ISSN NO.2395-0692

IJAHMS International Journal of Arts, Humanities and Management Studies

The Rise of Sustainable and Smart Cities in the UAE: The Experiences for Türkiye

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ABSTRACT:

The United Arab Emirates (UAE) has been considered as a pioneer in advancing smart and sustainable Cities in the Middle East region. This study seeks to shed light on the successful experience of the UAE in this field, and identify the potential challenges and opportunities for Türkiye to develop such cities. By doing so, the present study will provide a roadmap to the Turkish government to create convenient, efficient and safe urban ecosystems meeting citizens' needs. According to the experiences of the UAE government, the Turkish government could focus on using use of technology in government services, increasing the public awareness on the fourth industrial revolution and the potential benefits it could bring for them, prioritization of investments on creating a sustainable society which aims to strike a balance between artificial intelligence and the nature and finally designing an effecting plan to reduce carbon consumption in urban planning.

KEYWORDS: *Sustainable Development; Smart Cities; Industrial Revolution; Nature; Artificial Intelligence*

INTRODUCTION

The growth of urbanization leads to an increase in the complexity of lifestyles, a deterioration in the quality of life, and a lack of conventional energy sources. At the same time, with the increasing use of smart devices to connect to the Internet, life will be easier with many IoT-based technologies in the future. This implies the need for enormous electrical energy or, alternatively, the demand for energy-efficient solutions. In this context, the cities of the UAE, especially Dubai and Masdar, as sustainable smart cities, can be considered as clear examples for the deployment of natural energy sources in the construction of smart buildings and other infrastructures, while reducing energy consumption. However, it should be noted that there is no specific way for the "smart" evolution of a city. Different cities around the world have approached the smart city concept in different ways and have evolved differently to suit their unique priorities and needs. All cities faced different challenges during their evolution, and in many cases, the goals and objectives of the smart city had to be constantly changed to align with the growth, priorities and interests of the city. This study seeks to shed light on the development of smart cities in Türkiye and potential challenges and opportunities it may face with. In order to do so, the study focus on successful experience of smart

cities in the UAE. The first part will discuss the initial emergence of smart city, then we will discuss the experience of the UAE and finally the development of smart cities projects in Türkiye.

What is a smart city?

The concept of smart city was first used in the 1990s. At that time, the focus was on the significance of new information and communication technology regarding modern infrastructure within cities. The California Institute for Smart Communities was one of the first to focus on how communities can become smart and how a city can be designed to implement information technology (Alawadhi et al, 2012). In the field of urban planning, the term smart city is often considered as an ideological dimension, based on which being smarter requires strategic orientations. Governments and public organizations at all levels use the concept of intelligence to differentiate their policies and programs to target sustainable development, economic growth, better quality of life for their citizens, and happiness. (Ballas, 2013). In fact, being a smart city means using all available technologies and resources in a smart and coordinated way to develop urban centers that are integrated, livable, and sustainable at the same time (Barrionuevo et al., 2013).

However, it is not possible to provide a precise definition of the smart city because a deep analysis of the relevant literature suggests that the meaning of the smart city is multifaceted and has different dimensions, some of which we will discuss in this paper.

Dirks and Keeling emphasize the importance of organic integration of different city systems (transportation, energy, education, health care, buildings, physical infrastructure, food, water and public safety) in creating a smart city (Dirks & Keeling, 2009). Researchers who support this integrated view of a smart city often put emphasis on a dense environment, such as that of cities, in this kind of system we don't have isolated operations. In other words, combining the subsets of a city with the facilities and features of an artificial city, one by one is not enough to create a smart city, because it must be considered as a whole unit (Kanter, and Litow, 2009). Some researchers also defined four factors for a smart city: industry, education, participation and technical infrastructure (Giffinger et al., 2007). This list has been expanded in a recent project at the Centre of Regional Science in Austria, which identified six main components (Giffinger & Gudrun, 2010), including Smart economy, smart mobility, smart environment, smart people, smart life and smart governance. These authors rely on traditional and neoclassical theories of urban growth and development that is regional competitiveness, transportation and ICT economics, natural resources, human and social capital, quality of life, and participation in community members to develop and analyses their subjects under studies (Giffinger et al., 2007). An interesting point to note in the previous list of components of a smart city is the inclusion of "quality of life". This component emphasizes the definition of a smart city as a city that increases the quality of life of its citizens (Giffinger et al., 2007). However, many researchers argue that quality of life may not suggests a separate dimension of a smart city, since all actions taken in other areas should seek to increase quality of life in order to represent this main component (Shapiro, 2006). To further clarify this concept, in the following sections, we will discuss the experiences of UAE and Türkiye in the field of smart cities.

Experiences of Smart Cities in UAE

Smart and Sustainable City (SSC) initiatives have been positioned as potential solutions to economic, social and environmental issues and pressures in cities. In addition, advances in

information and communication technology (ICT) create the potential for significant transformation in the way cities are planned and managed (Geray, 2019). Taking a more holistic approach, smart cities enable urban planners and managers to increase efficiency in many infrastructure sectors including energy, water, transportation, telecommunications, cooling and waste. Due to these benefits, the number of smart cities is expected to increase dramatically worldwide by 2025 (Tayar et al., 2015). Smarter city power grids provide the advantage of monitoring consumption over time and thus create more efficient consumption patterns, leading to large reductions in usage. In Abu Dhabi, for example, electricity demand has grown at a rate of more than 10 percent per year, well outpacing the UAE's 9 percent annual population growth rate (AL-Dabbagh, 2022). As a result, the government of Abu Dhabi has implemented an advanced metering system with different features and tariffs to encourage users to reduce consumption or shift it to off-peak hours (AL-Dabbagh, 2022). Similarly, Dubai has implemented several related projects to significantly reduce electricity consumption, including smart metering, demand side management, and distributed generation to encourage energy customers to use more efficiently (which includes on-site energy generation to reduce transmission losses). These methods saved about 1,100 GWh of electricity and 5.4 billion gallons of water between 2009 and 2014, and reduced carbon dioxide emissions by about 536,000 tons (AL-Dabbagh, 2022). Another key sector of smart cities is transportation, which has seen significant technological advances. The UAE is promoting the use of electric vehicles and developing the infrastructure needed to support them. Before 2015, the country had 16 electric car charging stations in place, and their number was more than 100 charging stations by the end of 2015 (AL-Dabbagh, 2022). To meet the transportation needs of a growing urban population, the UAE needs to focus on more important issues such as improving the fuel efficiency and emissions of imported cars, convincing citizens that they don't need cars, and reducing reliance on cheap gasoline (Karlsson et al., 2015). Consequently, public awareness initiatives should be included as part of the smart city program, as it is a gentler way to influence citizen behavior. Funding for such efforts has already been set up in the UAE. For example, the Emirates Energy Award was established by the Dubai Energy Council and provides monetary awards for outstanding work in various public and private sector projects (AL-Dabbagh, 2022). Dubai Electricity and Water Authority (DEWA) has also supported customer awareness programs that persuade households and businesses to reduce the temperature of air conditioners. Since 2009, DEWA's campaign has saved a total of more than AED 600 million (US$163 million) (Karlsson et al., 2015).

These were just a few examples of the Emirate's experiences in this field. For further investigation, we will look at the history of the emergence of the smart city in the UAE. Dubai's first technological experience began in 1999 with the announcement of the first ICT strategy, which was followed by the launch of Dubai Internet City, Dubai e-Government, Dubai Smart Government and later in 2014, the Smart Dubai Initiative (Geray, 2019). The ruler of the UAE, Sheikh Mohammed bin Rashid Al Maktoum, has also emphasized the important role of technology in the Smart Dubai initiative, which was put on the agenda by him. The initiative aims to make Dubai the “Happiest City on Earth” (Geray, 2019). Numerous implementations ranging from massive IoT systems, data analytics, block chain projects, Hyperloop projects and innovative 3D printing designs to experiments on self-driving vehicles and drones, robotics and artificial intelligence applications were developed and tested as part of the Smart Dubai initiative (Geray, 2019). The Dubai Smart City Strategy includes more than 100 plans and plans to transform 1,000 government services into smart services. The project aims to encourage collaboration between the public and private sectors

to achieve goals in six "smart" focus areas: Smart life, smart transportation, smart society, smart economy, smart governance and smart environment. This strategy is based on three basic principles: communication, integration and collaboration (Dassani et al., 2015). In 2017, Dubai implemented its first five-year plan, and in 2021, the new strategy clearly shifted the strategic focus from empowerment with significant positive impact to digital city transformation (Geray, 2019). In addition, Dubai, as one of the smartest cities in the Persian Gulf countries and the Arab world, has seen growth in the economy and people's well-being since the beginning of technological initiatives. According to Dubai Economic Council estimates, the GDP growth rate increased by 4.7% in the second half of 2013 (Badran, 2019). In addition, Dubai has a modern ICT infrastructure built on government communication networks and planning systems that are the best in the world which paved the way for winning the United Nations Government Service Award in June 2013 which suggested the UAE's efforts to become a smart government not only in the world but also in the world (Badran, 2019).

In this regard, the United Arab Emirates has been at the forefront of e-government implementation in the Arab region since the early 2000s. According to studies, this country has the highest use of smartphones among Arab countries (Badran, 2019). This situation improved significantly after the implementation of the smart government initiative and the use of smart technologies in public service delivery processes (Badran, 2019). In 2001, the Council of Ministers issued a decision and handed over the responsibility of developing a strategic plan for the implementation of electronic government to the Ministry of Industry and Finance at that time (Badran, 2019). In the same year, the Ministry of Finance introduced the first electronic service in the federal government called the E-Dirham service, and to achieve coordination between the various activities included in the e-government program, a committee led by the Minister of Finance and Industry in the federal government in 2011 was formed (Badran, 2019).

This brief and quick review of the developments of e-government efforts at the federal level shows that the UAE government has taken the issue of e-government evolution seriously since the first years of implementation and by providing a favorable environment for implementation, it has developed and implemented the program at a constant pace until Now it has continued. In the case of a study of Dubai, we observed that this city has adopted its own unique smart city approach.

The city of Masdar is another city where the United Arab Emirates adopted the necessary infrastructure to create a smart city. This city with traditional Arabic architecture seamlessly blends with modern technology to maximize energy efficiency and pave the way for the cities of the future (Alzaabi et al., 2019). In fact, this city is considered an emerging global center for knowledge, business, research and development, which includes Abu Dhabi's commitment to a sustainable future and pioneering best practices in sustainable urban planning, design, development and operation (Alzaabi et al., 2019). Masdar City offers a high quality living and working environment with the lowest possible ecological footprint and strives to be a model of sustainable development where residents want to live, work and play. Designed as a clean technology hub with special economic zone incentives, the city attracts companies to commercialize and deploy new energy technologies in the Middle East. Masdar City uses several green building rating systems to determine and verify the sustainability characteristics of selected buildings (Alzaabi et al., 2019). One such rating system is the Estidama Pearl Rating System (PRS), which is a requirement for all new buildings designed and built in Abu Dhabi. In addition to the rating system, Masdar City has used internationally recognized green building rating systems such as Leadership in Energy and

Environmental Design (LEED) in some cases (Alzaabi et al., 2019). Masdar City hosts the Masdar Institute of Science and Technology (now part of Khalifa University), the Incubator Building, the headquarters of the International Renewable Energy Agency (IRENA) which has an Estidama 4 pearl rating, the Siemens Building, which is officially LEED Platinum certified for its internal and external structures (Alzaabi et al., 2019). According to a research conducted by some researchers, the themes of Masdar City's sustainability performance are: workforce, economic development, products and services, environmental performance data, supply chain management and community participation (Alzaabi et al., 2019).

Smart City Experience in Türkiye

According to the report of Switzerland Global Enterprise, the official Swiss organization for export and investment promotion, the active cities in the field of smart cities in Türkiye are Istanbul, Kuja Ali, Ankara, Izmir, Bursa, Konya, Gaziantep, Eskishahr-Tepebashi, Çankala, Antalya (Switzerland Global Enterprise, 2021).

Istanbul Metropolitan Municipality (İMM) launched a smart city transformation master plan and roadmap in 2015 with its related companies such as İŞBAK. The vision of the smart city of Istanbul in this project is "the smartest city in the world that contributes the most to the quality of life until 2029" along with short-term (2019), medium-term (2023) and long-term (2029) strategic goals and the smart city roadmap which is focused on the field of “movement, environment, energy, government, economy, life, human and safety” (Switzerland Global Enterprise, 2021). In addition to the work of the Eskişehir metropolitan municipality, Tepebashi district municipality has received financial assistance from the European Commission for the REMOURBAN-Smart City project, which was carried out for the first time as a major city from Türkiye between 2015 and 2020. REMOURBAN is a 5-year long-term project (2015-2020) funded by the H2020 research and innovation program of the European Commission (Switzerland Global Enterprise, 2021).

Ankara is another city that has been active in the field of smart city. For example, in 2011 Ankara started communication technologies based on smart cities and informatics works (Gürsoy, 2019). Some of the programs and projects implemented in the city of Ankara that facilitate urban life and improve the quality of life are urban and traffic cameras that are used both to manage traffic and to create safety within the city (Switzerland Global Enterprise, 2021). Intelligent transportation system that includes traffic information, displays, signaling system for central connection control, dynamic connection control system and mobile and web traffic density maps. In addition, the city has environmental projects such as integrated solid waste management system, intelligent water management systems (Switzerland Global Enterprise, 2021). For example, citizens can conduct their financial transactions, especially in the tax field, through mobile applications through the electronic management systems of units such as ASKI in the electronic environment (Varol, 2017).

Izmir manages more than 10,000 smart devices and has the longest fiber optic network in Türkiye as of 2017 with 621,000 meters of fiber optic cables within the scope of the IzmirNet project and intelligent traffic systems (Switzerland Global Enterprise, 2021). In addition to the development of mobility, Izmir also has sewage treatment plants and solid waste disposal which is supported by solar panels on the roof of 10,000 square meters in the workshop buildings of the General Directorate of ESHOT and environmental lighting systems in public spaces as environmental projects. The city's startup ecosystem is flourishing and has attracted young entrepreneurs in recent years (Switzerland Global Enterprise, 2021).

Bursa Metropolitan Municipality established the Smart City and Innovation Department in order to achieve an integrated strategy in the municipality and created and defined five categories of smart city as smart transportation, smart governance, smart environment, smart society and smart healthcare (Switzerland Global Enterprise, 2021). Like some other cities, the city of Bursa started smart city solutions in the field of mobility such as smart connectivity, city and traffic cameras, traffic density maps, smart car parking solutions, public transportation information systems. The city also has environmental projects such as generating energy from methane gas, generating energy by burning sludge, tracking sea brooms and solar power plants (Switzerland Global Enterprise, 2021). In the environmental category, the municipality promoted the use of renewable energy sources and established a SCADA center under the supervision of BUSKİ to achieve real-time control, observation and decision-making of these facilities (Switzerland Global Enterprise, 2021).
Projects and implementations within the scope of the Konya Smart City vision are carried out by the Information Technology Department of the Konya Metropolitan Municipality (KMM) and is known for its smart city initiatives in Türkiye, especially in the field of transportation and e-municipality. Fleet and passenger management information is provided by the Intelligent Public Transportation System (ATUS) and dynamic traffic management, accident detection and traffic information by the Central Traffic Operations System (METIS) (Switzerland Global Enterprise, 2021). To preserve the historic city center, Konya gave importance to the use of bicycles, the bicycle sharing program and the use of catheter-free trams -without the use of poles and wires (Switzerland Global Enterprise, 2021).

The Mayor of Gaziantep City (GMM) is the member of the Turkish Municipal Union and has a strong vision and commitment to the development of smart cities. The local operator Turk Cell presented various technological solutions for GMM in 8 main topics within the scope of smart city programs (Switzerland Global Enterprise, 2021). More than $11 million was saved in GMM in 2015 through smart city practices that provide efficient use of natural resources and increase the quality of life for city residents. This project also achieved savings and efficiency in electricity and water consumption and drilling management (Switzerland Global Enterprise, 2021). It is also planned to create technological infrastructure in the Zeugma Museum and Zoo, which is visited by 2.5 million people annually (Switzerland Global Enterprise, 2021).

As the region has been rocked by strong earthquakes in the recent past, the Kocaeli Metropolitan Municipality (KMM) is focusing on smart initiatives in disaster and emergency management in addition to other regular areas (Switzerland Global Enterprise, 2021). The aim of the smart city solution is to provide automatic warning to the beneficiaries against gas leaks, explosive mechanisms related to water and electricity in factories before an earthquake occurs (Switzerland Global Enterprise, 2021). Highlighting the potential of Kocaeli regarding the smart city, some experts believe that Kocaeli region is one of the cities that needs the concept of smart city planning because it is an industrial city and has culture, tourism and green areas, since it is an industrial city and has culture, tourism and green areas. Koja Ali Metropolitan Municipality has established the foundations of today's smart city concept by establishing the geographic information systems management unit in the municipal organization in 2007 (Demirel and Mülazımoglu, 2022). The first project that was implemented in line with smart city studies is the Kojali Bicycle Sharing System (KOBIS). With this project, a bicycle rental system called KOBIS was created to provide an alternative to public transport in the borders of Kocaeli and to encourage the use of a sustainable and ecological vehicle (Demirel and Mülazımoglu, 2022). After the KOBIS application, the smart

parking system, earthworks management information system, cemetery information and guidance system, walking routes application, Eco mobile system and smart school registration system have been implemented (Demirel and Mülazımoglu, 2022).

The Chanakkale on my Mind project is a smart city transformation plan to improve the quality of urban life and ensure a sustainable environment, while creating a competitive advantage for Chanakkale on a global scale (Switzerland Global Enterprise, 2021). This initiative is the first smart city project in Türkiye, initiated by the visionary leadership of a company in that city, Kale Group, in collaboration with a prominent NGO-Turkish Informatics Foundation (TBV)-, with the aim of helping Türkiye become an Information Society which matches the passion of local stakeholders (Switzerland Global Enterprise, 2021). The main goal of this project is to ensure the participation of local authorities and local residents in all stages of the development of the smart city of Chanakkale. Therefore, ensuring sustainable collaboration between local governments, public and private sectors, universities and non-governmental organizations is crucial for the successful implementation of the project (Benli & Gezer, 2017).

The main smart city projects initiated by Antalya Metropolitan Municipality are: electronic traffic control system, urban information kiosks, especially tourism, remote health programs, free internet services at designated points in several areas, devices/ Child and elderly tracking apps and voice navigation apps (Switzerland Global Enterprise, 2021). An integrated smart city management platform was also created to monitor, control and manage smart services from a single data collection center. One of the big projects is the transformation of an urban area in Kapez Central neighborhood. The municipality sees the urban transformation project as an opportunity to launch a smart district based on ICT solutions in energy, environment and transportation issues (Switzerland Global Enterprise, 2021).

In Istanbul, there is a smart city project office titled "Smart City Project Consulting Services Procurement". There are also smart applications for traffic and vehicles in cities such as Izmir, and the first licensed research and development center for intelligent transportation systems in Türkiye started in 2016 (Switzerland Global Enterprise, 2021). Also, in this same year, a cloud traffic management system based on the Internet of Things was created for the first time in Türkiye in cooperation with Istanbul Municipality (Sabah, 2017). This system sent text messages to the citizens to inform them about the projects, and in this way, their individual characteristics and interests were clearly evaluated and specified (Sabah, 2017). In Ankara also, there are many projects such as smart connections, smart structures in new buildings, conversion of old buildings and energy saving projects, etc. (Varol, 2017).

Türkiye is also the percentage of smart city creation in several cities. However, if other elements are neglected and the smart city is emphasized only through its technology, it may become a technology exhibition rather than a smart city. This issue can also be a threat to the sustainability approach (Varol, 2017). In addition to the three big cities of Türkiye, another example of megacities is Kayseri Municipality, which started its work and implemented its pilot programs in line with all the above-mentioned components according to the Smart Urbanization Report 2018 (Kestelloğlu, 2022). These applications are described in this report as follows: urban air quality tracking stations, smart parking lots, smart lighting, smart stops, shared bicycles, Kayseri Municipality mobile applications, tourist cameras, door numbers with QR codes, Free wireless internet (Wi-Fi), electric buses, energy management from solid waste, smart irrigation, traffic control centers, smart

connections, SCADA (supervisory control and data acquisition), autonomous (unmanned) public vehicles, Smart libraries, smart management, call centers, MIS information management system (Kestelloğlu, 2022). Although they are generally in the form of a tentative application, it is understood that the work of the municipality is going on vigorously. NGOs and universities are also invited to this workshop (Kestelloğlu, 2022).

The analysis shows that there are encouraging, guiding and comprehensive documents at the national level for smart cities in Türkiye. Long-term development plans and annual short-term plans are positive for determining the goals and policies of smart cities. The fourth strategy and the third action plan prepared at the national level in the transformation of the smart city 2020-2023 of the national smart cities strategy and action plan also specify these things (TUBİTAK BİLGEM, 2021). Annual presidential programs also include smart cities, and there is a "National Smart Cities Strategy and Action Plan" that is published every two years as a mid-term plan. "Smart export platform" and development plans in smart cities are of great importance and should be important in local administrations as well. Other action plans and documents also consider smart cities and encourage actions in this area (Kestelloğlu, 2022).

When we look at the internal organizations of metropolitan municipalities, departments under "Data Processing Departments" usually focus on this aspect, however, we see Bursa Metropolitan Municipality with a separate department called "Smart Urbanization and Innovation Department" which It focuses directly on this aspect (Kestelloğlu, 2022). Some other metropolitan municipalities have departments called "Department of Map and Geographical Information Systems," "Department of Strategy Development," "Department of Economic Development, Research and Development and Innovation," and "Department of Reconstruction and Urban Development" (Kestelloğlu, 2022). A smart city is defined within the requirements of the relevant city. If we look at the strategic plans of the municipalities of big cities, it can be said that several technological projects have been designed and implemented in the field of "intelligence" (Kestelloğlu, 2022). To refer to the current situation in Türkiye, it can be said that the concept of smart city is taken seriously in terms of reference documents and strategies. In addition, it can be added that local management has extensive studies in this field (Kestelloğlu, 2022).

Based on this, local administration organizations of smart cities should be expanded and appear more in plans and programs. On the national scale, on the other hand, local governments must be supported materially to realize their plans. Nevertheless, it can be said that this is a vital process in which progress must be made (Kestelloğlu, 2022).

Challenges of Implementing Smart Cities in Türkiye

Infrastructure

Infrastructure development pose a significant challenge in the implementation of smart cities in Türkiye. Despite advancements in urban centers like Istanbul and Ankara, still we have witnessed a notable gap between urban and rural areas, regarding technological and infrastructure development. This divide could negatively impact the development of smart cities in Türkiye. The roots of this problem trace back to limited financial resources of smaller municipalities and rural regions to modernize the technological and other infrastructures.

ISSN NO.2395-0692
IJAHMS International Journal of Arts, Humanities and Management Studies

Policy and Regulation:

The formulation of clear policies and regulations regarding the monitoring and deployment of smart technologies is necessary but often fraught with some challenges including data privacy, cybersecurity, and interoperability need to be addressed to foster public trust and confidence in government-led initiatives.

People's Pessimism about Technology

Pessimism about technology often stems from concerns regarding its potential negative impacts on society, including fears of losing job displacement, loss of privacy. Furthermore, rapid technological advancements may induce feelings of uncertainty and alienation, especially among those who feel unequipped to navigate a rapidly changing digital landscape. To encourage greater acceptance and adoption of technology, it is essential to address these concerns through education, transparency, and inclusive policy-making. Providing accessible training programs and digital literacy initiatives can empower individuals to harness technology effectively and mitigate fears of being left behind. Moreover, fostering open dialogue and soliciting feedback from diverse stakeholders can promote greater trust and confidence in technological solutions. Additionally, policymakers should prioritize the development of inclusive and ethical technology frameworks that prioritize privacy, security, and equity. By emphasizing the positive potential of technology to improve lives and enhance connectivity, we can inspire greater enthusiasm and engagement among individuals and communities, leading to more widespread acceptance and adoption of technological innovations. Engaging citizens in the decision-making process and ensuring inclusivity in smart city projects are essential but often overlooked aspects. Empowering communities, fostering digital literacy, and soliciting feedback from diverse demographic groups can help tailor solutions that address the unique needs and preferences of different population segments.

CONCLUSION

In conclusion, the transition towards smart cities in Türkiye is fraught with challenges, ranging from infrastructure limitations and regulatory hurdles to financial constraints. However, by embracing technology in government services and fostering collaboration between various stakeholders, Türkiye can overcome these challenges and create urban ecosystems that are convenient, efficient, and safe. encouraging citizens, promoting digital literacy, and prioritizing inclusivity are paramount in ensuring that smart city initiatives align with the diverse needs and aspirations of Türkiye 's population. However, Turkish cities have a lot to do in terms of smart environment and smart mobility. Green urban planning, green buildings and green energy issues, clean and non-motorized options should be prioritized and action plans should set a clear goal to become the smartest city in the world. Turkish cities should also use the latest technology to attract citizen participation, which offers a wide range of mobile software and tools for cities to communicate and engage citizens in discussions about urban projects. To pave the way to smart cities, clear strategies must be presented with stakeholders. The first thing should be creating a vision for the city and citizen participation. The use of information and communication technology and social media can be a way to create active participation. Each city has its own needs depending on density, topography, existing infrastructure, etc. Once a city has established clear goals and indicators to measure its progress, it should develop long-term plans. Starting with a pilot project can test the feasibility of its planned program.

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