



البحوث الثمانية المقدمة للفحص

البحث الخامس

Shoroq Adel, Ahmed H. Aboulsaadat, Walaa A. Nour, "A Comparative Study of Green Urban Planning as an Approach for Urban Sustainability", Journal of Engineering Research, Vol. (9) – Issue (2) - June 2025.



2025

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Recommended Citation

Ali, shoroq Adel; nour, walaa ahmed prof; and Aboulsaadat, Ahmed H. (2025) "A Comparative Study of Green Urban Planning as an Approach for Urban Sustainability," *Journal of Engineering Research*: Vol. 9: Iss. 2, Article 15.

DOI: <https://doi.org/10.70259/engJER.2025.921953>

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Cover Page Footnote

The author would like to acknowledge the support and valuable assistance of Prof. Dr. Walaa Ahmed Nour, As well as the assistance of Dr. Ahmad Aboulsaadat for his guidance throughout the duration of my research. Conflicts of Interest: The authors declare that they have no conflict of interest.



A Comparative Study of Green Urban Planning as an Approach for Urban Sustainability

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Abstract-The world's cities deal with numerous issues brought on by rapid and bad urban planning, which leading to issues that weren't just urban planning problems but also had an impact on the environment, society, and the economy. As a result, new types of urban planning have developed including sustainable urban planning and green urban planning, which is reflected in the basic components of enhancing the individuals wellbeing without compromising the environmental aspect. Furthermore, this study discusses the identification and the latest trends of urban planning. Then, the study presented the concept of green urban planning and sustainable urban planning. As well as, the difference between sustainable and green cities. In addition, this study will analyze and compare some examples based on the specific criteria for green and sustainable urban planning. In order to determine the extent of urban planning's impact on the basic principles of improving quality of life and the degree to which these cities apply these criteria. As a result, the analytical comparison study indicated the significance of sustainable urban planning in solving the problems that affected current society in terms of all its needs, whether in terms of nature, resources or space, and the share of future generations. Also, planners should use these indicators as a base for any new cities they plan to reduce difficulties.

Keywords: urban planning, modern trends of urban planning, sustainability, urban sustainability indicators.

Research problem

This research problem addresses the need to understand and promote sustainable and environmentally friendly urban development through effective urban planning strategies. the research problem becomes more comprehensive, providing a holistic understanding of urban planning challenges and opportunities in the context of green and sustainable development.

Research objectives

The main objective of the research can be expressed as follows:

- 1) To identify current practices and trends in urban planning, including advancements, challenges, and emerging paradigms.
- 2) To define and conceptualize green urban planning and urban sustainability, elucidating their principles, objectives, and implementation strategies.
- 3) To examine the integration of green principles and sustainability practices into urban planning processes, with a focus on promoting environmentally friendly development, resource efficiency, and resilience.
- 4) To conduct analytical studies of three selected cities, evaluating their urban planning strategies, policies, and outcomes related to green and sustainable development.
- 5) To compare and contrast the urban planning approaches of the three selected cities, analyzing similarities, differences, strengths, and weaknesses in their implementation of green and sustainable urban planning initiatives.

Research Methodology:

The research methodology relies on three basic axes, namely the theoretical, analytical, and Conclusions and Recommendations.

1) Theoretical method: Where research is divided into:

- Provide an overview of urban planning and the emerging concept of green urban planning, Explore the specific concerns addressed in conventional urban planning practices, resent and analyze contemporary trends in urban planning
- Introduce the concept of green urban planning, including its definition, characteristics, and principles and identify and explain key indicators used to evaluate the success of green urban planning efforts.
- Define urban sustainability and its relevance to contemporary urbanization, Explore the three pillars of sustainable urbanization, propose a framework for developing a performance index to assess urban sustainability,
- Identify and elaborate on indicators used to evaluate the sustainability of urban areas, conduct a comparative analysis of cities embracing green urban planning and those adhering to sustainable urban planning.

2) Analytical method: Described in chapter three and containing the following study:

- Analyzing samples of projects that applied sustainable urban planning based on the criteria identified in the theoretical section.
- Making use of theoretical and analytical results to Present the findings and outcomes resulting from the comparative analysis.



3) Conclusions and Recommendations.

I. INTRODUCTION

The world is urbanizing, and this trend is expected to continue in the years to come. About 2% of the global populace resided in cities in 1800; however, by 1900, that figure had increased to 14%, 29% in 1950, 47% in 2000, and over 50% in 2008 [1]. Predictions indicate that 70% of people on Earth will live in cities by 2050, and that number will rise to 100% by 2092. Although socioeconomic advancement is sometimes linked to urbanization, a number of environmental problems have also been brought about by it [2].

Literature Review

Urban planning emerged in response to the challenges posed by urban growth during the industrial revolution. The introduction of urban planning in the 19th century led to densely populated areas with poor infrastructure networks, causing issues with public health, mobility, and natural place distribution. Urban planning is a state intervention in a private sector-controlled development process, aimed at managing land-use and environmental change [3].

A. The Definitions of Urban Planning

Table I. Urban Planning Definitions

Definition
American Planning Association (APA): "Urban planning is a dynamic profession aimed at enhancing people's welfare and communities by creating more convenient, equitable, healthful, efficient, and attractive places for present and future generations" [4].
United Nations Human Settlements Programme (UN-Habitat): "Urban planning is a method used to manage the built environment, which includes public spaces, housing, transportation, and infrastructure, with the goal of enhancing sustainable development and improving the quality of living in cities and communities" [5].
International Federation of Housing and Planning (IFHP): "Urban planning is the act of arranging and modifying an urban area's physical, social, and economic features to accommodate all of the needs of its people while encouraging environmentally responsible growth and development" [6].
World Bank: "Urban planning involves making decisions about land use, infrastructure investment, and development legislation to create sustainable, inclusive, and resilient cities that provide opportunities for all residents" [7].

From the previous descriptions, we can infer that the definition of urban planning is as follows: Urban planning is a holistic vision of future urban life, integrating political, economic, social, and environmental considerations to address challenges such as housing and transportation. This

process involves determining the development of land within a city, including both public and private usage, with detailed consideration for public projects and facilities.

B. The Modern Trends of Urban Planning

Facilities for living are getting worse and environmental problems are a result of technological advancement and urbanization. New ideas in urban planning have emerged as a result, emphasizing the use of contemporary technology, environmental preservation techniques, and city preparation [8], such as:

1) *Smart city*: is one that enhances its livability, workability, and long-term viability through the use of information and communications technology (ICT) [9]. City monitoring and integrating critical infrastructures, such as roads, bridges, and buildings, allows for better resource allocation, preventive maintenance, and security monitoring, thereby maximizing citizen services [10].

2) *Sustainable city*: The Brundtland Commission report (1987) significantly influenced the concept of a sustainable city, which became the most popular term for future urban development after 1950 [11]. A sustainable city should focus on social, economic, environmental, and urban governance to minimize ecological footprints [12].

3) *Digital Cities*: In the late 1990s, "digital cities" was the second most common term in publications, referring to rapidly developing information and telecommunication technology and vast data. The European Commission established the "European Digital Cities" initiative from 1996 to 1999 [13]. However, since 2009, the term "smart cities" has taken over, covering sustainability, social inclusion, and the evolving nature of internet technologies [14].

4) *Eco-cities*: Eco-city refers to environmentally conscious cities, promoting the elimination of carbon waste, renewable energy generation, and a sync with nature. Urban Ecology, a California-based group, gained prominence in the mid-90s. Since 2011, eco-city has gained attention as cities compete for high-quality living conditions. Sustainable innovative initiatives, such as those in Abu Dhabi and China, have been presented [13].

5) *Green cities*: The Green City Concept is a recent approach to urban planning aimed at addressing issues caused by dispersed growth and promoting sustainable, less dispersed, and livable cities [15]. The concept has progressed from its origins in the urban parks movement of the late 19th and early 20th centuries toward a development-driven approach to urban greening [16]. The concept focuses on improving the long-term viability of urban regions through ecological services provided by green infrastructure. It includes city meeting nature, restoring urban ecosystem values, limiting resource and energy use, and utilizing blue-green natural components [17]. Green infrastructure protects and restores



natural ecosystems, improves air and water conditions, and encourages commercialization for urban revitalization and smart growth policies [18].

6) *Compact cities*: The concept of a compact city, developed by George Danzig and Thomas L. Saaty in 1973, emerged in the 1980s and 1990s as a response to postwar urban planning that negatively impacted communities' economic, environmental, and sociocultural aspects. Criteria for a compact city include a minimum density of 40 to 80 residential units per net hectare, land use multi-functionality, residential projects in nodes containing housing, jobs, and daily necessities, harmony between spatial organization and public transportation, and a goal to reduce car travel time [19]. However, the concept is still promoted, as higher density may contribute to economic viability and social sustainability, but it may also lead to overpopulation, reduced open space, increased traffic, and pollution [20].

C. Green Urban Planning Definition

"Green urbanism" emerged in the early 1990s, originating from pioneering urban thinkers' original writings. Although there is no universally accepted definition, it shares common beliefs and ontological assumptions among different theorists. Green urbanism, for instance, is described by Lehmann as "a conceptual model for zero-emission and zero-waste urban design." encouraging densely populated areas that are energy-efficient, working to rebuild the post-industrial city Centre and change and restructure current city districts, encourages the growth of city districts that are sustainable in terms of both social and environmental aspects" [21]. Green urbanism is characterized by the following characteristics in cities:

- 1) Green urbanism emphasizes respecting ecological boundaries, minimizing ecological footprints, and acknowledging the interconnectedness of cities and the earth.
- 2) It challenges the traditional view of cities and nature as polar opposites, advocating for a balance between urban ecology and nature.
- 3) Green urbanism encourages waste reduction and balancing of city's Eco-cycles to harmonize inputs and outputs.
- 4) Cities striving for self-sufficiency utilize local and regional resources, requiring communities to take responsibility for their lifestyle choices' environmental impact.
- 5) Green cities should facilitate walking or cycling, extending beyond environmental benefits.
- 6) Green urbanism focuses on creating emotionally uplifting, aesthetically inspirational, and livable cities, recognizing the importance of nature in human health and well-being.

D. Sustainable Urban Planning Definition

The theory of sustainability [22] helped to balance urban development, social justice, economic growth, and environmental preservation in the 1990s (see fig.1). It also cleared the way for the emergence of other ideas, which are still relevant today and are at the core of the discussion about how city designs, natural resource use, energy, and other factors affect city development [2]. These ideas include compact cities, livable cities, sustainable cities, and green urbanism. The expression "think globally, act locally" is popular among sustainability advocates, implying that a variety of local activities can have global consequences. What can a community do to support the three Es of sustainability, which are environmental quality, social justice, and economic development, as previously stated [23]?

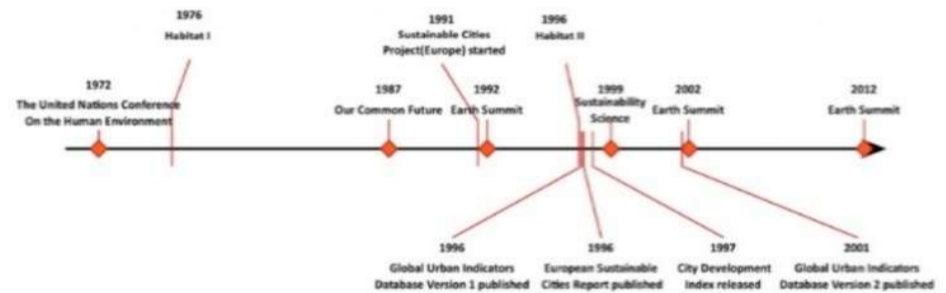


Fig.1, Timeline of significant events in the history of urban sustainable development, with six highlighted points denoting well-known sustainability landmarks [24].

Table 2. Sustainable Urban Planning Definions

Definition
Five goals that make city sustainable: "minimizing the consumption of space and natural resources; rationalizing and efficiently managing urban flows; protecting the health of the urban population; ensuring equal access to resources and services; maintaining cultural and social diversity" [25].
"Sustainable development of human settlements combines economic development, social development and environmental protection, with full respect for all human rights and fundamental freedoms, including the right to development, and offers a means of achieving a world of greater stability and peace, built on ethical and spiritual vision. Democracy, respect for human rights, transparent, representative and accountable government and administration in all sectors of society, as well as effective participation by civil society, are indispensable foundations for the realization of sustainable development"[26].
"A sustainable city is a city where achievements in social, economic, and physical development are made to last and where there is a lasting supply of the natural resources on which its development depends. Furthermore, a sustainable city maintains lasting security from environmental hazards that may threaten development achievements by allowing only for acceptable risk"[25].
Urban sustainability is "an adaptive process of facilitating and maintaining a virtual cycle between ecosystem services and human well-being through concerted [27].



So, we can conclude the definition of sustainable urban planning as a comprehensive and interdisciplinary process of designing, managing, and regulating the development of urban areas. It addresses both physical and social aspects of cities, aiming to create sustainable, equitable, and efficient urban environments. Urban planning considers factors like land use, transportation, infrastructure, housing, environmental sustainability, economic development, and social equity.

green city indices prioritize environmental sustainability by emphasizing practices such as energy efficiency, waste reduction, and green space preservation. These initiatives not only mitigate environmental degradation but also enhance the quality of life for urban residents by improving air and water quality and reducing pollution. On the other hand, sustainable city indices focus on broader aspects of sustainability, including social equity and economic viability. Overall, the comparison of these indices highlights the interconnectedness of environmental, social, and economic factors in urban development. By adopting a comprehensive approach that addresses all aspects of sustainability, cities can create vibrant, resilient, and livable environments for current and future generations.

category	indicator	Green city indices [34]	Sustainable city indices [35]	Related indices
The concept of the city		About the city, its population, area and location.		
Environmental	Energy consumption indicator	- Adapting to Climate Change. - Renewable energy. - energy efficiency	- Energy consumption. - Renewable energy consumption. - Reducing the rate of energy consumption through the use of renewable energy sources. - Self-sufficiency in local resources. - Policies for managing energy resource [23].	- Decreasing energy consumption by adopting renewable energy sources. - Achieving self-sufficiency through the utilization of local resources. - Implementing policies to effectively manage energy resources.
	Water consumption indicator	- water efficiency. - water recycling. - Preservation of aquatic habitats - Rainwater harvesting.	- Availability of households with tap water that meets WHO drinking water standard. - Percentage of capacity of city in supply water to meet average consumption. - Possibility of using freshwater from ground and surface water extracted for us. - households with access to potable water infrastructure [23].	- Ensuring homes have access to tap water that meets WHO drinking water standards. - Possibility of using freshwater from ground and surface water extracted for us or recycling water for other uses. - households with access to potable water infrastructure.
	Waste management indicator	- preventing soil erosion - reducing bacterial impacts on people and animals by cleaning the air. Zero waste (avoid, reduce, recycle, recover). - Waste recycling and recovery. - Waste reuse. - Waste reduction	- solid waste regularly collected and recycled. - practical techniques for the collecting of solid waste. - Percentage of reduction in total waste generated a year. - Waste recycling strategy. - households and industries linked to sewerage system. - Percentage of households with secured sanitation systems. - reusing or recycling building waste. - Proportion of wastewater treatment plants in the city [23].	- Solid waste is frequently collected and recycled. - methods that are realistic for gathering solid waste. - sewerage system-connected buildings and houses. - reusing or recycling building waste.
Social	Green, public	- The green spaces serve a variety of important purposes in enhancing the living environment. - Biophilic urban design. - resilient urban systems.	- The ratio of public and green spaces compared to the total area of the city. - Availability of urban parks - leisure areas in the city. - Percentage of the budget provided to maintain the cultural and natural heritage [23].	- The ratio of public and green spaces compared to the total area of the city. - Residents residing in public and green spaces.
	Urban mobility indicator or clean transportation indicator	-Transportation Mode: It depends on people's ability to walk or use alternative means such as bicycles in addition to using cars -Transportation Technology: Vehicles work with fossil fuels -Effects and Climate Change: Utilizing more ecologically friendly methods to reduce road capacity has reduced its impact on the climate - carbon neutral development.	- Percentage of population living within 10.5 km of public transport access. - Eco-friendly public transports. - Number of taxi and bus. - Usage of environmentally friendly vehicles [23]. - Pedestrian accessibility - bicycle paths network	- Public transport is located no more than 0.5 kilometers from the population. - Eco-friendly public transports. - usage environmentally friendly vehicles. - Pedestrian accessibility (both walking and bicycle paths)
	Housing quality indicator	- Designing with climate and context. - retrofitting/ usage of sustainable materials.	- Percentage of the population living in slums. - Percentage of the population spending more than 30% of their income on housing costs. - Number of low-income housing units. - Percentage of population living in owned houses. - Percentage of aging residential buildings [23]. - Using architectural elements to reduce the building's heat absorption - Architectural character of residential buildings.	- Using sustainable architectural elements to reduce the building's heat absorption. - taking context and climate into account when designing.
economic	Economic Urban Sustainability Indicator	- Partnership in green initiatives. - Attractive urban green spaces for new residents, businesses and tourists.	- Economic costs of energy consumption. - Waste disposal system costs. - Building life cycle costs. - conservation of natural resources. [1] - Economic viability. - Local economy. - Employability [34].	- The financial implications of energy usage. - Attractive urban green areas that draw in newcomers, companies, and visitors. - Employability.

E. Green Urban Planning and Urban Sustainability

The comparison of green city indices, sustainable city indices, and related indices reveals the multifaceted approach to urban development and environmental sustainability. It's essential to delve deeper into the implications and significance of these indices. For instance,

Analytical Studies

A comparison study was conducted on three cities: Masdar City, Plaine Saint-Denis, and Sheikh Zayed City, based on sustainable urban planning indicators. The study established a set of criteria to guide the selection of indicators deemed most effective for its objectives. In line

with these considerations, the indicators were selected based on their objectivity-characterized by clarity, simplicity, precision, and lack of ambiguity as well as their relevance and reproducibility. The three cities were chosen by considering factors like population and area in addition to how well they met the guidelines for sustainability.

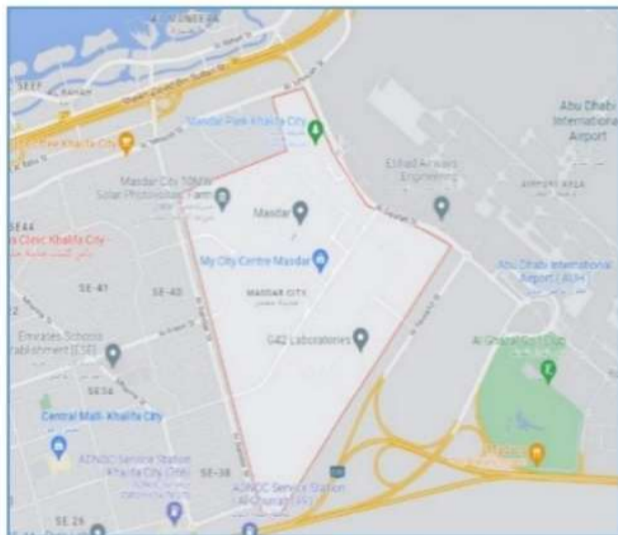
I. THE CASE STUDY OF MASDR CITY, UAE

Masdar City is one of the works of Masdar Company, which is a subsidiary of the government-owned Mubadala Development Company. It was designed by Foster and Partners in 2008 [36].

Table 3. Masdr City Profile[37]

Area	Population	Location
Masdar City's 1,483-acre plot.	40,000	It is located 17 kilometers south east of Abu Dhabi's metropolitan center(see fig.2) , within a larger population of 470,000 people

Fig.2, Masdar City - Abu Dhabi - United Arab Emirates [2021] [38].



In order to reduce the effects of the desert climate, Masdar City's architecture employs a variety of techniques. One of these techniques is to design the city and its roadways along the southeast/northwest axis (see fig.4), which decreases wall heat absorption and offers some shade at street level throughout the day [39]. The traditional Arab architecture served as inspiration for the city's design. Because of its northeast-southwest orientation, it reduces solar gain and makes use of cold winds that arise at night [40].

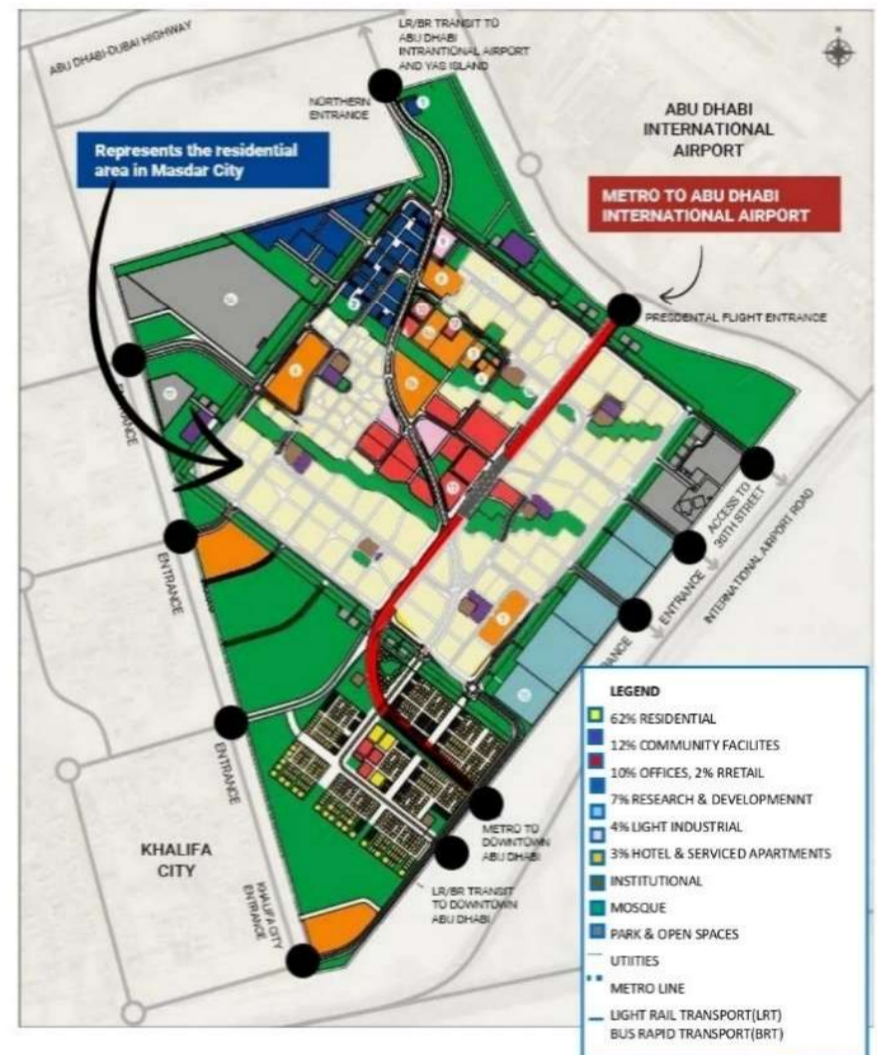


Fig.3, The master plan of land uses for Masdar[37]

A. Urban Planning

One of the world's most sustainable cities is Masdar City. Masdar City is a low-carbon city in development that combines sustainable technologies and land uses. Masdar's approach to sustainable urban development is founded on three core pillars: environmental, social, and economic sustainability. For cities looking to grow sustainably, Masdar City is a green example. It turned out so in its prevalent public and green spaces, both within and outside of buildings (see fig.3), provide comfort and help to reduce pollution. It draws companies who concentrate on the testing and promotion of sustainable energy technology and permits foreigners to own businesses and real estate there [39].



Fig.4, Masdar City's orientation [41].

B. Urban mobility or clean transportation

The mobility strategy of Masdar City is founded on a hierarchy that emphasizes pedestrians, highlights the significance of a sustainable transportation network, and

eventually includes both personal vehicles and public transportation powered by clean energy [42]. Masdar City has employed a range of technologies in its mobility initiatives. The city has built compounds that are close to essential services, making walking more environmentally friendly than driving an electric vehicle. This kind of development has contributed to the city's success. Masdar City is expected to become the first sustainable land city by relying less on fossil fuels and more on walking, bicycling, public transport and the NAVIA system (see fig.5,6) [43]. Also, Masdar City has installed the first fast charging station of its kind in the Middle East for electric car batteries (see fig.7).



Fig.5, The sustainable bus



Fig.6, The NAVIA system



Fig.7, The express personal transportation system

Masdar City's pedestrian streets are shaded and compact, making it simple for people to go around(see fig.8). Masdar is known for being a pleasant place for pedestrians to walk (see fig.9) because the temperature

outside Masdar residences will be 20 degrees Celsius lower than it is in the Emirate of Abu Dhabi.



Fig.8, Shows Masdar City's shaded, mixed-use pedestrian Fig.4, Masdar City's orientation [41].

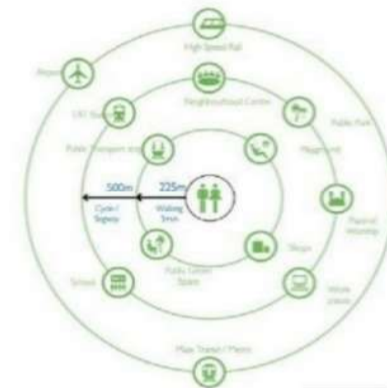


Fig.9, Indicates that pedestrian streets allow easy movement of pedestrians and easy access to the locations [45]

C.Environmental characteristics

1)Energy: Masdar City, built on a 23-foot-tall concrete base to maximize its exposure to cold winds and minimize the need for air conditioning. will have 70% less energy needs than a typical city, powered by solar, wind, and thermal energy underground (see fig.10).

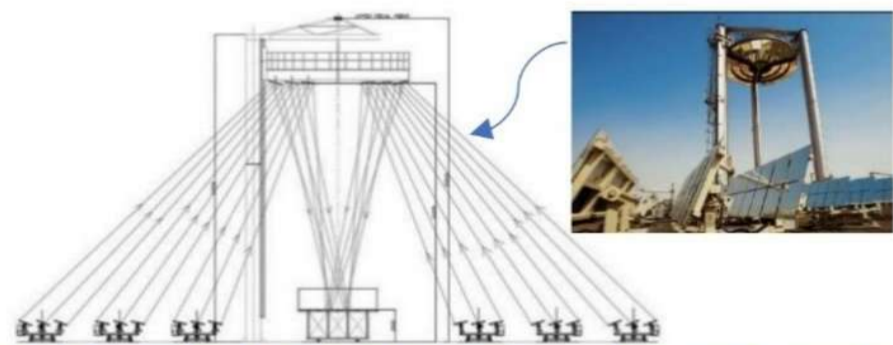


Fig.4, Masdar Fig. 10, One notable application of renewable energy is the Beam-Down Solar project, a collaborative effort between the Masdar Institute, Japan's Cosmo Oil Company, and the Tokyo Institute of Technology [46].

2)Water:The city will reduce water usage by 60% using desalination plants and solar electricity, with 80% of water recycled, utilizing grey water recycling and low consumption plants.

3) Waste management: The city implemented a water desalination program using renewable energy, saving \$500 on energy costs. Waste management uses vacuum technologies, with some waste recycled or burned for power . Composting bio-waste improves farmland outside

the city. These sustainable practices reduce carbon dioxide emissions [46].

D. Building

Masdar City's buildings must achieve LEED Gold classification, using low carbon cement, recycled aluminum, and 40% water and energy reduction, aiming to achieve a "3 pearls" sustainability rating. Masdar City is a hub for investment, education, and environmental sustainability, serving as a test model for modern technology and renewable energy. Utilizing architectural features in facade design to reduce solar absorption and minimize direct radiation, resulting in decreased energy consumption (see fig.11).



Fig. 11, The Masdar Institute of Science and Technology

E. Economic urban sustainability

Masdar City's development strategy aims to diversify the local economy by introducing sustainability and alternative energy sectors. The Masdar Institute provides high-quality education through post-graduate programs, enabling students to compete for jobs in renewable energy and sustainable development, a rapidly growing sector in Masdar City [47].

I. THE CASE STUDY OF PLAINE SAINT-DENIS CITY, PARIS

Plaine Saint-Denis, a major industrial zone in Europe, provided 50,000 jobs in 1940. It attracted workers from France, Spain, Italy, and North Africa, attracting a strong working-class character.

Table4. Plaine Saint-Denis city profile[48].

Area	Population	Location
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in an area of more than 3064.107 acre plot	with an estimated population of 111.354 in 2008. The population density is 21,350 people per square mile.	Plaine Saint-Denis is situated immediately south of the historic cathedral city of Saint-Denis, renowned as the burial site of French kings, and to the north of Paris (see Fig. 12).
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Fig. 12, The Area In The Regional Context[48].

In the 1970s, a severe economic and social crisis impacted the Plaine region, with manufacturing companies shutting down or moving abroad, exposing their downfalls [49] Unhealthy environment, Low level of infrastructure, facing declining populations, low-income households, and poor living conditions.

The story of integrated regeneration involves integrating social, economic, transportation, housing, and public space aspects at various scales, including long-term regional, 10-year city, and area-based planning.

A. Urban Planning

In 1992, Hippodamos 93 authorized the Urban Project for Plaine Saint Denis, aiming to enhance the area's assets and create conditions for change through a grid of public spaces and 28-meter-wide multipurpose avenues.

To facilitate the long-term transition of a single-use area into a mixed-use district, the project prioritized the preservation and enhancement of the city's stable and vital components, including public spaces and significant landmarks. The initiative was grounded in principles of social integration, urban diversity, and functional mix. Its goal was to support the continuation and expansion of beneficial activities rather than their cessation. Key sites identified for substantial public engagement in the short to medium term included the Plaine center, the Canal side, the main thoroughfare (Wilson Avenue), and the gateways of Porte de Paris, Porte de la Chapelle, and Porte d'Aubervilliers, all targeted for environmental

improvements. The adaptive reuse of industrial buildings was recognized as a valuable asset for future development. The Urban Project set both qualitative and quantitative targets, aiming to increase housing stock by 10,000 units beyond the existing 4,000 and to generate 23,000 new jobs in addition to the current 27,000 by 2015 [50].

Fig. 13, The Master Plan Of Land Uses For Plaine Saint-Denis City[48].



B. Urban mobility or clean transportation

One of the city's challenges was the A1 motorway, which linked the city to Paris but limited east-west connectivity. As a result, The Stade de France in Paris was placed in the Plaine in 1993 after discussions with the municipality of Saint-Denis. The Urban Project, supported by local authorities, aimed to expedite the project's implementation by enhancing public transportation, creating large pedestrian public spaces, and constructing public gardens (see fig. 14). The project aimed to restore the industry by opening up the canal, highway, and railway line, promoting the blending of various urban activities (see fig. 15). Networks covering the area include Metro line 12, RER Line B, train station, and tramway (see figure 9). The canal's accessibility will be improved by building a new Pierre Larousse crossing, creating routes for people with special needs, and enhancing the moveable bridge [51].

Fig. 14, It represents a section of road A1 which shows vegetation, It has allowed for additional public space to be recreated allocated to residents and employees section.



Fig. 15, . Public transport network plan

C. Environmental characteristics

The Territorial Coherence Scheme (SCOT) is a legally mandated document by Plaine Commune, focusing on sustainable development, environmental protection, and resource preservation, extending beyond current projects and encompassing the community's vision. Plaine Commune is integrating urban ecology into its policies and programs to address 21st-century issues. In 2021, the Commune will collaborate on Fabriques d'Avenirs projects, aiming to improve processes and expand the network of actors involved in ecological and solidarity-based transitions [52].

The subjects of the projects are:

1) *Energy*: Increasing the use of bicycles with innovative concepts, major initiatives to promote physical activity, such as the Walking and Cycling Guidelines and the tracking of projects to expand the public transport system, support for the construction of a large and ambitious heating network that is powered by more than 50% renewable energy sources.

2) *Water*: The conservation of urban agriculture, biodiversity, and environment in cities.

3) *Waste*: cleaning up the city, reduction in waste, pollution, and annoyances.

D. Building

Restructuring buildings while protecting the environment is one of the strategies employed by the city of Saint-Denis. This includes:

1)The introduction of the urban metabolism strategy, which aims to encourage the reuse of building materials and so lower greenhouse gas emissions in the area (see fig. 16).

2)Support for households in thermal renovation by the local energy and climate agency, and home renovation operations.



Fig. 16, South of La Plaine by Icade, a former warehouse sector has undergone new construction (left). new communal rental housing in the Montjoie neighborhood, centered on a plaza (right) [53].

E. Economic urban sustainability

The city was originally an industrial city providing numerous job opportunities and hosting a large workforce, and it continues to do so.

II. THE CASE STUDY OF SHEIKH ZAYED CITY, EGYPT

The city of Sheikh Zayed was officially established by Republican Decree No. 523 in 1995 [52]. It is one of the newly developed towns located on the outskirts of Greater Cairo and is part of the ENC (Emerging New Communities), typically situated beyond the traditional population centers and away from the limited agricultural land corridor. [54].

Table5. Sheikh Zayed City profile[48].

Area	Population	Location
Sheikh Zayed City's 21.28 thousand acres plot of these, 20.94 are urban blocks, this is after updating the city's master plan	Current: 398 thousand people, Target: 688 thousand	It is located on a hill high above sea level of 220:92 m2 and It has connections to the Cairo-Alexandria Desert Road in the north, the Dahshur

(residential - service - industrial - tourist and entertainment areas....)	people for the existing city	Road in the southwest, and The eastern extension of the 26th of July corridor. Also it is located 15 kilometers from the city center (see fig. 17)
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The road network and city of Sheikh Zayed City are oriented diagonally from northwest to southeast, with side streets having east-west to reduce heat absorption and offer shade. This strategy makes use of solar radiation theories. Housing, constituting nearly 60% of the city's total area, significantly influences social and economic diversity among its population(see fig. 18).

Fig.18, The master plan of land uses for Sheikh Zayed City



El-Sheikh Zayed City is surrounded by Cairo-Alexandria Desert Road, Dahshur Road, and the 26th of July corridor. Gated communities are designed with gradient street networks and patterns like radial, grid, circular, and cul-de-sac. Semi-circular roads parallel

residential boundaries and perimeter fences separate communities. However, streets outside gated communities are unsafe for pedestrians due to a lack of services and facilities [55].

Fig.18, The Street network width differences in and around Sheikh Zayed City [56].



El-Sheikh Zayed City is actively focusing on improving urban mobility through various transport projects, including a monorail project connecting downtown and 6th October city, a "MWASLAT MISR" bus station with park and ride services, designated bike lanes on major streets, bike sharing stations, and multi-story parking as futuristic measures [57].

Fig.19, It shows the 6th of October monorail stations, including the station at one of the entrances to Sheikh Zayed (Hyper One).



Sheikh Zayed City's street network with pedestrian pavement widths is in poor condition, with parts destroyed, bricks out of place, and metal protrusions that are unprotected during the day and dimly illuminated at night. The landscape components are not always present, lack pedestrian barriers, and are too small to serve as a canopy. The city also has the most bicycle paths, with a 7-kilometer-long path being built on AlBustan Road on the central island. Additional maintenance and improvements are needed to attract more people to walk [58]. The two projects lack traffic lights, violating traffic laws, and do not pass through commercial, service, or educational activities.

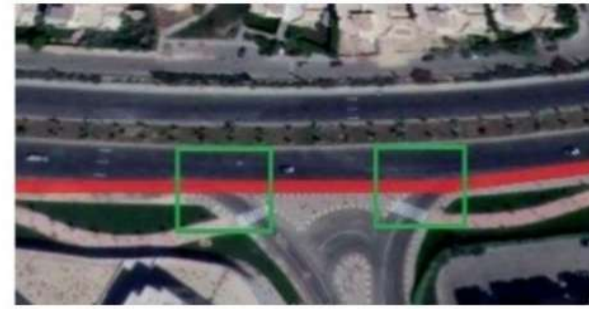


Fig.20, It shows Pedestrian and bicycle paths intersect with car traffic.



Figure21. It shows Car traffic coming and going on secondary roads intersects with the pedestrian and cycling path.

C.Environmental characteristics

1)Energy: Sheikh Zayed satellite city's average annual energy consumption is 5,811 kWh, lower than the typical German household's 7000 kWh (Braun, 2017). The goal is to phase out inefficient lighting products and make energy-efficient lighting an essential option for residential, commercial, and administrative buildings and street lighting (Ministry of Environment, 2018).. Prepaid electricity meters, or smart meters, will be installed in newly constructed residential buildings to increase user awareness of energy consumption and prevent false readings. These systems aim to rationalize energy use and reduce false readings.

2)Water: Sheikh Zayed City's water-saving strategy combines physical and biological methods for treating wastewater, using chemicals for the former and aerobic and anaerobic bacteria for the latter. Gray water is used for plant irrigation, rationalizing water consumption through sources like the Nile River or groundwater, and reducing electricity usage.

3) Waste: There is no clear and effective project to separate and recycle waste. However, there are campaigns to raise awareness of waste recycling [author].

D.Building

Sheikh Zayed's neighborhoods houses commercial, residential, educational, and religious buildings, with 85% being residential. Developed in 1996, the buildings are made of concrete, not matching downtown Cairo's materials. One of the sustainable buildings in Sheikh Zayed City is the Environmental Cultural Center (see fig. 22), which is the first green center, recycles demolition and construction waste with a solar cell system, providing energy for the building and its garden. This energy also benefits the public network of Sheikh Zayed City.



Figure 22. It shows It Sustainable Environmental Cultural Center in Sheikh Zayed

III. COMPARISON OF THE ANALYSIS OF THE THREE CITIES

Table 6. I.COMPARISON OF THE ANALYSIS OF THE THREE

category	Indicators	Related indices	Masdr city	Plaine Saint-Denis City	Sheikh Zayed City
Environmental	Energy consumption indicator	Decreasing energy consumption by adopting renewable energy sources.	Good	good	acceptable
		Achieving self-sufficiency through the utilization of local resources.	Good	good	acceptable
		Implementing policies to effectively manage energy resources.	Good	good	acceptable
	Water consumption indicator	Ensuring homes have access to tap water that meets WHO drinking water standards.	Good	good	good
		Possibility of using freshwater from	Good	good	good
	Social	Waste management indicator	ground and surface water extracted for use or recycling water for other uses.		
households with access to potable water infrastructure.			Good	good	good
Solid waste is frequently collected and recycled.			Good	good	acceptable
methods that are realistic for gathering solid waste.			Good	good	weak
sewerage system-connected buildings and houses.			Good	good	good
reusing or recycling building waste.			good	good	weak
Green, public space and heritage indicator		The proportion of public and green spaces relative to the city's total land area.	Good	good	good
		Residents living within a 0.5 km radius of accessible public and green spaces.	good	good	good
		resilient urban systems.	good	good	acceptable
		Biophilic urban design.	good	good	weak
		- Public transport is located no more than 0.5 kilometers from the population.	good	accept able	acceptable
		Urban mobility indicator or clean transportation indicator	Eco-friendly public transports.	good	weak
usage environmentally friendly vehicles.	good		accept able	weak	
Pedestrian accessibility (both walking and bicycle paths)	good		good	acceptable	
Housing quality indicator	Using sustainable architectural elements to reduce the building's heat absorption.		good	good	acceptable
	taking context and climate into	good	good	acceptable	



		account when designing.			
economic	Economic Urban Sustainability Indicator	- The financial implications of energy usage.	good	good	acceptable
		Attractive urban green areas that draw in newcomers, companies, and visitors.	good	good	acceptable
		Employability	good	good	acceptable
extra	Sustainable building		good	good	acceptable
weight	Good= It has been applied	Acceptable= It has been implemented, but it needs to be supplemented or added	Weak= It has not been applied		

VI. CONCLUSION AND FUTURE WORK

Literature covered an overview of urban planning and the emerging concept of green urban planning, Explore the specific concerns addressed in conventional urban planning practices, resent and analyze contemporary trends in urban planning. The article also Introduce the concept of green urban planning, including its definition, characteristics, and principles and identify and explain key indicators used to evaluate the success of green urban planning efforts.also Defining urban sustainability and its relevance to contemporary urbanization, Explore the three pillars of sustainable urbanization, propose a framework for developing a performance index to assess urban sustainability, Identify and elaborate on indicators used to evaluate the sustainability of urban areas, conduct a comparative analysis of cities embracing green urban planning and those adhering to sustainable urban planning.also the study analyzed samples of projects that applied sustainable urban planning based on the criteria identified in the theoretical section.Making use of theoretical and analytical results to Present the findings and outcomes resulting from the comparative analysis.Based on previous studies future aspects recom-mendations will be:

- 1) Develop comprehensive urban plans that consider sustainable land use, transportation, and infrastructure to create compact, efficient, and wellconnected urban spaces.
- 2) Invest in and promote public transportation systems to reduce reliance on private vehicles, alleviate traffic congestion, and decrease air pollution.
- 3) Develop and maintain safe and accessible cycling and pedestrian infrastructure to encourage active transportation and reduce carbon emissions.

4) Adopting renewable energy sources, including solar and wind power, to mitigate greenhouse gas emissions and strengthen energy resilience.

5) Implement and enforce energy-efficient building codes and standards to promote sustainable construction and reduce energy consumption in buildings.

6) Implement comprehensive waste management strategies encompassing recycling programs, waste minimization efforts, and initiatives promoting circular economy principles.

7) Preserve and enhance green spaces, parks, and urban biodiversity. Incorporate green infrastructure in urban planning to mitigate heat islands and improve air quality.

8) Implement water-efficient technologies, promote water conservation practices, and invest in sustainable water management to address water scarcity issues.

9)Develop affordable and inclusive housing policies to address social inequality and promote a diverse and resilient urban community.

Acknowledgment

The author would like to acknowledge the support and valuable assistance of Prof. Dr. Walaa Ahmed Nour,. As well as the assistance of Dr. Ahmad AbouIsaadat for his guidance throughout the duration of my research.

Conflicts of Interest: The authors declare that they have no conflict of interest.

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