

# Title: The role of Digital infrastructure and citizen engagement in the creation of smart sustainable cities

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Urban share of the world population is expected to reach around 6.4 billion by 2050 (United Nations, 2018). But what does this mean for cities globally? With several people concentrated in urban centers around the world, urban cities will face more pressure in keeping things running smoothly. From reducing pollution and traffic to enhancing public safety and reducing waste management, cities are turning to digital infrastructures to create sustainable solutions to the everyday challenges faced in these cities (Tektelic, 2024).

But why is digital infrastructure even important to cities? Imagine a city where traffic lights adjust to ease rush hour, air quality is always being checked, wastes are properly managed. A city where services instantly respond to the needs of the people? All of the above is possible with digital infrastructure.

# **Definition of Digital Infrastructure and Smart Sustainable City**

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Digital infrastructure plays an essential role in the development of smart sustainable cities by enabling effective management of resources, improving the quality of life of residents and fostering connectivity.

First of all what is digital infrastructure? And what exactly is a smart sustainable city?

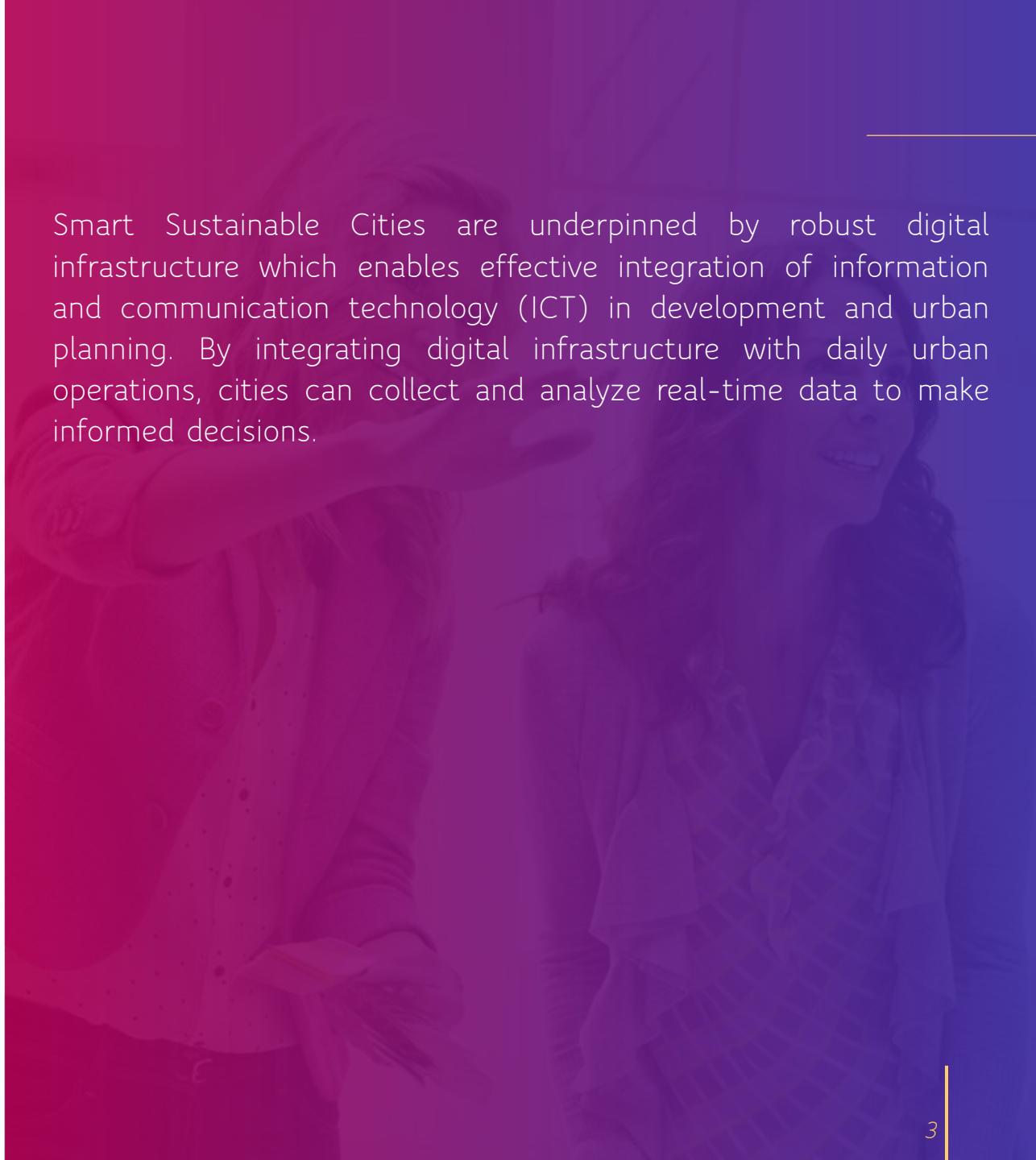
## **Definition of Digital Infrastructure**

Digital infrastructure can be regarded as a combination of hardware and software technologies that facilitate data management, connectivity, collaboration and automation offering efficient operation of services by users (Very, n.d).

# **Why Digital Infrastructure in Smart Cities?**

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Smart Sustainable Cities are underpinned by robust digital infrastructure which enables effective integration of information and communication technology (ICT) in development and urban planning. By integrating digital infrastructure with daily urban operations, cities can collect and analyze real-time data to make informed decisions.



# Digital Infrastructures used in Smart Sustainable Cities

## IoT and Smart Sustainable Cities

### FUN FACT!

The total number of IoT-connected devices worldwide is anticipated to surpass 28.5 billion by 2029 with a large share contributing to smart city solutions, making it a widely used digital infrastructure in smart sustainable cities.

A good example of its usage is in Lithuania to create a fully connected urban environment in Kaunas. By leveraging TEKTELIC's KONA Macro IoT gateways, cohesive network for smart lighting, environmental monitoring, and waste management Kaunas has become a model of efficient and sustainable urban living.



# Smart Sensors in Waste Management

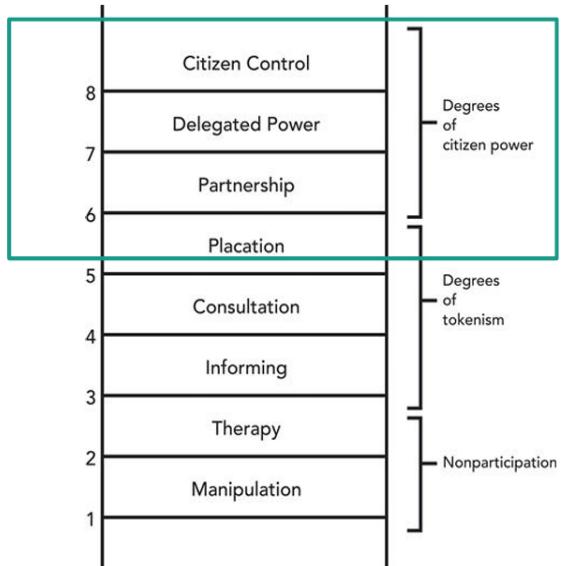
The seamless integration of connected devices and sensors into the urban fabric constitutes a cornerstone of the digital infrastructure in smart cities. These interconnection helps in intelligent waste disposal and management

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One of the popular usage of smart sensor is in waste management is in San Francisco where smart sensor was used to reduce overflow waste by 80% , reduce illegal dumping by 64%, reduce street cleaning requests by 66% and provide residents with cleaner city experience (State of Green, 2018).



# No Smart City without Smart People



The People are the most crucial component of any digital infrastructure!!!

## Arstein's Ladder and Citizen Engagement

Looking at the ladder on the left, Sprung 6-8 is where citizen's input are actually considered. We can use San Francisco's waste management as an example. Without local knowledge the placement of sensors might not be optimized.

When a city collaborates with community groups and residents, it leads to a sense of shared decision making (partnership). Even better is when citizens are allowed to manage certain aspects of the project such as monitoring sensor data and reporting anomalies or maintenance needs through a platform. They are given significant control over the project's operation and maintenance (delegated power).

# **Challenges of Sustaining Digital Infrastructure in smart Sustainable cities**

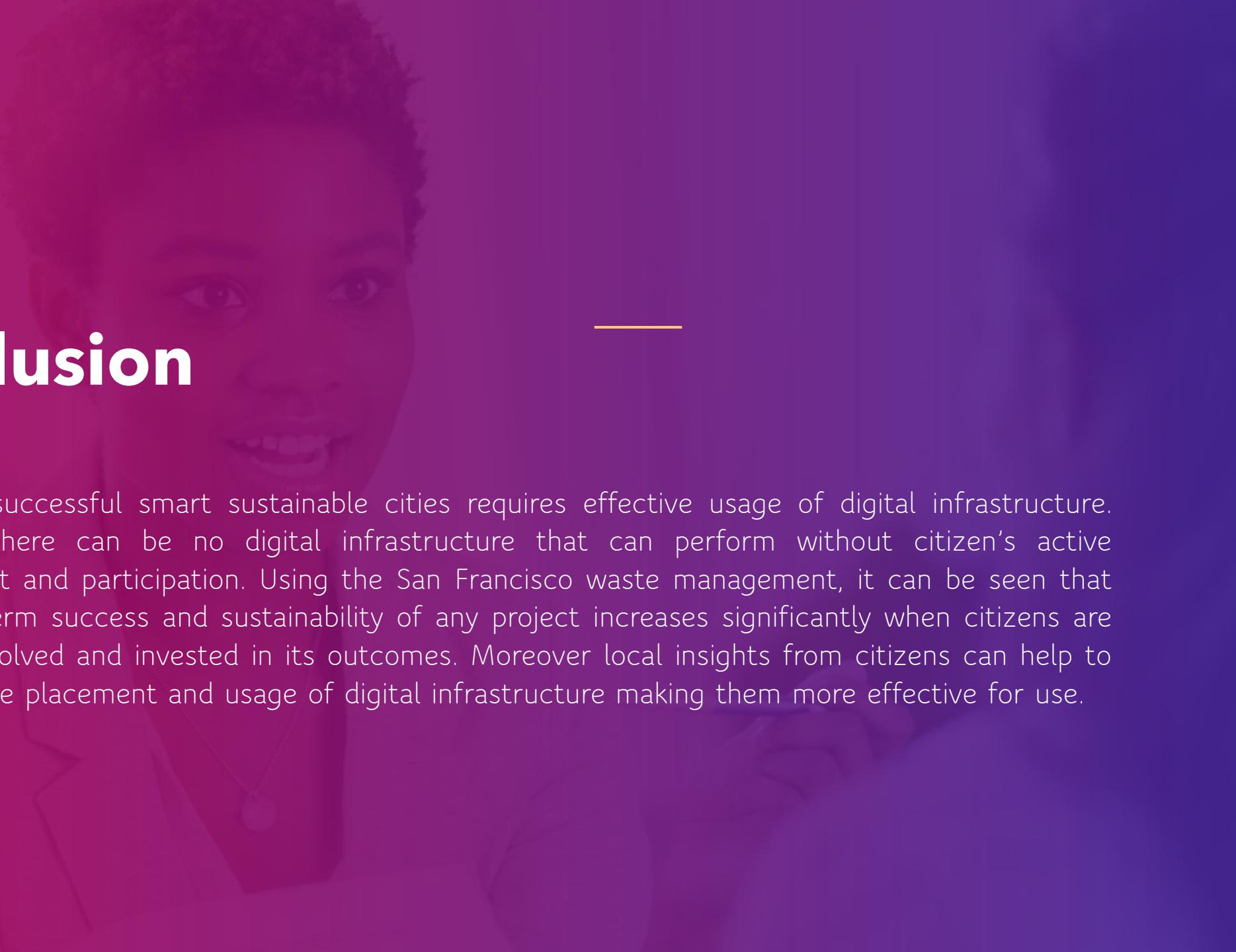
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Installed digital infrastructures often need respective resources (personal and financial) for their maintenance. Unfortunately, according to the study of Exner and Andres (2024), shortage of adequately trained personnel to maintain digital infrastructures is often a challenge. There is a need to address this human resource gap by emphasizing training programs and streamlined process to ensure the functionality and care of digital infrastructures in cities.

Another challenge faced by smart sustainable city projects is often funding policy. There is often a lack of sustained, long term funding surpassing the current emphasis on experimental projects, and with digital infrastructures requiring personal and financial resources to run, this often affects their long-term usage. There is a need to create sustainable funding models through either public private partnerships or the development of long-term funding plans beyond initial experimental phases.

# Conclusion

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Achieving successful smart sustainable cities requires effective usage of digital infrastructure. However, there can be no digital infrastructure that can perform without citizen's active engagement and participation. Using the San Francisco waste management, it can be seen that the long-term success and sustainability of any project increases significantly when citizens are actively involved and invested in its outcomes. Moreover local insights from citizens can help to optimize the placement and usage of digital infrastructure making them more effective for use.

# References

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