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## Towards applying the Model of Sustainable Cities on Marsa Alam City

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### Keywords

Marsa Alam City,  
Sustainable cities,  
Sustainable Tourism  
Development.

### Abstract

A sustainable city is one that meets the needs of the current population without undermining the ability of the future generations to meet their own needs. The current research aims to study the ability of applying the model of a sustainable city to Marsa Alam. The research investigates the adoption of a new method in the construction of cities by relying on environmentally friendly systems. It also examines the importance of transforming the traditional tourist destinations into sustainable tourist cities. This research used the descriptive-analytical approach, where a questionnaire was prepared and distributed to a random sample of 106 of researchers of the Egyptian Environmental Affairs Agency (EEAA) in the Red Sea Governorate, the employees and decision makers of the General Administration of Environmental Affairs in the Red Sea General Office in addition to other academic researchers. The data were analyzed using descriptive statistics, Pearson correlation analysis, and regression analysis in SPSS 22.0. These analyses result in a moderately positive and significant relationship between the possibility of applying the sustainable cities model to the city of Marsa Alam and the benefits that will accrue to Marsa Alam after it transforms into a sustainable city. As a result, this research recommends paying attention to Marsa Alam from the perspective of sustainability as a worthy coastal destination in Egypt.

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## 1. Introduction

Cities ought to embrace sustainability and prioritize knowledge, innovation, and technology to foster progress and generate value for their residents, businesses, communities, and society at large. A sustainable cities approach should be embraced as a strategic outlook that guides future urban development (Romanelli, 2017).

Sustainable cities are cities that achieve social justice for their residents by promoting concepts of democracy, participation in decision-making, and self-reliance. The sustainability of the city stems from the self-reliance of its society by fulfilling and satisfying the basic needs of its members, reducing the gap between the poor and the rich and different levels of income, ensuring the minimum acceptable quality of life for all members of society, ensuring participation and accountability, while using technical techniques compatible with local conditions (Lahham, 2017).

A sustainable city is built on knowledge and must prioritize efficiency in all aspects of urban life. For example, energy efficiency is crucial to prevent waste and improve existing systems, resulting in better performance and reduced external dependence in the energy sector while addressing environmental concerns (Sodiq et al., 2019).

### **Research problem:**

The research problem centers around the significance of sustainable cities and the lack of awareness and understanding within certain communities regarding this crucial concept. Despite its global significance, the topic of sustainable cities has not been sufficiently addressed from a tourism perspective by researchers. However, it has been widely discussed from an engineering standpoint. Therefore, it was necessary to fill this gap by exploring the subject of sustainable cities from a tourism sector perspective, with a focus on its importance. By shedding light on the effects and general benefits, a comprehensive understanding of sustainable cities and their impact on an important destination like Marsa Alam can be achieved.

### **Research questions:**

The study aims to answer the following questions:

- 1- To what extent can the sustainable city model be applied to Marsa Alam?
- 2- What are the benefits that will accrue to Marsa Alam after transforming into a sustainable city?
- 3- What are the potential opportunities for Marsa Alam to transform into a sustainable city?
- 4- What are the barriers that Marsa Alam will face when transforming into a sustainable city?

### **Research objectives:**

This research aims to study the ability of applying the model of a sustainable city to Marsa Alam. In order to achieve the research's main aim, some objectives were targeted as follows:

1. Assessing Marsa Alam's inherent capabilities that can contribute to its transformation into a sustainable city.

2. Examining the anticipated benefits that Marsa Alam will experience upon achieving sustainable city status.
3. Identifying the potential opportunities available for Marsa Alam to embark on the path of becoming a sustainable city.
4. Investigating the challenges and obstacles that may hinder the transformation of Marsa Alam into a globally recognized sustainable destination.
5. Investigating innovative approaches to urban development that incorporate environmentally friendly systems, information and communication technologies, services, and social welfare.

## **2. Literature Review**

### **2.1 Sustainable cities concept**

For over thirty years, sustainable cities have emerged as the dominant global model for urban planning and development. The concept of sustainable cities, born out of the discourse on sustainable development in the early 1990s, has become the prevailing solution to address sustainability challenges. Concurrently, research and efforts in developing sustainable cities have gained significant momentum and widespread acceptance across the globe. This encompasses a broad range of urban aspects, considering the environmental, social, and economic dimensions of sustainability (Bibri & Krogstie, 2019).

“A sustainable community is one that is economically, environmentally, and socially healthy and resilient. It meets challenges through integrated solutions rather than through fragmented approaches that meet one of those goals at the expense of the others” (Petit-Boix et al., 2017, p.940).

A sustainable city applies sustainability principles in planning and design, aiming for long-term goals through balanced urban development. It optimizes energy and resource use, minimizes waste, promotes renewable energy, achieves carbon neutrality, reduces pollution, prioritizes efficient transportation, compactness, and green spaces, and fosters livable, community-oriented environments (Bibri, 2021).

A sustainable city involves the transformation of urban areas with the primary objective of inclusivity, ensuring that people from diverse cultures and backgrounds have access to safe and affordable living. It prioritizes creating a clean and environmentally friendly atmosphere, building resilience to withstand shocks, and promoting smart and inspiring living conditions (Tedong et al., 2021).

### **2.2 The main pillars of sustainable cities:**

The United Nations (2013) stated that achieving sustainable cities requires the integration of four pillars: social development, economic development, environmental management, and urban governance. These four pillars are presented in Figure (1), which shows that urban sustainability can be achieved by balancing social and economic development, effective environmental management, and governance.

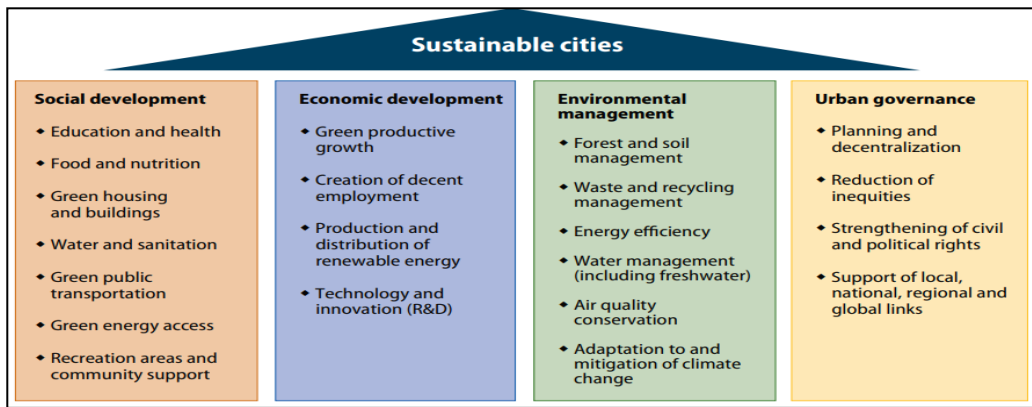


Fig (1): The pillars for achieving sustainability of cities.

Source: The United Nations (2013).

### 2.3 achieving a sustainable balance of human activities in the natural environment

Table (1): Ways to achieve sustainable balance of human activities in the natural environment

<p>Sustainable land use and urban design: A sustainable city can be described as an ideal urban structure that is based on sustainable land use and urban design principles. These principles include:</p>	<ol style="list-style-type: none"> <li>1. Enhancing quality of life by promoting social interactions and convenient access to a broad range of services.</li> <li>2. Minimizing energy usage through the implementation of green building design technologies.</li> <li>3. Decreasing greenhouse gas emissions by promoting development that relies less on automobiles.</li> <li>4. Mitigating the impact on environmentally sensitive areas through measures such as limiting urban sprawl and restoring park and greenway systems.</li> </ol>
<p>Providing transportation services that are energy-efficient and environmentally friendly, while also respecting the Earth's carrying capacity.</p>	<ol style="list-style-type: none"> <li>1. Bike path and lane development.</li> <li>2. Pedestrian infrastructure improvement.</li> <li>3. Public transport accessibility promotion.</li> <li>4. Demand reduction through measures like congestion pricing and vehicle taxes.</li> </ol>
<p>Environmental protection and restoration: One of the fundamental principles of sustainability is to safeguard and rejuvenate the current species, habitats, and ecosystems in urban areas. This can be achieved by creating ecologically valuable green spaces, such as public or private gardens, parks, green alleys and streets, and green roofs.</p>	<p>These green spaces help in:</p> <ol style="list-style-type: none"> <li>1. Bringing nature into city life;</li> <li>2. Making urban places more attractive and pleasant;</li> <li>3. Mitigating the negative impacts of urbanization;</li> <li>4. Offering recreational opportunities;</li> <li>5. Providing a habitat for wildlife and aquatic life.</li> </ol>

<p>Renewable energy and waste management: Due to the increasing demand for non-renewable resources, it is imperative to adopt a renewable approach to resource utilization for the development of sustainable communities.</p>	<p>Renewable energy technologies encompass various sources like hydropower, biomass energy, geothermal energy, wind power, solar energy, and photovoltaic technologies. Waste management practices, including landfill management, incineration, biological treatment, zero waste approaches, recycling-focused eco-industrial parks, and the implementation of environmental taxes, laws, and policies, are also part of the equation.</p>
<p>Environmental justice and social equity: Current urban development policies demonstrate the disparities and biases between the living standards of wealthy and impoverished populations, both nationally and globally. Sustainable development promotes the protection of public health and well-being by ensuring the equitable management of natural resources on Earth.</p>	<p>The strategies for well-balanced and sustainable communities can be:</p> <ol style="list-style-type: none"> <li>1. Increasing affordable housing;</li> <li>2. Providing efficient transportation and easier access to public amenities;</li> <li>3. Promoting local economic growth by increasing job opportunities;</li> <li>4. Providing environmental quality, protection and improving community participation into decision-making processes.</li> </ol>
<p>Economic development: The economic system has failed to account for the value of environmental services and functions, leading to environmental problems.</p>	<p>Creating a sustainable economy promotes:</p> <ol style="list-style-type: none"> <li>1. Clean or green technologies;</li> <li>2. Renewable sources of energy;</li> <li>3. Green business and job initiatives;</li> <li>4. Green tax policies;</li> <li>5. Green infrastructure;</li> <li>6. Real estate developments that promote walkability, mixed-use, and public transportation.</li> </ol>

By researchers, based on (Yigitcanlar& Dizdaroglu, 2015)

Yigitcanlar& Dizdaroglu (2015) has stated that it is important to apply sustainable development principles to achieve a balance between human activities and the natural environment.

#### 2.4 principles for the sustainable planning of coastal cities:

Hegazy (2021) have identified principles for the sustainable planning of coastal cities as follow:

1. Incorporating a mix of land uses, including those that rely on water resources.
2. Utilizing compact community designs that preserve and provide access to waterfront resources.
3. Offering a variety of housing options to meet the needs of both permanent and seasonal residents.
4. Creating walkable communities that allow for public access to and along the waterfront.
5. Promoting and preserving the unique character and heritage of waterfront communities.

6. Preserving open spaces, farmland, natural beauty, and critical environmental areas that are essential to coastal and waterfront communities.
7. Directing development towards existing communities and encouraging waterfront revitalization.
8. Providing a range of transportation options that utilize both land and water.
9. Ensuring predictable, fair, and cost-effective development decisions through consistent policies and coordinated permitting processes.
10. Encouraging collaboration with community members and stakeholders in development decisions while upholding public rights to access the waterfront.

## **2.5 Marsa Alam City:**

Marsa Alam is a city situated on the western coastline of the Red Sea, approximately 270 km south of Hurghada. The city lies at the intersection of the Arabian Desert and the Red Sea, close to the Tropic of Cancer. It has a total area of 15,000 km<sup>2</sup> and it is considered the most recent promising tourist center (Center of Information and Decision Support of Red Sea Governorate., 2022).

### **2.5.1 Attractions of Marsa Alam:**

#### A) Natural attractions:

Marsa Alam is well-known for its wonderful beaches and unique coral reefs. There are many places which administratively affiliate the city. These places are famous for snorkeling, diving and safari such as (Center of Information and Decision Support of Red Sea Governorate, 2022):

- Satayh Dolphin Reef
- Dolphin House
- Samadi Reefs- Dolphin House
- Marsa Moubark (National Park)
- Abu Dabab National Park
- Sharm El Lulli And Wadi El Qulaan
- Wadi El Gemal (National Park)
- Hankorab Beach

#### B) Man-made attractions (Center of Information and Decision Support of Red Sea Governorate, 2022):

- Religious landmarks: the Shrine and Mosque of Al-Arif Allah Abu Al-Hassan Al-Shazly.
- Archaeological sites: Siti temple which is located in the west on Marsa Alam city- Edfu Road, in addition to the Ptolemaic Road and some Pharaonic inscriptions.
- Cultural landmarks: Marsa Alam international conference center in Port-Ghalib.

### **2.5.2 Number of tourists coming to Marsa Alam from 2017 to 2022:**

The Department of tourism of the general office of Red Sea governorate provides a comprehensive overview of the number of tourists visiting Marsa Alam, categorized

by month and year, covering the period from 2017 to 2022. The data presented includes the total number of tourists for each year, as well as the monthly breakdown of tourist arrivals.

Table (2): Number of tourists coming to Marsa Alam from 2017 to 2022:

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2017	32331	27802	36478	43711	44111	41312	65095	49881	64325	63274	59599	44495	572414
2018	43332	40967	52018	59929	51360	60645	83021	91814	79674	63717	70497	66156	763130
2019	57665	55335	66106	81889	71243	74169	85832	107053	83186	82086	75472	64064	904100
2020	57568	59362	23920	0	0	0	0	6928	9483	6225	3224	10660	177370
2021	6447	7677	14372	24086	32045	31547	41696	50257	45034	55530	56250	43737	408678
2022	39926	36998	44908	51537	74867	69173	96647	199353	87201	85102	63289	47503	896504

Source: Department of tourism of the general office of Red Sea governorate (2023)

From the previous table, some conclusions can be discussed as follows:

#### 1. Yearly Trends:

- The total number of tourists visiting Marsa Alam shows a general increasing trend over the years, with some variations.
- The highest number of tourists was recorded in 2022 (896,504), followed by 2019 (904,100) and 2018 (763,130).
- The lowest number of tourists was observed in 2020 (177,370).

#### 2. Monthly Patterns:

- The months with the highest number of tourists vary across the years. It's important to note that different factors such as seasons, holidays, and events can influence these patterns.
- August and September of 2019 had the highest numbers of tourists, with 107,053 and 83,186 visitors, respectively.
- In 2022, the month with the highest number of tourists was July, with 199,353 visitors.

#### 3. Seasonal Variations:

- From the available data, it seems that the summer months (June, July, and August) tend to attract a larger number of tourists to Marsa Alam.
- The winter months (December, January, February) also show relatively high numbers of tourists, likely due to the mild weather and holiday periods.

#### 4. Impact of COVID-19:

- The year 2020 witnessed a significant drop in tourist numbers, likely due to the COVID-19 pandemic and travel restrictions.
- It's worth noting that 2021 and 2022 showed signs of recovery, with the number of tourists gradually increasing compared to 2020.



### **3. Methodology**

The researchers used the descriptive-analytical approach, to demonstrate the significance of a novel technique in building sustainable cities that rely on eco-friendly systems, information and communication technologies, services, and social welfare to tackle environmental challenges and achieve sustainability goals. Since it is the most appropriate approach to describe the phenomenon in question, in this approach the researchers are trying to describe the subject of the study, analyze the data, and compare, explain, and assess, hoping to derive meaningful conclusions that can enhance knowledge on the topic.

#### **3.1 Data collection**

The data was gathered by preparing a questionnaire form. It was distributed to researchers of the Egyptian Environmental Affairs Agency (EEAA) in the Red Sea Governorate, the employees and decision makers of the General Administration of Environmental Affairs in the Red Sea General Office in addition to other academic researchers. This questionnaire was distributed online on google drive available at: ([https://docs.google.com/forms/d/e/1FAIpQLScX56nOqVZoNcXMzMLYAj4xq9EAFvGkN2HeL8eOAcg4EQZDoQ/viewform?usp=sf\\_link](https://docs.google.com/forms/d/e/1FAIpQLScX56nOqVZoNcXMzMLYAj4xq9EAFvGkN2HeL8eOAcg4EQZDoQ/viewform?usp=sf_link)). The questionnaire was available from November 2022 to February 2023. It has been answered by 106 participants.

#### **3.2 Measures**

The research aims of applying the model of sustainable cities to Marsa Alam to achieve that, this research employed a method of descriptive analytical methodology by using a questionnaire tool consisting of five sections. The first section focused on gathering demographic characteristics of the respondents, such as gender, educational level, and years of experience. The second section comprised nine variables assessing the applicability of the sustainable cities model to Marsa Alam. The third section encompassed fourteen variables examining the potential benefits that would arise from transforming Marsa Alam into a sustainable city. The fourth section consisted of thirteen variables identifying the possible opportunities for Marsa Alam to achieve sustainable city status. Lastly, the fifth section addressed the barriers that Marsa Alam may encounter during its transition to a sustainable city, encompassing ten variables. The questionnaire items were anchored according to the Five-Point Likert Scale: "1 = strongly disagree", "2 = disagree", "3 = neutral", "4 = agree", and "5 = strongly agree".

#### **3.3 Data Validity and Reliability**

##### **3.3.1 Data Validity**

To assess the effectiveness of the data collection tool utilized in this study, specifically its readability, format, and capacity to measure the study's constructs, the researchers distributed the questionnaire instrument to researchers of the Egyptian Environmental Affairs Agency (EEAA) in the Red Sea Governorate, the employees and decision makers of the General Administration of Environmental Affairs in the Red Sea General Office in addition to other academic researchers. The questionnaire instrument was then updated and refined to reflect comments and suggestions received by the domain experts. In addition, the experts expressed their interest and engaged with the researchers regarding the questionnaire instrument, which contributes to its validity.



### 3.3.2 Data Reliability

In order to ensure the reliability and consistency of measurement across the questionnaire items, the researchers conducted a reliability test as a preliminary step before further analysis. This test was crucial because the reliability of a measure indicates the stability and consistency of the instrument. The internal consistency of the research instrument, such as the questions (items) in the questionnaire, was examined to determine reliability. Cronbach's Alpha, a commonly used metric to measure scale reliability, was employed, with values ranging from 0.0 to 1.0. Researchers aim for a value closer to 1.0, indicating a strong and consistent instrument for the study. However, it should be noted that in the social sciences, a threshold value of 0.7 is generally considered acceptable.

**Table (3) Cronbach’s Alpha value:**

Variables	No. of items	Cronbach’s Alpha Value	Validity Coefficient*
To what extent can the sustainable cities model be applied to Marsa Alam?	9	0.930	0.964
What are the benefits that will accrue to Marsa Alam after transforming into a sustainable city?	14	0.975	0.987
What are the potential opportunities for Marsa Alam to become a sustainable city?	13	0.977	0.988
What are the barriers that Marsa Alam will face when transforming into sustainable city?	10	0.955	0.977
<b>Total</b>	<b>46</b>	<b>0.978</b>	<b>0.989</b>

\* Validity coefficient =  $\sqrt{\text{Reliability coefficient}}$

To measure the internal consistency and reliability of the study's constructs, the researchers employed Cronbach's alpha ( $\alpha$ ) measure. The reliabilities of the scales were determined, and the Cronbach's alpha values for all scales in Table (2) ranged from 0.930 to 0.977. The total questionnaire items yielded a Cronbach's alpha of 0.978, indicating acceptable reliability for each field. Generally, a Cronbach's alpha value above 0.7 is considered acceptable.

### 3.4 Data Analysis

The researchers utilized the Statistical Package for Social Sciences (SPSS) to analyze the collected data. The statistical methods employed in the analysis included the Cronbach's Alpha Test to assess the reliability of the questionnaire and the stability coefficients of each axis of the study, Percentage and frequency to describe the characteristics of the study population and determine their responses to the study axes in addition to Means, standard deviation (SD), Pearson correlation and Regression analysis.

## 4 Results and Discussion

The following part explains the results concerning the five dimensions representing of applying the model of sustainable cities on Marsa Alam city.

#### 4.1 Descriptive analysis

The researchers utilized descriptive analysis in this section to obtain the means and standard deviations of the study constructs and their corresponding items. The items were assessed using a Likert-type scale as follows.

##### Section One: Demographic Characteristics of Respondents

- 1- The discussion of the research findings begins with a brief demographic profile of respondents in terms of gender; the majority of the respondents were male (94.30%), rather than female respondents (5.70%) of this sample.
- 2- In analyzing the level of education, the most representative degree is a bachelor's degree with 36.80% of the respondents, while 27.40% of the respondents were diploma holders.
- 3- In analyzing the years of experience in the study sample that the majority (52.80%) of the sample spent around more than 15 years, while 19.80% of respondents spent around 11 to 15 years.

##### Section 2: To what extent can the sustainable cities model be applied to Marsa Alam?

**Table (4): descriptive analysis of the possibility of applying the sustainable cities model to the city of Marsa Alam**

Items	S D	D	N	A	S A	Mean	Std Deviation	Rank	Attitude
Marsa Alam is a promising city which isn't polluted yet.	0.9	0	4.7	53.8	40.6	4.33	.658	1	Agree
Marsa Alam is increasing the use of new sources of renewable energy such as wind and solar energy.	2.8	6.6	18.9	45.3	26.4	3.86	.980	2	Agree
Marsa Alam relies on modern electric transportation or zero-emission mass transportation.	6.6	18.9	19.8	29.2	25.5	3.48	1.244	8	Agree
Marsa Alam's location is remote and high above sea level, which helps in reducing carbon emissions, pollution and noise sources	3.8	5.7	22.6	38.7	29.2	3.84	1.034	3	Agree
Marsa Alam is distinguished by the multiplicity of water sources with the ease of producing pure drinking water by condensing water from air.	7.5	15.1	21.7	34.9	20.8	3.46	1.197	9	Agree
Marsa Alam is characterized by a balance between the built surroundings, afforestation, and green spaces.	3.8	15.1	30.2	29.2	21.7	3.50	1.106	7	Agree
Marsa Alam has a good sewage and water treatment system.	5.7	13.2	27.4	30.2	23.6	3.53	1.156	6	Agree
Marsa Alam provides clean drinking water to residents and	3.8	10.4	19.8	39.6	26.4	3.75	1.078	5	Agree

tourism establishments.										
Marsa Alam provides comprehensive and detailed environmental information about the area.	3.8	7.5	24.5	34.9	29.2	3.78	1.069	4	Agree	
<b>Total Mean</b>							<b>3.73</b>			<b>Agree</b>

Table (4) presents the means and standard deviations of the possibility of applying the sustainable cities model to the city of Marsa Alam, where the means ranged between 3.46 and 4.33 compared with the total instrument mean for the domain (3.73). The item "Marsa Alam is a promising city that isn't polluted yet" ranked first with a mean and standard deviation (mean = 4.33, standard deviation = 0.658) compared with the total instrument mean and standard deviation. The item "Marsa Alam is distinguished by the multiplicity of water sources and the ease of producing pure drinking water by condensing water from air" ranked last and reached a mean of (3.46) and a standard deviation of (1.197) compared with the mean and standard deviation of the total instrument.

**Section 3: What are the benefits that will accrue to Marsa Alam after transforming into a sustainable city?**

**Table (5) descriptive analysis of the benefits that will accrue to Marsa Alam after transforming into a sustainable city.**

Items	S D	D	N	A	S A	Mean	Std Deviation	Rank	Attitude
A sustainable city will positively affect the practices of tourism stakeholders and tourists.	3.8	0	8.5	53.8	34	4.14	.867	5	Agree
A sustainable city will change the type of potential tourists.	1.9	0.9	16	52.8	28.3	4.05	.809	10	Agree
A sustainable city will increase the awareness of the local community.	1.9	0.9	13.2	52.8	31.1	4.10	.804	8	Agree
A sustainable city will affect the type of workers.	2.8	0.9	20.8	49.1	26.4	3.95	.877	13	Agree
A sustainable city will affect the visiting rate of the destination.	1.9	1.9	15.1	56.6	24.5	4.00	.805	12	Agree
A sustainable city will help in reducing costs of construction.	1.9	4.7	23.6	45.3	24.5	3.86	.910	14	Agree
A sustainable city is a reasonable solution for avoiding pollution and deterioration.	2.8	0	7.5	53.8	35.8	4.20	.810	2	Strongly Agree
As a result of trained labor, the labor turnover will decrease, which will lead to a decrease in the unemployment rate.	2.8	0.9	19.8	45.3	31.1	4.01	.900	11	Agree
A sustainable city will help in enhancing investment opportunities.	1.9	0	8.5	50	39.6	4.25	.769	1	Strongly Agree
A sustainable city will increase the green area as a result of desert	1.9	0.9	17	46.2	34	4.09	.845	9	Agree

reclamation.									
A sustainable city will achieve environmental balance as a result of combating climate change.	1.9	0.9	11.3	54.7	31.1	4.12	.789	6	Agree
A sustainable city will save some aspects of marine life from deterioration and extinction.	1.9	0.9	11.3	49.1	36.8	4.18	.814	4	Agree
A sustainable city will increase the standard of living of the population.	1.9	0	15.1	50.9	32.1	4.11	.797	7	Agree
The Sustainable City will form a huge database that serves as a reference for sustainable city projects in the future	1.9	1.9	11.3	45.3	39.6	4.19	.852	3	Agree
<b>Total Mean</b>						<b>4.09</b>			<b>Agree</b>

Table (5) presents the means and standard deviations of the benefits that will accrue to Marsa Alam after it transforms into a sustainable city, where the means ranged between (3.86– 4.25) compared with the total instrument mean for the domain (4.09). The item “A sustainable city will help in enhancing investment opportunities.” ranked first with a mean and standard deviation (Mean=4.25, standard deviation = 0.769) compared with the total instrument mean and the standard deviation. The item "A sustainable city will help in reducing costs of construction" ranked last reached a mean (3.86) and the standard deviation was (0.910) compared with the mean and standard deviation of the total instrument.

#### **Section 4: What are the potential opportunities for Marsa Alam to become a sustainable city?**

**Table (6): descriptive analysis of the potential opportunities for Marsa Alam to become a sustainable city:**

Items	S D	D	N	A	S A	Mean	Std Deviation	Rank	Attitude
There is an alternative cooperation between the public and private sectors in Marsa Alam.	2.8	9.4	22.6	39.6	25.5	3.75	1.031	12	Agree
The local community has desired level of awareness to adapt to the idea of sustainable city.	5.7	14.2	25.5	35.8	18.9	3.48	1.123	13	Agree
The stakeholders of tourism industry in Marsa Alam can participate in transforming into sustainable city.	1.9	1.9	14.2	50.9	31.1	4.08	.836	1	Agree
The Ministry of Tourism and Antiquities is encouraging environmentally-friendly itineraries such as: bike tourism, bird-watching tourism and hiking tourism to diversify the tourism product in Marsa Alam.	2.8	7.5	18.9	44.3	26.4	3.84	.997	10	Agree

The Ministry of Environment is launching online Carbon calculators in order to help tourism enterprises to calculate their consumption of energy, water and material.	1.9	6.6	22.6	41.5	27.4	3.86	.961	8	Agree
The Ministry of Environment is adopting waste management and water conservation programs in hotels and resorts.	1.9	3.8	19.8	44.3	30.2	3.97	.910	2	Agree
The Ministry of Tourism and Antiquities is adopting training programs for staff and tourists to deal safely with coral reefs and marine life.	3.8	6.6	17	44.3	28.3	3.87	1.024	7	Agree
The Ministry of Environment is reinforcing awareness programs targeting the locals, staff and visitors.	2.8	2.8	18.9	46.2	29.2	3.96	.925	4	Agree
The Ministry of Environment is adopting green construction methods and energy-saving systems.	1.9	4.7	22.6	43.4	27.4	3.90	.925	6	Agree
The Ministry of Environment is establishing visitor centers to educate them about the high value of environment, diving sites and marine eco-systems.	1.9	1.9	20.8	49.1	26.4	3.96	.850	3	Agree
The Ministry of Tourism and Antiquities is providing incentives for tourism enterprises in order to broaden the use of renewable energy sources in Marsa Alam.	3.8	7.5	18.9	41.5	28.3	3.83	1.046	11	Agree
The Ministry of Tourism and Antiquities is monitoring diving centers activities in terms of adhering to universally accepted global sustainable tourism criteria Base line best practices.	2.8	4.7	16	49.1	27.4	3.93	.939	5	Agree
Ministry of Civil Aviation is encouraging airline to use sustainable jet fuel now, in order to reduce carbon emissions.	2.8	7.5	20.8	39.6	29.2	3.85	1.022	9	Agree
<b>Total Mean</b>						<b>3.87</b>			<b>Agree</b>

Table (6) presents the means and standard deviations of the potential opportunities for Marsa Alam to become a sustainable city, where the means ranged between (3.48–4.08) compared with the total instrument mean for the domain (3.87). The item “The stakeholders of tourism industry in Marsa Alam can participate in transforming into

sustainable city” ranked first with a mean and standard deviation (Mean=4.08, standard deviation = 0.836) compared with the total instrument mean and the standard deviation. The item "The local community has desired level of awareness to adapt to the idea of sustainable city" ranked last reached a mean (3.48) and the standard deviation was (1.123) compared with the mean and standard deviation of the total instrument.

**Section 5: What are the barriers that Marsa Alam will face when transforming into sustainable city:**

**Table (7): descriptive analysis of the barriers that Marsa Alam will face when transforming into a sustainable city**

Items	S D	D	N	A	S A	Mean	Std Deviation	Rank	Attitude
Lack of cooperation between civil administrations.	6.6	10.4	27.4	34.9	20.8	3.53	1.131	10	Agree
Insufficiency of qualification level.	5.7	8.5	20.8	47.2	17.9	3.63	1.054	8	Agree
Deficiency of understanding the concept of sustainable city.	5.7	9.4	16	46.2	22.6	3.71	1.095	6	Agree
Absence of a well-defined strategy.	4.7	11.3	16	44.3	23.6	3.73	1.035	4	Agree
Insufficient awareness of Egypt’s 2030 vision.	3.8	9.4	18.9	42.5	25.5	3.76	1.056	3	Agree
Absence of sustainable design for the city.	3.8	8.5	13.2	49.1	25.5	3.84	1.025	2	Agree
Lack of transportation services that respect carrying capacity and environmentally-friendly transport options.	2.8	7.5	17.9	45.3	26.4	3.85	.993	1	Agree
Privatization and investment development decisions that ignore long-term programs and plans to preserve the environment and biodiversity.	2.8	8.5	27.4	37.7	23.6	3.71	1.014	5	Agree
The diversity of population life between urban and nomadic tribes.	2.8	13.2	21.7	41.5	20.8	3.64	1.044	7	Agree
Lack of environmentally friendly methods of electricity delivery.	4.7	14.2	21.7	37.7	21.7	3.58	1.121	9	Agree
<b>Total Mean</b>						<b>3.70</b>			<b>Agree</b>

Table (7) presents the means and standard deviations of the barriers that Marsa Alam will face when transforming into a sustainable city, where the means ranged between (3.53– 3.85) compared with the total instrument mean for the domain (3.70). The item “Lack of transportation services that respect carrying capacity and environmentally-friendly transport options.” ranked first with a mean and standard deviation (Mean=3.85, standard deviation = 0.993) compared with the total instrument mean and the standard deviation. The item "Lack of cooperation between civil

administrations." ranked last reached a mean (3.53) and the standard deviation was (1.131) compared with the mean and standard deviation of the total instrument.

#### 4.2 Pearson Correlation analyses

The researchers used Pearson correlations two times. First, the Correlation between the possibility of applying the sustainable cities model to the city of Marsa Alam and the benefits that will accrue to Marsa Alam after transforming into a sustainable city. Second, Correlation between the possibility of applying the sustainable cities model to the city of Marsa Alam and the potential opportunities for Marsa Alam to become a sustainable city

Table (8): Correlation between the possibility of applying the sustainable cities model to the city of Marsa Alam and the benefits that will accrue to Marsa Alam after transforming into a sustainable city

		the benefits that will accrue to Marsa Alam after transforming into a sustainable city
the possibility of applying the sustainable cities model to the city of Marsa Alam	Pearson Correlation	<b>.683**</b>
	Sig. (2-tailed).	<b>.000</b>

\*\*Correlation is significant at the 0.01 level (2-tailed).

As described in the table (8), there is a moderately positive and significant relationship between the possibility of applying the sustainable cities model to the city of Marsa Alam and the benefits that will accrue to Marsa Alam after transforming into a sustainable city. The value of the Pearson correlation coefficient was (.683\*\* - sig = 0.000). These results showed that there is a moderately positive trend. This positive correlation indicates that as the possibility of applying the sustainable cities model to the city of Marsa Alam increases, so do the benefits that will accrue to Marsa Alam after it transforms into a sustainable city.

Table (9) Correlation between the possibility of applying the sustainable cities model to the city of Marsa Alam and the potential opportunities for Marsa Alam to become a sustainable city

		potential opportunities for Marsa Alam to become a sustainable city.
the possibility of applying the sustainable cities model to the city of Marsa Alam	Pearson Correlation	<b>.740**</b>
	Sig. (2-tailed).	<b>.000</b>

\*\*Correlation is significant at the 0.01 level (2-tailed).



As described in the table (9), there is a strong positive and significant relationship between the possibility of applying the sustainable cities model to the city of Marsa Alam and the potential opportunities for Marsa Alam to become a sustainable city. The value of the Pearson correlation coefficient was (.740\*\* - sig = 0.000). These results showed that there is a strong positive trend. This positive correlation indicates that as the possibility of applying the sustainable cities model to the city of Marsa Alam increases, so do the potential opportunities for Marsa Alam to become a sustainable city.

Table (10) Correlation between the potential opportunities for Marsa Alam to become a sustainable city and the benefits that will accrue to Marsa Alam after transforming into a sustainable city

		the benefits that will accrue to Marsa Alam after transforming into a sustainable city
potential opportunities for Marsa Alam to become a sustainable city	Pearson Correlation	<b>.777**</b>
	Sig. (2-tailed).	<b>.000</b>

\*\*Correlation is significant at the 0.01 level (2-tailed).

As described in the table (10), there is a strong positive and significant relationship between the potential opportunities for Marsa Alam to become a sustainable city and the benefits that will accrue to Marsa Alam after transforming into a sustainable city. The value of the Pearson correlation coefficient was (.777\*\* - sig = 0.000). These results showed that there is a strong positive trend. This positive correlation indicates that as the potential opportunities for Marsa Alam to become a sustainable city increases, so do the benefits that will accrue to Marsa Alam after transforming into a sustainable city.

### 4.3 Regression

**Table (11) Simple Linear Regression analysis**

	<b>R</b>	<b>R<sup>2</sup></b>	<b>F</b>	<b>Beta</b>	<b>Sig</b>	<b>Results</b>
The possibility of applying the sustainable cities model to the city of Marsa Alam directly affects the benefits that will accrue to Marsa Alam after it transforms into a sustainable city.	<b>.683<sup>a</sup></b>	<b>.466</b>	<b>90.800</b>	<b>.683</b>	<b>.000<sup>b</sup></b>	<b>acceptable</b>
The possibility of applying the sustainable cities model to the city of Marsa Alam	<b>.740<sup>a</sup></b>	<b>.547</b>	<b>125.602</b>	<b>.740</b>	<b>.000<sup>b</sup></b>	<b>acceptable</b>

directly affects the potential opportunities for Marsa Alam to become a sustainable city						
The potential opportunities for Marsa Alam to become a sustainable city directly affect the benefits that will accrue to Marsa Alam after transforming into a sustainable city.	.777 <sup>a</sup>	.603	158.207	.777	.000 <sup>b</sup>	acceptable

From the results in Table 11, the impact of the possibility of applying the sustainable cities model to the city of Marsa Alam on the benefits that will accrue to Marsa Alam after it transforms into a sustainable city was 68.3%; the results of simple linear regression analysis show that the impact of the possibility of applying the sustainable cities model to the city of Marsa Alam on potential opportunities for Marsa Alam to become a sustainable city was 70.4%; and finally, the potential opportunities for Marsa Alam to become a sustainable city directly affect the benefits that will accrue to Marsa Alam after transforming into a sustainable city were 77.7%.

### 5. Summary and conclusion:

Marsa Alam, a promising coastal destination that remains unpolluted, holds significant potential for transformation into a sustainable city. This transformation would have positive impacts on both tourism stakeholders and visitors alike. By embracing sustainability, Marsa Alam can effectively address pollution and prevent further deterioration. Moreover, becoming a sustainable city would create opportunities for increased investment. However, a notable challenge lies in the absence of sustainable design for Marsa Alam as a crucial coastal destination. To overcome this, active participation from tourism industry stakeholders is essential in driving the transformation towards sustainability. Additionally, the local community of Marsa Alam needs to elevate its awareness of sustainability as a global trend. Furthermore, the lack of transportation services that adhere to carrying capacity and provide environmentally-friendly options poses a potential barrier to achieving sustainability in the city's transformation process. By addressing these challenges and focusing on sustainable practices, Marsa Alam can thrive as an environmentally conscious and economically prosperous coastal destination.

### 6. Recommendations:

These recommendations are suggested under the light of the results. these recommendations provide a roadmap for transforming Marsa Alam City into a vibrant and sustainable urban center that prioritizes the wellbeing of its residents and the environment.

A) Recommendations directed to Department of Planning and the General Administration of Environmental Affairs in Red Sea Governorate and The Ministry of Housing, Utilities and Urban Communities:

1. Developing sustainable design strategies and guidelines for Marsa Alam as an important coastal destination, with a focus on reducing pollution and protecting natural resources.
2. Increasing awareness and improve education on the importance of sustainability for the local community in Marsa Alam, including residents, business owners, and tourists, to encourage the adoption of sustainable practices and behaviors.
3. Developing and implementing policies and regulations that promote sustainable development in Marsa Alam, including green buildings, sustainable land planning, and waste management practices.

B) Recommendations directed to the Ministry of Tourism and Antiquities:

1. Encouraging tourism stakeholders in Marsa Alam to adopt sustainable practices in their operations, such as reducing water and energy consumption, minimizing waste generation, and using eco-friendly products and services.
2. Increasing promotion of responsible tourism and sustainable tourism to preserve tourist destinations.
3. Providing incentives for tourism stakeholders in Marsa Alam who implement sustainable practices, such as certifications or awards.
4. Encouraging tourism stakeholders in Marsa Alam to measure and report their sustainability performance and progress regularly.

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## نحو تطبيق نموذج المدن المستدامة على مدينة مرسى علم

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### المستخلص

المدينة المستدامة هي التي تلبي احتياجات السكان الحاليين دون التأثير على قدرة الأجيال القادمة على تلبية احتياجاتهم الخاصة. يهدف هذا البحث إلى دراسة إمكانية تطبيق نموذج المدينة المستدامة على مرسى علم. بالإضافة إلى ذلك، يسلط البحث الضوء على اعتماد طريقة جديدة في بناء المدن من خلال الاعتماد على الأنظمة الصديقة للبيئة. كما يؤكد على أهمية تحويل الوجهات السياحية التقليدية إلى مدن سياحية مستدامة. استخدم هذا البحث المنهج الوصفي التحليلي، حيث تم إعداد استبيان وتوزيعه على عينة عشوائية قوامها 106 من الباحثين بجهاز شئون البيئة بمحافظة البحر الأحمر، بالإضافة إلى العاملين وصناع القرار بالإدارة العامة لشئون البيئة بديوان عام محافظة البحر الأحمر وبعض الأكاديميين. تم تحليل البيانات باستخدام الإحصاء الوصفي وتحليل ارتباط بيرسون وتحليل الانحدار عن طريق برنامج SPSS 22.0. حيث نتجت عن هذه التحليلات علاقة إيجابية معتدلة وهامة بين إمكانية تطبيق نموذج المدن المستدامة على مدينة مرسى علم والفوائد التي ستعود على مرسى علم بعد أن تتحول إلى مدينة مستدامة. ونتيجة لذلك، يوصي هذا البحث بضرورة الاهتمام بمرسى علم من منظور الاستدامة كوجهة ساحلية هامة في مصر.

### الكلمات الدالة

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النتمية السياحية المستدامة.