Sustainable Cities

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A R T I C L E I N F O	A B S T R A C T

Egyptian cities have many problems and challenges that cause to continuously decline ability to Fulfills needs their citizens, which poses a threat to the right of current and future generations, the most important of these challenges is the problems of the cultural dimension represented in the lack of awareness towards sustainable cities among citizens, stakeholders and agencies concerned management of cities, thus inability to advance cities towards sustainability, which makes Egyptian cities always late in the global rankings of sustainable cities, so it's necessary to advance them towards sustainability. the research came as a kind of awareness to raise the level of culture about the concept of sustainable cities and their principles and what are the planning actions which should be followed to reach a sustainable city and how to measure the city's sustainability, through scientific research in the various approved references and compiling this information in a paper that can be used.

1. Introduction

Since the beginning of the definition of sustainable cities in the eighties of the twentieth century, many governments and peoples have tended to achieve that term to advance their cities, but Egypt is not on the path leading to achieving sustainability in its cities, according to the ARCADIS global indicators (a global design, engineering and management consulting company), it worked statistically for the best 100 sustainable cities in the world 2018, and Cairo - which is one of the largest and most important Egyptian cities - has achieved the penultimate position in the level of achieving sustainability around the world [1], Egyptian cities suffer from a lot of problems and challenges, such as deficits in health care and social services, low levels of income and high unemployment among young people, unsustainable management of natural resources, irresponsible consumption and production,

environmental degradation and climate change issues, in addition to issues related to biodiversity and the protection of ecosystems, and the unplanned urban expansion on agricultural lands, lack of public and green spaces, and environmental pollution, Egypt is ranked among the top ten countries that most polluted in the world, it is late in many crucial goals, resulting from many reasons, the most important of them is the weak educational and cultural visions of the concept of sustainable cities, which results in weak interaction between science and politics, the absence of policies and the lack of data lead to impeding efforts overcome the challenges which faces Cities in achieving sustainability [2].

Research Problem

Is the absence of culture and awareness of sustainable cities concepts, principles, practices and

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how to reach them in the existing Egyptian cities and the agencies concerned with their administrations (city councils and various departments in the governorates' bureaus), which makes these cities suffer from many problems that lose many of quality of life standards, then it in-creases the suffering of its citizens and poses a threat to their lives in the present and the future.

Research Goal

Established and consolidate the concepts of Sustainable cities among the agencies concerned with managing the existing Egyptian cities, by identifying and clarifying aspects related to sustainable cities such as concepts, principles, dimensions, indicators, strategies and how to reach sustainable cities.

Research Methodology

The research adopts the descriptive approach, through which a comprehensive office survey is conducted in scientific references, reports, studies, research, etc. issued by Considered scientific journals, or international institutions with weight and close connection with the subject of the research, in order to reach an accurate definition of the concepts of sustainable cities and its principles, various dimensions, indications and strategies for reaching them.

2. Sustainability - Sustainable development

The concept of sustainability first appeared in a handbook of forestry published in 1713, over time; the word sustainability began to be used in terms of how humans live on the planet, Now, the most common definition of sustainability is that of sustainable development, defined by the Brundtland Commission of the United Nations in 1987: "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [3]. in 2000 the Millennium Summit of the United Nations established 8 development goals to end poverty by 2015, The MDGs were considered relatively successful But didn't go far enough, In 2012, the member states of the United Nations came together in Rio de Janeiro to create a new global agenda for sustainable development that taking three years, in 2015 they were consensus on a document called "Transforming Our World: The 2030 Agenda for

Sustainable Development, It includes the 17 Sustainable Development Goals [4].

Fig.1. Sustainable development goals, Ref [22]

3. Sustainable cities

Thinking about sustainable cities started with sustainable development in the eighties of 20th century, and by 2015 the sustainable development goals were set, which includes sustainable cities in goal 11, making cities sustainable means creating careers and business, providing safe and affordable housing, building resilient economies and societies, creating green public spaces, and improving urban planning and management in participatory and inclusive ways [5]. cities can work as a string that connects all other sustainable development goals together, since they collect economy, energy, environment, science, technology and social together [6].

3.1. Definitions of sustainable cities

There is no fixed definition of a sustainable city, the definition of a sustainable city came as: a city that improves the quality of life for citizens, including environmental, cultural, social, economic, political

and institutional aspects, without leaving a burden on future generations [7], Sustainable cities be as a places planned and managed with consideration for economic, social, environmental impact, providing a resilient habitat for existing populations, without compromising the ability of future generations to experience the same [1], a city that improves its quality of life, improves access to services and opportunities, be socially inclusive, economically productive, and environmentally livable [8].

3.2. Sustainable cities goals

The goal of sustainable cities is to overcome the challenges facing cities in ways that allow them to continue to prosper and grow, that everyone has access to adequate, safe, affordable housing and basic services, with access to safe, affordable and sustainable transportation systems, and access to safe green and public spaces especially for women, Children, the elderly and people with disabilities, also protecting and preserving cultural heritage, ecosystems and biological diversity in the city, reducing the environmental impacts of cities and the negative impacts of natural disasters, efficiently using resources, reducing pollution and mitigating the effects of climate change.[5]

3.3. Pillars of access to sustainable cities

The Cities increasingly demands more sustainable ways of living, urban governance entails the fostering of environmental management and urban planning, which includes the decentralization of decision-making, the reduction of ecological footprints, Resource Management, and policy coordination between national and local authorities. In this context, achieving the sustainability of cities can be conceived as entailing the integration of four pillars: environmental management, economic development, social development, and urban governance.so addressing social, economic, environmental and governance issues was integral to the creation of sustainable cities, and that the inability to address those issues would prevent the achievement of that.[8]

Table 1. Pillars for achieving sustainability of cities, Ref [9]

Social development	• Education and health • Food and nutrition • Green housing and buildings • Water and sanitation • Green public transportation • Green energy access • Recreation areas and community support
Economic development	• Green productive growth • Creation of decent employment • Production and distribution of renewable energy • Technology and innovation (R&D
Environmental management	• Forest and soil management • Waste and recycling management • Energy efficiency • Water management • Air quality conservation • Adaptation to and mitigation of climate change
Urban governance	• Planning and decentralization • Reduction of inequities • Strengthening of civil and political rights • Support of local, national, regional and global links

3.4. Properties of sustainable cities

European Union (2010) has stated Properties that make cities attractive and sustainable. These Properties have been putted in four categories including, Clean and healthy, Efficient and sustainable, Green and pleasant, Well-managed and democratic.

Table 2.Properties of sustainable cities, Ref [23]

• **Clean and healthy** - Safe water to drink - Clean air to breathe - Collection and disposal of solid waste - Toxic free	• **Green and pleasant** - Green urban areas - Biodiversity friendly - Quiet places - Respect for urban heritage - Sustainable land use
• **Efficient and sustainable** - Resource efficiency - Energy efficiency - Green mobility - Local actions on climate change - Technological innovations and green jobs	• **Well-managed and democratic** - Integrated Environmental Management Systems - Green public procurement - Participatory urban planning - Assessing environmental impacts - Tracking progress

3.5. Advantages of sustainable cities

Sustainable cities use renewable energy that helps create healthy and livable environments while

reducing the environmental footprint through energy efficiency and reducing the use and impact of fossil fuels, and working to reduce environmental pollution, disposing of waste in a healthy and safe ways (solid waste and wastewater), rationalizing the consumption of materials and resources by re-using and recycling waste as productive inputs, also they preserve biodiversity and ecosystems and seek to locally self-sufficiency in food, materials and energy, which reduces the economic burden of the city and connects the community with the local environment and the city's heritage and culture, and work on effective land use, prevent of mixed use of them, eliminate of slums, and set limits for the urban mass to save agricultural lands.[9]

4. Sustainable Cities Indicators

Sustainable Cities Indicators is an assessment of cities and consideration of their vitality as living spaces and environmental impact. these indicators allow for find out of problems and pressures, and determining the Fields that the city can benefit from it to addressing them, they also allow cities to monitor the success and impact of sustainability interventions. Based on three dimensions of sustainability (social - environmental - economic), myriad of indicator tools have been advanced and tested in real cities by various organizations and research groups.[7]

Table 3. Sustainable Cities International's Indicators for Sustainability list, Ref [7]

Sector	Indicator	Measures
Economy	Unemployment rates/ Jobs	• employment, Underemployment, unemployment rates • Percentage of green jobs in the local economy • Average professional and education years of Laboure force
	Economic growth	• Annual GDP growth rate and Annual GNP growth rate • Net Export Growth rates • Foreign Direct Investments
Environment	Green spaces	• Percentage of reservoirs, waterways, parks in relation to total land area • Percentage of trees in the city in relation to city area and/or population size
	Reduce greenhouse gases/ Energy efficiency	• Total amount of GHG emissions per city and per capita • Percentage of total energy consumed in the city that comes from renewable sources
	Mobility	• Percentage of each mode of transportation, private, public, bicycles, pedestrians • Average commute time and cost
	Water quality/ Availability	• Proportion of population with access to adequate and safe drinking water • Total amount of water availability • Water quality score
	Air quality	• The average level of pollutants
	Waste/ Reuse/ Recycle	• Recycling rate • Volume of solid waste generated
Social	Complete neighborhood/ Compact city	• Access to local services within a short distance • Crime rates • Measures of income distribution and inequality
	Housing	• Percentage of social housing • Breakdown of housing sector by property type
	Quality public space	• Percentage of roadways in good condition • Percentage of green space in relation to city area and/or population size
	Education	• Number of schools with environmental education programs • Adult literacy rate
	Sanitation	• Percentage of population with access to sewage infrastructure
	Health	• Mortality rate/ Life expectancy • Percentage of population with access to health care services

5. Planning Actions Toward Sustainable cities

Actions is how the four pillars can be employed as a framework to systematically generate a comprehensive strategy of specific planning actions toward sustainability. The four pillars are applied to a range of areas as land use, housing & building, transportation, open space and recreation, economic development, infrastructure, watershed planning, floodplain management, and planning processes and education. Actions will vary from community to community and region to region, so; the most useful planning is generating a planning and policy agenda toward sustainability by the community itself, using the four pillars, as a framework in a participatory planning process.[10]

5.1. Land use

Adopting city-wide land management strategies in line with social and environmental development as well as economic development, ensuring access to social and green spaces at affordable prices, and sustainable use of land, with developing slums and degraded areas, eliminating human or natural Encroachments on agricultural lands, and respect for ecosystems and biological diversity.[11]

5.2. Transport and mobility

Transport and mobility play an important role in connecting people to goods, services, and enhance social & economic growth, and in fostering sustainable development for cities. Sustainable transport achieves better integration of the economy which respecting the environment, and improving social equity, health, and, Flexibility of moving between cities, through Safe, clean, convenient, time- and energy-efficient, and affordable transport for all people.[12]

5.3. Housing and Building

Availability of housing for all income groups, Provision of housing near places of employment, use renewable energy sources at cooking, heating and cooling, Reduction of waste and recycling of building construction waste materials, using ecological low-energy and affordable building materials, houses be Healthy, durable, safe, secure, and well connected to jobs, shops, health and child care, education and other services.[13]

5.4. Economic Development

Promote inclusive and sustainable economic growth, development policies that support productive activities, full and productive employment, sustain per capita economic growth and domestic product growth per annum, create decent job for all, and Protect labor rights and promote safe and secure working environments for all workers.[14]

5.5. Open & Green Space

provide enough green and open spaces, that safe and accessible, in particular for children and women, older persons and persons with disabilities [5]. Preservation of wilderness and biological diversity of area ecosystems [15].

5.6. Infrastructure

Create quality sanitation infrastructure and regional infrastructure to support economic and social development, with equitable, safe and affordable access for all people.[16]

5.7. Floodplain Management

Guiding development away from barrier beaches and floodplains, restoring and Preserving wetlands along rivers for natural flood control.[13]

5.8. Watershed Management

Achieve universal and equitable access to safe, clean and affordable drinking water for all people, improve water quality by reducing pollution, implement integrated water resources management, protect and restore water-related ecosystems, including wetlands, rivers, aquifers and lakes, support water and sanitation related activities and programs, including water efficiency, water harvesting, desalination, recycling and reuse technologies, wastewater treatment, and Support the participation of local communities in improving water and sanitation management.[17]

5.9. Resource Conservation

Reducing the use of fossil fuels, Encouraging and developing renewable energy sources and ensure easy access to it affordable [18]. Work on recycling solid waste and Encourage Purchasing Products Made from Recycled Materials [19]. Developing local farms that reduce the need for long-range transport of food, conserving soil biodiversity, preservation and planting trees and other vegetation that absorb carbon dioxide and air pollutants [20]. Rational water use, using recycled water from wastewater and rain water for fields not-potable, as Irrigation for agriculture [21].

5.10. Planning Processes

Establish strategies that develop the city, striving for carbon-neutral city, improving eco-efficiency, saving materials and resources, provision services energy-efficient, developing sustainable transport in order to reduce the adverse environmental impacts, expand renewable sources of energy and local food, and enabled local community participate in the prioritization of urban development projects.[8]

Some cities have succeeded in achieving sustainability by applying these measures in line with their surrounding environment, such as Frankfurt and Hong Kong, which were ranked among the first sustainable cities around the world after the many obstacles and problems they were experiencing, so it is not difficult to apply these measures to Egyptian cities already existing to reach sustainability.

Fig.2. Actions Toward Sustainable cities, Ref [researcher]

6. Results

many cities in the world seek to reach to sustainability since the beginning of that term, but the existing Egyptian cities are far from that, as evidenced in the United Nations reports and the global rankings of sustainable cities, as Egypt always ranks first terms of problems and the last ranks in terms of the level of sustainability, this is due to many reasons, the most important of them is the lack of cultural awareness of the concept of sustainable cities, which the focus of the research revolved around and came as a starting point for making a simple summary of what the world reached about sustainable cities and how to reach them, the sustainable city is a city that manages resources well to Fulfill the needs of its current citizens without harm the right of future generations to it, taking into account its environmental impact, and from that it was adopted four basic pillars: - Environmental, social, economic and urban governance, which includes many sub-pillars through which extracted number of measures to reach a sustainable city: - land use, housing and building, Transportation and mobility, open and green spaces, economic development, infrastructure, watershed management, floodplain management, resource conservation and planning processes, and then the city's sustainability can be measured through a number of measurement items that fall under three main indicators: - society, economy and environment.

7. Recommendations

In light of the above, the research recommends the following:
- Reconsidering the role of learning and teaching to raise intellectual awareness and increase knowledge and culture for sustainable cities and the imperative need for Egyptian cities to reach them to achieve actual change through: -
  o Inclusion of sustainability principles and sustainable city strategies in the school curricula for all ages.
  o Establishing media awareness campaigns with simple content to raise the awareness of all layers of the intellectual community.
  o Conducting cultural seminars and distributing free booklets to citizens.

o Training of stakeholders and responsible authorities to enable them to use the principles of sustainability in their development decisions.

- Requiring every work authority to adopt special cultural seminars for its workers to raise their intellectual level.
- Promote the development of integrated policies to combine the three dimensions of sustainability (environmental - socio-economic).
- Work to collect high-quality data that helps to develop sound plans for procedures to reach sustainable cities.
- Make data publicly available and allow youth and the rising generation to participate in the development planning process.

References

[1] ARCADIS, Citizen Centric Cities - Sustainable Cities Index 2018, PDF, p (8,11).
[2] United Nations Economic and Social Commission for Western Asia, Arab Report for Sustainable Development 2020.
[3] The World Energy Foundation, A Brief History of Sustainability,2014, in the website: - https://theworldenergyfoundation.org/a-brief-history-of-sustainability/ , Visited on 15/1/2020.
[4] 17 Goals, the story behind the goals, in the website: - http://17goals.org/the-story-behind-the-goals/, Visited on 15/1/2020.
[5] UNDP, Sustainable Development Goals - Goal 11: Sustainable cities and communities, in the website: https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-11-sustainable-cities-and-communities.htm , Visited in 8/4/2020.
[6] UN-HABITAT, Flagship programme 5, Sustainable Development Goals cities, PDF, p (1).
[7] European Commission, Science for Environment Policy, In-depth report: Indicators for Sustainable Cities, November 2015 (revised March 2018), PDF, p (5,7,17).
[8] UN-HABITAT, planning sustainable cities: policy directions, 2009, PDF, P (27,82,55,67).
[9] Department of Economic and Social Affairs, World Economic and Social Survey 2013 - Sustainable Development Challenges, United Nations, New York, January 2013 PDF, p (62).
[10] American Planning Association, Policy Guide on Planning for Sustainability, New York, April 2000, pdf, p (8,13).
[11] United Nations, Arab Report for Sustainable Development 2020, PDF, p (150-194).
[12] United Nation, Global mobility report 2017, PDF, P (24).
[13] G.Oleg; B.Anna, Sustainable Housing for Sustainable Cities: A Policy Framework for Developing Countries, UN-Habitat, 2012, PDF, P (9).
[14] UNDP, Sustainable Development Goals, Goal 8: Decent work and economic growth, in the website: - https://www.un.org/sustainabledevelopment/economic-growth/, Visited on 10/1/2020.
[15] UNDP, The Future We Want Biodiversity and Ecosystems - Driving Sustainable Development Biodiversity and Ecosystems Global Framework 2012-2020, PDF, P (16).
[16] UNDP, Sustainable Development Goals, Goal 9: Industry, innovation, infrastructure, in the website: - https://www.sdgfund.org/goal-9-industry-innovation-infrastructure, Visited on 12/1/2020.
[17] UNDP, Sustainable Development Goals, Goal 6: Clean water and sanitation, in the website: - https://www.sdgfund.org/goal-6-clean-water-and-sanitation, Visited on 12/1/2020.
[18] UNDP, Sustainable Development Goals, Goal 7: Affordable and clean energy, in the website: - https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-7-affordable-and-clean-energy.html, Visited on 12/1/2020.
[19] UN EPA, Recycling Basics, in the website: - https://www.epa.gov/recycle/recycling-basics ,Visited on 15/1/2020.
[20] IUCN, Common Ground, 2020, PDF, P (22,50,53,).
[21] United States, EPA, Basic Information about Water Reuse, in the website: - https://www.epa.gov/waterreuse/basic-information-about-water-reuse#main-content , Visited on 20/1/2020.
[22] UNDP, Sustainable development goals, in the website: https://www.undp.org/content/undp/en/home/sustainable-development-goals.html
[23] European Union, making our cities attractive and sustainable: How the EU contributes to improving the urban environment, 2010. PDF, p (10-26).