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Achieving Sustainability in Smart Cities & Its Impact on Citizen

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ABSTRACT

Life became digitalized and smartly controlled that requiring more energy usage. Smart cities and urbanization focus on the challenge of worldwide urbanization through the recognition of opportunities to integrate social, physical, environmental and technological infrastructure. Urbanization expand the need of all services including water, power, transportation, as well as other facilities. All those infrastructures should be delivered to citizen within a short period of time with very well controlled systems to provide more simple and comfortable life. Furthermore, stakeholders and citizens should be responsible and cooperative with government and organizations in order to achieve better solution for smart sustainable living approach. Although the smart urbanization can become a positive transformative force for different sustainable development aspects in cities, there is a lack of knowledge using the smart and sustainable concepts in cities. Therefore, this paper aims to propose a framework which merges the sustainable aspects with the Smart city components. The paper started by an analytical study about smart cities fields and their needs, then a study for sustainability aspects, all this end with a framework tested by a questionnaire to propose guidelines and recommendations to be followed by city planners in order to achieve sustainability goals in smart cities for better impact on citizens.

1. INTRODUCTION

By 2050, the citizens in urban communities around the globe is estimated to develop from 3.3 billion to 5 billion individuals. With this rapid growth and fast life demands, people started to search for better and easier place to live in. They tend for a comfortable city that contains all type of technologies to help them achieving their jobs and duties. Also, they are seeking quitter roads, more open green and safe areas where they can have some time with their families to relief stress, looking for digital house that can respond remotely and facilitate their duties during the day and many more options to achieve more in less time with the respect of physical and mental health [1]. In addition, urban communities are facing difficulties in some fields; environmental change, population growth, transportation issues and other majors affecting the individuals' quality of life [2]. In order to serve and improve the new lifestyle of developing urban communities, it is important to create smart and sustainable urban areas. Therefore, there is an urgent necessity to improve the new lifestyle in urban communities to create smart and sustainable urban areas.

Although, the concept of a smart city is widely used, there are very limited specialists that adopt this idea to create innovative sustainable smart cities [3]. According to UNESCO, A Smart City could be defined as a high-performance urban context, where citizens benefit a better quality of life in accordance to progressive improvements in the fields of politic, economic, environment, and transportation [4]. Few researchers addressed the importance of public participation in order to create better solution for smart cities and life [5].

Creating smart cities can improve manageable financial turns for community and personal satisfaction throughout developing urban area in both soft and hard components within different basic zones [1, 6].

This paper introduces all principles of smart sustainable cities that should be followed by city planners and decision makers in order to improve the quality of life with respect of resources. It also targeted to study influence of smart intelligent architecture on citizen behavior and living quality.

Study will start first by analyzing all principles of smart technologies and all techniques used for different fields, it also studies all goals of sustainability and how it could be applied in order to create more successful spaces and activities. Those cannot be applied without studying the impact of these technologies on public health. The paper consists of three phases (see Figure 1): Phase one: starts with a literature review by understanding smart cities features with an analytical study for different components of smart cities and sustainability aspects.

Phase two: A questionnaire tool will be applied to different samples of professionals and users for discussion and analyses the smart sustainable city major elements and the applicability of smart components with their impact on sustainability and citizen behavior. Phase three: Concluded results for recommended smart sustainable city framework.

Figure 1. Methodology of the research

2. SMART CITY CONCEPT

The Smart city concept was introduced already in 1994 and although this concept has considerably increased since 2010 there is still not a clear and consistent understanding of its meaning [7]. The concept of the Smart city could be defined as 'Information City' or 'Digital City', former definition is to gather information from suppliers and help individuals through Web media while the latter one is an administrations network that serve to solve residents' and government problems [8]. Other interpretations suggested that the term "smart" comprises "intelligent," as the smartness is only achieved when an intelligent system adjusts to the requirements of users [9, 10]. As, it is inherently resilient, collaboratively built using different sorts of technology and informative data to improve residents' quality of life [11, 12].

This concept encompasses a wide range of perspectives, certain specialists utilize it to describe cutting-edge sustainable and environmentally friendly urban area, while others use it to describe an urban area which makes extensive use of data as smart development to reach human satisfaction, by improving the environment [13]. The European Commission shared that diverse technologies help in achieving sustainability in smart cities [7]. According to Marsal-Llacuna et al. (2015) the smart city assessment based on measuring environmentally friendly and livable cities, embracing the concepts of sustainability and quality of life with the addition of technological and informational components [14].

The main idea of smart city is based on development of urban communities' technical knowledge which is called the information and communication technology (ICT) [13]. The utilization of modern technologies and ICT as smart cities key, is spacious as it emphasizes the city technical and environmental aspects and also focuses on the use of modern technologies in regular urban life that introduce innovative city systems and enabling better quality of life and decreasing environmental impacts to provide more efficient services to citizens [7]. This type of city is characterized with transparent urban systems structure, technologically responsive and adaptable to advanced and smart design methods [12, 15].

Furthermore, literature highlights that the role of human capital in addition to new technologies is essential in developing smart cities that bring together technology, government and society to improve economic, social and environmental sustainability [16].

Several researches and organizations suggested framework and compiled lists of indicators for determining the smart city.

2.1 Smart city framework

There are several researchers, urban planner experts and organizations that have suggested Smart city framework from different perspectives. Some of these framework are selected for the study because they are widely used and have the same components.

The followings are the selected frameworks for the analysis:

2.1.1 The European smart city framework

European smart city framework addresses six characteristics clarified in Figure 2 that use ICTs to optimize the efficiency and effectiveness of necessary city processes, activities and services by joining up diverse elements and actors into an interactive intelligent system [17].

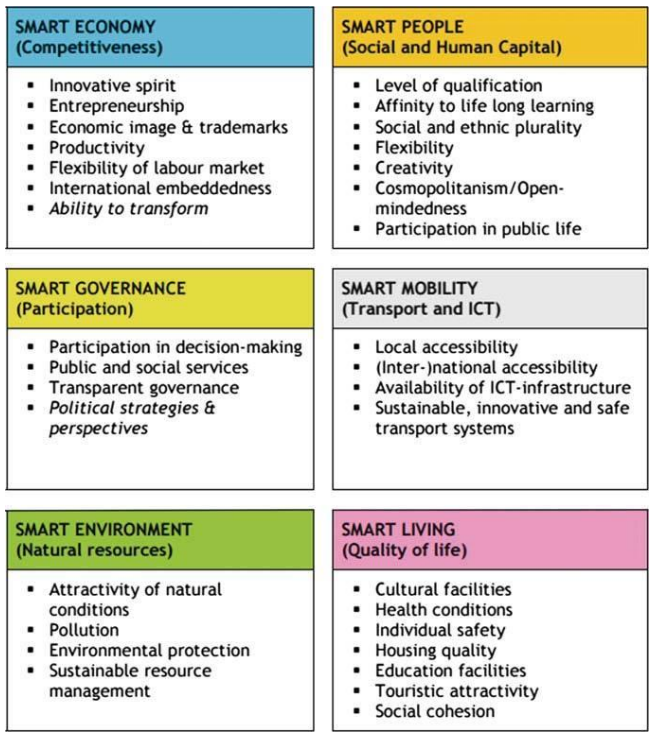

Figure 2. The European smart city characteristics [17]

2.1.2 The Smart City's six ICT-enhanced framework

This framework focus on people, sustainable and liveability aspects in the community through the integration and the holistic perspective of the information and communication technology (ICT) enhanced dimensions of the smart city (see Figure 3) [18].

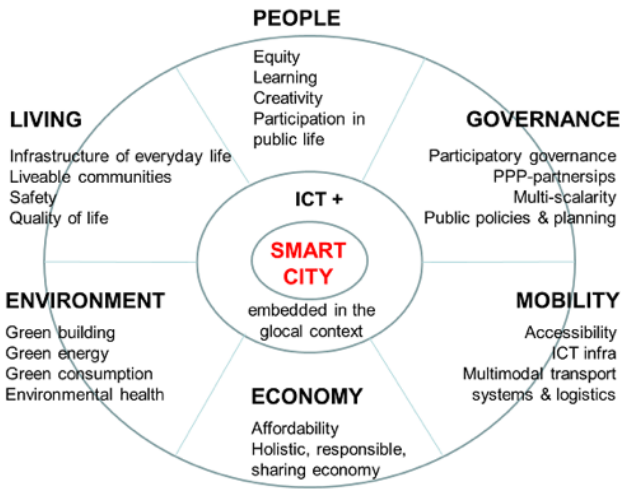

Figure 3. Smart city's six ICT-enhanced dimensions [18]

2.1.3 IBM Smart city framework

The IBM framework highlights smart city activities to city leaders by emphasizing comprehensive situation awareness and improved efficiency of the city's operations and help them

to gain insight into all the city aspects using the Information and Communication technologies (ICT). Also, it suggests that city must be able to sense and respond to its environment to provide a high quality of life and vibrant economic climate for better engagement with citizens (see Figure 4) [19].

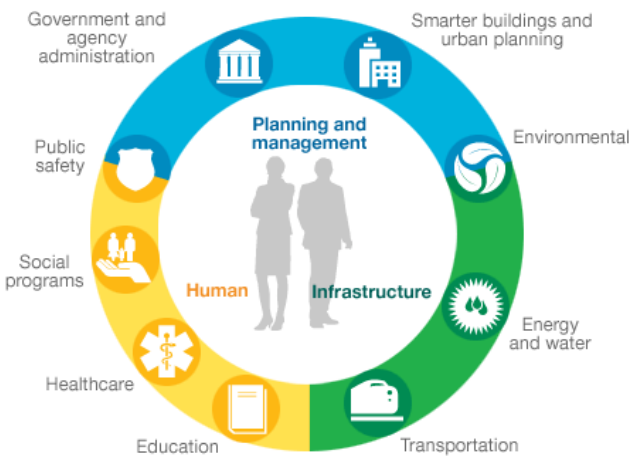

Figure 4. IBM smart city [19]

2.1.4 Frost & Sullivan Smart City framework

This framework allows cities to grow sustainably and improve the quality of residents' lives and defined the smart city as an active plan in at least five of its eight components stated in Figure 5 that define the 'Smartness' of a City [20, 21].

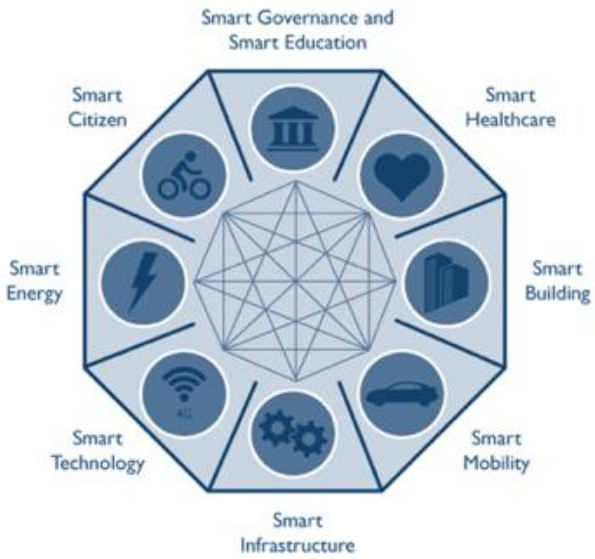

Figure 5. Frost & Sullivan Smart city [20, 21]

2.1.5 IoT-Enabled Smart City framework

In this framework, the Internet of Things (IoT) enabled smart cities is considered as the baseline for the future cities. It emphasis the relationships between each smart city domain with the related (IoT) technologies that have to be employed in the different city context (see Figure 6) [22].

Referring to the study and the analysis of the previous smart city frameworks proposed by different planner experts and organizations shown in Table 1, there are seven smart city components discussed below which are Citizen, Living, Mobility, Buildings, Energy, Infrastructure and Government that are selected due to their importance and similarity in all the mentioned frameworks.

Figure 6. IoT-Enabled classification of smart city [22]

- Smart Citizen

It means a more inclusive society which provides equivalent treatment to all people. These include social networks as well as people can benefit from the information, it also involves helping to develop smart city initiatives. The practice of new technology and innovation are aimed at enhancing knowledge management. People have to know how to use technology to be able to cope to the smart cities' system so public organizations need to have comprehensive citizens education programs that allow them to use smart technologies [23, 24]

- Smart Living

It highlights the enhancement of its citizens' quality of life. It includes education, urban safety, social cohesion, the attraction of tourism and health, such as IOT (internet of things) develops access to quality health care and decreases costs by patients, equipment and staffs [25].

Table 1. Smart city components in different frameworks

Smart city Components	Smart city Frameworks				
	European	Six ICT-Enhanced	IBM	Frost & Sullivan	IoT-Enabled
Citizen	☑	☑	☑	☑	
Living	☑	☑	☑	☑	☑
Mobility	☑	☑	☑	☑	☑
Buildings	☑		☑	☑	☑
Energy		☑	☑	☑	☑
Infrastructure			☑	☑	☑
Government	☑	☑	☑	☑	☑

- Smart Mobility

It refers to the development of a modern transportation system throughout the city' network that meets the needs of all users as citizens, and visitors. These innovative mobility solutions align with a plan focused on the availability of information and communication technologies (ICT) as well as local and international accessibility [26]. Smart cities have to be equipped with a range of intelligent transportation modes and initiatives like smart traffic management, intelligent parking, integrated multimodal transportation, which promotes urban mobility [24]. Such as in smart cities, cars can auto-blink messages concerning traffic jam [27].

- Smart Buildings

Smart buildings have active parts of the energy system and need different approaches from municipal authorities. Smart buildings incorporate people and systems in a functional and dynamic manner. Building should offer safe and secure operating areas, environments, IOT setup and network connectivity which serve as virtual gateways to connect people with worldwide [28].

Various areas within the buildings generally embrace a variety of solutions such as integrated access control, network intrusion detection, fire protection systems and video surveillance. In addition, the high-performance fiber optic systems in smart buildings play an essential role in the operation of the facility to maximize the efficiency of the buildings [20]. Such as in smart cities, houses will auto adjust temperature and lighting, hospitals can distantly monitor medical devices and factories can auto find and correct machinery issues [27].

- Smart Energy

It provides great opportunities for smart cities as cost savings, decarbonization, resilience with greater capacity, energy efficiency, new income potential, and cleaner environment. Intelligent energy applications provide cities with an understanding of their energy demand profile and resulting in the democratization of energy consumption and removes logistical and technological obstacles to access to energy. Intelligent energy policies effectively address the intermittent energy balance of new and renewable energy sources and the protection of life-saving supplies [29].

- Smart Infrastructure

It highlights the improvement of infrastructure and the provision of city services that leverage technology, information and data to meet the needs of citizens and support their use of resources. By providing water, electricity, affordable housing, healthcare and educational facilities, and IT connectivity to improve the quality of life [23, 24]

- Smart Governance

It integrates all the relevant stakeholders such as public organizations, businesses and civil society into the decision-making process by encouraging public participation through the use of e-government tools and new technologies initiatives like e-services [26]. These services are mainly provided through smart phones and other digital devices, making public services more affordable, transparent and efficient. Citizens are active participants in governance and provide response through a variety of digital channels [30].

3. SUSTAINABILITY CONCEPT

Sustainability concept is a comprehensive term as it is related to development, natural resources, and the pattern of human interaction with the environment. It is defined as meeting the current's requirements with respect of future generation's needs. This concept has three main interlocking pillars which are environmental, social and economic [31, 32]. Those pillars should be connected to work with balance in order to achieve main goals of sustainability for improving residents' quality of life [32, 33]. Several sustainable cities started focusing on clean perspectives such as green city, resilience city, zero carbon city, etc. [33, 34]. This could be prior to water and energy efficiency, and reducing greenhouse gas emission [35]. Goals of sustainable development concept press on improving of the quality of life, respecting the surrounding environment and investing in technological progress.

3.1 Pillars of sustainability

Sustainability as a concept has three main pillars: economic, environmental, and social shown in Figure 7. These three pillars are familiarly known as people, planet, and profits. Achieving sustainability is affirmed through the overlap of the three pillars with regard to be maintained [31, 32]. According to previous studies, the pillars are discussed as follows:

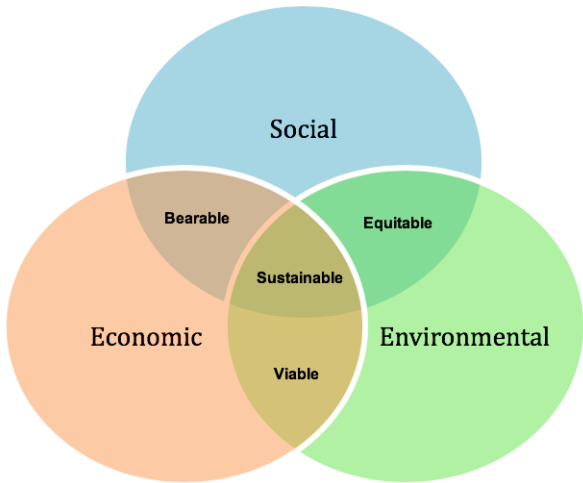

Figure 7. Sustainability pillars [31]

3.1.1 Environmental sustainability

Environmental Sustainability focuses on the well-being of the environment and its natural resources consumption including energy, water and air quality, and the reduction of all types of pollution [36]. This field work directly on human health and citizen quality of life. Environmental sustainability could be achieved by protecting and managing all-natural resources without the risk to compromise the future generations' needs [37].

3.1.2 Social sustainability

Social sustainability indicates the capacity of a city for achieving constant well-being in society. It stresses on the improvement of social equality and quality through concepts such as unity, mutuality, morality and their significance of human relations that have be fostered and supported by legislation, information and common ideas of rights [38]. It seeks preserving social capital through investment, maintenance and creation of services which comprise the framework for communities and culture [39]. To reach

sustainability for social life, the elements of social activity that include management of human health, environmental justice, education, safety and security should be improved and controlled [40].

3.1.3 Economic sustainability

It means the economy's capacity to sustain a definite level of economic output indefinitely and the efficient use of resources to generate a constant operating profit for supporting its activities [41]. It aims at improving living standards and maintaining both intact capital and high levels of stability in economic growth [42]. Job creation and profitability are the most important factors that could improve sustainability for city economy. Also developing cost-benefit analyses for ecosystem services help achieving the goal. Entrepreneurship and the circular economy are two concepts that promote interconnections between local and global economic ecosystems [43].

To maintain the city balance between the built environment and natural environment, the sustainable development should cover the urban community.

4. SUSTAINABILITY SMART CITIES (SSC)

Previous researchers have defined Smart Sustainable cities as "innovative cities which use information and communication technologies (ICT) and alternative ways for improving the quality of life, the effectiveness of urban operations and services, and competitiveness, while ensuring to meet the requirements of current and future generations in respect to economic, environmental, social as well as cultural aspects" [34, 44]. Planners should apply smart concept to sustainable cities to increase quality of life while achieving sustainability.

Smart and sustainable cities use ICT to enhance the quality of life for citizens by improving the performance of the city towards increasing the standard of the sustainability in economic, environmental and social objectives, based on the use and production of renewable energy while applying new technologies to optimize resource management and control all city services, facilities and infrastructure [45, 46].

Furthermost descriptions of environment and society emphasize how smart cities incorporate technology into governance for improving the quality of life and reducing the environmental effect of urbanism. On the other hand, the few descriptions oriented towards the economy suggested combining physical infrastructure with flexible capital to create competitive cities and boost sustainable economic development [10].

The use of ICTs into existing SSC give municipal stakeholders access to real time spatial, economic and environment data about their cities while improving [47]:

- Energy efficiency
- Urban infrastructure operation and transparency
- Resilience of road networks
- Water Efficiency and wastewater management
- Security services

The most significant feature of smart mobility consists of the ICTs existence as well as modern and sustainable transport networks with local and international access [18].

4.1 Questionnaire

A questionnaire has been developed using the above features of smart cities and the aspects of sustainability. It was sent to various samples of professionals, such as architects, planners, architecture professors and students, also it was sent to different users who have contributed by their knowledge and experience about the smart cities. The questionnaire was a three-point Likert scale was used for surveying, with "3" denotes agree, "2" Neutral, and "1" disagree. Respondents with a total of 220 had to choose the importance of each feature in order to analyze the main elements of a sustainability smart cities.

For Statistical analysis of the data, the information was transmitted to and analysed through the IBM SPSS software package version 20.0 (Armonk, NY: IBM Corp). The Kolmogorov- Smirnov test was utilized to check the normality of the variables' distribution. The Mann Whitney test was used to compare between two groups of quantitative variables that are not normally distributed. The significance of the results achieved was assessed at the level of 5%.

The results of the questionnaire were summarized in 4 tables. Table 2 represents the distribution of the responses according to demographic data. Then, Table 3 shows the distribution of responses according the smart cities' features. Next, Table 4 displays the priority of the smart cities' features. So, the Infrastructure has received the high rank although the living has got the low rank. Finally, the Table 5 compare between the responses of the responds who have lived or visited a smart sustainable city and the others who didn't visit and this analysis assure that the people who have visited this type of city have demonstrated the importance of using the city features for better life.

Table 2. Distribution of the studied cases according to demographic data (n = 220)

	No.	%
Educational level		
College	142	64.5
Post graduate	78	35.5
Age group		
15 - 25	143	65.0
26 - 40	45	20.5
41 and older	32	14.5
Gender		
Male	71	32.3
Female	149	67.7
Profession		
Academic	11	5.0
Architectural engineering	82	37.3
Assistant professor	3	1.4
Associate professor	8	3.6
Engineering	31	14.1
Others	23	10.5
Student	62	28.2
Have you ever lived or visited a smart sustainable city?		
Yes	92	41.8
No	128	58.2

4.2 Proposed framework

Based to the previous literature review and the questionnaire. proposed framework is proposed (as shown in Table 6) which merges the sustainable aspects with the Smart city components. This framework may be applied as part of the planning process of a smart sustainable city. As general target of smart cities is to improve sustainability with help of technologies.

4.3 Impact on citizen

Smart cities promote sustainability manners through its economic, environmental, and social aspects, it improves city's infrastructure and conditions needed for residents' ability to contribute and enjoy more livable and resilient city. [48]. Previous studies proved that applying ICT concept on SSC have major impact on citizen psychological and health behavior.

Sustainability also requires changes in human behavior. For this purpose, priority areas include the reform of official associations, the strengthening of civil society institutions, the improvement of citizen engagement, the reduction of consumption and demographic growth, the resolution of social justice problems, and reflection on systems of values and beliefs.

Table 3. Distribution of the studied cases according to Items (n = 220)

Q		Agree		Neutral		Disagree	
		No.	%	No.	%	No.	%
	Living						
8	Smart living increase social connections	172	78.2	39	17.7	9	4.1
9	Usage of digital instruments make kids more active and smarter	162	73.6	30	13.6	28	12.7
	Mobility						
10	Automated traffic increase circulation flow	170	77.3	36	16.4	14	6.4
11	Smart traffic system is safer for pedestrian use	196	89.1	16	7.3	8	3.6
12	Smart traffic system decrease accident number	182	82.7	13	5.9	25	11.4
14	Pedestrian circulation is better than motor mobility	214	97.3	6	2.7	0	0.0
	Citizen						
13	Increasing pedestrian walking distance enhance human health and make citizen more relaxed	203	92.3	8	3.6	9	4.1
15	Integration between green vegetated areas and the built environment enhance human physical health	161	73.2	47	21.4	12	5.5
16	Integration between green vegetated areas and the built environment enhance human mental health	211	95.9	6	2.7	3	1.4
	Infrastructure						
17	Smart irrigation system maintain vegetation life and sustain landscaping	220	100	0	0.0	0	0.0
18	Bio swales save water and increase water efficiency	181	82.3	26	11.8	13	5.9
	Energy						
19	Green energy like solar energy, wind turbine.. sustain power usage	202	91.8	9	4.1	9	4.1
20	Renewable energy improve air quality	199	90.5	11	5.0	10	4.5
21	Energy	195	88.6	18	8.2	7	3.2
	Government						
22	Smart management speed up citizen services; security, health..etc	200	90.9	9	4.1	11	5.0
23	Central security system control number of crime	180	81.8	29	13.2	11	5.0
24	E-government services always save time and efforts for citizen	207	94.1	9	4.1	4	1.8

Table 4. Distribution of the studied cases according to scores (n = 220)

	Average Score Mean ± SD.	% Score Mean ± SD.	Rank
Living	2.68 ± 0.48	89.17 ± 15.85	**6**
Mobility	2.81 ± 0.32	93.75 ± 10.61	**5**
Citizen	2.83 ± 0.28	94.49 ± 9.41	**4**
Infrastructure	2.88 ± 0.27	96.06 ± 9.13	**1**
Energy	2.86 ± 0.33	95.45 ± 10.86	**2**
Government	2.85 ± 0.37	95.0 ± 12.35	**3**
Overall	2.82 ± 0.21	94.14 ± 7.10	

Table 5. Relation between lived or visited a smart sustainable city and % Scores (n = 220)

	Have you ever lived or visited a smart sustainable city?		U	p
	Yes (n = 92) Mean ± SD.	No (n =128) Mean ± SD.		
Living	94.57± 12.86	85.29± 16.68	3976.5*	<0.001*
Mobility	96.83± 7.29	91.54± 12.01	4301.0*	<0.001*
Citizen	96.38± 6.61	93.14± 10.81	5096.0*	0.040*
Infrastructure	97.64± 7.24	94.92± 10.15	5187.5*	0.024*
Energy	96.50± 7.17	94.70± 12.85	5693.0	0.561
Government	96.50± 9.16	93.92± 14.14	5478.5	0.236
Overall	96.46± 4.94	92.46± 7.91	3725.0*	<0.001*

U: Mann Whitney test

*: Statistically significant at $p \leq 0.05$

Table 6. Proposed framework

Smart City Components	Sustainability Goals		
	Environmental	**Economy**	**Social**
Citizen	- People awareness - Attractivity of natural conditions	- Productivity - Flexibility of labor - Innovation spirit - Entrepreneurship - Economic image & trademark - Ability to transform - E-Tourism - Connected Retailer	- Social Programs - Creativity - Participation in public life - Social Programs Level of qualifications Social and ethnic plurality - Flexibility - Open-mindedness - Affinity to life-long learning
Living	- Education facilities - Emergency Management - Health conditions - Individual safety - Green spaces	- Provision of sanitation facilities. - Smart business - Education facilities - Allocation of land and facilities for industrial uses - Touristic attractivity	- Healthcare - Education - Video surveillance - Telehealth and Telecare - Cultural facilities - Social cohesion
Mobility	- Sustainable Transportation - Intelligent transport system - Traffic management	- Smart parking - Smart taxi - Logistics services - Transportation networks - Fleet management - Cost savings	- Innovative and safe transport systems - Reduce Congestion Local accessibility - International accessibility - Community biking - Self-driving vehicles
Buildings	- Smart buildings - Housing quality. -Technological changes	- Smart grid and smart meters -Network connectivity -Enabling the IoT	-Public and social services -Risk management -Affordable homes
Energy	- Environment protection - Energy management - Controlling pollution - Noise Detection -Decarbonization	- Smart Urban lighting	- Energy efficiency - Decrease energy consumption
Infrastructure	- Water management - Waste management - Electric vehicles infrastructure -Sustainable resources management	- Water supply - NFC services - Availability of ICT-infrastructure - City Maintenance - Electricity - Telecommunication	- Digital signage - Public safety
Government	-Smarter urban planning - Smart city dashboard	- Smart city operation center - E-government services and transformations - International embeddedness -Political strategies and perspectives	- Government and agency administration - Participation in decision-making -Feedback via various digital channels.

Transforming smart city technology into a system capable of changing human behavior is a conscious attempt to design behavioral processes and systems operationalizing this data for behavioral change. This improvement demands delineating behavior which the system will try to deal with (such as travel options, waste management, energy usage, etc.) and a behavioral diagnostic for every behavior which enables the city to build a design approach which encourage people to support behavior through inclusive urban purposes, both in terms of the reduction of traffic jams and emissions or the encouragement of the use of utilities. By iterative behavioral development procedures with suitable testing, cities can maximize their investment in smart city hardware and data, increase quality of life and meet citizens' expectations.

Overcrowding and over-consumption can lead to significant environmental risks. For achieving sustainability, it is essential to change human behavior. This could be done by supporting citizens in adopting sustainable lifestyles and encourage them to contribute to the political and environmental activities and even contributing into social structure and economic aspects of sustainability [49]. This could be defined by the urge of participation of non-government institutions and society for achieving sustainable development by decentralizing decision making [50]. Such co-operation between government and non-government members is needed for the establishment of a new governance system, where everyone have equal participation with no dominant decisions [51]. In smart cities, the use of new ICT eases good governance through methods like smart administration and electronic governance and electronic democracy. All this develop political participation between residents and officials by strengthening expression and the improvement of intelligent and controlled access to information and public services [18, 52]. The usage of online participation and discussion is preferred by citizen [53]. In order to achieve development of urban sustainability, integration of economic, social and environmental priorities, and encouraging public involvement in decision making would be taken into

consideration, all parallel by the use of high-performance technology settings for smart living and facilities [54]. Sustainability development projects could be applied by encouraging non-profit organizations and community environmental associations to be as part of urban governance [24].

Smart city can also impact tourism behaviour, as advanced information systems (ATIS) offer travelers adequate info for better decisions, which in turn decrease trip time, stress and traffic jam in transportation systems [55, 56]. Smart mobility can link all parts of the city, improve all modes of transportation and transform it in a better place for both transit users and pedestrians, as well as improving conditions for personal cars driving. Also, the improvement of new facilities, and roads intersections can increase the safety of walking and cycling [57]. All this shall save time and effort for citizen of all categories and will improve their quality of life and in turn their psychological behavior would be better and relaxed.

The improvement of citizen cultural education to increase their awareness of mechanisms used to reduce energy-consumption in households. This shall be taught in ICT businesses, transportation media, waste management enterprises, schools, academic and financial institutions can play essential roles to develop this kind of education [58].

5. CONCLUSION AND RECOMMENDATIONS

In the 21st century, sustainability assessment has been transformed to smart city goals. Based on the literature review, modern technologies and smartness has been emphasized in the smart city frameworks compared to urban sustainability frameworks which contain a large number of indicators that measures the environmental sustainability, while smart city frameworks lack of environmental indicators and highlight the social and economic aspects. As a result, the general goal of smart cities is to improve sustainability with the help of technologies. This could be described by the term "smart sustainable cities" instead of smart cities. However, the current extensive gap between sustainable city frameworks and smart cities recommends the urgent need of smart city frameworks development to improve the smart city concept. Thus, the assessment of smart city performance should include impact indicators that measure the contribution of the ultimate goals such as environmental, economic or social sustainability along with the indicators that measure the efficiency of deployment for smart solutions.

Smart sustainable city perspective is regarded by the International Telecommunication Union, as cities using ICT for improving citizen quality of living through the use of efficient services and operations in urban space that achieve all human needs for present and future generations.

This paper studies all features of smart cities and sustainability pillars in relation to citizen behavior and health life. As result for this study, it proved that smart city must follow many urban living aspects, such as quality of life improvement, smart transportation, smart airports, buildings, universities, hospitals, waste management, smart security, digital public utilities like power, water and gas, …etc.

Completely automated city is an important technological solution in the respect of sustainability. Those to be following main indicators to improve citizen life in the field of economy, environment, and society & culture. In order to support planners for setting development priorities, from designing to implementation of concrete actions and measures.

As for smart sustainable cities benefit which affect human need, those are defined as follows:

- Better city planning, facilitating the lives of residents, meeting sustainability goals and improving quality of life.
- Emphasizing urban wealth, equity, comfort and innovation.
- Enabling the meaningful participation of citizens in realizing their rights and engaging them in decision-making in the city.
- Addressing social needs and ensuring high quality and affordable housing and different urban services.
- Responding the various needs of the residents and the disabled.
- Achieving the greatest possible potential in terms of environment, network, and economic opportunities.
- Improving skills and beneficial natural effect.
- Increasing stability and enhancing well-being.
- Creating a city that is more supportive and attractive to citizens and social events.
- Making effective use of resources to reduce costs and improve the environment, while also reduce indirect pollution or ozone depletion.
- Solving transportation and traffic problems through mechanical conditions favorable to the streets, in particular using GPS and sensors and the use of GPS to increase city.
- Reducing congestion indicates for reducing the number of private vehicles, thereby reducing the people's time spend on the streets.

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