Perugia's Digital Twin
A Innovative Model of Urban Governance

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The Municipality of Perugia adopts an innovative approach to respond to current urban challenges. The city's digital twin is a cutting-edge solution for the city's transition to a digital, sustainable and participatory environment.

In the 21st century, the world is experiencing exponential urban expansion, exceeding 4 billion people. This figure represents more than half of the global population, highlighting a marked demographic increase in cities.

This rapid growth introduces significant challenges, requiring effective responses to urbanization and climate change. Urban planners, researchers, governments and citizens demonstrate the need for innovative solutions to foster sustainable socio-economic growth, with particular attention to the well-being of inhabitants, the enhancement of the territory and the promotion of environmental sustainability.

To effectively support this transformation, the adoption of the new generation of information technologies is essential. Among the most notable innovations is the Urban Digital Twin, a revolutionary technology that allows the creation of a detailed digital replica of an entire city. This virtual representation, powered by real-time data, advanced analytics and machine learning, offers a holistic approach to the design, management and monitoring of smart cities. It is an indispensable tool for making decisions oriented towards the sustainable future of cities and for formulating mitigation and adaptation strategies to the new climate context, in line with Sustainable Development
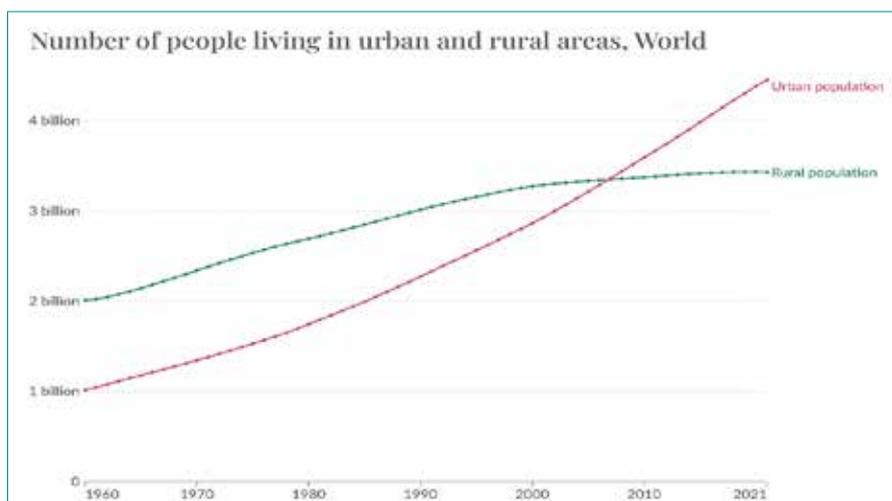

Fig. 1 - Number of people living in rural and urban areas in the world – Source: World Bank based on data from the UN Population Division - https://ourworldindata.org/urbanization .

Goal 11 (SDG11: Sustainable Cities and Communities). Among the most ambitious and innovative examples of urban digital twin projects at a national level, WiseTown (https://wise.town/) stands out, developed by the software house TeamDev (https://teamdevecosystem. it/) for the Municipality of Perugia. Winner of the prestigious national Top of the Pid 2023 award by

Fig. 2 The WiseTown platform of the Municipality of Perugia with the interactive 3D visualization of the city.
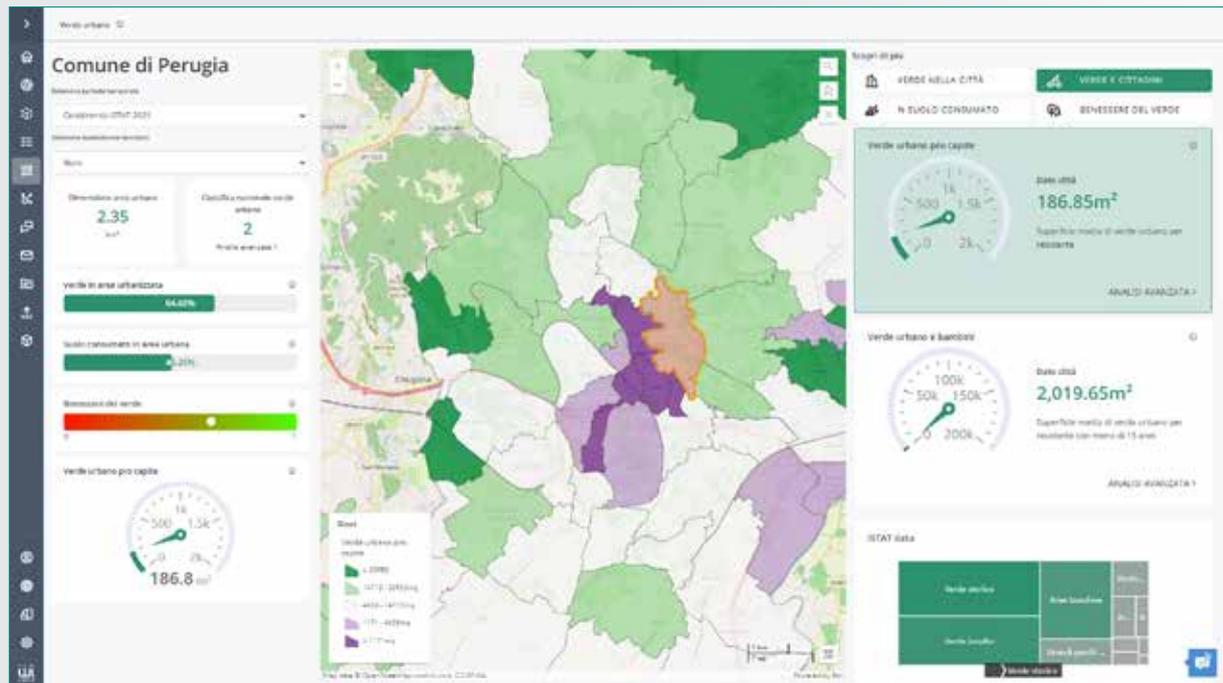
Fig. 3 The green dashboard showing data related to the green indicator and citizens of the historic center of Perugia.

Unicamere, the WiseTown project was conceived with the aim of providing the city administration of the Umbrian capital with a wide range of applications and dashboards that virtually recreate the city. The main objective is to make Perugia more digital, sustainable, participatory and inclusive. Through WiseTown, urban decision makers can maximize the utility of the system at their disposal, acquiring a clear vision of how the city would react to specific inputs or scenarios. Problems such as heat islands, pollution, extreme events, high-traffic streets and other critical situations can be effectively addressed through constant monitoring and implementation of targeted actions. Maps, graphs, indicators and statistics help create the

virtual version of Perugia, highlighting relevant information and providing in-depth understanding that facilitates informed urban planning.
The WiseTown toolset includes a workspace that integrates a three-dimensional GIS (Geographic Information System) map of the city, allowing 3D navigation to visualize, analyze and query spatial data related to all urban elements. This system provides detailed information on descriptions, dimensions and characteristics of each element. Specific information layers, created with GIS systems, provide details on the geometry of the city, the layout of buildings, urban roughness with details on building heights, as well as data on population and services.
The City Dashboards, key

components of the platform, constitute an advanced tool to analyze, visualize and monitor different aspects of urban life, including urban greenery, economy, welfare, urban planning and mobility.
The different analytical perspectives offered by the dashboards reveal the potential of this resource, allowing us to note, for example, that the historic center has a high density of green areas, with an average of 186 square meters per inhabitant. However, this area is characterized by a high old age index of 222.46%, highlighting the significant presence of elderly people compared to children (0-14 years). The unemployment rate is very low, around 7% and land consumption is 46%.
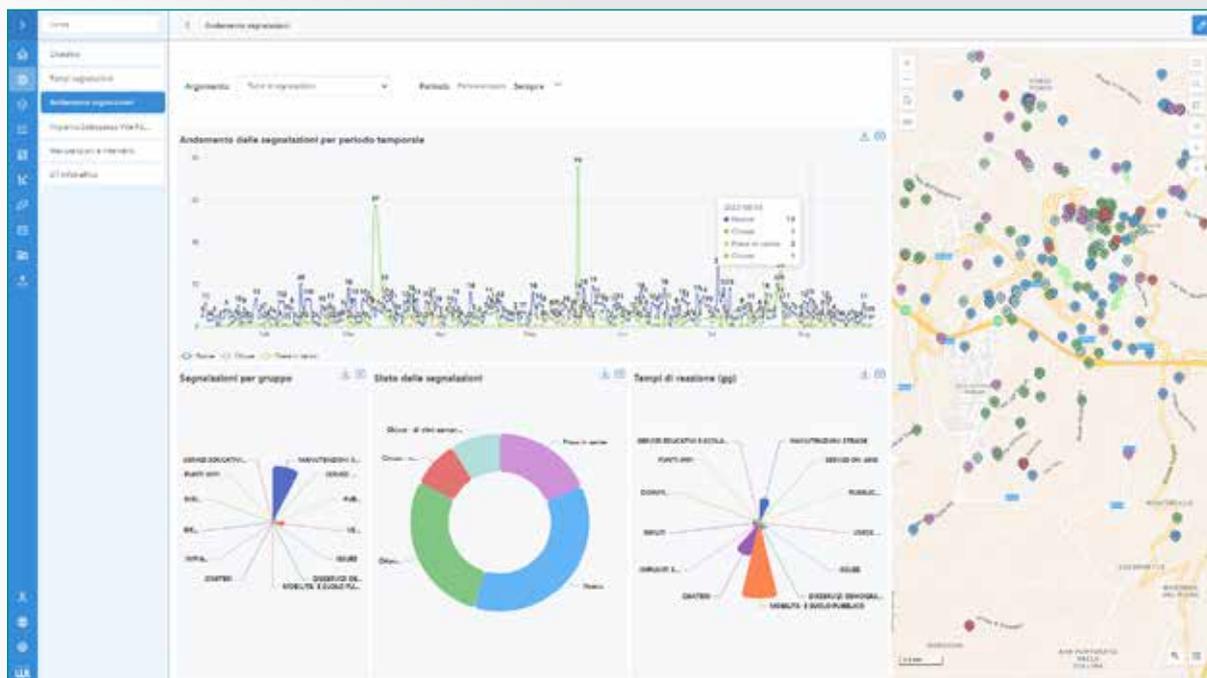On the other hand, the area near the train station offers

Fig. 4 WiseTown Issue Manager, work area on the municipal administration side

just over 30 square meters of greenery per resident, with an old age index of 141%. In this area the unemployment rate is 10% and land consumption is higher, at 70%.

WiseTown's portfolio of solutions also includes Civic Tech technologies, which transform the citizen of Perugia into a key protagonist of his territory. Among these, Issue Manager is a software dedicated to managing citizen reports and optimizing the Authority's workflows. Thanks to the generation of reports and the accessibility of georeferenced data, Issue Manager takes on the role of a decision support system for the administrators of Perugia.

Another software, Crowd Planning, allows urban decision makers to actively involve the community in the creation of projects or initiatives, aiming to generate active citizen participation and enhance local knowledge to develop significant projects. The system allows the publication, in specific thematic areas, of urban development projects accompanied by illustrative cartographic data, information sheets and multimedia content. Citizens can use the platform to interact with the administration, offering their own vision on the proposal and contributing to an effective participatory planning process.

ABSTRACT
The Digital Twin of Perugia, an innovative model of urban governance. The Municipality of Perugia adopts an innovative approach to respond to current urban challenges. The digital twin of the city is a cutting-edge solution for the transition of the city towards a digital, sustainable and participatory environment.

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