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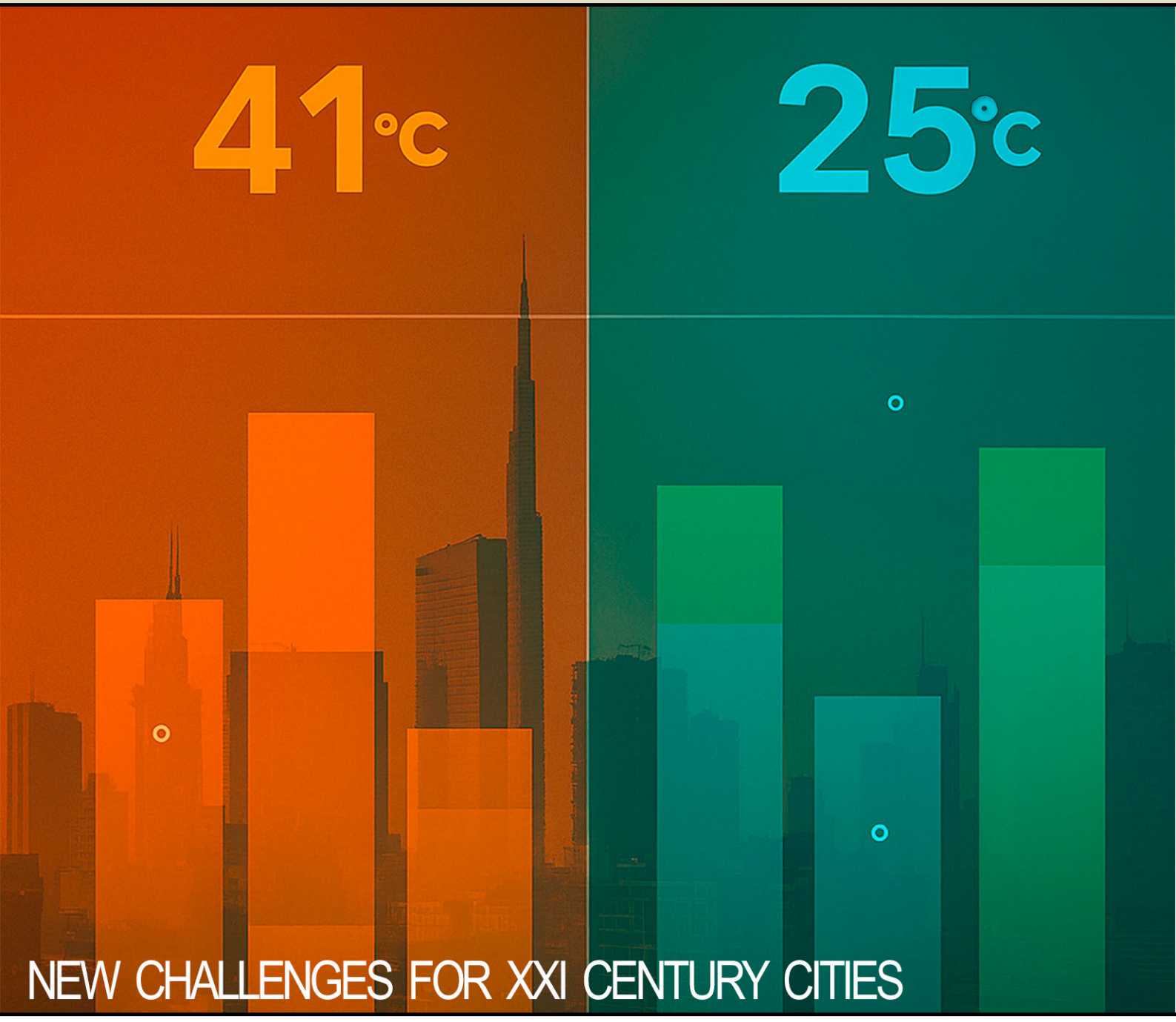

NEW CHALLENGES FOR XXI CENTURY CITIES

Multilevel scientific approach to impacts of global warming on urban areas, energy transition, optimisation of land use and emergency scenario

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TeMA Journal was established with the primary objective of fostering and strengthening the integration between urban transformation studies and those focused on mobility governance, in all their aspects, with a view to environmental sustainability. The three issues of the 2025 volume of TeMA Journal propose articles that deal with the effects of Global warming, reduction of energy consumption, immigration flows, optimization of land use, analysis and evaluation of civil protection plans in areas especially vulnerable to natural disasters and multilevel governance approach to adaptation.

TeMA is the Journal of Land Use, Mobility and Environment and offers papers with a unified approach to planning, mobility and environmental sustainability. With ANVUR resolution of April 2020, TeMA journal and the articles published from 2016 are included in the A category of scientific journals. The articles are included in main scientific database as Scopus (from 2023), Web of Science (from 2015) and the Directory of Open Access Journals (DOAJ). It is included in Sparc Europe Seal of Open Access Journals, and the Directory of Open Access Journals.

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TeMA - Journal of Land Use, Mobility and Environment offers researches, applications and contributions with a unified approach to planning and mobility and publishes original inter-disciplinary papers on the interaction of transport, land use and environment. Domains include: engineering, planning, modeling, behavior, economics, geography, regional science, sociology, architecture and design, network science and complex systems.
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Contents

REVIEW NOTES

TeMA Journal of Land Use, Mobility and Environment

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REVIEW NOTES
Urban strategies, programmes and tools

Digitalization in urban planning: how Europe is building its digital future

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Abstract
Starting from the relationship between urban planning and mobility management, TeMA has gradually expanded the view of the covered topics, always remaining in the groove of rigorous scientific in-depth analysis. This section of the Journal, Review Notes, is the expression of continuously updating emerging topics concerning relationships between urban planning, mobility and environment, through a collection of short scientific papers written by young researchers. The Review Notes are made of four parts. Each section examines a specific aspect of the broader information storage within the main interests of TeMA Journal. In particular, the Urban strategies, programmers and tools section presents presents the different strategies and tools that guide the digitalization of urban planning.
This contribution aims to provide an overview of the policy tools employed by the European Union for digital transformation, and how they apply specifically to the governance of urban and territorial transformations. Digital transformation is a complex and ongoing undertaking, and the EU is mobilizing a range of tools to shape its digital future. Some of the key levers of this strategy are examined, including the Digital Decade Policy Programme (DDPP), financial instruments such as the Recovery and Resilience Facility (RRF) and the Digital Europe Programme (DIGITAL), and the INSPIRE regulatory instrument.

Keywords
Digital cities; Europe; Urban strategies; Technologies; Digitalization

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1. The digital future of the EU

Digital society and digital technologies open up unprecedented horizons in the ways we learn, entertain, work, explore, and achieve our goals. They also bring new freedoms and rights, and offer citizens the opportunity to transcend physical communities, geographic locations, and social positions. Furthermore, digital technologies help governance and research effectively address the growing complexity of contemporary challenges.

The Covid-19 crisis has seen an acceleration in digitalization and its use in everyday life but also in work and services (D'Amico, 2025a; Boujari et al., 2024). The Covid-19 crisis has further highlighted the critical role of digital technologies and infrastructures in our lives and demonstrated how our societies and economies rely on digital solutions.

The digital transformation of the European Union is "a central driver for ensuring that Europe remains competitive, resilient, reduces its excessive dependencies and enhance its technological sovereignty, while reinforcing its strategic autonomy" (European Commission, 2025). To this end, the Digital Decade Policy Programme (DDPP), adopted in 2021, has provided the EU with a structured governance framework and demonstrates the EU's commitment to decisive, long-term action, promoting coordination among Member States, aligning their efforts, and addressing the urgent need for digital transformation.

Digital transformation isn't just about driving innovation and growth, it's also becoming important as a way to leverage resources to make a country more stable and influential globally.

The Digital Decade Policy Programme 2030 sets the framework for the EU's digital transformation. The political programme encourages Member States to work together to achieve common objectives encompassed in four thematic areas: digital skills, digital business, and digital public services. The Commission monitors its evolution each year with a report on the State of the Digital Decade.

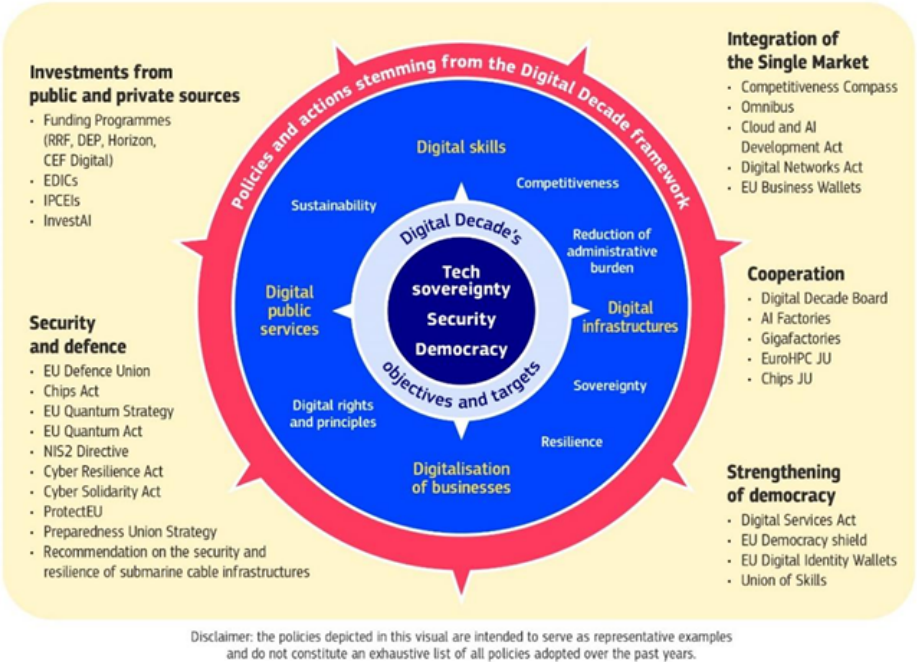

Fig.1 The Digital Decade and EU digital priorities (European Commission, 2025)

The report maps the progress made towards the 2030 targets and objectives, examines relevant developments in digital policies and the progress made by each Member State. Starting from the targets and objectives of the Digital Decade, 5 representative clusters of priority policy issues have been drawn up (see Fig.1):

- investments from public and private resources;
- security and defense;
- integration of the Single Market;

– cooperation;
– strengthening of the democracy.

With regard to urban transformations, the DDPP pushes for the creation of platforms that simplify cross-border and administrative processes, essential for a more efficient Public Administration in governing the territory, which digitizes and speeds up its services and guarantees data interoperability.

More generally, while EU countries have generally increased their efforts and national roadmaps for the Digital Decade, including measures worth €288.6 billion, the 2025 Report highlights the need for further public and private interventions and investments to strengthen the EU's technological capacity, ensuring better infrastructure and digital skills development. Despite progress in areas such as the digitalization of public services, the deployment of essential 5G, and the deployment of edge nodes to process data faster and smarter, there are still structural challenges to address. For example, the adoption of AI, cloud, and big data by businesses has increased but still needs to accelerate. Furthermore, the EU remains too dependent on external providers for AI and cloud services, which are often used in public administration as well.

A key priority for the EU is to position itself as a truly leading continent in AI. This obviously requires a combination of resources, capabilities, advanced skills, and highly efficient infrastructure and the Digital Decade Policy Programme 2030 can guide a series of actions towards this goal. Fig.2 illustrates and specifies the seven pillars on which the EU is relying to become an AI leader:

– 1.Digital infrastructure;
– 2.Energy infrastructure;
– 3.Data availability & Governance;
– 4.Talent & Skills;
– 5.Innovation & Research;
– 6.Regulation & Ethics;
– 7.Industrial Coordination.

With respect to these seven pillars, Fig.2 also illustrates the possible actions that the Digital Decade Policy Programme can implement to support them.

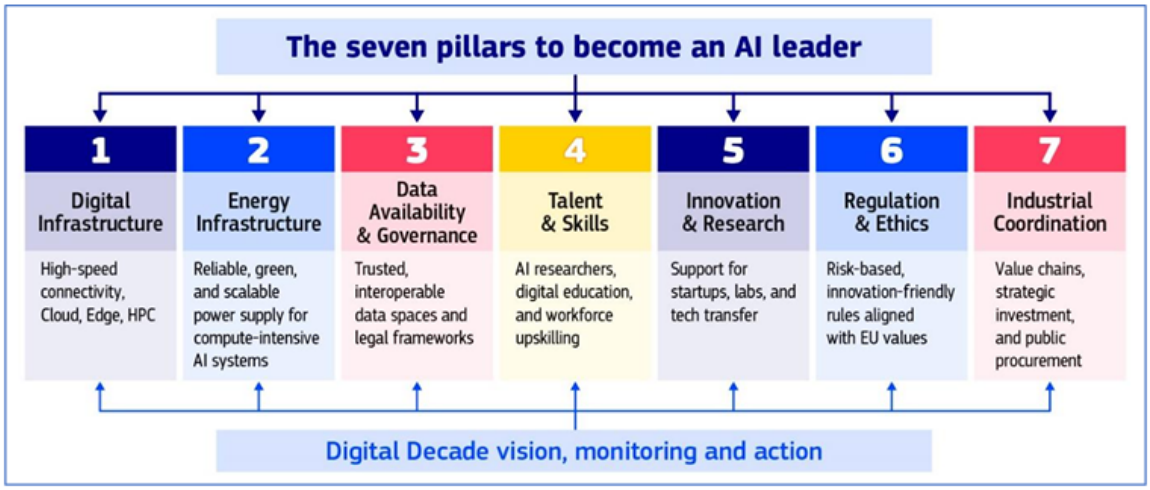

Fig.2 The seven pillars for becoming an AI leader and the role of the Digital Decade (European Commission, 2025)

In line with the EU objectives defined by the DDPP is the Digital Europe Programme (DIGITAL) which aims to shape the digital transformation of European society and economy. The Digital Europe Programme is a part of the long-term EU budget, the Multiannual Financial Framework 2021-2027, with an overall budget of over €8.1 billion. These funds provide strategic financing for the contribution of digital technology to businesses, citizens, and public administrations.

The mission of the DIGITAL program focuses on:

- building essential capacities and advanced skills in key digital technologies, contributing to the EU's open strategic autonomy;
- accelerating their deployment and making the best use of them in areas of public interest and the private sector.

The Digital Europe Programme focuses on strengthening the EU's digital capabilities in the key areas of artificial intelligence (AI), cybersecurity, advanced computing, data infrastructures, data governance and processing, the deployment of these technologies and their best use for critical sectors like energy climate change and environment, manufacturing, agriculture and health (European Commission, 2021).

In order to fulfil its mission, Digital Europe Programme will deploy a network of European Digital Innovation Hubs (EDIH) offering access to technology testing and support in their digital transformation for private and public organisations all across Europe, including government at national, regional or local level, as appropriate. Figure 3 shows only some of the objectives already achieved through funding from the DIGITAL Programme, many projects are still ongoing as funding will end in 2027.

Fig.3 Some results achieved through funding from the DIGITAL program (Digital Europe Programme, 2025)

The DIGITAL Program also contributes to supporting the development of smart city initiatives (D'Amico, 2025b; European Commission, 2023; Nastjuk et al., 2022) and the Sustainable Development Goals (Giuliodori et al., 2023; Rosário & Dias, 2022). Indeed, sustainability and digitalisation are considered key drivers that together are essential to driving a fair global transformation of the European Communities (Garau et al., 2023).

Specifically, regarding SDG11 "Make cities and human settlements inclusive, safe, resilient and sustainable", a number of activities funded by DIGITAL Programme are expected to contribute to more inclusive and sustainable cities and communities. One example is the data space for tourism (over EUR 8 million and over 40 participants), which aims to enable more efficient crowd management at tourist destinations, among other outcomes. This goal is also supported by the data space for smart communities (with over EUR 17.9 million in funding), allowing cities to have the right data to model aspects such as energy use in buildings or infrastructures. In addition, DIGITAL Programme is supporting the large-scale roll-out of local digital twins (Caprari et al., 2022) across the EU (EUR 20 million in funding). As a further step, virtual reality / augmented reality and metaverse technology (over EUR 6.4 million involving 29 beneficiaries) will be introduced, creating an immersive environment for citizens and businesses: the "Citiverse" can be used for virtual/real spatial planning, management or navigation while also enhancing the social, architectural, green and cultural heritage dimensions of living spaces (Digital Europe Programme, 2025).

Regarding data, interoperability, and the single market, Europe has been focusing significant efforts for years. Policy-relevant assessments and analyses are often based on a combination of different types of data, including

environmental and geographic data, such as land use, administrative boundaries, altitude, hydrology, transport networks, population density, etc. Data relevant to environmental and territorial policies are often geo-referenced. However, the geographic information required for good governance at all levels is often not readily available, of adequate quality, or effectively stored.

It is in this context that the EU Infrastructure for Spatial Information (INSPIRE) was launched in 2007. INSPIRE is a European spatial data infrastructure supporting EU environmental policies. It enables easy cross-border access and sharing of data and provides interoperable services to support policy makers and implementers, as well as businesses, science and citizens.

Although it is a Directive and not a funding program, INSPIRE is a fundamental tool for digital territorial governance. It establishes the legal framework for the establishment of an interoperable spatial and geographic data infrastructure (GIS) in Member States, requiring administrations to standardize and share geographic and spatial data, laying the foundation for the construction of national and regional geoportals.

Digital technologies are increasingly placing new demands and expectations on the public and private sectors. Realizing the full potential of these technologies has therefore become a key challenge to achieve a wide range of benefits, greater efficiency, and savings for governments, citizens, and businesses.

Next Generation EU is another tool implemented by the European Union post-pandemic to promote a new growth model based on a clean, innovative, and inclusive economy and on digital and technological sovereignty. With loans and grants provided to Member States through the Recovery and Resilience Facility (RRF), NextGenerationEU has been investing in a series of critical areas, including digital transformation. Indeed, each Member State must dedicate at least 20% of the total allocation of its recovery and resilience plan to measures that contribute to the digital transition or address the challenges arising from it.

Reforms and investments in digital technologies, infrastructure, and processes are crucial to increasing the Union's resilience and innovative capacity. These actions are also crucial to diversifying supply chains and making Europe less dependent on external sources. The Recovery and Resilience Facility (RRF) actively supports reforms and investments aimed at expanding very high-capacity networks, the digitalization of public services and government processes, the digitalization of businesses -with a specific focus on small and medium-sized enterprises (SMEs)-, the development of digital skills, and, finally, initiatives that incentivize digital Research and Development (R&D) and the adoption of next-generation technological solutions.

2. Conclusion

This contribution aims to provide an overview of the policy tools deployed by the European Union for digital transformation, highlighting how this process is a crucial factor for the EU's competitiveness, resilience, and technological sovereignty and how it applies specifically to the governance of urban and territorial transformations. Digital transformation represents a strategic imperative for the European Union and a central pillar for improving competitiveness, resilience and technological sovereignty. Indeed, in recent years, with a view to actively shaping the continent's digital future, the European Union has mobilized and launched a broad and diverse set of policy instruments and strategic investment programs.

However, there are still many challenges related to digital transformation. Digital transformation is a complex and ongoing undertaking, where the EU is mobilizing resources and regulatory frameworks to ensure that new technologies are fully available, integrated into the economy, society and, crucially, the effective governance of urban and territorial transformations.

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