

Mechanisms for Ensuring Environmental Sustainability in Smart Cities

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Abstract: Cities are currently facing numerous urban and environmental issues, such as traffic congestion and various forms of pollution. In response, countries around the world, especially developed ones, have sought to develop a modern model of urbanization that combines intelligence and sustainability. This involves creating cities that are better equipped to face economic and environmental challenges, preserve available resources, and rationalize energy use, all while meeting smart human and social needs. These cities rely on technical foundations based on information and communication technology, as well as environmental and social principles, within the framework of what is known as sustainable smart cities.

Algeria has embraced the concept of smart cities through Executive Decree 04-274, which involves the development of the new city of Sidi Abdallah. The country demonstrated its progress in this area by hosting the World Smart Cities Investment and Technology Summit in 2018 as part of the 'Algeria is a Smart City' project. However, Algeria still faces numerous challenges in achieving the level of smartness and sustainability seen in more advanced countries. These challenges include financial constraints, legal barriers, technological limitations, and security issues.

Key words: sustainable-smart-cities-mechanism-environmental- protection.

المخلص: تعرف المدن في الوقت الراهن مشاكل حضرية وبيئية لا حصر لها كالازدحام المروري، التلوث بشتى أنواعه، لذا سعت دول العالم خاصة المتقدمة منها للبحث عن نموذج حديث للمدن يجمع بين الذكاء والاستدامة، بإنشاء مدن تكون أكثر استعدادا لمواجهة التحديات الاقتصادية والبيئية، تستجيب لمتطلبات الحفاظ على الموارد المتاحة وترشيد الطاقات، مع تلبية الحاجيات الانسانية والاجتماعية الذكية، وذلك بالاعتماد على أسس تقنية تعتمد على تكنولوجيا المعلومات والاتصالات وأسس بيئية واجتماعية، في إطار ما يعرف بالمدن الذكية المستدامة.

ولقد عرفت الجزائر فكرة المدن الذكية من خلال المرسوم التنفيذي 274-04، المتضمن إنشاء المدينة الجديدة لسبدي عبد الله، وقد وصلت إلى مستويات متقدمة لتنفيذ تطلعاتها من خلال عقد قمة المدن الذكية العالمية للاستثمار والتكنولوجيا لعام 2018 في إطار مشروع "الجزائر مدينة ذكية"، غير أن المدن في الجزائر ما زال بعيدا عن مظاهر الذكاء والاستدامة التي حققتها الدول المتقدمة، تواجه عدة تحديات: تمويلية، قانونية، تقنية، أمنية....

الكلمات المفتاحية: المدن- الذكية- المستدامة- آلية - حماية - البيئة .

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Introduction:

Cities presently stand as the primary contributors to environmental pollution due to their infrastructure, including factories, roads, and the dense presence of automobiles, various modes of transportation, and other pollution sources. The rising global population further accentuates the pressing necessity to fundamentally reconsider and devise innovative, more intelligent approaches to avert impending disasters. This endeavor not only seeks to mitigate environmental harm but also aims to establish prospects for an enhanced quality of life, particularly in light of the uncertain and evolving trajectory toward an unprecedented future.

Hence, the contemporary direction of nations engaged in urban development is shifting towards a more sophisticated approach characterized by the equilibrium between two fundamental trajectories. The initial path emphasizes the establishment of sustainable cities, with the objective of conserving existing environmental resources and energy while reutilizing them in a manner that adheres to sustainable health and environmental standards. The second trajectory is embodied by smart cities, which harness information and communications technology as both a means to attain their objectives and a tool for enhancing urban life. This amalgamation of principles is commonly referred to as "smart sustainable cities."

This is achieved by the transformation of urban areas into more sustainable living environments, facilitated by the implementation of advanced mechanisms in the realms of renewable energy, water management, and waste reduction, all underpinned by state-of-the-art technology.

Therefore, the importance of the topic is to highlight the role of sustainable smart cities in facing economic and environmental challenges and the requirements of conserving resources and rationalizing energies while meeting smart human and social needs.

Consequently, the central issue at the heart of this topic revolves around:

- How do smart sustainable cities contribute to protecting the environment? What are the challenges they face?

Study hypotheses:

- Modern technology contributes to maintaining a sustainable environment and meeting smart human and social needs.
- The transition from urbanization to smart sustainability in construction in Algeria.

- Objectives of the study:

- Revealing the interrelationship and integration between the principles of smart cities and the principles of sustainable cities.
- Pointing out the importance of modern technology in serving current and future generations environmentally and meeting smart human and social needs.
- Recognize the characteristics of sustainable smart cities as a guarantee of environmental protection.
- Identify the reality of sustainable smart cities in Algeria.

Research Methodology:

we adopted a descriptive approach to elucidate the pertinent concepts associated with the study's subject matter. Additionally, we employed an analytical approach to underscore the role of smart sustainable cities in environmental preservation, their current status in Algeria, and the primary challenges they encounter. This research is structured as follows:

First: The concept of smart sustainable cities

Second: The reality and challenges of smart cities' sustainable development in Algeria.

First: The concept of smart sustainable cities

Establishing a comprehensive understanding of smart sustainable cities entails the definition of these cities along with a delineation of their defining attributes.

1-Definition of smart sustainable cities:

The concept of sustainable smart cities has gained prominence, prompting extensive discourse, as a result of the growing integration of information and communication technology into everyday societal activities. In urban planning, smart cities are frequently associated with themes encompassing communication technology, scientific advancement, economic considerations, social dynamics, and environmental conservation.¹

Certain studies suggest that it is plausible to classify smart cities as sustainable, although the reverse is not necessarily accurate. This is due to the fact that smart cities may at times neglect environmental considerations. Within the broader category of sustainable cities, green cities and livable cities can be subsumed, while smart cities typically align more closely with the categories of information cities and digital cities.² Therefore, we will attempt to provide meaning to both smart cities and sustainable cities so that a clear definition of smart sustainable cities is given.

1.1- Definition of smart cities:

The term "*smart cities*" emerged approximately a decade ago and is related to several other terms that may carry similar meanings, including digital cities, ecological cities, electronic cities, and information cities, among others. However, the most prevalent and likely term is "smart cities."

Smart cities refer to urban areas where various services rely on information and communication technology infrastructure. These services encompass smart and automated traffic systems, advanced security management services, building management systems, the integration of automation in both offices and residences, as well as the implementation of metering systems for billing and reporting purposes.³

Smart cities can also be characterized as urban areas that employ information and communications technology with the primary objective of enhancing the residents' quality of life while simultaneously promoting sustainable development.⁴

Some individuals argue that a smart city is one where the integration of physical infrastructure, information technology infrastructure, social infrastructure, and commercial infrastructure results in a collective intelligence that transcends the prominence of ICT in driving smart city development. This perspective aligns with what certain urban theorists

¹ عمر مخلوف، الحاجة إلى مدن ذكية لتحقيق التنمية المستدامة، الفرص والتحديات، مجلة التعمير والبناء، المجلد 04، العدد 01، 2020، ص 28.

² يارة ماهر محمد فتاوي، دور أبعاد المدن الذكية المستدامة في تعزيز مشاركة المواطن الرقمية بالمكتبات العامة في مصر، دراسة تحليلية، المجلة الدولية لعلوم المكتبات والمعلومات، مجلد 09، العدد 01، 2022، ص 308.

³ محفوظ برحمان، المدينة الذكية بين الحتمية الإدارية والضرورة البيئية، مجلة الحقوق والعلوم الإنسانية، المجلد العاشر، العدد الثاني، الجزء الثاني، 2017، ص 317.

⁴ إبراهيم جواد آل يوسف، محمد مهدي حسين، المدن الذكية المستدامة، آفاق وتطلعات على خطى مدن الحادي والعشرين، ص 11، مقال من موقع <http://www.researchgate.net> يوم 2023/07/18 على الساعة 20:19.

refer to as collaborative urban systems, even though ICT often serves as the primary catalyst for smart city initiatives and innovations.⁵

Some individuals define a smart city as one that heavily depends on electronic technologies stemming from the information technology era. This progression typically includes the evolution from a digital city to an electronic city, followed by the emergence of the virtual city, ultimately culminating in what is termed the knowledge city. In this context, knowledge is regarded as the most encompassing framework encompassing data and information.⁶

According to IDC (International Data Corporation) Research, a smart city, as delineated, represents a distinct administrative entity, such as a district, town, city, province, or municipality, each with its governing authority. This entity is established upon a robust communications and information technology infrastructure, facilitating efficient governance and fostering economic growth, sustainability, innovation, and active citizen engagement.⁷

Hence, smart cities are founded on robust communications infrastructure and the virtual representation of urban environments. However, it's important to emphasize that the development of smart cities cannot be realized in isolation; it necessitates the concurrent evolution of a smart society.

1.2 Sustainable cities:

These cities adhere to the principles of sustainable development and environmentally conscious urban planning. They actively promote methods of operation and transportation that encourage the utilization of renewable energies. Often, they consist of clusters of eco-friendly neighborhoods with the goal of minimizing their environmental impact.⁸

They can also be characterized as cities meticulously designed with consideration for their environmental impact. These cities are home to residents who are committed to diminishing the demands for energy, water, food, and waste, thereby mitigating the consequences of heat, air, and water pollution. This dedication to sustainability ensures that the burdens placed on future generations are minimized.⁹

After providing definitions for both smart cities and sustainable cities, it becomes evident that the convergence of sustainability and intelligence is essential to realize smart sustainable cities and attain desired outcomes. Smart sustainable cities are characterized as urban areas that fulfill the present population's requirements while preserving the capacity of subsequent generations to fulfill their needs, all of which are facilitated by information and communications technology.

According to the International Telecommunication Union, a smart sustainable city is an innovative city that leverages information and communications technology and other

⁵ المرجع نفسه، ص 11.

⁶ يارة ماهر محمد فتاوي، المرجع السابق، ص 309.

⁷ Kumar Megha, **Building a smart city based on smart data**, IDC documents analyze the future, 2015.

⁸ فؤاد بن غضبان، المدن المستدامة والمشروع الحضري نحو تخطيط استراتيجي مستدام، دار صفاء للطباعة والنشر، عمان، الأردن، 2015، ص 153.

⁹ عايذة مصطفىاوي، مفهوم المدن المستدامة، مجلة القانون العقاري، المجلد 07، العدد 01، 2020، ص ص 19-20.

methods to enhance the quality of life, promote competitiveness, and effectively address its immediate and future needs across economic, social, and environmental dimensions.¹⁰

Hence, the objective in constructing sustainable smart cities is to convert urban areas into more sustainable, intelligent, robust, and disaster-resistant living environments.¹¹

2-Characteristics of sustainable smart cities - a guarantee of environmental protection

For the realization of smart, sustainable cities, it is imperative that both the attributes of intelligence and sustainability coexist, and they can be harmoniously integrated as follows:

2.1- Smart Governance /E-Government: E-government entails the provision of government services through electronic means. Some of the key applications of e-government include:¹²

- Providing information related to the city's residents.
- The ability to exchange information and communicate between the population and the government
- Electronic transactions by providing services electronically.

2.2-Intelligent Community:

order to achieve the success of smart cities, it is crucial to foster the adoption of ICT applications and technologies. This acceptance should extend to the broader society, transforming everyday technology users into members of an innovative society capable of devising creative solutions for both present challenges and future development. In essence, this transition allows society to operate within an information-rich city, conducting activities and accessing services in an informed manner.¹³

2.3- Smart living:

This encompasses elements such as culture, educational institutions, healthcare, and intelligent housing, which encompasses aspects of building design, security, and tourism attractions, all within the framework of delivering comprehensive community services to its inhabitants.¹⁴

2.4 - Intelligent Energy:

The primary hallmark of sustainable smart cities is the minimization of reliance on non-renewable energy sources, with the utilization of renewable alternatives like solar, wind, and hydroelectric energy¹⁵. Smart energy solutions have the potential to curtail emissions by a noteworthy 10 to 15%. Additionally, there are energy-saving initiatives, such as the deployment of air quality sensors capable of identifying pollution sources, which can enhance

¹⁰ Mersal, L ,City indicators on Social Sustainability as standardization technologies for Smarter governance of Cities, Social indicators Research,128 (3),2016, pp 1193-1216.

¹¹ Silvia Gorman, The Path to Smart Sustainable Cities, A Guide for City Leaders, ITU News, Issue 02, ITU, Geneva 2016, p 4.

¹² أحمد نجيب عبد الحكيم القاضي، مُجد ابراهيم العراقي، خصائص المدن الذكية ودورها في التحول إلى استدامة المدينة المصرية، المجلة الدولية في العمارة والهندسة والتكنولوجيا، المجلد 01، دون سنة، ص 2.

¹³ أحمد نجيب عبد الحكيم القاضي، المرجع السابق، ص 4.

¹⁴ حسون عبود، كفاء عبد الله، لفلوف الجياشي، دور المدن الذكية في الحد من آثار البيئة الحضرية، المجلة الأمريكية الدولية للعلوم الإنسانية والاجتماعية، الجزء الثالث، العدد 13، يناير 2022.

¹⁵ Simon Joss FRSA, Smart cities at a Crossroads, Public Sector Executive, N 18, 2017, p 40.

air quality. As an illustration, Beijing has managed to reduce airborne pollutants by approximately 20% within less than a year by closely monitoring pollution origins.¹⁶

The smart grid is recognized as a central element of smart infrastructure, functioning as a system that integrates information and communications technology with the distribution of electricity from its source to its endpoint. This integration is aimed at optimizing network operations and improving consumer services throughout the energy supply chain.¹⁷

2.5 - Enhanced Water Resource Management through Smart Technologies:

A defining attribute of sustainable smart cities is the emphasis not only on conserving energy but also on preserving water resources. Advanced technology has the capacity to lower water usage by approximately 20 to 30%, a particularly critical factor in developing nations where pipe leakage stands as the primary contributor to water loss and contamination. This issue can be effectively mitigated through the installation of sensors designed to detect leakage sources, potentially reducing water losses to as low as 25%.¹⁸

It's essential to highlight that smart water management focuses on recycling and efficient utilization of water resources. Information technology has given rise to various applications that have played a pivotal role in safeguarding natural water resources to ensure their long-term sustainability.¹⁹

As a practical illustration in this domain, we can point to the **Jabal Omar** area in Makkah **Al-Mukarramah**. Here, each building is outfitted with mechanical and chemical systems designed for the recycling of water utilized in ablutions, sinks, and bathrooms. This recycled water is subsequently employed for the purpose of irrigating street trees and gardens.²⁰

2.6 - Smart Solutions for Effective Solid Waste Management:

Solid waste stands out as a paramount urban pollutant, underscoring the significance of recycling in ensuring the sustainability of smart cities. The latest technologies play a pivotal role in diminishing the volume of non-recyclable solid waste through digital monitoring and waste disposal payment systems that are contingent upon the quantity and type of discarded garbage.²¹

2.7- Efficient Traffic and Transport Management through Smart Solutions:

Smart transportation and traffic management encompass a collection of technological methods aimed at gathering data pertaining to the operational aspects of transportation systems, as well as insights into weather and environmental conditions. This approach is designed to address challenges encountered by individuals during land transportation processes, ultimately leading to enhancements in service quality and overall mobility.²²

Smart transportation and traffic management encompasses systems that leverage a range of contemporary technologies in transportation to attain several objectives, with a

¹⁶ عمر مخلوف، المرجع السابق، ص 28.

¹⁷ سامية نزالي، الشريف عمروش، دور المدن الذكية في تحقيق التنمية المستدامة، مجلة الإدارة والتنمية للبحوث والدراسات، المجلد 08، العدد 01، 2019، ص 79-80.

¹⁸ عمر مخلوف، المرجع السابق، ص 59.

¹⁹ أحمد نجيب عبد الحكيم القاضي، المرجع السابق، ص 4.

²⁰ عمر مخلوف، المرجع السابق، ص 60.

²¹ سامية نزالي، الشريف عمروش، المرجع السابق، ص 81.

²² ابتسام بولقواس، تقنية نظم النقل الذكية كاستراتيجية لتطوير قطاع النقل، رؤى اقتصادية، العدد السادس، 2014، ص 157.

primary focus on mitigating emissions arising from land transportation, thus reducing its environmental impact and energy consumption. This is achieved through:²³

- Reducing harmful exhaust emissions from vehicles.
- Reducing noise pollution, traffic nuisance, and residential neighborhoods.
- Reducing wasted fuel due to traffic congestion and not choosing the appropriate route.
- Reducing the consumption of environmentally harmful materials.

2.8 - Smart Economic Strategies: Driving Growth and Innovation:

The smart or information economy is distinguished by its reliance on information and communications technologies and information infrastructure. This is evident through its utilization of e-commerce, e-tourism, and e-services as integral components of its framework.²⁴

The foremost feature of the information economy is its detachment from conventional economic elements like capital and raw materials. Instead, its primary assets are information and knowledge, which do not deplete natural resources or harm the environment. Furthermore, it has minimal material requirements, limited to buildings, devices, and equipment. This economy is not constrained by geographical boundaries, enabling the assessment of economic activities and their geographic dispersion without reliance on transportation and communication infrastructure, thereby alleviating strain on road networks.²⁵

Second: The reality and challenges of smart sustainable cities in Algeria

Algeria have tried to adopt the idea of smart sustainable cities, but this transformation faces several challenges.

1- The reality of smart sustainable cities in Algeria - Far from intelligence and sustainability –

The initial indications of Algeria's transition towards smart cities became apparent in the year 2004 with the issuance of Executive Decree 04-275, later amended and expanded, which outlined the creation of the new city of Sidi Abdallah.²⁶ This decree came as an expression of keeping up with the pace of progress and innovation, and the Algerian government's awareness of the importance of technology and sustainability in the field of urbanization.

The new city of Sidi Abdallah is situated approximately 25 kilometers from Algiers, encompassing areas within the municipalities of Maalma, Rahmania, Zeralda, and Douira. It spans a total area of 7,000 hectares, comprising 3,000 hectares dedicated to development and 4,000 hectares reserved for green spaces and protected forests. The city is equipped with comprehensive amenities, including facilities for higher education, healthcare services, recreational areas, and entertainment venues. It was officially inaugurated on December 11,

²³ ابّسام بلقواس، المرجع السابق، ص 157.

²⁴ أحمد نجيب عبد الحكيم القاضي، المرجع السابق، ص 4.

²⁵ المرجع نفسه، ص 4.

²⁶ مرسوم تنفيذي رقم 04-275، مؤرخ في 05 سبتمبر 2004، متضمن إنشاء المدينة الجديدة لسيدى عبد الله، ج ر عدد 57، صادرة بتاريخ 05 سبتمبر 2004، المعدل والمتمم.

2016, with the aim of serving as an exemplar that embodies the ideals of modern urban planning and organization.

The government is actively working to transform the city of Sidi Abdellah into a fully integrated smart city, intending it to serve as a model for the development of the remaining four new cities (Bouinane, Boughzoul, Hassi Messaoud, and Menia). These new cities were established in alignment with the strategy initiated with the enactment of the New Cities Law in 2002.²⁷

As for the position of the urban legislator on sustainable smart cities, with reference to the laws of preparing the region, most notably Law No. 01-20²⁸, as well as Laws 02-08²⁹ and 06-06³⁰, While there hasn't been explicit disclosure of adoption of the smart sustainable cities trend, the city's policies clearly reflect a commitment to pursuing sustainable development. Smart cities are regarded as the prime model for realizing sustainable development across all dimensions, particularly the environmental dimension, which underscores the significance of preserving natural resources as the cornerstone of sustainable development.³¹

In order to develop and improve Algerian cities, the Algiers Province held the **Smart Cities Summit for Investment and Technology** in the period from June 27 to 28, 2018, under the auspices of the Algeria Smart City project launched by the Algiers Province.

This summit convened over 4,000 attendees, including 150 international experts, at the International Conference Center in Algiers. Prominent cities like Seoul, Paris, Caracas, Kigali, London, and San Francisco were well-represented at the event. Additionally, international institutions and organizations such as NASA, the World Economic Forum, the Islamic Development Bank, the World Bank, and the United Nations participated. Leading academic institutions like MIT and the University of Toronto, along with technology industry leaders, were also in attendance.

The summit's guests discussed the trends and challenges sought in establishing smart cities. The summit was also considered an opportunity to gather the best experiences in terms of technological innovation seeking to develop and develop the city. The summit also gave special attention to the challenges facing Africa and emerging countries in developing their innovative technologies and environmental systems³². The city of Bougazoul, located in the Medea and Djelfa regions, was put on hold by order of the President of the Republic, Abdelmadjid Tebboune. However, on May 9, 2023, the Minister of Housing and Urban Development, Mohamed Tarek Belaribi, convened a technical meeting with researchers, specialists, and academics affiliated with the Ministry of Higher Education and Scientific Research. During the meeting, the project manager presented a comprehensive overview of the new city of Bougazoul, which spans an extensive area of 19,500 hectares. Notably, the

²⁷ حميدة شباب، الإطار التشريعي للمدن الجديدة بالجزائر "مدينة سيدي عبد الله"، مجلة البناء والتعمير، المجلد 04، العدد 01،

2020، ص 147.

²⁸ قانون رقم 20-01، مؤرخ في 12 ديسمبر 2001، يتعلق بتهيئة الإقليم والتنمية المستدامة، ج ر عدد 17، صادرة بتاريخ 15 ديسمبر 2001.

²⁹ قانون رقم 08-02، مؤرخ في 08 مايو 2002، متعلق بشروط إنشاء المدن الجديدة وتهيئتها، ج ر عدد 34، صادرة بتاريخ 14 مايو 2002.

³⁰ قانون رقم 06-06، مؤرخ في 20 فبراير 2006، متضمن القانون التوجيهي للمدينة، ج ر عدد 15، صادرة بتاريخ 12 مارس 2006.

³¹ عواطف بوطرفة، المرجع السابق، ص 1370.

³² أمينة داودي، قمة المدن الذكية العالمية للاستثمار والتكنولوجيا يومي 27-28 جوان 2018، النهار ONLINE، يوم 03 جوان 2018،

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city has witnessed significant progress in the preparatory infrastructure works across various networks.³³

Hence, it can be asserted that the new city of Sidi Abdallah serves as Algeria's initial foray into smart city implementation, with a technological focus on waste management and environmental conservation. Nevertheless, the full realization of these initiatives remains incomplete due to hesitancy among investors in the city. Furthermore, the city lacks essential components characteristic of smart sustainable cities, such as renewable energy infrastructure (e.g., solar and wind energy), waste recycling facilities, and rainwater harvesting systems.

Consequently, sustainable smart cities in Algeria remain distant from the ideals of intelligence, appearing as cities devoid of vitality. These cities lack the essential elements of a smart city, encompassing technology, healthcare services, quality education, and recreational amenities. Furthermore, they are characterized by isolated and segmented neighborhoods that lack integration and cohesiveness.³⁴

2- Challenges facing smart sustainable cities:

In recent times, numerous countries, including Algeria, have embarked on the construction of sustainable smart cities as part of their endeavors to address the needs of their populace while safeguarding the environment. However, this transformation has encountered several noteworthy challenges, some of which are highlighted below:

2.1- Financing and legal challenges:

The issue of financing stands out as one of the foremost challenges encountered by numerous cities worldwide in their endeavors to transition into smart cities. The substantial cost associated with transforming a conventional city to meet the prerequisites of a smart city poses a considerable hurdle for governments³⁵. This challenge arises from the need to replace decades-old infrastructure, which is often inadequate, and it can surpass the cost of constructing an entirely new city. This challenge is exacerbated by the prevailing financial constraints faced by Arab governments, along with the pressures on their public budgets. The development of smart cities necessitates substantial investments in physical, human, and technological resources.³⁶

Alongside the financing challenge that impedes the transition towards smart cities, another equally significant issue arises—the absence of a robust legal and regulatory framework capable of guiding the transformation towards smart sustainability in construction. The lack of a legal framework hinders the provision of legal mechanisms that could support this transformative process. This is particularly critical as the existing construction and urban expansion regulations in Algeria are outdated, inadequate, and fail to align with contemporary urban trends or effectively contribute to sustainable development goals.

2.2 - Lack of experience in the field of smart urbanization:

The scarcity of experts and technology professionals dedicated to formulating a strategy for the successful realization of smart city projects stands out as a pressing challenge in the realm of smart urbanization. To address this challenge effectively, it is imperative for the government and pertinent stakeholders to assess the required number of

³³ الغد الجزائري، جريدة إلكترونية، ليوم 10 ماي 2023.

³⁴ فؤاد منصوري، المدن الذكية في الجزائر: بين التصور والواقع!، جريدة أخبار الوطن، يوم 04 مارس 2023.

³⁵ Mostafa Behzadfar..., *International challenge of smart cities*, Armanshahr Architecture & Urban Development, V 10, N 20, 2017, p82.

³⁶ عواطف بوطرفة، المرجع السابق، ص 1372.

professionals and take proactive measures to recruit and deploy them prior to commencing planning for smart initiatives.³⁷

2.3 - The challenge of planning and controlling technology:

Sustainable smart planning makes it easier for managers to anticipate risks that may occur in the future, and work to avoid them. Therefore, the authority managing sustainable smart cities must be able to understand and evaluate the transition stage they are going through for the success of this transformation. Accordingly, smart sustainable planning is one of the biggest challenges facing Developing countries that are new to this transition.

Managing the realm of technology remains a significant challenge for the implementation of sustainable smart city initiatives in developing countries. This challenge is exemplified by the underdeveloped state of information and communications technology infrastructure, coupled with limited access to these technologies. Moreover, the delay in formulating national strategies to harness technology for urban development exacerbates this issue.³⁸

2.4- The challenge of cybersecurity and the right to privacy:

Cybersecurity and the right to privacy are among the most important challenges facing smart cities after they are implemented on the ground. If the city's operating systems do not have information security, it becomes easy to infiltrate and control the city's information services, such as banking, risk management systems... as well as citizen information.

There are many methods of attacking and penetrating smart city systems, such as viruses, malware, impersonation, and others.³⁹

To face this challenge, it is necessary to develop and implement policies that guarantee the protection of privacy and confidentiality, and to establish modern and advanced protection systems.

2.5- Smart Society Challenge:

Implementing a smart city into reality requires a smart citizen who interacts with and benefits from new technologies. However many citizens are unable to afford to learn technology and do not know how to deal with it due to their old age and different cultural backgrounds.⁴⁰

- Conclusion:

Sustainable smart cities are now considered a necessity rather than a luxury for countries. These cities can help overcome environmental issues like pollution and climate change while promoting clean economic development. The transition to smart cities is a move towards green and sustainable cities that prioritize the rights of citizens and future generations.

However, in Algeria, where smart urbanization is still in its early stages, there are various challenges to be addressed, including weak infrastructure, lack of expertise in ICT technologies, cyber security concerns, privacy issues, and planning challenges. To successfully transition to sustainable smart urbanization, it is important to focus on developing a strong information and communication technology infrastructure, encouraging

³⁷ عمر مخلوف، المرجع السابق، ص 42.

³⁸ ابتسام بولقواس، المرجع السابق، ص 157.

³⁹ عمر مخلوف، المرجع السابق، ص 45.

⁴⁰ صباح بلقيدوم، حياة مامن، المدينة الذكية آفاق جزائرية بخطى عابئة، مجلة الأصيل للبحوث الاقتصادية والإدارية، المجلد 03، العدد 01، 2019، ص 173.

long-term investment in smart city projects, and establishing a legal and regulatory framework. These measures will help Algeria achieve the same level of smart and sustainable development as more developed countries.

The transition from traditional urbanism to sustainable smart urbanism requires the following:

- Develop a strong infrastructure in the field of information and communication technologies.
- Opening the way for long-term investment in sustainable smart city projects.
- Establishing a legal and regulatory framework to frame the transition towards smart sustainability in urbanization.
- Establish an effective legal framework that limits cybercrime and protects the privacy of citizens.
- The need for the private sector to contribute to the recycling of waste in terms of collection, sorting, treatment and disposal.

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