# SMART CITY CRITERIA

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ABSTRACT

In order to achieve the vision of creating a "smart city," it is necessary to reach a number of basic requirements first. The purpose of these criteria is to emphasize the ways in which a city's opportunities and resources contribute to the growth of a prosperous economy that is mindful of the environment, while also supporting the development of a society that is healthy. In order to shed light on the prevalent practices of smart cities, this study conducts a comparative analysis of the criteria defined by the European Union (EU) and the European Investment Bank (EIB). The paper not only offers a clarification of the idea behind smart cities, but it also investigates the many different ways in which smart cities might be applied. In addition to this, it provides a thorough investigation of a number of the most common criticisms raised concerning smart cities. This study intends to enhance the understanding of the fundamental elements driving the implementation and growth of smart cities by investigating these features.

KEYWORDS _ *Smart city criteria; EU SCC; EIB SCC; quad helix stakeholder; sustainability*

## INTRODUCTION

Smart cities offer a new, efficient way of dealing with urban challenges by using technology to collect and analyze data, with the goal of applying solutions that benefit residents. New technology is continuously helping social infrastructure and pushing necessary social change by helping manage numerous urban problems, (i.e. traffic congestion), making information more accessible, reaching the underserved, and raising money.[1] As smart city practices are highly profitable, their contribution to sustainability, and focus on human needs is being put into question.[2] Ideally, the word "smart" can serve as a basis for creating intelligent solutions that meet the needs of all actors in modern ecosystems, and add value to the collective. Smart cities do not have an exact widely agreed-upon definition, and, as the term is growing in popularity, its definition is considered to be a work in progress.[3] However, as cities need to prioritize their citizens' well-being, the best working definitions are those with human needs at their center. Moreover, smart cities aim to create more responsive and interactive city administrations and safer public areas. Currently, more than half of the world's population lives in urban areas, and it is expected that the number will increase to almost 70% by 2050.[4] Such high numbers lead to cities producing 80% of global Gross Domestic Product (GDP), while also generating 70% of carbon emissions.[5] In these circumstances, smart cities have the potential to make urban areas more livable for the expected growing population. There are numerous ways to conceptualize a smart city. However, any successful initiative should have a criterion. Both the EU and EIB possess criteria based on which they judge smart cities and their impact on urban areas. The EU and EIB smart city definitions are also elaborated ICT acts as a link between networks of individuals, infrastructure, and resources by providing intelligent solutions that governments can utilize. The EIB supports a wide array of urban projects. Their investments have helped numerous urban regions deliver substantial improvements in intelligent and sustainable mobility, infrastructure development, better water and waste management systems, and enhanced e-government and other municipal services and facilities. Despite the wider scope of projects they support, all EIB-financed projects in the field of smart cities are innovative, integrated, and inclusive. One project financed by the EIB University Research Sponsorship Programme is ASCIMER (Assessing Smart City Initiatives for the Mediterranean Region), a three-year research project. The project aims to create an inclusive framework that enables private and public stakeholders to make smart decisions about Smart City investment strategies and develop skills to assess and prioritize such projects, including suggestions addressed at minimizing difficulties about deployment and transferability.[6]

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[3] Camero, A., & Alba, E. (2019). Smart City and information technology: A review. Cities, 93, 84–94. doi: 10.1016/j.cities.2019.04.014

[4] Ritchie, H., Roser, M. (2018). Urbanization. OurWorldInData.org. Retrieved from: https://ourworldindata.org/urbanization

[5] United Nations Department of Economic and Social Affairs, Population Division (2022). World populationprospects 2022: Summary of results. UN DESA/POP/2022/TR/NO. 3.

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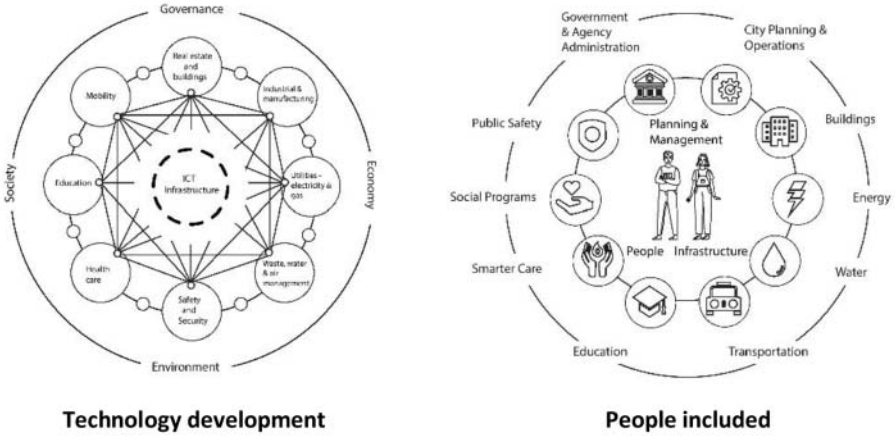


**Figure 1:** Technology development vs. People included. Source Authors

## DESCRIPTION AND COMPARISON

Numerous studies have been carried out in order to evaluate and track the growth of smart cities. The European Union (EU) Urban Audit dataset was used to analyze the variables affecting the performance of smart cities.[7] The EU Urban Audit is a compilation of comparable data and criteria for European cities; it includes information for more than 250 indicators in the areas of demography, social and economic aspects, civic engagement, education and training, environment, travel and transportation, information society, culture, and recreation. These six criteria align with those established by Professor Dr. Rudolf Giffinger and his research team at the Vienna University of Technology's Centre for Regional Science, which later found widespread adoption in the "Smart Cities Wheel" created by renowned urban planner and smart city expert Dr. Boyd Cohen. From a strategic standpoint, an approach that addresses all six criteria can be seen as a comprehensive plan for creating a smart city. The six criteria, namely: smart economy, smart living, smart people, smart mobility, smart governance, and smart environment are incorporated in both the EU and EIB and are elaborated and compared considering both organizations below: Smart economy is innovative, well-connected, competitive, and it incorporates technology for its functions. Furthermore, it is transparent and offers diverse work opportunities.[8] The EU study makes mention of various facets of smart economy including ecommerce and online businesses. Additionally, the same study states that such an economy crosses borders and includes a larger, global scale.[9] On the other hand, the EIB factsheet on smart city investments focuses on sustainable development through investing well in the smart economy, fostering innovation, and having sound and fruitful collaborations.[10] Smart living is reflected through the living standards of the city's residents, which are first and foremost safe and healthy. It incorporates smarter, more economical ways of functioning in domicile, the workplace, and transportation. Various sources, including the EU, agree that one key aspect of smart people is their access to data and involvement in public life and decision-making.[11] Moreover, other factors such as creativity, cultural

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[11] Braga, I., Ferreira, F., Ferreira, J., Correia, J.C., Pereira, L., Falcao, P. (2021). A DEMATEL analysis of smart city determinants. Technology in Society. https://doi.org/10.1016/j.techsoc.2021.101687

diversity, and flexibility are also utilized to signify smart people. Smart mobility improves urban traffic by using ICT and increasing inter-modality. ICT can be used for users to find relevant information that saves time and helps enhance the commuting experience. Smart governance, commonly known as e-government, focuses on keeping the citizens informed, and making them a part of decision-making processes by incorporating open data on their websites. Thus, such partnerships and other civil and private ones, enabled by e-governance, help with achieving a smart city's goals by making communication faster and more transparent.[12] A smart environment includes two main aspects: a focus on sustainability, and the interconnectedness of all aspects above. By focusing on sustainability, a smart environment promotes and utilizes renewable energy sources, electric vehicles, ICT-enabled energy grids, green urban planning and green buildings. Moreover, Aleta et al.[13], state that a smart environment also has the ability to trace leaks and faults in distribution networks. On the other hand, a smart environment is also one that brings together smart governance, mobility, people, and living, thus it reflects all aspects by its healthy functioning. Meanwhile, EIB's ASCIMER Assessment methodology strives to assess Smart City Projects by learning their effects on the city and their contribution to reaching a Smart City. The following key elements must be inherently part of the Smart City Project and constitute one of the bases taken as a departure in developing the ASCIMER methodology. The EIB believes that smart city investments should be grounded in an integrated planning framework to meet their real needs. The EIB is also enthusiastic about helping stakeholders make customized solutions and finance smart investments that encourage the development potential of any city. It has made numerous investments, which help enhance mobility and public services by using smart technologies (i.e., smart lighting, alternative fuel vehicles, ICT in health and social care services, and city administration). The EU has also invested directly in smart economy development i.e., intelligent traffic systems across various countries of the EU.

**Table 1:** Smart city criteria EU and EIB

| | **EU Smart City criteria** | **EIB Smart City criteria** |
|---|---|---|
| **1** | Smart environment | Smart environment |
| **2** | Smart people | Smart people |
| **3** | Smart living | Smart living |
| **4** | Smart governance | Smart governance |
| **5** | Smart economy | Smart economy |
| **6** | Smart mobility | Smart mobility |

## SMART CITY PROJECTS IMPLEMENTED BY THE EU AND EIB: ELABORATION AND COMPARISON OF THE CRITERIA

According to the European Parliament's in-house think tank, nearly all cities in Nordic nations are smart cities. Many cities with more than 100,000 residents in the Netherlands, Austria, and Italy are smart cities, not to mention half of the British, French, and Spanish cities. On the other hand, Poland and Germany are currently behind, while the eastern EU members have the lowest rate of smart cities. [14]Here are some EU city projects that meet the aforementioned smart city criteria: The Smart Building Management System Project in Amsterdam minimizes office buildings' energy use and operating expenses. The pilot project was run in the ITO Tower, where different Smart Energy management solutions were deployed.

[12] European Investment Bank (2014). Investing in Smart Cities, European Investment Bank https://data.europa.eu/doi/10.2867/94870

[13] Aletà, N. B., Alonso, C. M., & Ruiz, R. M. A. (2017). Smart mobility and smart environment in the Spanish cities. Transportation research procedia, 24, 163-170. https://doi.org/10.1016/j.trpro.2017.05.084

The project's objective is to lessen energy consumption by gathering, analyzing, and visualizing data on the amount of energy used and employing energy-saving tactics based on that information. Thus, this project meets the smart environment criteria set in place by the EU. Moving on to Finland, the Helsinki Region Infoshare project strives to make regional data from public institutions more accessible to the public, thus meeting the EU smart governance criterion. The data are free and can be utilized by governmental institutions, research organizations, schools, businesses, or citizens. In 2013, more than 1,030 databases were accessible on the website, covering a broad spectrum of urban phenomena like well-being, economics, transport, employment, and conditions. In Barcelona, the smart and sustainable architecture Media-tic Building accommodates organizations and businesses in information and communication technologies and the audio-visuals and media sectors. It was made as a communication hub and meeting point for such businesses. The building's façade is striking and functional at the same timeFor EIB, all selected cases elaborated below belong to the East and Mediterranean Region: Beginning with Sfax, Tunisia, Taparura is considered a new urban development project whose guideline is sustainability. This project moves in different areas like public transport systems, public spaces, and the littoral, growing tourism attraction. On top of that, it supports green modes of transportation, supporting smart mobility, through different initiatives such as cycle paths and lowering water and energy consumption by using more efficient materials in design and construction. The development of this project strives to improve the quality of life and create more friendly spaces, improving liveability and increasing tourism opportunities in Sfax. The E-vehicle pilot in Amman, Jordan is part of the Amman Smart City Initiative that will allow ten charging stations free of cost. It will also serve 250 electric vehicles, deployed by GAM and replace the same number of regular fuel-powered cars. The project will highlight and support the use of electric vehicles, thus promoting sustainability and smart mobility. The GIS platform in Palestine was designed by Ramallah's municipality with the aims of collecting, managing, reviewing, compiling, visualizing, and analyzing spatial data describing the details of the city. Every department in the municipality has an application on the platform. Data could be easily updated in real time to offer logistical support to municipal services. The app is also accessible to citizens through web apps, like Tourist Interactive Map and Municipal Mapping. Also, feedback and complaints can be shared on the app. This municipal platform helps keep the residents informed, thus increasing transparency, and helping meet the EIB criteria of a smart government. Lastly, Zenata eco-city is a new urban development between Mohammedia and Casablanca in Morocco that has been designed with strong sustainability criteria and integrating uses. It's anticipated to accommodate 300,000 inhabitants and create 100,000 jobs. The development includes education and healthcare services, a logistics center, and a commercial district. Urban planners and politicians have been laying the groundwork to use technology to meet the demands of residents and offer better efficiencies in providing services in the journey to make these smart cities. A smart city's success is the outcome of meticulous strategic planning in all crucial areas related to the environment, mobility, lifestyle, people, economy, and governance. The smart city platform is being used by an increasing number of cities worldwide to help with urbanization-related issues. Planning that creates a compassionate atmosphere for all citizens, especially the impoverished, is essential for the development of smart cities. A better quality of life is provided by smart cities. In order to achieve the goal of an equitable society with a balance between the economy, social well-being, and the environment, a vibrant economy built on the sustainable exploitation of natural resources, investments in people, and social capital would be needed.

## SMART CITY CRITICISM

Smart cities can and have revolutionized the lives of their citizens. Nonetheless, there's a dark side to those smart cities that should not go unnoticed. Smart cities leverage modern technologies like the Internet of Things (IoT) and artificial intelligence (AI) to eliminate numerous urban problems. Different advanced applications show their potential to minimize traffic, improve security, energy

consumption, and pollution, and enhance citizen participation.[15] Various governments are adopting smart governance in smart cities to implement the principles of good governance more efficiently. Considering such unmatched potential, several governments use modern technologies and make new policies for building smart cities. With numerous benefits, smart cities can pose different problems like power consumption, invasion of privacy, and poor data security.[16] Such concerns may have massive impacts on public welfare and negatively impact citizens' trust in the system. One of the architectural critics of smart cities is Rem Koolhaas. He wrote about how tech firms have usurped the role that urban planners and architects once played in informing people's view of urban environments. *"This transfer of authority has been accomplished cleverly by calling their city smart. And by calling it smart, our city is condemned to being stupid."* [17] This transfer of roles undeniably asks the question whether smart cities do put citizens first, as the new smart city advancements tend to be uniform, and as the role of architects has always been to represent unique elements of citizens on their design, such position is now being put to question. According to Paul Doherty, a registered architect, CEO, and chairman of The Digit Group, the smart city will need a level of sacrifice for not completely clear returns*. "This is the double edge of smart cities. How much do we want to maintain the anonymous way of living and working? [What can we] get back from these tools that will measurably increase the quality of life?"*[18] There are far more concerns than solutions about smart cities. But this much we understand: data alone doesn't make a city smart. Indeed, data can serve as a tool for improving the urban experience and supporting higher efficiencies. However, it can't usher in an urban technotopia that will smooth away all the challenges of city living – and do so at no harmful cost to the public. Urban planners, designers, and architects should be responsible for creating cities that put citizens' needs first.

## CONCLUSIONS

As urbanization keeps increasing in today's world, finding necessary ways to deal with the growing population is a contemporary challenge facing cities. The article introduced, elaborated, and compared the criteria looking at them from the perspectives of the EU and EIB. In order to achieve the status of a smart city, both the EU and the EIB, have either created or funded various projects that were both innovative and useful for the city's residents. The EU has additionally created a Smart City marketplace where smart ideas are discussed before they proceed to the next stage of funding. Additionally, the EIB has funded ASCIMER, among other projects, a project that has assessed smart cities by looking at their effects on the smart city, offering very useful feedback on further smart city initiatives. For the purpose of the article, different smart city projects from both the EU and EIB were elaborated. From the EU, smart city projects in Amsterdam, Helsinki, and Barcelona all have reached the goal of solving urban problems and helping the residents' livability. The Helsinki Region Infoshare project, for example, has increased transparency between the government and the citizens living there by publishing open-data documents. On the other hand, the EIB projects included in the article belonged to the East and Mediterranean Regions and included Sfax, Amman, Ramallah, and Casablanca. The projects range from those focused-on sustainability, such as Taparura's focus on green transportation, and Aman Smart City Initiative's to charge e-vehicles for free, to those focusing on improving the economy by means of tourism such as the GIS platform in Palestine, which is an interactive map containing valuable information about the city.

[15] Dameri, R.P., Rosenthal-Sabroux, C. (2014). Smart City and value creation. Springer, Cham. https://doi.org/10.1007/978-3-319-06160-3_1

[16] Colding, J., Barthel, S., & Sörqvist, P. (2019). Wicked problems of smart cities. Smart Cities, 2(4), 512-521. https://doi.org/10.3390/smartcities2040031

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With their numerous benefits, the drawbacks of smart cities were also discussed in the article. Three main disadvantages including power consumption, invasion of privacy, and poor data security were identified among the projects discussed. Further, the architect Rem Koolhaas criticized smart cities as he brought attention to the fact that calling cities smart is not a novel idea, as cities have always been smart as architects have always put the citizens' needs on their planning. On the other hand, Paul Doherty raised the question of anonymity in a smart environment, which is a great concern nowadays. The EU and the EIB have both incorporated the same smart city criteria in order to judge what makes a city smart and the success of various projects they have financed. Moreover, both organizations have financed many projects which did indeed meet some criteria including smart living, people, governance, mobility, economy, and environment. However, to determine which challenges should receive paramount importance, smart cities should emphasize efficient urban planning and consulting.

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