

Cities Dynamics as a Tool to Assess the Urban Planning Approach Suitability for Egyptian Cities

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Abstract Egypt widely turned its planning approach from comprehensive to strategic planning without considering the characteristics of cities. One of the main characteristics is city dynamics which is used as a tool to assess the suitability of the urban planning approach. Eighteen indicators are extracted as dynamic indicators measured to cover the demographic, social, and economic dimensions, and only four indicators are available in the Egyptian context due to the lack of data in developing countries. All indicators were collected for the time frame from 1986 to 2006 as a time before SPA implementation. The pre-implementation test was planned to run depending on SPSS, but it could not consider the negative as well as the positive changes as a type of dynamics. Static analysis divided indicators depending on their special value into three negative and three positive categories. For each city, the value was collected as the strong and moderate change together and the weak and no change together. Out of 56 cities, 45 are suitable for strategic planning, with a percentage of 80%. Around 11 cities are not suitable for using the strategic planning approach; those cities do not follow the same pattern of city size, economic or administrative role. The post-implementation results match the pre-implementation results as the city of Kafr El-Sheikh mostly exceeded the plan targets, which confirms the high dynamic of the city, contrary to Matria city, which is classified as a city with no dynamic, after comparing the 2027 strategic plan targets with the recent 2024 situation.

Keywords Comprehensive Planning, Strategic

Planning Approach (SPA), Cities Dynamics, Dynamic Indicators

1. Introduction

Planning in practice has its complexities that may not appear in theoretical models, but these complexities are related to the decision-making system and the specificity of the spatial scale to be developed and planned. Different city planning approaches have been adopted since the post of World War II to achieve the development goals and social welfare [1]. The comprehensive approach was widely used until the vast shift to SPA, but both vary in requirements and characteristics. Identifying the spatial character of each city is crucial when it comes to city planning, which is one of the fundamental goals that contribute to achieving the development goals at accelerated rates and maximise the development return [2]. Achieving alignment between the stages of the planning methodology and the planning approach, which reflect the spatial character of each city, is crucial when it comes to city planning. As the success of any planning approach is correlated to its use within the appropriate limits for its application and in which the application requirements are met, this is one of the fundamental goals that contribute to achieving the development goals at accelerated rates and maximise the development return. Considering this, there are prerequisites for using the strategic planning approach

for cities, particularly in the case of Egypt. This research aims to evaluate the application of the strategic planning approach for Egyptian cities using city dynamics as a tool for assessment. City dynamic components include the population's demographics, behaviours, pollution, overpopulation, infrastructure pressure, economic growth, and job creation. Understanding these dynamics is vital for urban planning and development, since it helps cities adapt to changes and plan for sustainable growth [3].

The General Authority for Urban Planning (GOPP), which is affiliated with the Ministry of Housing, Utilities, and Urban Communities and is in charge of creating plans for cities across all of Egypt's regions, has adopted the strategic planning approach (SPA) for all cities without taking into consideration any factors that might influence the choice and use of this approach, which has persisted since the beginning of 2008 until the present.

The strategic planning approach (SPA) has a significant role to play in achieving the sustainable development goals and helping the Egyptian government go forward in applying the National Agenda for Sustainable Development and Egypt's Vision 2030 through targeting national strategic goals and following the strategy by measuring a group of indicators. But what tools could be used to evaluate this application? So, this study depends on the city's dynamics as a tool to measure the extent to which the characteristics of cities meet the basic requirements for

applying the SPA.

The city's dynamic indicators will be identified and then tested on a group of cities to evaluate the compatibility of the SPA application, which is more important than before, as developing countries may be seen as static ones with fewer changes that affect their cities, and the lack of data may hinder the idea of measuring dynamic in developing countries, as it will be seen in the Egyptian case. This research study will examine the suitability of using the SPA in Egyptian city planning as its main focus, using the cities' dynamic indicators as a tool after examining the SPA conceptual framework (Figure 1).

This examination is to ascertain the conditions for its application, in addition to understanding the city's dynamic concept and extracting the applied indicators and finding out the availability of them in the Egyptian context. The SPSS statistical data analysis technique will be used to classify the cities according to their level of dynamics and changes using a time framework before applying SPA to the Egyptian cities as a pre-implementation test. After getting results and finding out the suitable cities for the SPA application, another test will be used as a post-implementation test by comparing two cities as a sample; one is a dynamic city and the other is a city with no change to see the reliability degree of the pre-implementation results.

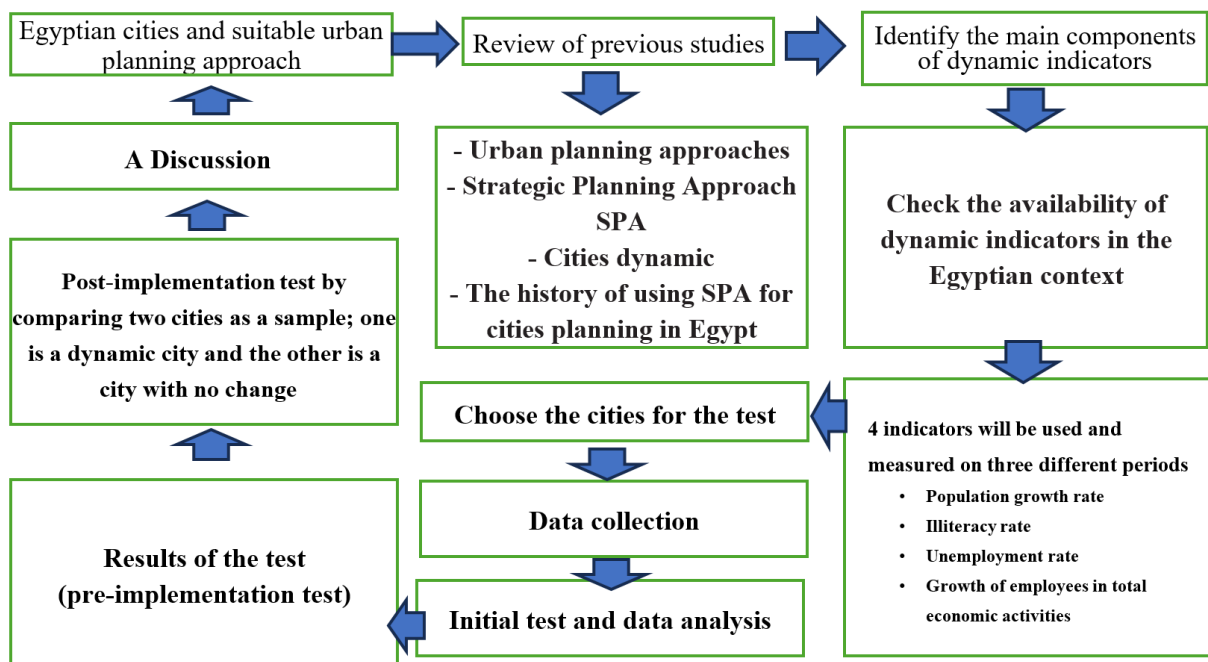


Figure 1. Research process

2. Literature Review

2.1. Cities Planning Approaches History

The use of various planning approaches for city planning has undergone numerous subsequent developments over time, and one of these approaches is the comprehensive approach to urban planning, which gained prominence and came to dominate urban planning theories around 1950 and held this position until the early 1960s [4]. From the beginning of the century until the late fifties, urban planning thought focused on shaping the urban mass and directing urban growth. This led to the primary planning function being the comprehensive repair of what the war had caused in cities, which was done by governments in the aftermath of these two wars [1, 5]. Urban planning thought was translated into a set of approaches to deal with planning approaches, among which are the traditional planning approach, physical planning approach, rational planning approach, top-down planning approach, central-coordinate planning approach, and comprehensive planning approach [6].

This method aims to offer comprehensive solutions known as Master Plans, which are those plans that govern how future land uses will be distributed in the selected urban planning space [7]. As multiple concurrent trends are considered at once (urban dimensions, social dimensions, economic situation, and resource availability), the planning process within the comprehensive planning approach appears to be a multi-faceted process. This planning process is dynamic "in theory" [8]. However, the Master Plan, the final result of comprehensive planning, is actually a hard product that is challenging to alter. It depicts the urban complex for a time span of up to 25 years, and this representation is based on the findings of social and economic research, which are frequently the outcome of certain numerical equations that forecast social situations and sustained economic expansion across decades, possibly even for twenty or twenty-five years [9]. In 1982, another approach began to be used to make urban decisions, which is the strategic planning approach (SPA), although this approach's origins date back to the 1920s, it was not used in urban planning until the early 1980s, this is because it establishes a future vision for the city by examining how it interacts with the outside environment, utilizing the resources of the city, and identifying the needs of the parties involved in planning. Based on this, it then takes appropriate strategies to achieve that vision (long-term strategies) [10]. In SPA, the development of urban plans comes next, then work schedules, because each stage of implementation triggers a response from the economic, social, and urban systems, and these plans are phased rather than long-term (as in the Comprehensive Planning Method). All stakeholders in society, including representatives from the public sector, are included in the decision-making process in this case [11].

2.2. Strategic Planning Approach

SPA known as a vision for the future of a city and its surrounding areas can be created and implemented using the strategic planning approach. It includes determining the key obstacles and possibilities, establishing objectives and priorities, including stakeholders and citizens, and tracking results. It can support innovation, raise living standards, increase environmental sustainability, and promote fair growth in cities [12, 13]. The idea of strategic planning is goal-oriented rather than problem-oriented, and from this perspective, it works to promote capabilities and advantages with the aim of formulating future development thought rather than falling into a single template upon which decisions are made. Plan to address the issues that the study area is facing [14]. It is a comprehensive document that outlines the vision, mission, values, objectives, initiatives, and indicators for a city over a specific time horizon using the local government strategic plan, which is a framework that aligns the objectives and actions of various departments and agencies within a local government to achieve common outcomes, and is the strategic planning process (SPA), which is an action-oriented process that encourages participatory and long-term urban planning [15].

According to [14], the SPA reflects a number of basic principles that influence the planning process:

- It aims to offer a long-term strategic framework that will enable the provision of short-term projects, programmes, and activities.
- In order to achieve sustainable development, it also tries to contain the spatial, economic, social, environmental, and institutional components.
- The strategic plan also aims to win widespread support from institutions in the public, private, and civil sectors by promoting involvement and consultation throughout the planning, implementation, monitoring, and evaluation phases. To put it another way, it promotes and supports public-private collaborations.
- To be consistent with executive capabilities, budget, finance and decision-making cycles, strategic planning deals with the planning process as a component of the management process which needs to collaborate closely with urban management organizations in order to understand the necessary development ideas from the perspective of local administration and to make sure that the institutional and human resources available are capable of carrying out their executive responsibilities.
- The strategic plan aims to improve the process of ongoing assessment of short-term actions (3-5 years). This encourages the local and regional executive departments and the public sector to balance their annual budgets within the framework of short-term spending (3-5 years).

The SPA is a multi-link process, and the process to be completed should pass with sequential stages, and specifically there are four main steps commonly included in SPA [12, 16]:

- First stage: It relates to preparation and includes setting the vision and goals, gathering data and information, assembling geographic data leaders, establishing alternatives, and figuring out the skills required for development [5].
- Second stage “situation analysis”: In this step, the city's strengths and weaknesses, opportunities and dangers, as well as its vision and goals are evaluated. Additionally, it lists the major parties involved along with their objectives and expectations.
- Third stage “Strategy formulation”: Based on the situation analysis and stakeholder input, this process establishes the strategic priorities and objectives for the city. It also lists the steps and expenditures required to accomplish them, along with the metrics to gauge advancement.
- Fourth stage “implementing the strategy”: This stage turns the strategy into workable plans and projects, mobilises alliances and resources, assigns roles and duties, and creates systems for collaboration and communication.
- Fifth stage "following-up": It is regarded as one of the most crucial ones because it requires the planner to ensure that the plan is carried out in accordance with a set time schedule and to keep track of any deviations from the planned path [5].

To ensure a successful application, many requirements should be set before starting the SPA process and modified within the process itself. Those requirements are as follows:

Set the objectives: The SPA addresses the general and intermediate objectives, which guide the focused choices that will be made to bring about this shift in society's future [6].

Find the decision-making and governing structure: it is easier to make interim decisions at each stage of strategic planning without following the administrative routine set by the system. The core system helps to activate the participative framework, which serves as the foundation for strategic planning [17].

Determine the degree of change in surrounding environments: A dynamic and flexible strategy that is consistent with any future changes occurring in the planning environment (internal and external) is used when dealing with environments characterized by continual change in their characteristics [18].

Searching for participating parties and entities: The SPA specifies the actual effective participation of all parties, which supports the principle of mutual effective participation of all parties involved in the planning process, including stakeholders (members of the planning team, community members, interest groups, and state representatives) [5].

Information and data collection: The strategic issues are identified based on this analysis, and the data determines the information on those issues and how to solve them; it establishes the priorities for data collection based on the initial indicators of strategic planning and identifies the strengths, weaknesses, opportunities, and risks [6].

Set the time frame: The proposed plans and strategies may be implemented throughout a range of time periods “long, medium, and short term” [17].

2.3. Cities Dynamic

Sana and Kamila [19] stated that Dynamic is an urban phenomenon that the urban system is constantly exposed due to external and internal factors, so it appears through the manifestations of urban growth of the elements of the urban system and their relationship with each other; and the concept of the word “dynamics” has Greek origins (dynamikos) which means (powerful), and Arabic dictionaries have described it indirectly through Multiple meanings such as (growth - movement - development - continuity - ... etc.).

This indicates that dynamic is a force, either external or internal, that changes the behavior of a system over time to cause shifts and mutations in it [18]. The ability to plan for growth and to provide the infrastructure, basic services, and affordable housing that residents of expanding cities need is essential for urban development. Urban dynamics can also play an increasingly crucial role in preventing climate change because urban areas are more susceptible to natural disasters and climate change [20]. The idea of a city dynamic encompasses a variety of processes that take place in cities over a variety of time scales, but they are typically intertwined due to the influence of the built environment's life cycle, the directions and paths of roads, the movement of goods [21], and the difference in population between cities. Another perspective sees the dynamic as a series of changes, and it also embodies the idea that "it is a distinctive behavior of urban systems, including cities, and expresses the reality of the internal changes taking place at the smaller urban level (through growth or interaction... etc.) of the urban elements." Due to internal and external urban factors, as well as occasionally to create some sort of spatial mobility (urban growth outside or inside the city bounds) [18], city dynamic indicators are used to evaluate and monitor several facets of urban planning approaches, and decisions about sustainable growth are aided by dynamic indicators, which provide city planners and policymakers with an understanding of a city's advantages and disadvantages. In addition to population demographics and behaviors, some frequent dynamic indicators are infrastructure, job creation, and economic growth [22].

2.4. History of Using SPA for Cities Planning in Egypt

Given the ongoing planning issues facing Egyptian cities and their development, Egypt is regarded as one of the nations that has followed specific steps in urban planning

since the beginning of the nineteenth century. This includes applying the comprehensive planning approach under Urban Planning Law No. (3) of 1982 and its executive regulations until 2008. In light of the Unified Building Law No. 119 of 2008 [23], which gives the General Authority for Urban Planning (GOPP), a division of the Ministry of Housing, Utilities and Urban Communities, the authority and responsibility to carry out the tasks of creating strategic plans for planning regions and governorates, the Egyptian government turned to use the strategic planning approach as these issues worsened.

In Egypt, the GOPP creates what are known as "strategic plans," which are plans that outline the desired direction for urban development at all scales, including the national, regional, governorate, city, and village levels. These plans outline the objectives, guidelines, plans for social and economic growth, and the built environment required to achieve sustainable development. It also defines future requirements for urban growth, varied land uses, programmes, priorities, implementation strategies, and funding sources.

Through coordination between the GOPP and its regional centres dispersed among the seven economic regions of Egypt, the general policies in these strategic plans at the regional or governorate level are translated into general strategic plans at the level of cities and villages. Finally, these strategic plans are put into action at the local level by the general planning and urban development agencies situated throughout the different governorates, who create what are known as "detailed plans". This planning process has an impact on a variety of areas of citizens' lives, whether by proposing local projects with direct benefits to local residents or national initiatives with indirect benefits to the nation, like infrastructure projects, services, and programmes for education, health, and economic development [11].

When the GOPP starts and approves the strategic plan, the implementation phase gets started. The follow-up stage, which comes after creating the implementation plan and is among the most crucial in the planning process, loses the flexibility in implementing the strategic plan to take into

account the ongoing urban dynamic is one of the challenges that this stage must overcome, particularly because it lacks access to the mechanisms for the implementation and follow-up stage of the strategic plan for cities.

3. Materials and Methods

Egypt has 249 cities according to the 2017 census including new and exciting cities [24]. The exciting cities count 231 which are distributed in seven regions and cover all the territory (Figure 2) [25]; GOPP ran strategic plans for 189 cities, representing 82% of the total cities, and the rest of the cities will be included in the plan continually. By examining the number of cities in each region (as shown in Table 1 and Figure 3), it is evident that the Delta region has the maximum number of cities, with a total of 58 cities. This results in a variety of variances in the fundamental traits of each city. In addition, the large number of cities in the region will be used as a sample, making the statistical study more reliable and demonstrating how dynamic those cities are. So, the Delta region is suggested as the testing ground for the investigation.

3.1. Study Region

The Delta Region is the fourth planning region in Egypt, divided into five governorates as next: Damietta, Dakahlia, Kafr El-Sheikh, Gharbia, and Menoufia (Figure 4). It extends from the northern (with a coastline of about 200 km) Mediterranean coast to the southern (with the borders of the Cairo region), and the region takes up the majority of the Egyptian Delta's land area and its total area is about (12,052 km²), which is equivalent to (1.2%) of Egypt's total area [26]. The Delta region has acquired strategic importance at the national level considering its geographic location and its features as the nation's primary source for agriculture and food security for all citizens. But it faces population growth on agricultural lands and urban encroachment (Table 2).

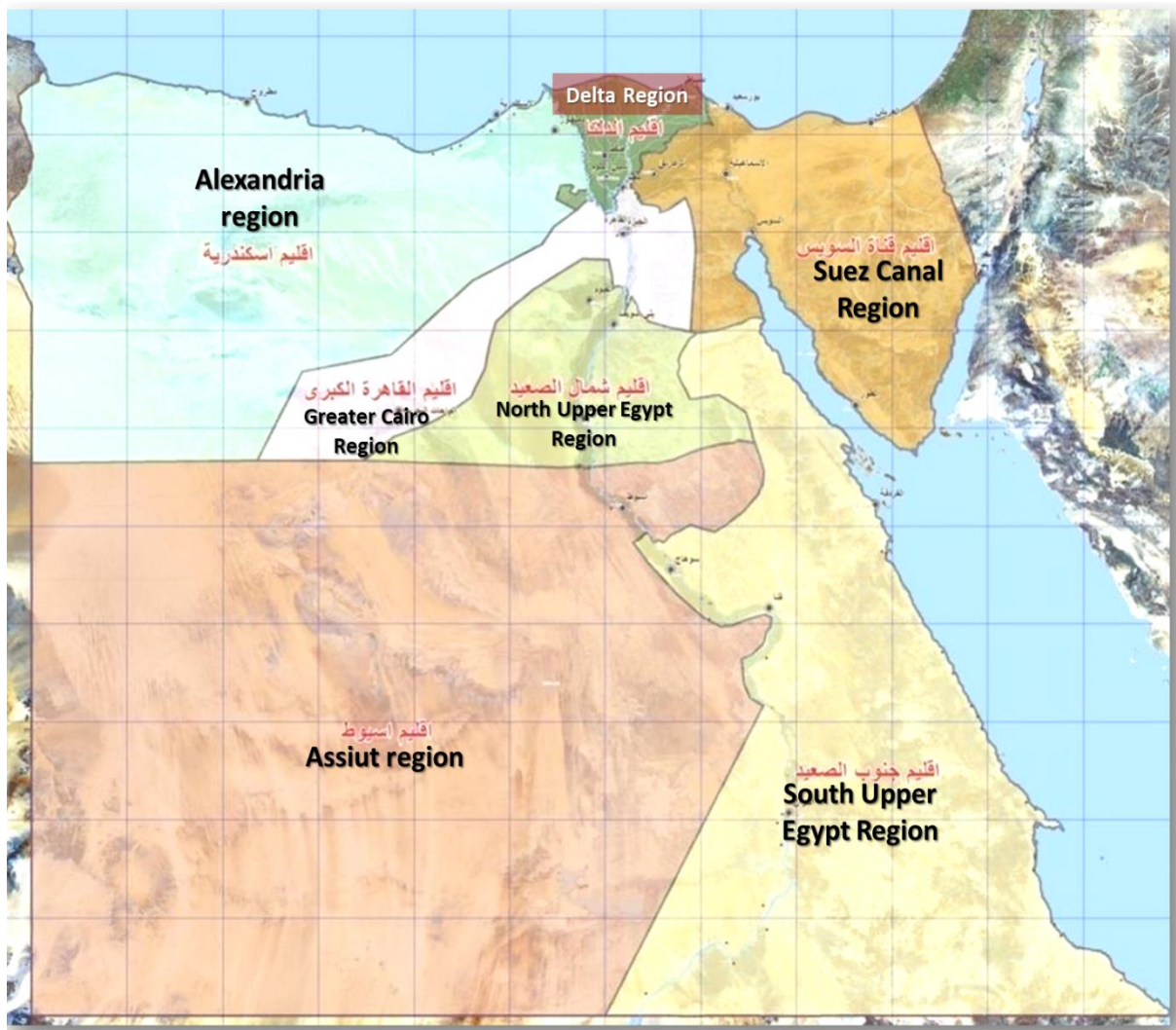
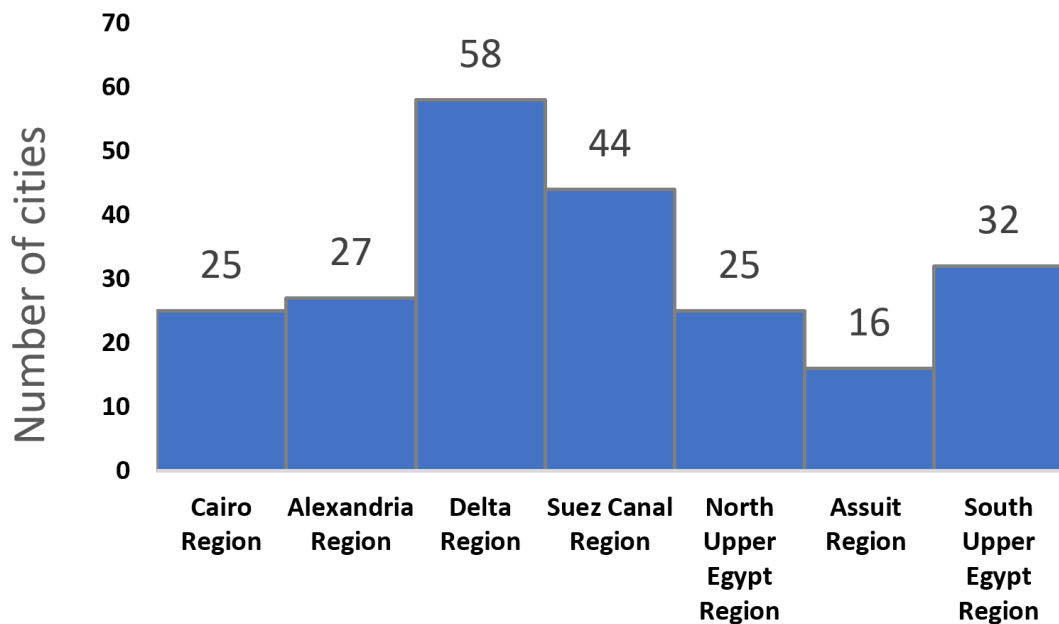


Figure 2. Egypt's regions [25]

Table 1. Distribution of the number of cities among the Egyptian regions and governorates (by authors)

| Governorate | No. Cities | Governorate | No. Cities | Governorate | No. Cities |
|------------------------------------|------------|-------------|------------|----------------|------------|
| Cairo Region (25 city) | | | | | |
| Cairo | 1 | Qalubia | 11 | Giza | 13 |
| Alexandria Region (27 city) | | | | | |
| Alex | 3 | Matroh | 8 | Bahaira | 16 |
| Delta Region (58 city) | | | | | |
| Demmita | 10 | Dakahlia | 17 | Kafr El-Sheikh | 13 |
| Gharbia | 8 | Menoufia | 10 | | |
| Suez Canal Region (44 city) | | | | | |
| Sharkia | 19 | Ismalia | 7 | North Sinai | 6 |
| Port Said | 2 | Suez | 1 | South Sinai | 9 |
| North Upper Egypt Region (25 city) | | | | | |
| Bani Souf | 8 | Fayoum | 7 | Minia | 10 |
| Assuit Region (16 city) | | | | | |
| Assuit | 11 | New Valley | 5 | | |
| South Upper Egypt Region (32 city) | | | | | |
| Sohag | 13 | Qenna | 10 | Luxor | 9 |
| Aswan | 11 | Red Sea | 7 | | |

**Figure 3.** Distribution of the number of cities among the Egyptian regions (by authors)

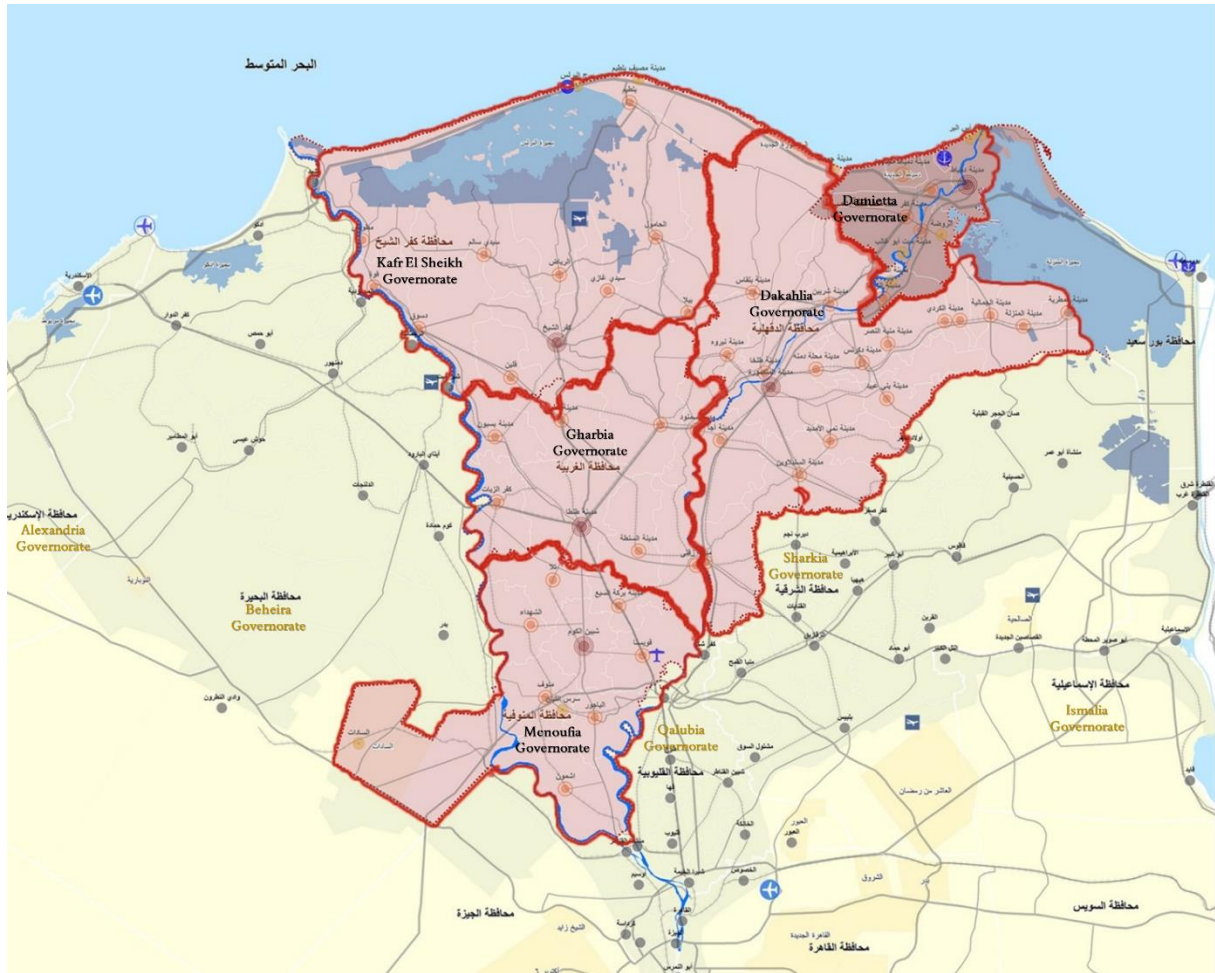


Figure 4. Governorates division of the Delta region [26]

Table 2. The total area, inhabited area, population, and population density of the governorates of the Delta region in 2016 [27]

| Governorate | The total area Km ² | % The Inhabited area to the total area | Population | Inhabited density person/km ² |
|----------------|--------------------------------|----------------------------------------|------------|------------------------------------------|
| Damietta | 910.26 | 73.4 | 1372639 | 2053.4 |
| Dakahlia | 3538.23 | 100 | 6129487 | 1732.4 |
| Kafr El-Sheikh | 3466.69 | 100 | 3284147 | 947.3 |
| Gharbia | 1942.34 | 100 | 4897042 | 2521.2 |
| Menoufia | 2499 | 97.5 | 4076657 | 1673.6 |
| Delta region | 12356.5 | 97.5 | 19759972 | 1639.6 |
| Egypt | 1010407.87 | 7.8 | 91023393 | 1162.9 |

3.2. Selecting Criteria of Dynamics

The change in the size and functions of cities is at the core of the growth doctrine and development [28]. Cities can grow or decline in a speedy or cumbersome way depending on different factors such as spatial location potentials, demographic growth, and the process of urbanization. The cumbersome cities are also recording changes, but it might take a long time to observe this change. In this case, in the short and middle term, cumbersome cities look like they are in a static situation without any changes, and this type of city might not face changeable driving forces that lead them to use the SPA. So, the growing or declining cities are both dynamic, but one in a positive way and the other in a negative way, as those cities lose manpower, economic function, investments, and urban attraction [28, 29].

Many indicators have been used to figure out the way cities change and the type of change. These indicators are given sectorally, such as a demographic, economic, and social view, or a comprehensive perspective, by using multiple dimensions to avoid a unilateral judgement on the city's dynamics. The comprehensive indicators will be

illustrated in Table 3.

In order to confirm the indicators that will be measured to define the degree of dynamic, all sources of data have been revised, and in (Table 3), the indicators that will be measured are illustrated with the reasons why the rest will not be available for the test.

3.3. Data Time Framework

Data demonstrating population, social, and economic dynamics have been used in this study. Since the implementation of the strategic planning strategy for Egyptian cities began with the issuing of Building Law 119 of 2008, population census data from the years 1986 to 2006 have been used. The purpose of classifying cities using the strategic planning approach is to determine which cities fit the criteria for doing so, with the growth dynamics of those cities being the most crucial. To ensure that conditions would be identical prior to the start of the law's implementation, data up to 2006 were used, and various census statistics from the time periods 1986/1996/2006 were relied upon. This is because it is possible to calculate the values of rates of change in order to measure dynamics.

Table 3. Dynamics indicators availability and reasons for unavailability [28, 29, 30, 31, 32]

| Indicators | The availability | Reason for unavailability |
|------------------------------------------------|------------------|----------------------------------|
| Population growth rate | Yes | |
| Illiteracy rate | Yes | |
| Unemployment rate | Yes | |
| Poverty rate | No | Available for governorates level |
| Growth of employees in all economic activities | Yes | |
| Per capita consumption level | No | Available for national level |
| Ratio of import and export volume and GDP | No | Available for national level |
| Worker GDP | No | Available for national level |
| Total GDP | No | Available for national level |
| Industry employment share | No | Available for governorates level |
| Manufacturing productivity | No | Available for governorates level |
| Total investment costs | No | Available for governorates level |
| Employment output | No | Available for governorates level |
| Urban violence | No | Not available |
| Access to safe water | No | Available with no variations |
| Access to sanitation | No | Available with no variations |
| School enrolment | No | Not available |
| Women councillors | No | Not available |

3.4. Data Collection

To determine and measure the dynamics of cities in the region, this will depend on statistical data characterised by temporal development, and the secondary data source will be relied upon through data from CAPMAS especially the General Census of Population and Establishments across different time periods for the governorates of the Delta region, and that data is:

Table 4. The selected indicators and time interval (by authors)

| Data | Year | Year | Year | |
|---------------------------------------------|------|------|------|--------------------------------------------------|
| No. of Population | 1986 | 1996 | 2006 | Population growth rate |
| No. of illiterate people | 1986 | 1996 | 2006 | Illiteracy rate |
| No. of Unemployment people | 1986 | 1996 | 2006 | Unemployment rate |
| No. of employees in all economic activities | 1986 | 1996 | 2006 | Growth of employees in total economic activities |

$$\text{Growth Rate} = \left(\frac{\text{Present}}{\text{Past}} \right)^{110} - 1 \quad (1)$$

$$\text{The illiteracy Rate} = \frac{\text{Number of illiterate}}{\text{Population (10 years and above)}} \quad (2)$$

$$\text{The Unemployment Rate} = \frac{\text{Number of unemployed}}{\text{Population within the labor force}} \quad (3)$$

Employment Growth Rate: Growth rates of all economic activities employment between 1986-1996 and 1996-2006 (See Equation 1).

One of the conditions for adopting the strategic planning approach for cities in accordance with the theoretical framework previously stated is the dynamic of cities in the Delta region, which will be measured by the rate of change occurring in prior raw data. The rate of change, as it is also known, "describes the rate at which a quantity changes in relation to another quantity" [33]. It is the quantity or percentage of change of a particular value with respect to time in mathematics and science. The values of the rates of change vary, which have statistical significance, and these values are:

- Positive rate of change: it is known that the positive rate of change is increasing, and it is always sloping upward in the graph.
- Negative rate of change: the negative rate of change is always negative, and unlike the positive rate of change, the negative rate in the coordinate graph is sloping downward.

- Zero: the zero rate of change is constant, meaning it does not change, and is represented graphically by a straight horizontal line that never changes.

3.5. The Initial Test

The data collection is done for all cities in the Delta region (58 cities) and a coding system will be used instead of the city names to ease the link between the different indicators for each city and to facilitate the data analysis in a better way (see table 5). During the initial step of the test, some abnormal values appeared for the rates of change especially the values of the new cities in the region (Sadat - New Damietta). Since they are new cities, the values of the rates of change and dynamics are inevitable, and their values are much higher than the existing cities. For example, in New Damietta city, the values of population change rates during the period 1986-1996 reached about 41.3, as well as the rate of change for the total number of workers in economic activities 86-96, scored 47.39, while all cities in the region did not exceed the values for the rate of change in activities scored 3. In a same case for New Sadat city, the value for the rates of change in population size during the period 1986-1996 was about 26.86, and the rate of change for the total number of workers in economic activities from 86 to 96, was 31.64. Accordingly, the data for those cities was excluded from the test, and in the next step, the statistical test will be done without the new cities (New Damietta - Sadat).

Table 5. Cities codes

| Code | City name | Code | City name |
|------|-----------------|------|--------------------|
| 1 | Mansoura | 29 | Sidi Ghazi |
| 2 | Talkha | 30 | Baltim (El_Borols) |
| 3 | Aga | 31 | El_Borg |
| 4 | Mit Ghamr | 32 | El_Hamoul |
| 5 | Sinbillawain | 33 | EL_Riad |
| 6 | Dekkernes | 34 | Biala |
| 7 | Minyat alnasr | 35 | Dessouk |
| 8 | El_Gammalia | 36 | Sidi Salem |
| 9 | Manzala | 37 | Fwa |
| 10 | Sherbeen | 38 | Qeleen |
| 11 | Mit salisbil | 39 | Metoabs |
| 12 | Tamaa Alamadid | 40 | Tanta |
| 13 | Matria | 41 | Mahalla al-Kubra |
| 14 | Bani Ubaid | 42 | Kafr El_Ziat |
| 15 | Nabrua | 43 | Zefta |
| 16 | Belqas | 44 | Basyoun |
| 17 | Gamasa | 45 | Santa |
| 18 | Demmitta | 46 | Samanood |
| 19 | Ras Al Bar | 47 | Qotoor |
| 20 | Ezbet El-Borg | 48 | Shbeen El Koom |
| 21 | Kafr Saad | 49 | Ashmoon |
| 22 | Kafr EL_Bateekh | 50 | Al-Bajur |
| 23 | Fariskur | 51 | Al_Shohada |
| 24 | Alrawda | 52 | Barakat Al-Sabaa |
| 25 | Alzarqa | 53 | Quisuna |
| 26 | Alsarw | 54 | Tala |
| 27 | Kafr El-Sheikh | 55 | Menoof |
| 28 | Maseer | 56 | Sars Al-Lyan |

3.6. Data Analysis

In this step of the analysis, the groups of change rates were divided according to each indicator, whether a variable had only positive values, only negative values, or both positive and negative values (see Table 6), and the categories for each variable were divided using the following calculations:

$$\text{the mean} = (x_1 + x_2 + x_3 + \dots + x_n)/n,$$

where x_1, x_2, \dots, x_n are numbers of cities.

$$\text{The standard deviation} = \sqrt{\frac{\sum (x - \mu)^2}{N}},$$

where \sum means "sum of", $[x]$ is a value in the data set, $[\mu]$ is

the mean of the data set, and $[N]$ is the data number of cities.

The arithmetic median: as the total number of cities is even, then the median formula is:

$$\text{Median} = \frac{\left(\frac{n}{2}\right)^{\text{th}} \text{ term} + \left(\frac{n}{2} + 1\right)^{\text{th}} \text{ term}}{2},$$

where n is the number of cities.

Table 7 shows the classification of each city regarding each indicator through three categories: [First category (weak) change], [Second category (moderate) change] and [Third category (strong) change]. In each category, the values are illustrated depending on the degree of strength and weakness.

Table 6. Indicators change rates (by authors)

| Population change rate 1986-1996 | | | Population change rate 1996-2006 | | |
|---------------------------------------------------------------------|------------|--------------------------|---------------------------------------------------------------------|------------|--------------------------|
| Values | Categories | Description | Values | Categories | Description |
| More than 0.19 | 3 | strong positive change | More than 0.35 | 3 | strong positive change |
| 0.17 to 0.18 | 2 | Moderate positive change | 0.17 to 0.35 | 2 | Moderate positive change |
| 0.06 to 0.16 | 1 | Weak positive change | 0.06 to 0.16 | 1 | Weak positive change |
| 0 to 0.05 | 0 | No change | 0.05 to -0.05 | 0 | No change |
| | | | -0.20 to -0.16 | -1 | Negative change |
| Illiteracy change rate 1986-1996 | | | Illiteracy change rate 1996-2006 | | |
| 0.05 to -0.05 | 0 | No change | 0.23 to 0.06 | 1 | Positive weak change |
| -0.18 to -0.06 | -1 | Weak negative change | 0.05 to -0.05 | 0 | No change |
| -0.27 to -0.19 | -2 | Moderate negative change | -0.25 to -0.06 | -1 | Weak negative change |
| Less than -0.27 | -3 | Strong negative change | -0.36 to -0.26 | -2 | Moderate negative change |
| | | | Less than | -3 | Strong negative change |
| Illiteracy change rate 1986-2006 | | | | | |
| -0.31 to -0.11 | -1 | Weak negative change | | | |
| 0-0.48 to -0.32 | -2 | Moderate negative change | | | |
| Less than -0.48 | -3 | Strong negative change | | | |
| Unemployment change rate 1986-1996 | | | Unemployment change rate 1996-2006 | | |
| More than 0.17 | 2 | Moderate positive change | More than 1.79 | 3 | strong positive change |
| 0.17 to 0.11 | 1 | Weak positive change | 1.79 to 0.38 | 2 | Moderate positive change |
| 0.27 to -0.13 | -1 | Weak negative change | 0.37 to 0.6 | 1 | Weak positive change |
| -0.58 to -0.28 | -2 | Moderate negative change | 0.05 to -0.05 | 0 | No change |
| Less than -0.58 | -3 | Strong negative change | -0.24 to -0.06 | -1 | Weak negative change |
| | | | -0.51 to -0.25 | -2 | Moderate negative change |
| | | | Less than -0.51 | -3 | Strong negative change |
| Total employees in economic activities change rate 1986-1996 | | | Total employees in economic activities change rate 1996-2006 | | |
| More than 1.62 | 3 | strong positive change | More than 0.69 | 3 | strong positive change |
| 1.62 to 0.15 | 2 | Moderate positive change | 0.69 to 0.16 | 2 | Moderate positive change |
| 0.14 to 0.06 | 1 | Weak positive change | 0.15 to 0.16 | 1 | Weak positive change |
| 0.05 to -0.05 | 0 | No change | 0.05 to -0.05 | 0 | No change |
| -0.54 to -0.06 | -1 | Weak negative change | -0.31 to -0.06 | -1 | Weak negative change |
| Less than -0.54 | -2 | Moderate negative change | 0.56 to -0.32 | -2 | Moderate negative change |
| | | | Less than -0.56 | -3 | Strong negative change |

Table 7. The dynamic strength and weakness degree for each city (by authors)

| City Code | Total employees in economic activities change rate 1996-2006 | Total employees in economic activities change rate 1986-1996 | unemployment change rate 1996-2006 | unemployment change rate 1986-1996 | Illiteracy change rate 1986-2006 | Illiteracy change rate 1996-2006 | Illiteracy change rate 1986-1996 | Population change rate 1996-2006 | Population change rate 1986-1996 |
|-----------|--------------------------------------------------------------|--------------------------------------------------------------|------------------------------------|------------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 12 | No change | No change | No change | -- | -- | - | --- | ++ | +++ |
| 17 | No change | No change | - | -- | - | - | No change | +++ | +++ |
| 18 | - | - | ++ | -- | -- | - | -- | +++ | - |
| 24 | No change | - | - | -- | -- | -- | -- | + | +++ |
| 26 | No change | -- | + | -- | --- | -- | -- | + | ++ |
| 19 | ++ | ++ | + | --- | --- | -- | --- | +++ | +++ |
| 28 | No change | No change | ++ | -- | -- | -- | -- | + | + |
| 32 | ++ | ++ | + | -- | --- | --- | - | ++ | + |
| 41 | ++ | ++ | + | No change | -- | - | --- | + | + |
| 51 | ++ | ++ | + | - | -- | - | --- | ++ | ++ |
| 54 | - | ++ | ++ | - | -- | -- | - | + | + |
| 55 | - | ++ | + | -- | -- | - | - | + | + |
| 27 | --- | ++ | ++ | -- | -- | - | --- | ++ | +++ |
| 31 | ++ | No change | --- | -- | - | - | - | ++ | ++ |
| 40 | +++ | ++ | ++ | -- | -- | - | --- | + | + |
| 49 | +++ | ++ | - | -- | -- | - | -- | ++ | +++ |
| 3 | ++ | ++ | --- | - | -- | - | -- | - | - |
| 11 | No change | ++ | - | -- | --- | - | --- | No change | +++ |
| 14 | ++ | ++ | --- | -- | - | - | - | + | +++ |
| 15 | - | ++ | -- | -- | - | No change | - | ++ | + |
| 29 | No change | ++ | No change | -- | --- | --- | - | + | +++ |
| 33 | ++ | ++ | --- | - | --- | -- | --- | ++ | +++ |
| 35 | ++ | ++ | -- | No change | - | No change | -- | ++ | ++ |
| 36 | ++ | ++ | --- | -- | --- | --- | -- | + | +++ |
| 37 | ++ | ++ | -- | - | --- | --- | -- | + | No change |
| 38 | ++ | ++ | - | - | --- | - | --- | ++ | +++ |
| 43 | - | ++ | - | -- | -- | - | -- | ++ | ++ |
| 1 | - | ++ | No change | - | --- | --- | - | ++ | + |
| 2 | - | ++ | + | -- | --- | - | --- | - | ++ |
| 4 | - | ++ | No change | -- | -- | - | -- | + | + |
| 5 | - | ++ | ++ | -- | -- | - | --- | ++ | +++ |
| 6 | - | ++ | No change | - | -- | -- | --- | + | +++ |
| 7 | - | ++ | ++ | -- | --- | --- | -- | + | +++ |
| 8 | ++ | ++ | + | - | -- | - | --- | + | +++ |
| 9 | ++ | ++ | ++ | -- | -- | -- | --- | ++ | + |

Table 7 continued

| | | | | | | | | | |
|----|-----------|------------------------------|-----------|-----|-----------------------------------|-----|-----|--------------------------------|-----------|
| 10 | - | ++ | No change | - | -- | - | --- | + | + |
| 13 | ++ | - | + | - | --- | --- | - | + | ++ |
| 16 | - | ++ | No change | - | -- | - | --- | + | +++ |
| 20 | --- | + | + | --- | --- | --- | --- | No change | + |
| 21 | --- | + | ++ | -- | --- | -- | --- | - | - |
| 22 | ++ | - | + | -- | --- | -- | --- | ++ | --- |
| 23 | -- | + | + | -- | --- | -- | --- | No change | No change |
| 25 | -- | ++ | ++ | -- | --- | --- | --- | + | ++ |
| 30 | ++ | ++ | --- | - | --- | --- | - | ++ | +++ |
| 34 | ++ | ++ | -- | - | ++ | ++ | ++ | ++ | +++ |
| 39 | ++ | ++ | -- | - | --- | --- | ++ | ++ | +++ |
| 42 | No change | ++ | ++ | ++ | ++ | - | --- | + | + |
| 44 | -- | ++ | No change | ++ | --- | ++ | --- | + | +++ |
| 45 | --- | No change | ++ | ++ | --- | ++ | --- | ++ | +++ |
| 46 | - | ++ | -- | - | -- | - | --- | ++ | + |
| 47 | - | ++ | -- | -- | --- | - | --- | ++ | +++ |
| 48 | - | ++ | - | -- | --- | -- | -- | + | ++ |
| 50 | ++ | ++ | No change | -- | -- | -- | --- | ++ | ++ |
| 52 | - | ++ | No change | -- | --- | --- | -- | ++ | +++ |
| 53 | - | ++ | + | -- | --- | -- | --- | ++ | +++ |
| 56 | ++ | ++ | No change | - | --- | - | --- | ++ | +++ |
| | | | | | | | | | |
| | | First category (weak) change | | | Second category (moderate) change | | | Third category (strong) change | |

4. Results

According to the results of the test (Table 8), there are a number of cities which classified as having no change or dynamics. The test ran in 56 cities, 11 of which were not appropriate to use the SPA. These cities represent 20% of the total. The test result showed inconsistency as follows:

- There is no exact population group for the no dynamic cities, as some of them are classified as small cities like Belqas, Sherbeen, and Nabrua, while others are classified as big cities like Mansora and Mahalla al-Kubra.
- The administrative role did not affect the dynamic of the cities, as parts of cities with no dynamic were the capitals of governorates, just as Mansora and Demmitta, and on the other side, the cities of Kafr El-Sheikh, Tanta, and Shbeen El Koom showed strong signals of dynamic and also were governorate capitals.
- The economic function did not show any effect on the dynamic of the cities, as industrial cities like Mahalla al-Kubra and Demmitta were not as

dynamic as Mansora, which was classified as a hub for regional service. Other cities also had no dynamic and no domain economic sector, such as Gamasa and Matria.

- There is no effect of the city's location on the level of its dynamics; some cities with no dynamics are located on the Mediterranean north coast, like Gamasa, while others are located in the Nile Delta.

The previous results of the test focused on the pre-implantation of SPA in Egypt using the characteristics of city dynamics as a tool to determine the suitability of SPA implementation, but to make results more reliable and trusted, the post-implementation of SPA should be tested to see if there are any disorders between the two phases. Two cities will be examined in the phase of SPA post-implementation; one is a city with a high dynamic score, which is Kafr El-Sheikh, and the other is Matria, which is classified as a city with no dynamic. Six elements will be compared in the recent year 2024 and the target year as fixed in the city strategic plan 2027 (Table 9). It is worth noting that the city of Kafr El-Sheikh

mostly exceeded the plan targets, which confirms the high dynamic of the city, at the same time Matria city all tested indicators in SPA post-implementation matching the

results of pre-implementation as the city is not dynamic as all recent indicators values are less than the targeted indicators in 2027 strategic plan.

Table 8. The final classification for cities dynamic level

| The city | Value categories of change rates with relative importance | | The city | Value categories of change rates with relative importance | | The city | Value categories of change rates with relative importance | |
|----------------------|-----------------------------------------------------------|--------------------|------------------|-----------------------------------------------------------|--------------------|----------------------|-----------------------------------------------------------|--------------------|
| | Strong and moderate change | No and weak change | | Strong and moderate change | No and weak change | | Strong and moderate change | No and weak change |
| 12- Tamaa Alamadid | 56% | 44% | 15- Nabrua | 44% | 56% | 20- Ezbet El-Borg | 56% | 44% |
| 17- Gamasa | 33% | 67% | 29- Sidi Ghazi | 56% | 44% | 21- Kafr Saad | 67% | 33% |
| 18- Demmitta | 44% | 56% | 33- El_Riad | 89% | 11% | 22- Kafr El_Bateekh | 78% | 22% |
| 24- Alrawda | 56% | 44% | 35- Dessouk | 67% | 33% | 23- Fariskur | 56% | 44% |
| 26- Alsarw | 67% | 33% | 36- Sidi Salem | 89% | 11% | 25- Alzarqa | 89% | 11% |
| 19- Ras Al Bar | 89% | 11% | 37- Fwa | 67% | 33% | 30- Baltim | 78% | 22% |
| 28- Maseer | 56% | 44% | 38- Qeleen | 67% | 33% | 34- Biala | 89% | 11% |
| 32- El_Hamoul | 67% | 33% | 43- Zefta | 67% | 33% | 39- Metoabs | 89% | 11% |
| 41- Mahalla al-Kubra | 44% | 56% | 01- Mansoura | 44% | 56% | 42- Kafr El_Ziat | 56% | 44% |
| 51- Al_Shohada | 67% | 33% | 2- Talkha | 56% | 44% | 44- Basyoun | 78% | 22% |
| 54- Tala | 44% | 56% | 4- Mit Ghamr | 44% | 56% | 45- Santa | 89% | 11% |
| 55- Menoof | 33% | 67% | 5- Sinbillawain | 78% | 22% | 46- Samanood | 56% | 44% |
| 27- Kafr El-Sheikh | 89% | 11% | 6- Dekkernes | 56% | 44% | 47- Qotoor | 78% | 22% |
| 31- EL_Borg | 56% | 44% | 7- Minyat alnusr | 78% | 22% | 48- Shbeen El Koom | 67% | 33% |
| 40- Tanta | 67% | 33% | 8- EL_Gammalia | 56% | 44% | 50- Al-Bajur | 89% | 11% |
| 49- Ashmoon | 78% | 22% | 9- Manzala | 89% | 11% | 52- Barakat Al-Sabaa | 78% | 22% |
| 3- Aga | 56% | 44% | 10- Sherbeen | 33% | 67% | 53- Quisuna | 78% | 22% |
| 11- Mit salisbil | 56% | 44% | 13- Matria | 44% | 56% | 56- Sars Al-Lyan | 67% | 33% |
| 14- Bani Ubaid | 56% | 44% | 16- Belqas | 44% | 56% | | | |
| | Dynamic and changing cities | | | Cities with no change or dynamics | | | | |
| | It is appropriate to use the SPA | | | It is not appropriate to use the SPA | | | | |

Table 9. Comparison between city targets in 2027 strategic plans [34,35], and the recent year 2024 [by authors]

| | 27- Kafr El-Sheikh | | | 13- Matria | | |
|------------------------------------|--------------------|-------------|----------------------------|-------------|-------------|----------------------------|
| | Target 2027 | Recent 2024 | Compare recent with target | Target 2027 | Recent 2024 | Compare recent with target |
| Residential area (acres) | 914.5 | 962.12 | exceed | 474.49 | 390 | less |
| Community services area (acres) | 398.2 | 479.12 | exceed | 194.82 | 66.75 | less |
| Industrial and craft area (acres) | 222 | 101.41 | less | 55.7 | 0.0063 | less |
| Recreational and open area (acres) | 137 | 110 | less | 38 | 8.5 | less |
| City's boundary area (acres) | 2323.33 | 2569 | exceed | 1152 | 1063 | less |
| Population growth (%) | 2.21 | 2.29 | exceed | 3.17 | 1.66 | less |

5. Discussion

PARNREITER [36] quoting Juergen Voegele said that “Cities are at the frontier of development; they are where people go to chase their dreams of a better life for themselves and their families”. So, taking care of cities through proper plans to sustain their future is very important for any state. In Egypt, the SPA vastly used as an approach to prepare the cities for the future without considering the characteristics of those cities, one of the main characteristics is the dynamic, whether economic, social, or demographic changes. Indeed, there is no city with no absolute change, but some cities are very cumbersome to change and need a long time; conversely, others are very dynamic and fast-changing. The test of this study faced some challenges. The main one was the lack of data to measure a larger number of dynamic indicators, in addition to the unsuitability of using the analysis of SPSS to get a precise result. The result of the test confirms that the small and medium cities are much more dynamic compared to the larger ones. Also, the cities with an industrial base economy like Mahalla al-Kubra and Demmitta showed less dynamic, which is a sign of decay [25], and they need applying industrial activation policies. The test experienced numerous difficulties due to the lack of data to assess additional indicators and make the test more coherent; nonetheless, data in many disciplines is lacking in developing countries. The SPA pre-implementation test results match the SPA post-implementation for the two cities examined as a sample; one is a highly dynamic city and the other is a city with no dynamic. Results are the same as the highly dynamic city needs to apply the SPA as the recent situation exceeds the target. In contrast, in the city with no dynamic, all recent indicators are less than the targets in the plan.

6. Conclusions

Egypt largely abandoned strategic planning and did not take city features into account. This study tried to use the city dynamics technique as a tool to evaluate whether the

SPA is appropriate for Egyptian cities challenged with the lack of data, which is common in developing countries and Egypt as well. Counting on that, the study extracted 18 different dynamic indicators that could be applied, but only four indicators are accessible in the Egyptian context. Before the SPA was put into place, from 1986 to 2006, all indicators were gathered. Depending on SPSS, the pre-implementation test was scheduled to run, but it failed to get consistent results. A static analysis was used to classify the change rates, whether positive or negative, and each indicator value was split into three positive and three negative groups based on its unique value. The values of the strong and moderate changes combined as well as the weak and no changes together for each city led to forty-five out of 56 cities (80%) being appropriate cities for SPA. Eleven cities—whose sizes, economies, and administrative roles differ from one another—cannot all be served by SPA. In contrast to Matria, which is categorized as a city with no dynamic after comparing the 2027 strategic plan targets with the most recent 2024 situation, the post-implementation results match the pre-implementation results because Kafr El-Sheikh mostly exceeded the plan targets.

Acronyms and Abbreviations

(SPA) Strategic Planning Approach, (GOPP) The General Authority for Urban Planning, (CAPMAS) Central Agency for Public Mobilization and Statistics.

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