specific ideals. They are the starting point for individuals and institutions in addressing urban sustainability issues [79]. There is a contrast in the way many institutions address sustainability principles depending on the goals they strive to achieve. In order for this research to achieve its goals, we find that we need to agree on the principles that support the development and execution of a sustainable urban capital and adhere to those principles using rigorous coherent and transparent assessment methods. By reviewing many of the principles suggested by multiple institutions [80–84] or adopted by urban sustainability practices and what they sought to achieve in their plans and visions [85], we adopted a set of principles. These principles contribute to building the general framework for urban sustainability in the Egyptian capital, which were identified in three groups: the first group consists of principles pertaining to creating a framework to protect the environment from human interference, **Natural Resources Protection**: protection through the management and utilisation of renewable resources in manners and quantities that do not exceed its renewal possibility, reserving and benefitting from nonrenewable natural resources through efficient utilisation and accurate planning, and choosing and developing environmentally sound technologies. **Environmental Quality**: maintaining environmental quality by managing and developing urban areas to achieve risk prevention, through the use of effective and efficient alarm systems, to predict danger, developing strategies that contribute to solving urban issues that constitute large environmental dangers such as inadequate housing and industrial development areas that are constantly prone to danger, and adopting plans and systems that make environmental conservation and reform an integrated element in all developmental activities. **Environmental Impact**: like any living system, the community consumes material, water, and energy inputs and processes them into a usable form and produces waste. This is known as the city's "metabolism" [86]. It is essential to make this metabolism more efficient, to minimise the capital's environmental footprint, and to solve problems locally, when possible, rather than passing them to other geographical areas or to future generations. The second group of principles is concerned with monitoring the outcome of human intervention with social and economic practices, **Economic Growth**: economic strategies need to increase the value and vitality of natural and human systems and preserve and renew financial and natural resources. **Social Justice**: creating equality and justice, ensuring that everyone receives adequate housing, healthy amenities, education, a source of sustainable income, and empowering marginalised classes to develop their abilities and seeking to realise their aspirations. **Infrastructure**: infrastructure depends on integrated management of urban development, promoting cross-functional approaches (such as entertainment facilities, housing, industry, ports, transportation, renewable energy, water supply, extraction of material resources, and waste disposal) that observe treaties,

laws, and urban policies, and building strong partnerships with beneficiaries. **Sustainable Urban Environment:** emphasising the uniqueness of the capital, with its distinctive human, cultural, historical, and natural characteristics, which provide an insight into sustainability paths acceptable to its population and are compatible with their values, traditions, and environmental realities. Building on these characteristics helps to motivate and mobilise human and financial resources of the capital to achieve its sustainability. **Community Participation:** effective participation of all concerned stakeholders or those affected by the management and development of urban areas in the capital, and providing information, communication technologies, technical tools, institutional frameworks, and innovative styles that support their continuing participation. **Well-being and Prosperity:** humans have the basic rights of freedom, equality, adequate living conditions within an environment that provides a decent and prosperous life, and protection of cultural and spiritual valuable places. **Responsible Consumption:** adopting lifestyles and tools that promote the capital's sustainable practices which support a good quality of life and provide adequate resources in a world with limited resources. **Lifestyle:** eliminating all forms of discrimination, protecting the freedom of speech and expression, peaceful assembly, and freedom of opinion, supporting and encouraging common understanding, and eliminating corruption from every official and private institution of the Egyptian capital.

#### 5.6. *The Pillars of Urban Sustainability*

The urban environment is the foundation for economic opportunities and social interactions, but it can also contribute to damaging the natural environment when its resources are used in an unsustainable manner that endangers social well-being in the long run. The literature confirms that social, economic, and environmental development constitute the pillars, or what is referred to as the triple bottom line of sustainable development, to which urban governance is often added [49]. The goal of this research is building a general framework for the Egyptian capital that supports its capability to achieve urban sustainability and the periodical assessment of its urban policy. In reference to this research, we know that the capital adopted three pillars that are based on the definition of urban development as “the ability of the urban region and its territories, to continue developing the quality of life levels the society desires, without limiting the available options for current and future generations, or causing negative effects within or outside of the urban borders”: (1) quality and carrying capacity of the environment, (2) social and economic urban strategies, and (3) sustainable urban lifestyle. Knowledge of the integrative relationship between these pillars and observance of procedures in the Egyptian capital urban level supports and reinforces the achievement of its urban sustainability.

#### 5.7. *Quality and Carrying Capacity of the Environment*

Natural environment is the most beneficial commodity to residents; they understand its value and gain better appreciation for it with practice [87]. Hence, it is the residents' responsibility to act as guardians of their natural environment. The urban environment, on the other hand, is a living system that consumes resources, water, and energy inputs, processes them into usable forms, and produces waste that often constitutes an environmental impact, exceeding what can be handled within the urban environment borders [88]. In order to achieve urban sustainability for the Egyptian capital, it has to limit its environmental footprint, and give priority to including urban forms that support achieving environmental quality in the capital's urban development plans, for example, in the case of the compact city, which can contribute to reduction in energy consumption in transportation and limit its environmental impact.

### 5.8. Social and Economic Urban Strategies

Residents should be entitled to participate in making the decisions that affect them and those whose opinions are not always heard should be empowered in order to promote community cohesion. The population is the main driver of moving cities towards sustainability. They have the practical knowledge of their urban environment through their everyday life, which enables them to present innovative ideas and provide legitimacy to developmental decisions [89]. Hence, achieving social and economic sustainability of the Egyptian capital requires systems and institutions that enable public participation in urban development decision making based on a long-term vision that expresses the common aspirations of the population, a vision that takes into consideration the capital's human, cultural, historical, and natural distinctive characteristics, contributes to motivation and mobilisation of the capital's human and financial resources, realises equal accessibility to natural and human resources, promotes common responsibility for preserving the value of its resources for future generations, and provides a foundation for developing a strategy and a work schedule that reflects the distinctive nature and characteristics of the city for the achievement of urban sustainability.

### 5.9. Sustainable Urban Lifestyle

Cities are places dedicated to individuals [90]. Hence, the Egyptian capital needs to be a sustainable city that people want to live and work in both now and in the future, meets the needs of the current and future population, preserves its environment, participates in building a good quality of life in order to become a safe, inclusive, well-planned city with an efficient management, and provides equal opportunities and good services to all.

Researchers believe that this framework below can (Table 4) contribute to guiding local authorities towards urban sustainability pathways. It can enhance planning and management of the Egyptian capital's development, in a comprehensive and systematic manner, and drive motivation to become capable of providing an urban environment with a specified urban border, integrated and flexible in all forms of activities within its borders. It can help achieve an efficient, effective management that promotes a sustainable environment that is a favourable place to work and live in, with a unique and distinctive image and identity.

**Table 4.** A general framework for the Egyptian capital's urban sustainability.

Urban Sustainability Issues	Sustainability Indicators	Urban Sustainability Criteria	Urban Sustainability Principles	Urban Sustainability Pillars
<ul style="list-style-type: none"> <li>Water Resources Management</li> </ul>	<ul style="list-style-type: none"> <li>Water Quality</li> <li>Water Consumption</li> <li>Water Loss</li> <li>Water Treatment Policies</li> </ul>	<ul style="list-style-type: none"> <li>Efficient Water Consumption</li> </ul>	<ul style="list-style-type: none"> <li>Preserving Natural Resources</li> </ul>	
<ul style="list-style-type: none"> <li>Renewable Energy</li> </ul>	<ul style="list-style-type: none"> <li>Renewable Energy Consumption</li> <li>Efficient Clean Energy Policies</li> </ul>	<ul style="list-style-type: none"> <li>Improving Renewable Resources' Productivity</li> </ul>		
<ul style="list-style-type: none"> <li>Disaster Risk Reduction</li> </ul>	<ul style="list-style-type: none"> <li>Ozone</li> <li>Sunshine</li> <li>Environmental Footprint</li> <li>Natural Disaster Record</li> <li>Climate Change Adaptation</li> </ul>	<ul style="list-style-type: none"> <li>Preserving Natural Environment</li> </ul>	<ul style="list-style-type: none"> <li>Environmental Quality</li> </ul>	
<ul style="list-style-type: none"> <li>Revival and Protection of Natural Environment</li> </ul>	<ul style="list-style-type: none"> <li>Air Pollution</li> <li>Clean Air Policies</li> <li>Fine Particles</li> <li>Sulphur Dioxide/Carbon Dioxide</li> <li>Carbon Dioxide Density/Emission</li> <li>Carbon Dioxide Reduction Strategy</li> </ul>	<ul style="list-style-type: none"> <li>Adapting to Climate Change</li> </ul>		
<ul style="list-style-type: none"> <li>Sustainable Transportation, Clean Technologies, the Application of Green Tax Policies</li> </ul>	<ul style="list-style-type: none"> <li>Infrastructure and Promoting Green Transportation</li> <li>Clean Vehicle</li> <li>Use of Transportation Other than Cars</li> <li>Size of the Car Transportation Network</li> <li>Congestion Elimination Policies</li> <li>Sustainable Urban Transportation</li> </ul>	<ul style="list-style-type: none"> <li>Efficiency and Environmental Safety of Transportation Systems</li> </ul>		<ul style="list-style-type: none"> <li>Environmental Quality and Carrying Capacity</li> </ul>
<ul style="list-style-type: none"> <li>Green Building Design Techniques that Meet Different Needs and Reduce Resource Use</li> </ul>	<ul style="list-style-type: none"> <li>Green Buildings</li> <li>Low Carbon Building</li> <li>Energy Efficient Standards/Initiatives</li> <li>Green Practices, Techniques, and Skills</li> </ul>	<ul style="list-style-type: none"> <li>Green Building</li> </ul>		
<ul style="list-style-type: none"> <li>Avoid and Reduce waste, Reuse and Recycle</li> </ul>	<ul style="list-style-type: none"> <li>Waste Reduction Policies</li> <li>Waste Recycling</li> <li>Waste Disposal</li> </ul>	<ul style="list-style-type: none"> <li>Waste Generation and Management</li> </ul>	<ul style="list-style-type: none"> <li>Environmental Impact</li> </ul>	
<ul style="list-style-type: none"> <li>The Appropriate Urban Planning for Neighborhoods in Terms of Size and Density to Support Facilities, Reduce the Use of resources, Green Infrastructure, for Healthy Environment with Public Green Spaces</li> </ul>	<ul style="list-style-type: none"> <li>Urban Greenery</li> <li>Green Land Use Policies</li> <li>Urban Land Sustainable Planning</li> </ul>	<ul style="list-style-type: none"> <li>Urban Land Sustainability</li> </ul>		
<ul style="list-style-type: none"> <li>Planning According to the most suitable Size and Density to Support the main Facilities</li> <li>Reduce Energy Consumption by Using Green Building Technologies</li> </ul>	<ul style="list-style-type: none"> <li>Energy Performance</li> <li>Energy Consumption</li> <li>Energy Density</li> </ul>	<ul style="list-style-type: none"> <li>Energy Efficiency</li> </ul>		



Table 4. Cont.

Urban Sustainability Issues	Sustainability Indicators	Urban Sustainability Criteria	Urban Sustainability Principles	Urban Sustainability Pillars
<ul style="list-style-type: none"> <li>Thriving Local Economy that Provides Job Opportunities and Wealth</li> </ul>	<ul style="list-style-type: none"> <li>Growth and Diversity of Urban Employment</li> <li>Urban Employment in the Informal Sector</li> <li>Safe Work Conditions</li> <li>Employing Persons with Disability</li> <li>Current/Projected Unemployment</li> <li>Per Capita Gross Domestic Product</li> <li>Urban Investment Structure</li> <li>Urban Direct Foreign Investment</li> <li>Net Worth/Net Disposable Income for Family</li> <li>Banking Services/Exchange Regulations</li> </ul>	<ul style="list-style-type: none"> <li>Vital Local Sustainable Economy</li> </ul>	<ul style="list-style-type: none"> <li>Economic Growth and Employment</li> </ul>	<ul style="list-style-type: none"> <li>Social and Economic Urban Strategies</li> </ul>
<ul style="list-style-type: none"> <li>Securing Quality Living Conditions that are Socially Integrated</li> </ul>	<ul style="list-style-type: none"> <li>Quality of Community Support Network</li> <li>Poverty</li> <li>Homelessness</li> <li>Murder Rate</li> <li>Violence and Assault Rate</li> <li>Crime and Law Enforcement</li> <li>Terrorist Threat</li> <li>Military/Civil Conflict Threat</li> </ul>	<ul style="list-style-type: none"> <li>Urban Safety</li> </ul>		
<ul style="list-style-type: none"> <li>Ensure Fair Access to Educational services, Training Opportunities, Exchange of Information, and Cultural Activities</li> </ul>	<ul style="list-style-type: none"> <li>Education Years</li> <li>Educational Attainment</li> <li>Students Skills</li> <li>Private Education Quality / Availability</li> <li>Public Education Indicators</li> <li>Availability of International Schools/Standards</li> </ul>	<ul style="list-style-type: none"> <li>Efficient Quality Education</li> </ul>		
<ul style="list-style-type: none"> <li>Quality Comprehensive Healthcare Services</li> </ul>	<ul style="list-style-type: none"> <li>Health Education Programme</li> <li>Indicators of Public/Private Health Care</li> <li>Population/Health Practitioner/Nurse</li> <li>Percentage of Population Covered by Health Insurance</li> <li>Availability of Foreign Language Health Care</li> </ul>	<ul style="list-style-type: none"> <li>Public Health and Health Services</li> </ul>	<ul style="list-style-type: none"> <li>Social Justice</li> </ul>	
<ul style="list-style-type: none"> <li>Housing Diversity According to Family Size and Income. Affordable Housing Programs Supporting Disadvantaged Groups</li> </ul>	<ul style="list-style-type: none"> <li>Housing Density Person/Room</li> <li>Quality Housing Availability</li> <li>Housing Connection With Basic Facilities</li> <li>Percentage of Population With Inadequate Housing</li> <li>Living Space</li> <li>Housing Cost</li> <li>Housing Rental</li> <li>Home Appliances</li> <li>Home Furniture</li> <li>Maintenance Services</li> </ul>	<ul style="list-style-type: none"> <li>Adequate Housing</li> </ul>		

Table 4. Cont.

Urban Sustainability Issues	Sustainability Indicators	Urban Sustainability Criteria	Urban Sustainability Principles	Urban Sustainability Pillars
<ul style="list-style-type: none"> <li>Sustainable Efficient Transportation, Linking Urban, Rural, and Regional Areas</li> </ul>	<ul style="list-style-type: none"> <li>Connectivity/International Communication Quality</li> <li>Road Networks Quality</li> <li>Public Transportation Quality</li> <li>Access/Public Transportation Coverage</li> <li>Switching From Public to Private Transportation</li> <li>Traffic Management</li> </ul>	<ul style="list-style-type: none"> <li>Quality and Connectivity of Urban Transportation Network</li> </ul>	<ul style="list-style-type: none"> <li>Adequate Infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>Social and Economic Urban Strategies</li> </ul>
<ul style="list-style-type: none"> <li>Water Systems, Connectivity to</li> <li>Sewage Facilities, Energy, and Telecommunications</li> </ul>	<ul style="list-style-type: none"> <li>Water Availability and Management</li> <li>Sewage system Management</li> <li>Energy Sources Availability and Management</li> <li>Communication Quality and Management</li> </ul>	<ul style="list-style-type: none"> <li>Efficient Infrastructure Network</li> </ul>		
<ul style="list-style-type: none"> <li>Planning and Urban Design</li> </ul>	<ul style="list-style-type: none"> <li>Urban Design/Appearance</li> <li>Integrated Neighborhood/Compact City</li> <li>Urban Density/Urban Sprawl</li> <li>Public Spaces Quality</li> <li>Location Selection</li> <li>Brown Fields/Abandoned Industrial Sites</li> <li>Pedestrian Paths/Bicycles</li> </ul>	<ul style="list-style-type: none"> <li>City Space Planning</li> </ul>	<ul style="list-style-type: none"> <li>Sustainable Urban environment</li> </ul>	
<ul style="list-style-type: none"> <li>Governance</li> </ul>	<ul style="list-style-type: none"> <li>Urban Governance</li> <li>Green Management</li> </ul>	<ul style="list-style-type: none"> <li>Efficient Urban Management</li> </ul>		
<ul style="list-style-type: none"> <li>Leadership Capable of Change, Effective Community Participation In Urban Policy Decisions.</li> </ul>	<ul style="list-style-type: none"> <li>Political Stability</li> <li>Community Participation in Regulation Development</li> <li>Active Participation in Green Policy</li> <li>Voter Turnout</li> </ul>	<ul style="list-style-type: none"> <li>Efficient Public Participation</li> </ul>	<ul style="list-style-type: none"> <li>Community Participation</li> </ul>	
<ul style="list-style-type: none"> <li>Strong Leadership to Respond Positively to Change</li> <li>Effective Participation of Local Residents, Institutions, and Volunteers, in Planning and Design, and Long-Term Supervision</li> </ul>	<ul style="list-style-type: none"> <li>Develop Proactive Policies</li> <li>Green Growth and Environmental Innovation</li> <li>Decentralisation and Support Regional Authorities</li> <li>Local Government Competence in Basic Responsibilities</li> <li>Level Of Confidence and Satisfaction With the Local Government Performance</li> </ul>	<ul style="list-style-type: none"> <li>Transparent and Accountable Governance</li> </ul>		
<ul style="list-style-type: none"> <li>Entertainment and Recreation Capabilities</li> </ul>	<ul style="list-style-type: none"> <li>Sports and Entertainment</li> <li>Theatre</li> <li>Cinemas</li> </ul>	<ul style="list-style-type: none"> <li>Entertainment and Recreation</li> </ul>		
<ul style="list-style-type: none"> <li>An Attractive, Enjoyable Environment that Residents Want to Live and Work in Now and in the Future</li> </ul>	<ul style="list-style-type: none"> <li>Satisfaction With Life</li> <li>Time Allocated to Entertainment and Personal Care</li> <li>Employees Working Overtime</li> </ul>	<ul style="list-style-type: none"> <li>Work/Life Balance</li> </ul>	<ul style="list-style-type: none"> <li>Well-being and Prosperity</li> </ul>	<ul style="list-style-type: none"> <li>Sustainable urban lifestyle</li> </ul>

**Table 4.** *Cont.*

Urban Sustainability Issues	Sustainability Indicators	Urban Sustainability Criteria	Urban Sustainability Principles	Urban Sustainability Pillars
<ul style="list-style-type: none"> <li>The Ability to Live and Improve the Quality of Life Through Access to a Wide Range of Services</li> </ul>	<ul style="list-style-type: none"> <li>Food Availability and Daily Consumption Services and Consumer goods</li> </ul>	<ul style="list-style-type: none"> <li>Sustainable Consumption and Production</li> </ul>	<ul style="list-style-type: none"> <li>Responsible Consumption</li> </ul>	
<ul style="list-style-type: none"> <li>Preserving Public Spaces, Cultural and Natural Heritage, and the Diversity of Local Culture, that Encourage Pride, Social Cohesion, Connection to the Identity of the Place, and Emphasising the Healthy Ties with Regional, National, and International Community.</li> </ul>	<ul style="list-style-type: none"> <li>Cultural Diversity</li> <li>Tolerance</li> <li>Social and Religious Restrictions</li> <li>Corruption Level/Control</li> <li>Media Availability and Censorship</li> <li>Personal Freedoms Restrictions</li> </ul>	<ul style="list-style-type: none"> <li>Social Integration</li> </ul>	<ul style="list-style-type: none"> <li>Quality of Life Satisfaction</li> </ul>	<ul style="list-style-type: none"> <li>Sustainable urban lifestyle</li> </ul>

## 6. Conclusions

The reality of the Egyptian capital proves that its urban administration still plays a marginalised, ineffective role in urban development decisions within its range, thus confirming its deviation from the right path of applying the effective urban governance principles responsible for both dealing with the repercussions of the past and building a sustainable urban future. This led to the augmentation of challenges that require achieving urban sustainability of the Egyptian capital. The exponential growth of population and spatial extensions contribute to the decrease in the capability of natural and built environments to meet urban requirements. This may also cause many environmental, social, and economic problems as a result of the growing resource consumption without consideration to future needs, which leads to more economic and social unrest.

In reviewing urban sustainability practices, we find multiple cities have formulated their developmental plans through adopting a long-term vision. This relied on a number of pillars, a group of principles and criteria targeting their urban issues, and suggested a number of indicators to measure the advancement towards achieving their visions. Reviewing the results of those cities, according to indicators that measure the level of urban sustainability achieved, confirms the success of the course they adopted in achieving urban sustainability. Comparing the developmental vision adopted by the Egyptian capital in the last decade to these practices, we find that it adopted a long-term developmental plan, committing to a number of pillars and work axes. However, the Egyptian capital has not adopted any of the indicators that would allow it to measure the level of progress towards the achievement of the vision. The Egyptian capital also did not commit to principles that aim at achieving urban sustainability required for performing its global responsibility or form a group of criteria to enable urban decision makers to decide if they should proceed with the vision's axes, nor did they stop to update or correct its path.

There is no one-size-fits-all-cities method for developing an urban sustainability assessment process, as cities differ according to their local context, their ability to process social, economic, and environmental needs in a manner relevant to the local political decision making, and their consistency with their international responsibilities towards global sustainability. The authors managed to prepare a general urban sustainability framework for the Egyptian capital, through which we can evaluate its path towards achieving urban sustainability. This also sheds light on progress in urban sustainable development critical areas, decides how, when, and where work is required, and helps assess urban decisions and procedures.

The authors believe that the importance of the research is summed up in the extent of the framework's contribution to reviewing the projects carried out by the state in the Egyptian capital. Its ability to change the urban decision towards the most appropriate path and to work as a tool that enables the urban administration to periodically evaluate the state's development plans is essential. For example, in an attempt to descriptively evaluate a number of the framework's criteria in our current reality, "The adequate housing criterion". By evaluating the state's housing projects targeting low-income groups, we find that they do reduce the demand rates for the concerned group or raise their quality of life by relocating to such housing. The high vacancy percentage of those buildings confirms that those who obtained them are not the concerned group. In the criterion of the "effectiveness and environmental safety of transportation systems", we find the state's acceleration in establishing a high-cost transportation network that serves a very limited percentage of the capital's population. Due to the cost of its use, it strongly and effectively affects the percentage of that service's coverage in society. In the criterion of "effective public participation", this can be monitored in the largest current state projects adding a new urban burden on the original urban mass of the Egyptian capital in the east, while there are still internal urban vacant spaces that can be exploited instead of being left to be randomly developed and become a greater burden on the urban mass. This confirms individuality and unilateral decision making, the primacy of personal interests over the

general interest of the participants, and the complete absence of the local community from participating in defining its present and future urban priorities.

The results of this research show how cities can work on building their development plans according to a general framework based on the exchange of knowledge of the results of different practices that take into account their local context, their urban issues, and their global context in accordance with the principles and indicators approved by international bodies and institutions that support the verification of urban sustainability. The authors see the possibility of researching in the future a mechanism to root this framework in the institutions concerned with the preparation, management, and follow-up of development plans for the Egyptian capital at all local, regional, and national levels.

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