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ORIGINAL STUDY

A Methodological Framework for Setting up the Urban Observatory for Informed Cities (Case Study: El Tor City, South Sinai, Egypt)

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Abstract

Cities are now more than ever seen as crucial to addressing global issues. They have been repeatedly identified as key locations to address the interrelated environmental, health, and social issues affecting our increasingly civilized planet. Many global agreements and frameworks, including the 2030 Agenda for Sustainable Development (2015) and the New Urban Agenda (2016) and developing data and information, have certainly emerged as an increasingly critical element in how we think, experience, and ultimately manage cities. We produce more urban data than ever before, through a variety of formal and informal knowledge mobilization channels, but this is not always accessible or aggregated into formats that make it possible to use it. In that sense, urban governance is deeply mired in data, information, and knowledge flows, and many see it as increasingly dependent on it. As such, understanding how to develop, produce, and mobilize these urban visions is an urgent agenda for those seeking to manage cities around the world. 'Urban observatories' have thus emerged as organizations capable of supporting the translation of knowledge between research and decision-making. As a result, the problem of research concerns the need for accurate and up-to-date information on urban indicators, as it is critical for effective management and monitoring. Access to data and knowledge gaps hamper decision-makers' access to urban data that reflect the current state of the city and its strengths and weaknesses, thus making incorrect development decisions that do not reflect the real needs of the city. This aims to establish the urban observatory, which can fill knowledge gaps in research and decision-making, enable informed decision-making, monitor progress, and address access issues. It supports sustainable urban development and improved quality of life, enabling evidence-based policy formulation and overcoming data access challenges.

Keywords: El Tor City, Informed cities, Urban observatory

1. Introduction

The growth in urbanization and information technology has led to the conclusion that we are now in both an 'urban' and 'information' era (Dickey et al., 2021). This trend is altering human settlements on a global scale, and the way we think about, experience, and manage cities is becoming more and more dependent on data and the information that results from it (Acuto et al., 2019). However, making wise decisions about how resources should be distributed among urban settlements is becoming

increasingly difficult for city-level policymakers due to the lack of thorough and accurate information about many urban settings (Batty, 2013). This is especially true in light of international agreements aimed at achieving sustainable development, such as the New Urban Agenda 2 of the United Nations and its Sustainable Development Goals, including Sustainable Development Goal 11 that focuses on sustainable cities and communities (United Nations Sustainable development goals, 2015).

Urban observatories collect and analyze urban data to provide insights to decision-makers for useful urban development. However, despite the concept of

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'informed cities' gaining attention, these organizations are hardly examined and discussed. There are more than 187 urban observatories registered internationally as part of UN-Habitat's Global Urban Observatory Network (<https://unhabitat.org/news/29-jan-2021/first-of-a-kind-comparative-review-of-urban-observatories-launched>). The work of observatories is dependent on the capacity to gather, process, and mobilize knowledge, which is increasingly intertwined with technologies (Chiu and Webster, 2019). Urban observatories generally have the purpose of gathering, analyzing, and disseminating knowledge about urban areas (www.urbanobservatory.org). Many do so specifically to provide these insights to decision-makers who can then use them for useful urban development. Urban observatories are now numerous and widely dispersed enough that they present an interesting, if not to some extent unique, confluence of data and information to create knowledge on urbanization of cities (Ferreira et al., 2012).

The establishment of urban observatories has frequently been acknowledged and encouraged by the United Nations through the Global Urban Observatory program housed within the UN Human Settlements Agency (UN-Habitat), and in some cases directly supported through training and technical assistance (UN-Habitat, *Global Urban Observatory (GUO)*, 2015). However, there is still a lack of systematic knowledge about the roles played by these observatories, their placement in cities, and the justification for their creation in academia and practice (UN-Habitat and Data and Analytics Branch, 2020). Urban observatories provide a crucial window into what we 'know' about our cities, and how knowledge can be used to influence them. They have huge collections of data, knowledge, and information as well as researchers who are familiar with them and who can manipulate and present it to the general public, decision-makers, or other urban actors in a way that is explicative. The goal of this study is to offer a methodological framework for setting up the urban observatory for informed cities in El Tor City, South Sinai, Egypt by supporting the ability of the local government to make decisions based on evidence from systematic urban research. Urban observatories aid decision-makers in assessing city development through development indicators and guiding sustainable solutions for improvement.

2. Literature review

The literature review of this research discusses the concept, relevance, and role of urban observatories in the first section. The second section focuses on

informed cities, which have gained attention due to the increased focus on knowledge as a necessary component for executing international agendas. Urban observatories impact governance and decision-making through knowledge spaces.

2.1. The urban observatory concept

It is possible to classify a variety of different types of structures as 'observatories.' These structures can differ in size, operation style, content, and outcomes. But they all have one important trait in common that characterizes their operational style: observation (Dickey et al., 2021). Observatories are structures that focus on observation, offering details on specific issues, themes, or topics (Home, 2020). Over the past 20 years, the term 'observatory' has gained popularity, with organizations worldwide developing them through ministries, regional governments, specialized organizations, and universities (Smith and Turner, 2019). With the shift from government to governance, monitoring and continuous assessment have become crucial components of policy design and action implementation (Farah, 2011). Observatories are essential for enhancing institutions' ability to develop and implement policies (Acuto et al., 2019).

The United Nations Human Settlements Program (UN-Habitat) is a significant concept and definition of an urban observatory, which is a local network responsible for gathering and analyzing data for the development of indicators and policies (UN-Habitat and Data and Analytics Branch, 2020). These indicators can be used to support decision-making and develop effective policies and strategies (<https://www.belizeplanners.org/national-urban-observatory/>).

The urban observatory is a local network responsible for gathering and analyzing data for indicators, policy development, and monitoring implementation (<https://urban.jrc.ec.europa.eu/#/en>). It develops quantitative and qualitative indicators, measures performance across sectors, and conducts statistical applications and spatial analysis using GIS and SPSS. The observatory serves as a consulting group for national, regional, and local urban development policies (<https://www.esri.com/news/arcnews/spring10articles/the-uns-global.html>).

Urban observatories are crucial for accurately assessing the state of urban cities and promoting data-driven policy links. They aim to develop sustainable urban surveillance systems, increase local capacity for creating and employing urban

indicators, and foster a culture of monitoring and evaluation (UN-Habitat and Data and Analytics Branch, 2020). These observatories provide accurate data on city levels and promote cooperation in key areas like population, socioeconomic development, urban planning, and environmental concerns (UN-HabitatGlobal Urban Observatory (GUO), 2015). The establishment of urban observatories supports informed urban programs and policies (Washbourne et al., 2019).

2.2. Informed cities

Urban areas are increasingly recognized as crucial sites of global governance due to interconnected environmental and social challenges (Alberti, 2017). International agreements, such as the 2030 Agenda for Sustainable Development and the UN New Urban Agenda, emphasize the importance of urban knowledge in decision-making and societal action (UN-Habitat, 2016). Cities are encouraged to produce, mobilize, and access comprehensive knowledge about their environments to make informed decisions (McPhearson et al., 2016). Organizations like urban observatories can play a vital role in influencing governance and decision-making by providing data, information, and knowledge about cities.

Over the past two decades, urban observatories have become crucial for understanding cities and their inhabitants. With more than four billion people worldwide, urban data collection and knowledge have become a new frontier for science. The data-driven perspective on urban issues is ingrained in our perception of urban problems and is likely to influence policy in the future (Acuto et al., 2018).

Data has become a central aspect of urban management, with the UN's Habitat III summit and World Data Forum highlighting its importance in decision-making (McPhearson et al., 2016). The 'informed cities' paradigm, which emphasizes data as an essential component of urban policy, supports the belief that data is crucial for competitiveness, governance, accountability, and transparency (Caprotti et al., 2017). To fully understand this paradigm, it is essential to recognize the ecosystems that support it and move beyond the 'smart city' discussions. This shift requires a comprehensive understanding of information ecosystems and the application of the 'observatory' method in both developed and developing urban contexts (Zarocostas, 2020).

Platforms for urban knowledge and ethnographic insights are essential for collecting, analyzing, and interpreting complex datasets (Alberti, 2017). These platforms may require cooperation from multiple

institutions or adopt new institutional forms (Simon et al., 2016). Effective collaboration in knowledge generation processes is challenging due to different goals, organizational structures, cultural norms, and work rhythms (Robin and Acuto, 2018). New organizations, such as urban observatories, are emerging to bridge the gap between research and decision-making, addressing the growing importance of research in informative decision-making (Zarocostas, 2020).

3. Experiences of cities setting up urban observatories

The regional urban observatory of Vancouver, Canada, is a renowned urban observatory. Saudi Arabia's urban observatory of the Greater Medina assists decision-makers in monitoring policies and urban development in Medina. Cairo's local urban observatory complements Egypt's national urban monitoring system for housing studies (Table 1).

The experiences gained through the three cities' urban observatories have provided valuable lessons on how to set up and operate an urban observatory. Here are some of the key takeaways:

- (1) The urban observatory should have a clear purpose and objectives, engage stakeholders, develop a comprehensive data collection plan, implement a robust data management system, and develop analytical tools and techniques for data analysis and visualization.
- (2) Capacity-building programs should be provided for staff and stakeholders to effectively collect, analyze, and interpret urban data.
- (3) Long-term maintenance and sustainability mechanisms should be established, including funding, partnerships, and regular data updates.

These lessons can be applied to establish and operate urban observatories effectively, focusing on addressing specific urban issues and challenges, utilizing modern technologies and GIS programs, and identifying urban conditions and priority issues through studies, research, consultations, and joint discussions (UN-HabitatGlobal Urban Observatory (GUO), 2015).

4. Case study

Tor City is the capital of the South Sinai Governorate, with a population of around 44,384 people in 2023 (Figs. 1 and 2). The city is an important economic center for South Sinai, as it is a major fishing port (<https://www.sis.gov.eg/Story/68582/South-Sinai-Governorate?lang=en-us>). Tor City is

Table 1. The experiences of cities setting up urban observatories.

Classification	City experience	The role of urban observatories in the development, implementation, and monitoring of urban development policy	
The global experiences	Vancouver City Regional Urban Observatory (Canada)	Date of the observatory's establishment	2004
		The urban observatory's functions	One of the oldest and best urban observatories is to identify, compile, analyze, and develop the required indicators for ensuring adequate shelter for the city's population to measure progress in urban development sustainability processes
		Formulation, implementation, and evaluation of national and local urban action plans in light of emerging economic, social, and environmental issues in the regional	The Vancouver City Local Peripheral Observatory's urban indicators aided in the development of urban policies. Analyses based on the derived urban indicators were provided to interested parties and policymakers, which aided in the development of urban action plans
Arab experiences	Urban observatory in Greater Medina, Saudi Arabia	Supporting urban policies, national and local development decision-making, and the use and accessibility of digital technology for this purpose	Indicators are used as objective guides to demonstrate the realities of the city. It is critical to make every effort to address the challenges that urban areas face. Real evidence should be directed, and urban indicators can help with this
		Using digital databases, managing and analyzing urban information and data, and creating the website	The Vancouver City local urban observatory has benefited from modern technologies and GIS programs to create a vibrant and effective site that includes all urban indicators and initially displays them in the form of tables and maps that are easier to handle, understand, and deliberate on than previously
		Date of observatory's establishment	2002
		The urban observatory's functions	Identifying urban conditions and priority issues in urban and regional communities through studies, research, consultations, and joint discussions between government departments, the private sector, and civil society institutions
		Formulation, implementation, and evaluation of national and local urban action plans in light of emerging economic, social, and environmental issues in the region	The role of the medina urban observatory was limited to the extraction and simple presentation of urban indicators to decision-makers; it did not intervene in the development or implementation of urban action plans

The local experiences	Local urban observatory of Cairo, Egypt	<p>Supporting urban policies, national and local development decision-making, and the use and accessibility of digital technology for this purpose</p> <p>Using digital databases, managing and analyzing urban information and data, and creating the website</p>	<p>Medina's local urban observatory has strengthened the city's urban action plans by reviewing urban indicators related to the city's most pressing social issues, such as poverty and informal settlements</p> <p>The Madinah Urban Indicators Database program is designed to incorporate all data in a flexible and simplified manner, allowing the user to easily and quickly identify it, as well as allowing decision-makers to retrieve the values of indicators and related policies and make comparisons at the national, regional, and global levels</p> <p>1999</p>
		<p>Date of the observatory's establishment</p> <p>The urban observatory's functions</p>	<p>Urban indicators for Tanta and Ismailia are developed at the national and local levels and included in the national report submitted to the Istanbul Index</p> <p>The Egyptian Urban Observatory is not authorized to formulate and implement urban action plans due to the determination of its functions in accordance with its founding law, namely the issuance of urban indicators</p> <p>The Egyptian Urban Observatory makes urban indicator results available on the Internet. The indicators' results are delivered in accordance with a protocol of cooperation between the Urban Planning Authority and governors of major cities, but it lacks the authority to monitor the implementation of the recommendations and the outcomes achieved through urban indicators</p> <p>Through the use of GIS software, digital databases are used to link urban indicators to sites and display them in the form of periodic reports on the global information network</p>
		<p>Formulation, implementation, and evaluation of national and local urban action plans in light of emerging economic, social, and environmental issues in the region</p> <p>Supporting urban policies, national and local development decision-making, and the use and accessibility of digital technology for this purpose</p> <p>Using digital databases, managing and analyzing urban information and data, and creating the website</p>	

Source: (<http://www.rvu.ca/>; <https://muo.mda.gov.sa/about-en.html>; <https://www.cuipcairo.org/en/directory/local-development-observatory-unitministry-local-development>; <https://www.eea.europa.eu/publications/who-benefits-from-nature-in/diverse-collective-garden-project-2014>), by authors.

a good case study for urban indicators research for several reasons. First, it is a rapidly growing city, with a population that has increased by more than 50 % in the past decade. This rapid growth has put a strain on the city's infrastructure and services. Second, Tor City is a relatively diverse city, with a population that includes Egyptians, Bedouins, and immigrants from other parts of the Arab world. This diversity is reflected in the city's culture, economy, and social fabric. Third, Tor City is a coastal city, not a tourist city. Cities in South Sinai Governorate are divided into tourist cities and coastal cities. Tourist cities are cities that are dominated by tourism activity, and these types of cities always produce specific indicators that cannot be generalized. The tourism sector is the leading sector in these cities especially of Aqaba Gulf like Sharm, Dahab, Nuweiba, Taba, Catherine, and the leading sector is mostly affecting other service sectors, whether directly or indirectly. This means that the number of students in the classes is related to tourism because they are the children of families that work either in tourism companies, hotels, ports, or airports. It is clear now to say if any accident occurs in these cities affect directly the tourism sector, it will of course affects the number of students in schools, persons attending hospitals, the demand for housing, the number of occupied rooms, and thus the number of workers in hotels, and so on. Therefore, the authors decided to choose the city of El Tor because it is a coastal city and not

a tourist city. Its population is large and fairly regular, and this is reflected in the health, education, energy, and housing sectors (<https://south-sinai.gov.eg/>).

5. Materials and methods

5.1. Methodology for setting up an urban observatory in El Tor City as a case study

In the following research, the authors present a real case study of establishing the urban observatory in the General Office of South Sinai Governorate, which is considered the first of its kind as an administration that follows his excellency the Governor personally to develop agreed-upon policies and public visions, and the urban observatory reports to the Deputy Governor technically to follow up on the implementation of policies, verify the general strategy, compare results, and correct policies if necessary. This means that the methodological framework referred to an already existing model on the ground. The urban observatory now in 2023 is a fact. It was established in late 2022. The results of the indicators were presented to the Minister of Planning and Economic Development, Professor Hala Al-Saeed. Her Excellency sees the results from the unit as an added value and success story in the Governorate. She requested to validate the questionnaire forms, expanding the sample, and circulating it to the rest of the other cities, taking into



Fig. 1. Location in Egypt (https://en.wikipedia.org/wiki/Sinai_insurgency#/media/File:Sinai-peninsula-map.jpg).



Fig. 2. El Tor City map (<https://www.google.com/maps/@28.2404817,33.6298133,4419m/data=!3m1!1e3?hl=ar>).

consideration the identity of each city and the dominant economic activities.

The methodology is based on several specific phases and steps, most notably the guidance of the UN-Habitat and the World Urban Observatory (Global Urban Observatory); the urban observatory of the City of El Tor monitors a new urban program to achieve the Sustainable Development Goals 2030 in particular Goal 1: poverty eradication; Goal 5: sex equality in the indicators of social development like percentage of female pupils in education; Goal 6: ensure access to water and sanitation for all in the indicators of infrastructure development like family statement connected to drinking water network and level of household electricity grid connections; Goal 8: decent work and economic growth in the indicators of economic development, as well as Goal 11: sustainable cities and communities in the indicators of urban development and social development and environmental development like total and accessible area, number of sports clubs, and number of nurseries; and finally Goal 16: promote just, peaceful, and inclusive societies in the indicators of social development, as illustrated in Table 3, with a focus on improving the lives of slum dwellers and halving the proportion of people without access to safe drinking water and basic sanitation (<https://unhabitat.org/initiative/global-urban-observatories>). The program updates urban indicators at the level of the city and South Sinai Governorate; it produces a database of urban indicators. It is also comparable to the indicators of Vision 2030 to determine the current state of the city's development and its contribution to

sustainable development reports to achieve Vision 2030, the development of which is based on the classification of all tasks into interrelated sets of key and detailed tasks. The main tasks can be summarized as follows in Fig. 3:

- (1) Describe the urban observatory's frameworks by defining the purpose and objectives, developing the performance methodology, establishing a network of stakeholders, and linking with other urban observatories at the local, national, and global levels.
- (2) Describe, distribute, and use urban indicator production techniques and programs using modern technologies and GIS programs.
- (3) Develop the urban observatory's operational plans for data collection, implement a robust data management system, develop analytical tools and techniques, develop and evaluate its performance, and prepare an annual report at indicator rates.
- (4) Identifying urban conditions and priority issues through studies, research, consultations, and joint discussions of the city of El Tor, and linking them well to decision-making under the concept of e-government and digital transformation.

5.2. Stages of methodology for setting up an urban observatory in El Tor City

5.2.1. Phase 1: defining the purpose, objectives, and tasks of an urban observatory in El Tor City

The urban observatory in El Tor City is responsible for achieving the main purpose of collecting and

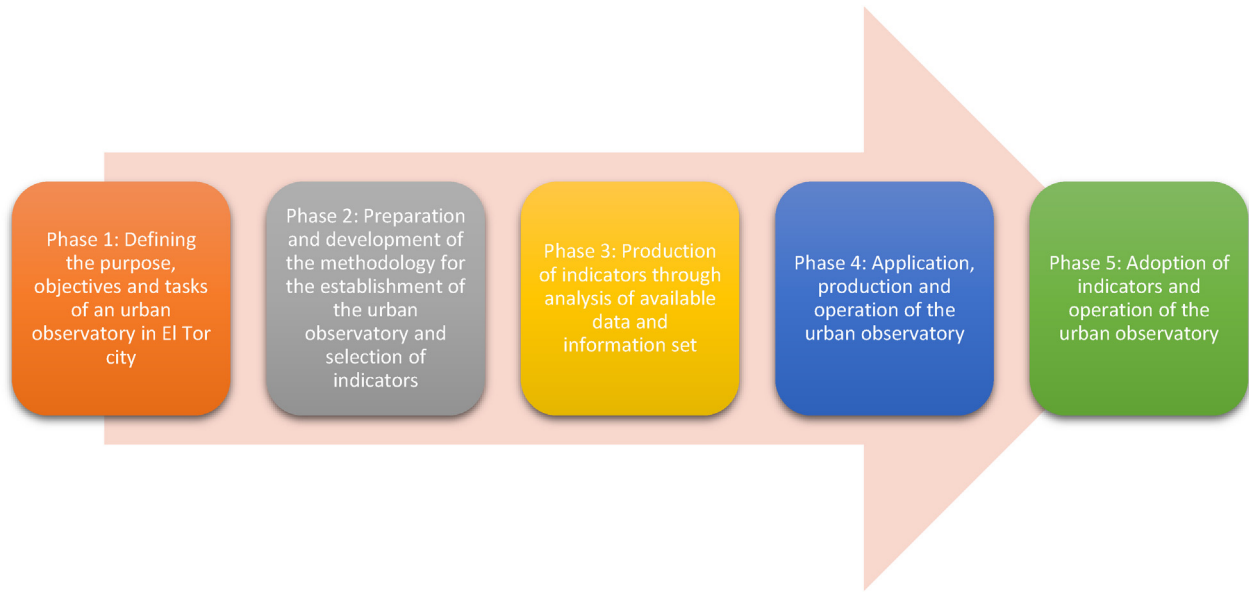


Fig. 3. Methodology for setting up an urban observatory. Source: authors.

analyzing data required for the conduct and analysis of urban indicators, thereby benefiting from them in the preparation, monitoring, follow-up, and evaluation of sustainable urban development policies and plans, as well as supporting decision-making to improve quality of life for the city's inhabitants.

Objectives of the urban observatory of El Tor City:

- (1) Collection and analysis of data on a range of local urban indicators.
- (2) Diagnosis of the current status of the governorate and its cities in all sectors and identification of future development directions.
- (3) Supporting decision-making and identifying sustainable development priorities.

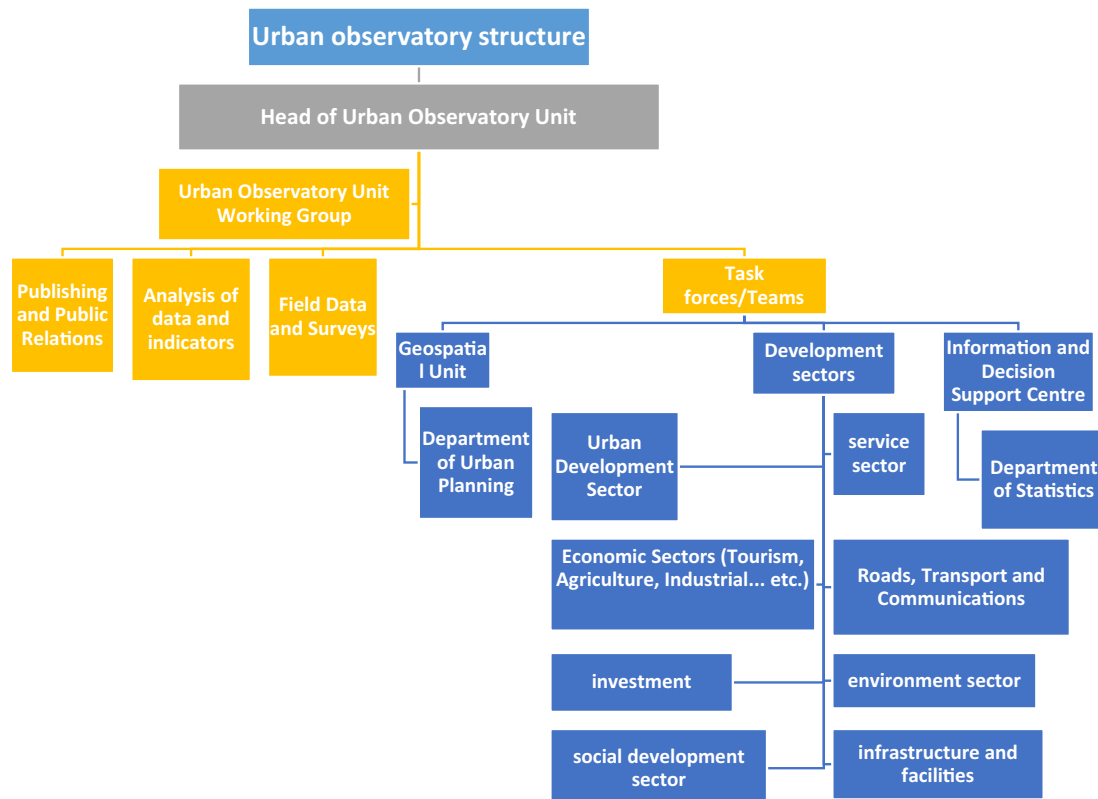


Fig. 4. Urban observatory structure. Source: authors.

- (4) Follow-up on development plans, policies, and monitoring of completion rates.
- (5) Clearing house for data and information with stakeholders, policymakers, researchers, and citizens.
- (6) Enhanced collaboration and partnerships among stakeholders to address urban challenges and promote sustainable development.

Tasks of the urban observatory of El Tor City:

- (1) Create an urban database with various urban indicators.
- (2) Operationalizing the partnership process between the government sector, the private sector, and civil society in the preparation of the urban indicator framework.
- (3) Production and application of quantitative and qualitative indicators, some measuring targets and others measuring the urban performance of all development sectors.
- (4) Production of maps and indicator boards to represent urban data and trends.
- (5) Analysis and comparison of regions and neighborhoods to support decision-makers in achieving balanced development.
- (6) Directing the governorate toward sustainable urban development in accordance with a local vision (strategic plan for the city of El Tor), national (Egypt Vision 2030), and global (Sustainable Development Goals 2030).

5.2.2. Phase 2: preparation and development of the methodology for the establishment of the urban observatory as well as indicator selection

The following are the key tasks for this phase:

First, the urban observatory's Higher Council was formed to develop a vision for sectors, institutions, and consultants. They collect and analyze data, prepare indicators, and present them to decision-makers to assess development in economic, social, urban, environmental, and institutional sectors as shown in Fig. 4.

Second, a group of officials from the South Sinai Governorate, including the Deputy, met to identify city-level information and data in various development sectors. In addition, meetings and workshops were held with the Geospatial Unit and the Department of Urban Planning to review the city-wide GIS program for indicator work. The information and data obtained are presented in Table 2.

5.2.3. Phase 3: production of indicators through analysis of available data and information set

This phase includes many tasks, the most important of which are.

First, production of indicators through analysis of the available dataset and information: at this stage, all available information and data on the city of El Tor were collected in the following years (2006, 2016, 2022) based on the meeting with the Deputy Governor of South Sinai Governorate and divided into a set of special indicators as shown in Table 3.

From the previous table, the indicators have been divided into about five main parts:

- (1) Economic development indicators program: tourism and agriculture.
- (2) Urban Development Indicators Program: macro, urban, and housing spaces.
- (3) Social development indicators program: demographic characteristics, unemployment rates, educational, health, cultural and religious services, civil protection, social solidarity, catering, youth, and sports.
- (4) Basic Infrastructure Indicators/Infrastructure Program: drinking water, sanitation, roads, electricity, and telecommunications.

Table 2. Information and data available for development sectors in El Tor City.

The main sector	Secondary sector information
Administrative division/area/ population/labor force	Administrative division Area Population Labor force
Utilities/housing	Water Sanitation Electricity Housing
Roads, transport, and communications	Roads and transportation
Education	Communications General preuniversity education Al-Azhar's Preuniversity education Higher education (General, Al-Azhar) Literacy
Health Agriculture Social solidarity/supply	Social solidarity Supply

Source: South Sinai Department's Centre for Information and Decision Support.

Table 3. Indicators of El Tor City.

SDG 2030	Major group	Subgroup	Subset	Indicators	Subclassification	Unit of measure	El Tor city				
							2006	2016	2022		
Goal 8: decent work and economic growth	Economic development	Tourism sector	Tourist facilities	Overall total	Hotels/villages/camps	Hotels/villages/camps	Null	12	12		
					Number of rooms	Room	Null	796	2772		
					Number of beds	Bed	Null	1959	5772		
					Rate of increase in the number of hotel rooms per year	Room	Null	680	2001		
Goal 11: Sustainable cities and communities	Urban development	Agriculture sector	Cultivated and cropped areas	Adequacy of agricultural production	Total area	km ²	0	0.02249	0.02532		
							Total and accessible area	Null	5419	5419	
Goal 1: (poverty eradication), Goal 5 (sex equality), Goal 11: sustainable cities and communities, and Goal 16: promote just, peaceful, and inclusive societies	Social development	The demographics	Population assessment in departments and centers according to type and residence	Accessible area	Male	Urban	km ²	3061	4256	4256	
							Male	Null	10 761	19 057	
							Females	Bedouin	Null	3614	2921
								Total	Null	14 375	21 978
								Urban	Null	9065	19 227
								Bedouin	Null	3150	2713
							Total	Total	Null	12 215	21 940
								Urban	Null	19 826	38 284
								Bedouin	Null	6764	5634
								Total	24 734	26 590	43 918
							Number of families	Urban	Null	4597	7552
								Bedouin	Null	1565	1230
Total	Null	6162	8782								
Average household size	Null	4.3151	5.0009								
Educational services	Total data for pre university general education	Percentage of female pupils in education	Population density	8.1	4.9068	8.1044					
			Percentage of female pupils in education	0	46.593	48.472					
			Class intensity	Pupil/class	22.535	30.179	30.308				

		Pupil's share of computerized schools		Pupil/school	#DIV/0!	284.19	250.88
		Number of pupils versus teacher		Pupil/teacher	10.577	12.107	16.892
		Teacher's share of pupil		(Teacher/pupil)	0.0945	0.0825	0.0591
	Literacy	Teacher's share of class		Teacher/Class	2.1306	2.4926	1.7941
		Percentage of people who have been literate for the number of people enrolled in literacy classes		%	Null	58.878	44.096
		Percentage of illiteracy eradicated for the target number of illiterates		%	Null	53.617	20.622
		Percentage of the total population eradicated		%	Null	0.4738	0.7058
		Target percentage of illiterates for total population%		%	Null	0.8837	0.5851
Health services	Health facilities with beds	Hospital beds			Null	7.1455	2.2769
	Data of doctors, pharmacists, and nursing body of the Ministry of Health	Human doctors per 1000 inhabitants		Human doctor per 1000 inhabitants	1.8598	4.4753	3.0511
		Dentists per 1000 inhabitants		Dentist per 1000 inhabitants	Null	0.3008	0.9107
		Pharmacists per 1000 inhabitants		Pharmacy per 1000 inhabitants	Null	1.4667	4.0302
		Nursing authority per 1000 inhabitants		Nursing authority per 1000 inhabitants	6.1858	13.839	14.117
	Family Organization and Preventive Medicine	Child mortality rate		Child	#DIV/0!	0.9372	7.8431
Social solidarity	Nurseries and social institutions	Crude birth rate		Child	Null	40.127	11.612
		Number of nurseries	Urban	Nursery	Null	11	18
			Bedouin		Null	2	2
			Total		Null	13	20
		Total nursery capacity	Urban	Child	Null	1215	1420
			Bedouin		Null	150	150
			Total		Null	1365	1570
Youth and Sport	Sports facilities of the sports body	Number of sports clubs		Club	3	2	2

(continued on next page)

Table 3. (continued)

SDG 2030	Major group	Subgroup	Subset	Indicators	Subclassification	Unit of measure	El Tor city			
							2006	2016	2022	
Goal 6: ensure access to water and sanitation for all, and Goal 11: sustainable cities and communities	Infrastructure development	Cultural services	Cultural facilities	Number of sports stadiums		Stadium	Null	1	1	
				Public libraries		Public library	Null	3.7608	2.2769	
				Number of fire stations and fire points		Center and point	Null	3	3	
		Drinking water	Statement of pure drinking water production and consumption plants	Number of fire engines		Car	Null	9	5	
				Average per capita water consumption		Year/1000 m ³	Null	0.7521	0.1859	
				Family statement connected to drinking water network	Level of household water connections in households	Number of families connected to water system (public network)/Total number of households × 100	Family	Null	93.459	202.86
				Sanitation	Sanitation	Level of household sanitation connections in households	Number of families connected to sewerage/total number of households × 100	Null	86.011	98.941
		Electricity	Electricity	Level of household electricity grid connections		Number of households connected to electricity grid/total number of households × 100	Null	97.452	180.82	
				Roads transportation and Roads	Roads	Road lengths per 1000 inhabitants		15.606	10.383	6.7398
				Environment	Environmental installations	Number of environmental monitoring stations	Total	Station	Null	3
Number of public parks	Total	Park	Null			2	38			

SDG, Sustainable Development Goal.

Source: by authors.

- (5) Environmental Development Indicators Program: environmental enterprises.

Some 42 indicators were initially based on the minimum required for the establishment of the database and indicators for the urban observatory of the city of El Tor, which will be updated later in the next stages to fully complete the construction of the urban observatory.

- (1) Second: visits to international urban observatories.
- (2) Third: creation, development, and dissemination of the urban observatory's website.

5.2.4. Phase 4: application, production, and operation of the urban observatory

The implementation, production, and operation of the urban observatory include the following:

- (1) First: download the geographic database through the development of available GIS databases and access to the database.
- (2) Second: preparation of databases of service units for government departments.
- (3) Third: production of field survey indicators through field surveys and use of GIS software in identifying samples required according to spatial distribution, design of field survey form, survey databases, and data analysis through the SPSS statistical analysis program.
- (4) Fourth: training and capacity development in urban observatory applications.

5.2.5. Phase 5: adoption of indicators and operation of the urban observatory

Adoption of indicators and operation of the urban observatory through:

- (1) First: operation and updating of data and maintenance of the urban observatory.
- (2) Second: coordination with the United Nations Development Program to assess the urban observatory's experience.
- (3) Third: preparation of a training course for members of the Urban Monitoring Network.
- (4) Fourth: dissemination of the results of urban indicators to decision-makers at both the city and governorate levels.

6. Results and discussion

Through the establishment of the Urban Observatory of El Tor City and the start of the collection of

data to reach a set of indicators of about 42 indicators in five major groups in three different years (2006, 2016, 2022). These years have been selected in Egypt through the Central Agency for Public Mobilization and Statistics (CAPMAS) by collecting data on all fields every 10 years. The most recent data from 2016 and before 2006, as well as 2022, helps decision-makers identify a city's strengths and weaknesses, enabling them to strengthen and address weaknesses for sustainable development in economic, social, urban, and environmental aspects. We note that most of the data and indicators available in 2006 are not available, as opposed to.

First, in the field of economic development, in the tourist sector, the rate of increase in the number of hotel rooms annually increased by about 1321 rooms from 680 rooms in 2015 to 2001 rooms in 2021, which means an increase in tourist activity at the city level. In the agricultural sector, the adequacy of agricultural production in 2015 and 2021 went from 0.02249 to 0.02532, respectively (Fig. 5).

Second: in the field of urban development, the inhabited area of the city of Tor increased from 3061 km² in 2006–4256 km² in 2016 and there was no change in 2022 (Fig. 6).

Third: in the field of social development and from the study of demographic characteristics, the total population during 2006, 2016, and 2022 reached 24 734, 26 590, and 43 918, respectively as in Fig. 7, where the population increased by 19 184 persons from 2006 to 2022. The total number of Bedouin households increased from 6162 in 2016–8782 in 2022 to a decrease in the rate of Bedouin households by about 335 during the period from 2016 to 2022.

The average family size and population density reached 5 and 8.1, respectively, in 2022, and at the level of educational services, the proportion of female pupils in education reached about 48.5 % in 2022. The class intensity is about 30 students in 2022 compared with 22 students in 2006. The percentage eradicated for the number of persons enrolled in literacy classes reached 58.8 % in 2016 to 44.093 % in 2022 (Figs. 8 and 9).

At the level of health services as in Fig. 10, the rate of human doctors per 1000 inhabitants in 2006, 2016, and 2022 to 1.8598, 4.4753, and 3.0511 human doctors, respectively. Also, the dentist rate per 1000 inhabitants increased from about 0.3 in 2016 to 0.9 in 2022, and the pharmaceutical rate per 1000 inhabitants increased from about 1.4 in 2016 to 4.03 in 2022 (Fig. 10).

Fourth: in the area of infrastructure as in Fig. 11, the average per capita water consumption decreased from 0.75 thousand m³ in 2016 to 0.18 m³ in 2022, while the number of households connected to the water network increased (Public Network)

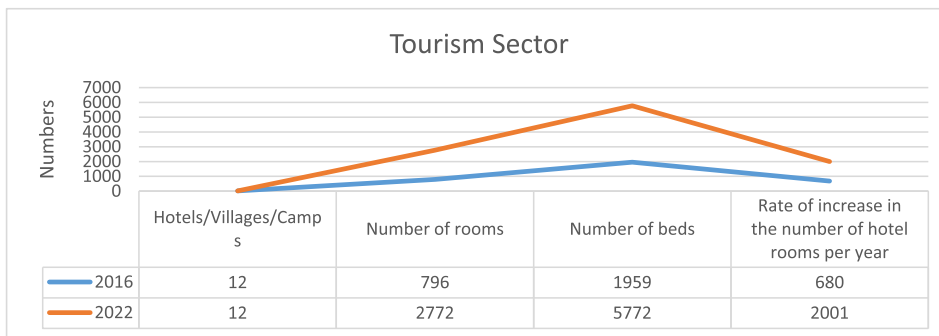


Fig. 5. Tourism sector in El Tor City during 2016 and 2022. Source: South Sinai Department's Centre for Information and Decision Support, by authors.

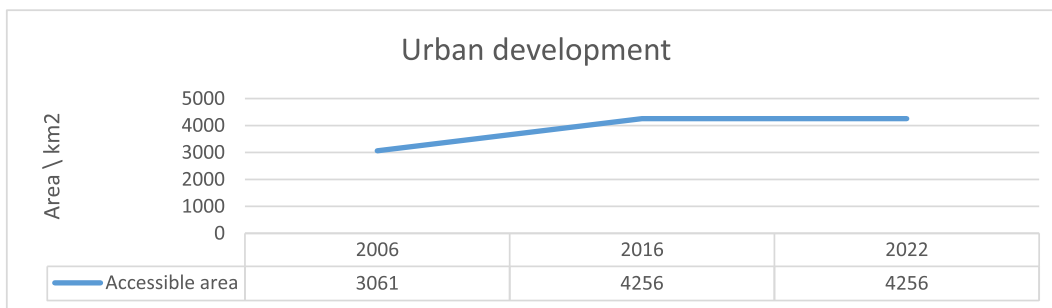


Fig. 6. Urban development in El Tor City during 2016 and 2022. Source: South Sinai Department's Centre for Information and Decision Support, by authors.

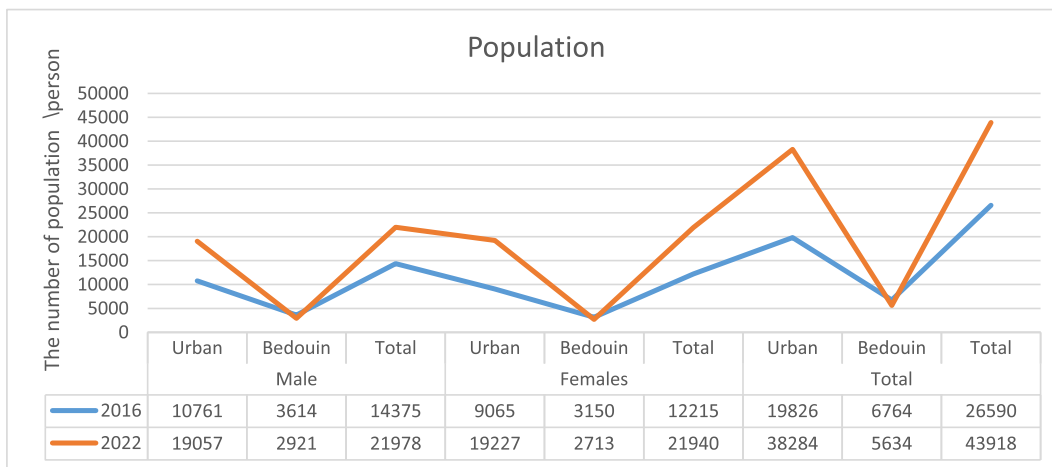


Fig. 7. Population in El Tor City during 2016 and 2022. Source: South Sinai Department's Centre for Information and Decision Support, by authors.

from 93.4 in 2016 to 202.86 in 2022. The number of families connected to the sanitation network increased from 86.01 to 98.94 in 2016 and 2022, respectively. In addition to increasing the level of connectivity of the household electricity grid from 97.4 in 2016 to 100 in 2022, we have already noted a significant increase in the rates of increase in infrastructure services at the level of water, sanitation, and electricity at the level of the city of Tor (Fig. 11).

Fifth: in the field of environmental development, there are about three environmental monitoring stations to measure the extent of air pollution at the city level, in addition to increasing the number of public parks from two in 2016 to 38 in 2022, up to 36 during that period (Fig. 12).

As a result of the establishment of the urban observatory in the city of El Tor, there is an increase in tourism development by increasing the number of hotel rooms by up to 34 % in 2022 in addition to

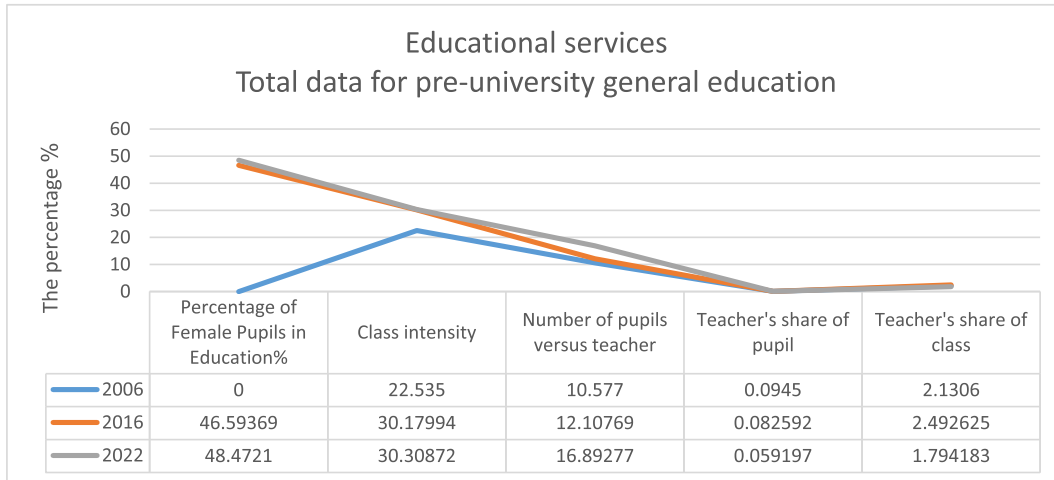


Fig. 8. Educational services in El Tor City during 2016 and 2022. Source: South Sinai Department's Centre for Information and Decision Support, by authors.

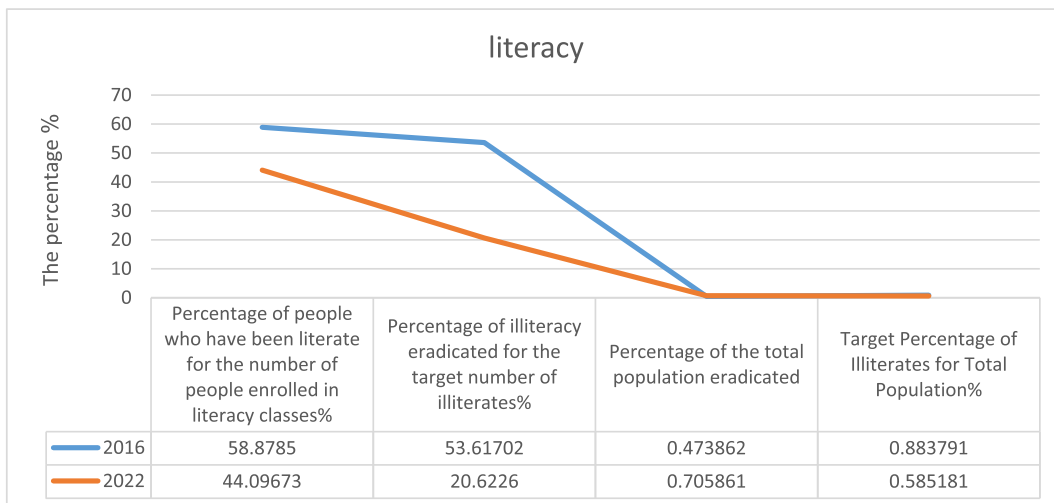


Fig. 9. Literacy in El Tor City during 2016 and 2022. Source: South Sinai Department's Centre for Information and Decision Support, by authors.

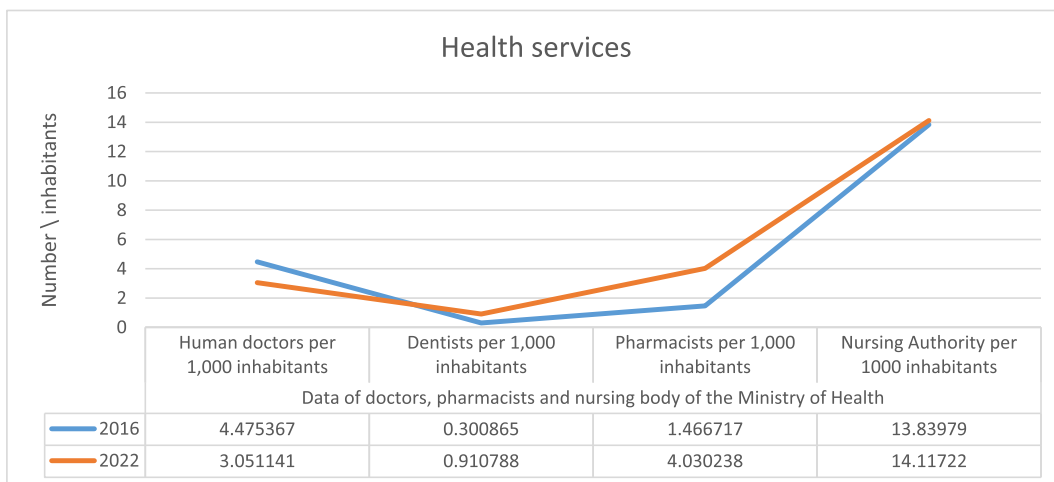


Fig. 10. Health services in El Tor City during 2016 and 2022. Source: South Sinai Department's Centre for Information and Decision Support, by authors.

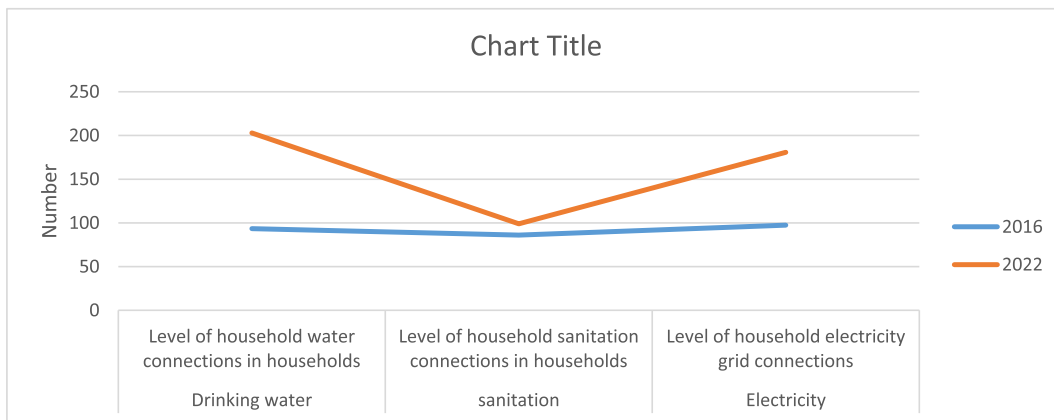


Fig. 11. Infrastructure development in El Tor City during 2016 and 2022. Source: South Sinai Department's Centre for Information and Decision Support, by authors.

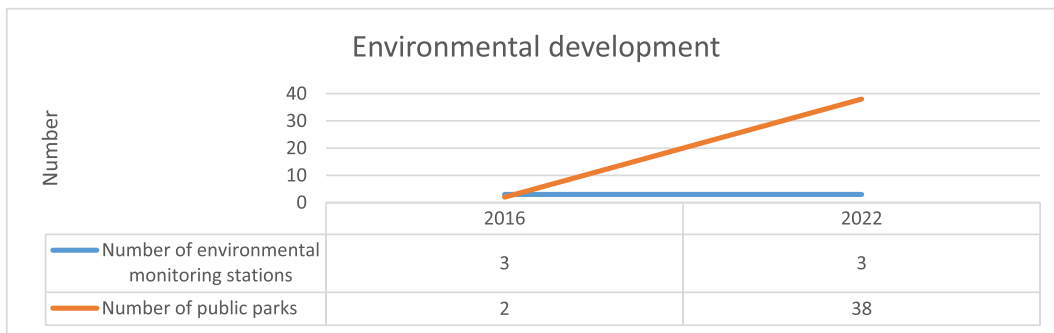


Fig. 12. Environmental development in El Tor City during 2016 and 2022. Source: South Sinai Department's Centre for Information and Decision Support, by authors.

increasing the inhabited area in the residential area by about 1195 km². This means an increase in the city's urban development rates and an increase in the population of the city for up to 60.5 % from 2016 to 2022, resulting in an increase in flats of residential premises and the surface of services, whether educational, health, or commercial. At the level of health services, human doctors, dentists, pharmacists, and nurses have increased by up to 35 % compared with the population, in addition to developing infrastructure significantly, as there has been an increase in the number of households related to water, sanitation, and electricity network to about 98 % of the total population of the city. There is also a significant increase in the number of green areas to reach 38 green areas in 2022 that help preserve the environment and help improve the quality of life for the city's inhabitants.

There is a clear picture before decision-makers in all areas of development, whether economic, social, environmental, urban, or infrastructure development at the level of the city of El Tor and identifying

strengths and weaknesses in each area of development in order to strengthen strengths, improve weaknesses, and identify development priorities in the city's investment plans. Follow-up of its implementation and its feasibility in improving the weaknesses monitored through the urban observatory of the city of El Tor, thus obtaining tangible results to achieve sustainable development and circulate it to other provincial cities such as Sharm el-Sheikh, Dahab City, and St Catherine City to expand the urban observatory's database to contribute to the realization of the South Sinai Governorate Strategic Blueprint. We hope to apply the experience of the urban observatory to the rest of Egypt's cities and governorates because of its strong return in achieving Egypt's Vision 2030, through a strong database at the level of Egypt, to ascertain the status quo, to learn about the impediments to development, to discuss it with stakeholders and to present it to decision-makers to take appropriate action toward achieving the objectives of sustainable development 2030.

6.1. Conclusions

Observatories play a crucial role in urban governance conversations by providing accurate and up-to-date information about city conditions and trends. They are reliable sources of evidence for decision-making due to their quality and analytical capabilities. Observatories foster personal connections with decision-makers, tailoring their activities accordingly. They also provide strong and continuous data that supplements state data, enabling governments to make informed decisions based on substantial evidence.

Urban observatories offer analytical expertise, baseline data, an established data collection infrastructure, and a resource for open collaboration with city officials. Regular monitoring and analysis of urban data help assess the effectiveness of strategies and make necessary adjustments. They can identify priority issues and challenges faced by the city, allowing planners to prioritize efforts and allocate resources accordingly. Comparative analysis of data across different cities or regions helps benchmark performance and learn from best practices implemented elsewhere.

Urban observatories facilitate effective communication and planning through maps, visualizations, and reports, facilitating effective communication and understanding of complex urban issues. By utilizing the data and insights provided by an urban observatory, city planners can make more informed, evidence-based decisions, leading to more effective and sustainable urban development.

6.2. Recommendations

An urban observatory can be a valuable tool for monitoring and analyzing urban development and progress toward sustainable development goals of observatories in all cities and regions of Egypt. It should produce a State of the City report, develop a database for indicators and statistics, and create a stakeholder network. Also, it needs to establish a data dissemination platform, recognize urban observatories as boundary-spanning organizations, and harmonize sustainable development and economic growth with socially fair principles. It must utilize modern technology tools such as GIS applications which are essential for collecting, compiling, and analyzing information to produce accurate and reliable indicators. Cooperation with officials in government, private entities, and civil society organizations is essential for providing accurate and

timely data and information to urban observatories. These recommendations help operationalize the observatory and ensure its effectiveness in promoting sustainable development and economic growth in cities. By following these recommendations, an urban observatory can serve as a valuable tool for achieving sustainable development goals.

CReDiT author statement

Eman Metwally: Conceptualization, Methodology, Software, Writing, Original draft preparation.
Enas Samir: Writing, Reviewing and editing, Visualization.

Conflicts of interest

There are no conflicts of interest.

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