THE FUTURE OF INNOVATION IN URBAN SPACES

TREND REPORT SUMMER 2025

CDTM VLC
CENTER FOR DIGITAL TECHNOLOGY AND MANAGEMENT

THE FUTURE OF INNOVATION IN URBAN SPACES

AJUNTAMENT DE VALÈNCIA

València Innovation Capital

Kindly supported by Valencia Innovation Capital

Valencia Innovation Capital is a public-private initiative committed to positioning Valencia as a leading European hub for digital transformation, entrepreneurship, and sustainable innovation. By fostering collaboration between startups, corporations, academia, and public institutions, we aim to accelerate the development of impactful solutions that address today's most pressing challenges.

Our mission is to empower talent, attract investment, and scale innovation with purpose locally rooted, globally connected. Through strategic programs and partnerships, we support the growth of a vibrant ecosystem that champions inclusion, creativity, and technological excellence.

CDTM VLC

A Project of the Center for Digital Technology and Management

The Center for Digital Technology and Management (CDTM) offers the interdisciplinary add-on study program "Technology Management". Students from various study backgrounds with creative ideas, great motivation and an entrepreneurial mindset are offered the tools to put their ideas into practice. As a research institution, CDTM closely cooperates with the industry, startups, and public sector concentrating on topics at the intersection of technology, innovation, and entrepreneurship.

The Center for Digital Technology Management (CDTM) is supported by Universitat de València (UV) and Universitat Politècnica de València (UPV).

The entire trend report was written by CDTM students under the close guidance of CDTM's Management Team.

Visit www.cdtm.com for more information.

TABLE OF CONTENTS

TRENDS

EXPLORATION

IDEATION

PREFACE OF THE PROJECT PARTNER

> **To play is not a luxury. It's a gateway to inclusive, resilient and connected cities.**
>
> Arturo Castelló

At Valencia Innovation Capital, we believe that innovation must be rooted in purpose and proximity. Our collaboration with CDTM during this year's Trend Seminar was a unique opportunity to explore how digital transformation can enhance public space, civic engagement, and urban wellbeing; starting with something as universal and powerful as play.

The challenge we presented invited students to reimagine the traditional playground as a modular, inclusive and digitally connected space. We asked: how can play become a driver of community resilience, sustainability, and digital inclusion? How can urban spaces designed for children also serve as living labs for data, creativity and civic participation? This challenge was part of our broader initiative, IMAGINE 2025, which seeks to position Valencia as a European benchmark for civic innovation and digital experimentation. By focusing on playgrounds, we aimed to highlight the importance of designing public infrastructure that is not only functional and safe, but also inspiring, participatory, and future-ready.

Throughout the seminar, we were impressed by the students' ability to navigate complexity, synthesize diverse perspectives, and propose actionable solutions. Their work demonstrated not only technical skill but also empathy, curiosity and a strong sense of civic responsibility. The CDTM methodology -interdisciplinary, agile and impact-driven- proved to be an ideal framework for tackling urban innovation challenges.

This collaboration also marked a milestone for us: it was the first time Valencia Innovation Capital participated as a project partner in the Trend Seminar, and it coincided with the expansion of CDTM's activities to Valencia. We are proud to support this bridge between Munich and Valencia, and to contribute to a growing ecosystem of European innovation. As we continue to develop the Citiverse -Valencia's digital twin for civic experimentation- we see this type of collaboration as essential. It helps us connect data with people, technology with empathy, and innovation with everyday life.

We are grateful to the CDTM team and to all the students who embraced our challenge with enthusiasm and rigor. Your ideas have inspired us to push further, think bolder, and design with joy.

Adrián Villanueva Martínez 

Alicia Durán González 

PREFACE OF THE EDITORS

> **Everybody can learn from the past. Today it is important to learn from the future!**
>
> Herman Kahn

As Herman Kahn, one of the founding fathers of modern scenario planning, nicely states, it is tremendously important for strategy and policymakers to get a deep understanding of possible future developments to be prepared for them.

The Center for Digital Technology and Management (CDTM) aims to connect, educate and empower the innovators of tomorrow. It is our mission to equip our students with the tools and knowledge they will need to become responsible leaders who actively shape their future environment rather than only react to changes.

This Trend Report is the result of the course Trend Seminar, which is part of the interdisciplinary add-on study program "Technology Management" at CDTM. 13 selected students of various disciplines, such as Business Administration, Computer Engineering, Economy, Mathematics, Law, and others, work together on a relevant topic of our time. Over the course of six intense weeks of full-time work during their summer break, the participating students dive deeply into the topic of the Trend Seminar. Working in several interdisciplinary sub-teams, students apply the knowledge of their main studies and learn new perspectives from their team members. They conduct trend research, develop scenarios of the future, generate ideas for innovative products or services, and detail them out into concrete business concepts.

We would like to take the chance to thank everyone who contributed and made this CDTM Trend Report possible:

We want to thank València Innovation Capital for supporting this Trend Seminar. Particularly, we want to thank Arturo Castello for his collaboration, valuable insights, and feedback throughout the whole project. We hope our findings support you in driving innovation in the context of the future of elderly care in nursing homes!

In addition, we very much thank all the expert collaborators, who shared their knowledge and largely contributed to this project's success:

Bas Boorsma (Urban Innovators Global)
Gema Roig Pallardó (Valencia Innovation Capital)
Alicia Correcher Parra (CDTM VLC Summer 2023)
Carmen Tomás (Educational Consultant)

Last but not least, we would like to thank the CDTM students of the class of Valencia Summer 2025. They put great energy and enthusiasm into this project, which made it a pleasure for us to supervise the course and coach the individual teams.

Alicia Durán González and Adrián Villanueva Martínez

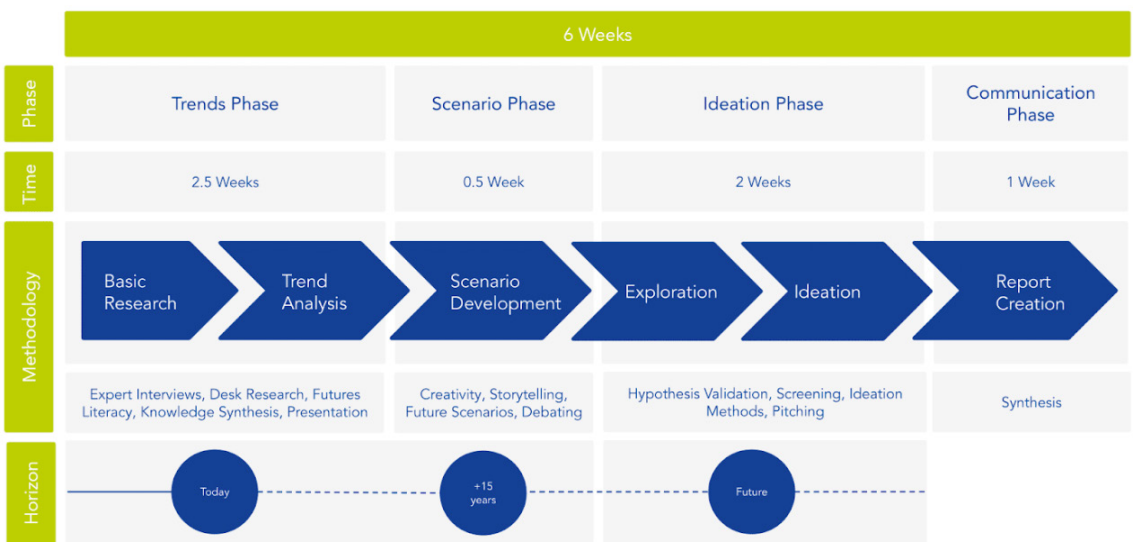
Center for Digital Technology and Management (CDTM)

METHODOLOGY

The objective of the Trend Seminar is to provide a methodological approach for diving into a specific subject or industry sector and contemplating its future trajectory. The seminar guides its participants through three phases of trend research: trends, exploration, and ideation. Following this approach, the seminar first analyzes current trends and developments using in-depth desk research, site visits, and interviews with experts to establish a shared industry understanding. Next, participants identify areas within the sector where problems and opportunities will likely arise. In the final seminar phase, the students generate future-proof business ideas for products and services, addressing the identified problems and opportunities.

Thirteen students, supervised by two doctoral candidates, pursue the Trend Seminar for six weeks full-time during their summer break. The sector and framing for the seminar is provided by project partners from within the industry, who share their expertise and feedback, acting as sparring partners to the participants. In each phase, interdisciplinary subteams are formed with students from business, technology, and other disciplines. This interdisciplinarity allows for novel ways of thinking and the development of non-obvious ideas as well as leverages the students' professional and personal growth throughout the course.

During the introduction week, the participants are prepared for the intense trend research ahead. First and foremost, the students are introduced to the specific industry the seminar is diving into. Project partners and industry experts present past and current industry developments from their individual stakeholder perspectives, engaging in open discussions with the students. Additionally, interactive sessions teach trend research methodologies and refine the participants' communication and teamwork skills.



Following the introduction, the trends phase of the seminar covers desk research and expert interviews, enabling the participants to dive deep into the topic at hand.
During the expert interviews, students are empowered to pose specific questions to challenge their initial assumptions on how the industry will develop. Beyond that, site visits at the project partners' facilities complement the students 'body of research and allow for further verification of their hypotheses. The derived trends are extrapolated 15 years into the future, providing a long-term perspective.

The first half of the ideation phase is about exploring, future problems and opportunities are clustered into specific spaces based on the research done in the preceding phase. The students are reshuffled into new teams and explore these spaces by looking into existing companies and projects. Through coaching sessions, the teams validate their hypotheses to identify unmet needs and existing gaps in the industry landscape.

During the second half of the ideation phase, students brainstorm business solutions addressing the previously identified gaps. To facilitate the ideation process, structured and unstructured ideation methods are introduced to the students. This allows them to generate many ideas before consolidating them and building comprehensive business models. Finally, the research results and the business ideas are pitched to the project partner.

LIST OF ABBREVIATIONS

AI
Artificial Intelligence

AR
Augmented Reality

AROPE
At Risk of Poverty or Social Exclusion

CAGR
Compound Annual Growth Rate

CNN
Convolutional Neural Network

COVID
Coronavirus Disease

CPI
Consumer Price Index

DANA
Isolated Depression at High Altitudes

EU
European Union

EUR
Euro

EV
Electric Vehicle

GB
Gigabyte

GDP
Gross Domestic Product

GDPR
General Data Protection Regulation

GVA
Generalitat Valenciana

INE
National Statistics Institute – Spain

IoT
Internet of Things

IT
Information Technology

LATAM
Latin America

LEZ
Low Emission Zone

LPWAN
Low-Power Wide-Area Network

MIT
Massachusetts Institute of Technology

MR
Mixed Reality

NB-IoT
Narrowband Internet of Things

NGO
Non-Governmental Organization

NYU
New York University

PB
Participative Budgeting

PD
Public Debt

PDF
Portable Document Format

PDR
Packet Delivery Ratio

PERTE
Strategic Project for Economic Recovery and Transformation

PIR
Passive Infrared

RFID
Radio-Frequency Identification

R&D
Research and Development

RNN
Recurrent Neural Network

SAM
Serviceable Available Market

SCADA
Supervisory Control and Data Acquisition

SME
Small and Medium-sized Enterprise

SOM
Serviceable Obtainable Market

STEM
Science, Technology, Engineering, and Mathematics

TAM
Total Addressable Market

UHI
Urban Heat Island

USD
United States Dollar

VR
Virtual Reality

XR
Extended Reality

TRENDS

The following chapter lists current trends that have a strong influence on the development and long-term strategic orientation of The Future of Innovation in Urban Spaces. In accordance with the Trends Phase methodology, trends and related driving forces are structured into four areas: technology trends, society and environmental trends, legal and policy trends, economic and business model trends..

TECHNOLOGY TRENDS

FUTURE OF INNOVATION IN URBAN SPACES

Efficient Resource Management
AI Driven Urban Intelligence
Urban Cybercrime Proliferation
Immersive Urban Digital Twins
The Surge of Data Collection

Carlos Gómez 
Gonzalo Martín 
Ivan Gilabert 

TECHNOLOGY TRENDS

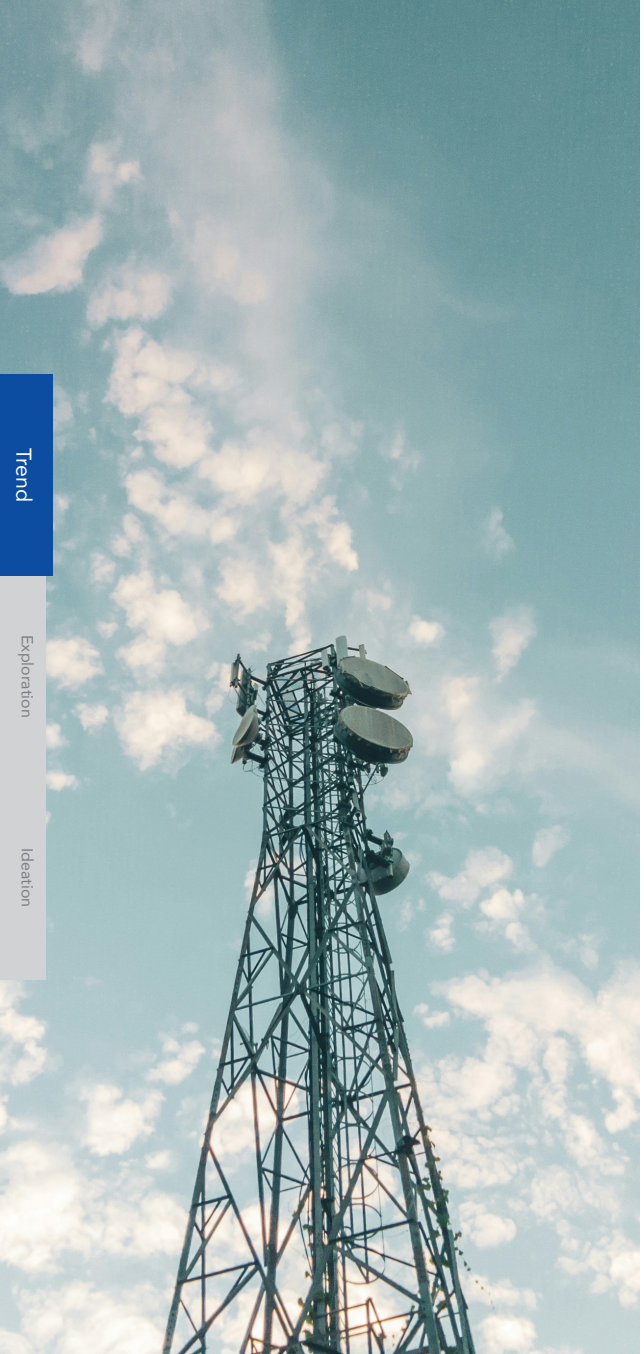
Future of Innovation in Urban Spaces

The cities that we live in today have never experienced so many changes. Urban population growth, rising temperatures caused by climate change, and an ongoing pursuit of optimization are all driving our cities towards smarter, more sustainable infrastructures. Technology is not just a tool; it is a strategic enabler in addressing the challenges of the future. Thanks to advancements and research in science, technology, engineering, and mathematics (STEM) fields, our societies have become more efficient, cost-effective, and livable. As a result, the future of urban spaces will be shaped by a new wave of integrated digital technologies that will transform how our urban landscapes are shaped, how their integrated systems function, and how we interact as citizens.

At the heart of today's urban transformation lies the increasing influence of digital innovation on the built environment of the cities. As urban spaces expand and become more complex, technology is not only supporting but also reshaping the way cities evolve. Digital infrastructure is redefining what is possible in terms of efficiency, connectivity, and responsiveness. Urban innovation now emerges from the ability to gather and interpret data, automate decision-making processes, and foster coordination across previously disconnected sectors. Cities are turning into platforms for experimentation, where emerging technologies intersect with governance, mobility, environment, and citizen participation. This convergence is giving rise to a new model of urban development: one that is data-informed, adaptive, and co-created. This shift is not limited to large global cities; even mid-sized and emerging urban centers are adopting smart governance frameworks and testing pilot technologies in mobility, energy, and citizen services.

However, this process is not happening without tensions. As digital tools grow more integrated into urban systems, questions around equity, transparency, and long-term resilience are becoming more urgent. Innovation in urban spaces must navigate a delicate balance between technological optimism and the realities of governance, inclusion, and privacy. While the promise of smarter, more efficient cities is compelling, the uneven access to digital services and the complexity of managing vast urban data ecosystems raise important societal challenges. Cities today are at a crossroads: they must harness the transformative potential of technology while ensuring that it serves all inhabitants, not just a technologically privileged few. Recognising this duality is essential for understanding how cities will continue to evolve, not as passive recipients of innovation, but as active environments where social needs and technological advancements must align.

In essence, the convergence of connectivity, intelligent systems, and immersive simulation is defining a new era in urban development. Cities are no longer static environments but dynamic ecosystems capable of self-monitoring, adaptation, and continuous improvement. The ongoing challenge lies in developing technological solutions that are not only effective and scalable but also inclusive, secure, and ethically sound. Understanding these emerging trends is essential for policymakers, engineers, researchers, and citizens alike as they work together to shape the urban environments of tomorrow.



EFFICIENT RESOURCE MANAGEMENT

The Rise of LPWAN in Urban Resource Management Systems

The management of resources such as water, electricity, gas, and waste is crucial in the context of urban growth, the climate crisis, and overexploitation of resources [1]. In this scenario, some technologies have become a trend for the optimization of resources management: LPWAN (Lower Power Wide Area Networks), a network technology that enables efficient data collection and transmission over long distances with minimal energy consumption, connecting multitude of devices such as sensors to a single network [1, 2].

These technologies are particularly relevant for enhancing water quality monitoring and leak detection. Which are essential activities for the goal of water management in cities: create an energy efficient, cost effective, and scalable system in the long term [3]. Different types of this technology have emerged as vital solutions, such as NB-IoT, which utilizes a licensed spectrum that allows higher building penetration, making it ideal for water and electricity management [4, 5].

Others, such as LoRaWAN, which operates on the unlicensed spectrum, allow cities to build and manage their own private networks without depending on telecom providers, helpful for cases requiring long range communication and data rate. Overall, the same technology has evolved into different approaches to help improve resource management, working synergistically to maximize its impact [3, 5].

Facts

- Many applications have been applied in Europe, highlighting the project which has taken place in 24 municipalities in Belgium, installing over 250,000 sensors in 2021 [6].
- LoRaWAN is a versatile technology, with a wide range of applications such as waste management systems developed in Barcelona or Amsterdam, helping reduce up to 50% costs in waste collection or the use of over 100,000 smart gas meters across multiple cities in Bulgaria and Greece, improving operational efficiency [7, 8].
- LPWAN technology demonstrates high robustness, achieving a packet delivery ratio (PDR) above 95%, ensuring reliable data transmission [9].

Key Drivers

- Valencia and nearby areas have implemented smart water management solutions such as the GoAigua platform, which has helped the city reduce leaks by 18%. The commitment of Spain to water management is clear, with the creation of the PERTE initiative, mobilizing nearly 1 billion EUR for these initiatives [10].
- One of the main factors increasing the integration of this technology is its scalability [1]. LPWAN networks can be easily scaled to cover larger urban areas, since they connect as many sensor networks as needed without dealing with big changes in the infrastructure itself [1, 11].

Challenges

- LPWAN technology's biggest challenge is its limited data rate and latency. It is designed for small data packets that might face problems with its integration into applications regarding real time, high volume acquisition of data. The difficulty of integrating it in the traditional water management systems must be considered [1, 11, 13].
- Cost benefit uncertainty is a usual challenge and limitation when introducing new technologies. Although LPWAN reduces operational costs, saving water from being unused, the initial investment in smart meters, gateways, and integration can be huge [12].

Impact on the Future of Urban Spaces

The use of LPWAN technology for the optimization of resource management enables urban cities to save costs. By incorporating into the actual resources management systems widespread, low cost, energy efficient sensor networks, it would be possible to track real time data on water, energy consumption, and waste [6, 12]. This digital transformation not only improves the reliability of these services but also helps save money and space for other city needs. Examples in European cities have shown how resources can be invested properly so urban spaces can take advantage of it, since more land and funding can be invested in recreational areas [6, 10, 13].

AI DRIVEN URBAN INTELLIGENCE

Transforming City Planning Through Deep Learning Innovation

Artificial Intelligence (AI) is increasingly shaping the future of urban spaces, highlighting Deep Learning models. In this field, Neural Networks, either Convolutional (CNN) or Recurrent (RNN), have become one of the most powerful tools for the analysis of complex data. Either related to the environment, public services, or infrastructure [14, 15]. By combining these AI models with vast amounts of sensors, cameras, remote sensing technologies, satellite and aerial images, it will help cities to operate more efficiently and sustainably. Enhancing urban planning, traffic management, infrastructure maintenance, environmental monitoring, and public safety.

Deep learning models are being widely implemented due to their ease of training as they use fewer parameters for their predictions, working alongside large and labeled datasets [16]. But it is not just about datasets, e.g. the use of real time data has also been implemented in traffic management to optimize signal timings and data congestion. Its versatility makes it a very useful tool. For example, CNNs excel at identifying structural anomalies (cracks, edges, corrosion), they are effective for identifying features such as roads, bridges, or green spaces, helping the city mapping process [17, 19].

Facts

- Studies have shown that predictive maintenance in urban infrastructure can reduce costs by up to 40%, making it a viable solution, as they have also shown accuracy rates up to 99.4% [14, 16, 18].
- CNN architectures are being used by city planners to classify urban spaces, highlighting the initiative developed in San Francisco, which calls for predicting microscale temperature variations to create thermally friendly layouts [17, 20, 21, 22].
- Other studies regarding traffic management have shown how traffic congestion could drop by 15% as well as predicting peak traffic conditions, thanks to CNN models in Taiwan [18, 24].

Key Drivers

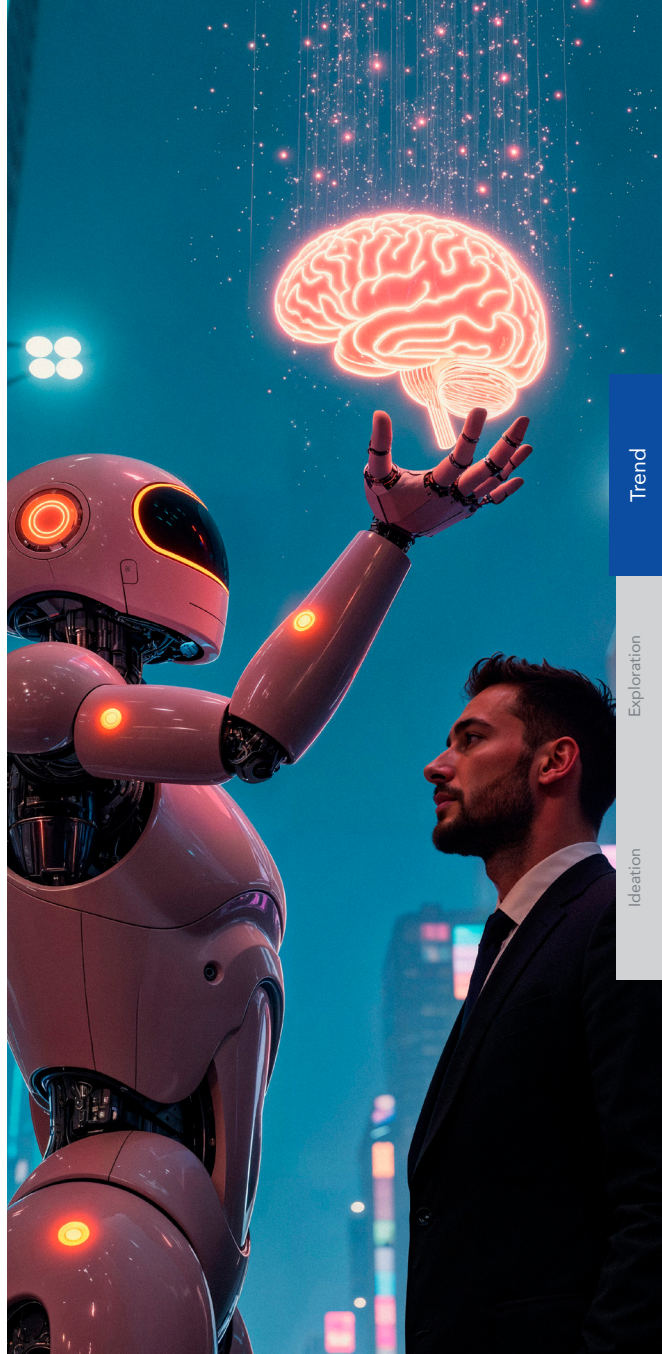
- The rapid development of Internet of Things technology is helping the efficiency of urban cities. Its implementation, combined with AI models, is enabling real time monitoring of many services. The synergy enables higher accuracy in predictions and better decision making [14, 18].
- Economic factors such as public/private investment play a crucial role in the development and implementation of this technology. AI models can lead to long term cost savings, but the initial investment is important. To profit from this technology, public private partnerships are needed, as evidenced by the many cities working on these type of agreements [24, 26].

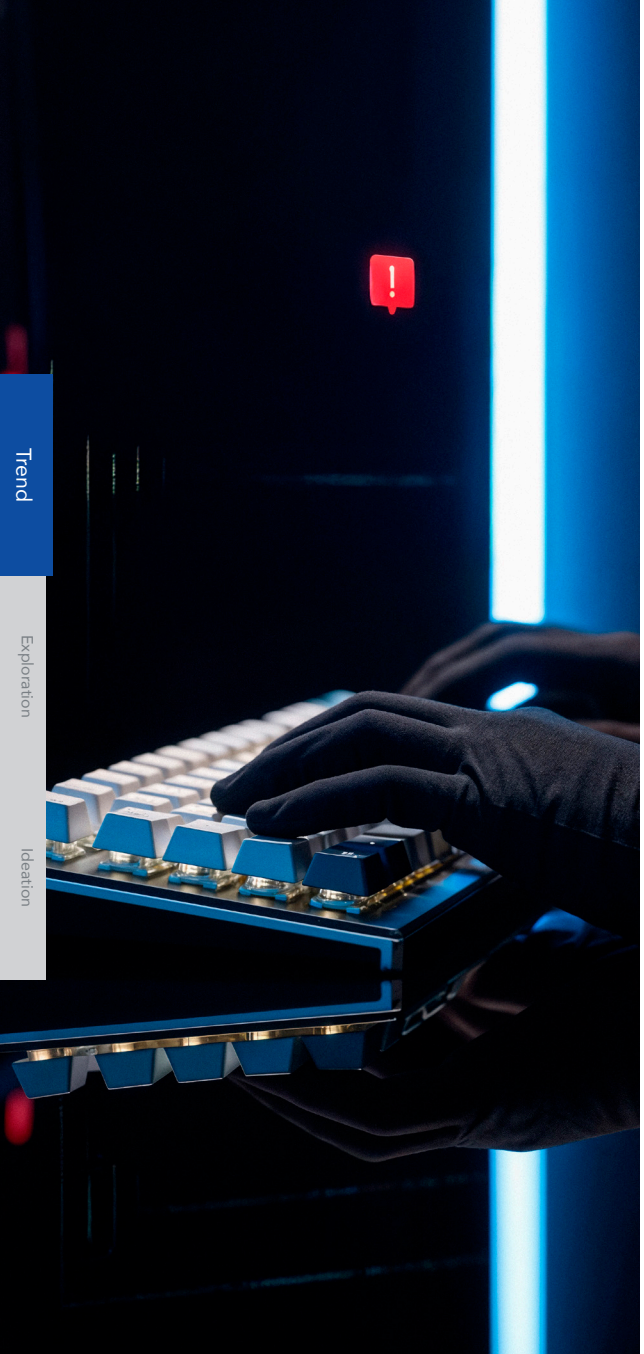
Challenges

- Privacy and data security concerns represent the most significant implementation barrier. Organizations struggle with employee distrust regarding movement pattern tracking and with sensitive data collection. Requiring anonymized data techniques, GDPR compliance measures, and robust cybersecurity protocols to protect against unauthorized access and data breaches while maintaining system functionality [27].
- The model's sensitivity to data quality and quantity is critical for AI models. Even though high precision has been achieved, the sensitivity could underscore the results obtained, lowering the model's reliability. It would be necessary to implement advanced filtering techniques with databases collecting more information to train the models to cover as many anomalies as possible [25, 28].

Impact on the Future of Urban Spaces

The future of urban spaces is being revolutionized by the synergies between neural networks such as CNNs and the IoT. The development of IoT, monitoring data, images, and other inputs will enhance the generation of large scale databases that will help train the different deep learning models that are being implemented. Thanks to this, they will become more accurate, enabling real time decision making in services such as energy usage and traffic management. Thus, citizens' quality of life will improve by creating safer, cleaner, and more efficient public spaces [25].





URBAN CYBERCRIME PROLIFERATION

Smart Urban Systems Under Siege

The growing sophistication of cyberattacks on smart city and IoT infrastructures pose a critical threat to European smart cities, including Valencia's digital transformation. European wide research identifies smart cities as high target environments: interconnected IoT devices, supervisory control and data acquisition (SCADA) systems, and public services are increasingly exploited for sabotage, data theft, and ransomware [29]. Criminal syndicates and state actors are often behind these attacks. Notably, a 2023 systematic study identified seven major cybersecurity dimensions and 31 sub dimensions, including infrastructure vulnerabilities, IoT, network weaknesses, access control, data privacy, security standards, and human behavior, spanning domains such as mobility, environment, and utilities in smart cities [30].

Additionally, recent research highlights that advanced attackers are increasingly exploiting interdependent urban systems, causing real world service disruptions, from grids to traffic systems, underscoring cities' elevated risk [31]. As Valencia expands its deployment of sensor networks, traffic management platforms, and smart utilities, it is essential to embed security-by-design, rigorously segment networks, and strengthen public–private cybersecurity collaboration to protect services and uphold citizen trust.

Facts

- A 2023 conference study from Valencia demonstrated that physical smart city systems (traffic, waste, electric vehicles charging) exhibit tangible cybersecurity vulnerabilities to realistic attacks [32].
- Smart city infrastructures are now enticing adversaries and cybercriminals to execute cyberattacks. New frameworks to improve forensic preparedness were proposed in a 2022 study [33].
- Nearly 28% of local government authorities in European countries reported experiencing cyberattacks at least once per day or more frequently, indicating pervasive threat levels in urban administrations [34].
- The number of data breaches involving smart device ecosystems and urban IoT frameworks increased by 45% between 2020 and 2022 [35].

Key Drivers

- The rapid rollout of sensors, actuators, and IoT devices in domains like transportation, utilities, and energy increases attack surfaces and entry points in smart city systems [36].
- Complex interconnectivity between legacy operational technology (OT) / SCADA and modern IT infrastructure creates intricate, interdependent networks that are attractive targets for well resourced attackers [30].
- Sophisticated cyberattacks using advanced tactics are on the rise. European smart city projects now are proposing 24 mitigation strategies to face the many security challenges that need mitigation and better protection and regulation [30].

Challenges

- Smart city ecosystems are built on complex IoT infrastructures, which offer a range of cybersecurity concerns to consider. This situation creates numerous vulnerable points and prevents conventional IT models from offering end to end protection [37].
- Holistic security frameworks and interoperability remain underdeveloped, making it difficult to manage reliability issues. This weakness is exacerbated by non standardized device protocols and governance fragmentation [38].
- There is a significant cybersecurity skills shortage across Europe, with an estimated worldwide deficit of 3.5 million trained professionals required for cybercrime prevention [39].

Impact on the Future of Urban Spaces

Cyberattacks in smart cities threaten the very foundation of urban life by disrupting essential services, from energy and water systems, to transportation and public safety. A 2025 study on resilience in smart cities found that such disruptions can erode trust in digital governance, slow innovation, and divert municipal investments toward cybersecurity recovery efforts rather than forward looking urban development [40]. Cyber resilience via AI detection and response frameworks is key to sustaining livable and connected urban environments.

IMMERSIVE URBAN DIGITAL TWINS

Integrating XR with Digital Twins for Interactive Urban Simulations

Immersive Urban Digital Twins combine city scale digital twin models with extended reality (XR) technologies to create interactive virtual replicas of urban environments, aligned with the real world [41]. XR, as an umbrella term encompassing augmented or virtual reality (AR/VR), and Mixed Reality (MR), enables seamless digital physical experiences that support diverse applications.

These platforms integrate real time data from IoT sensors into detailed 3D city models and use AR overlays or VR simulations to let planners, engineers, and citizens visualize and interact with urban scenarios in situ. Stakeholders can simulate "what if" scenarios, such as new construction, traffic rerouting, or flood events, and see the outcomes overlaid on the actual cityscape before making real world decisions. By merging AI driven predictive modeling with AR's intuitive visualization, this trend enhances data driven decision making and reduces project risks.

City planners are already using XR to explore proposed changes with communities, and first responders train in VR simulations of city emergencies. In essence, AR/XR enhanced digital twins are poised to transform urban management by making complex city data and forecasts accessible and tangible, leading to more resilient, efficient, and inclusive smart cities.

Facts

- Over 500 cities are expected to deploy smart city digital twins by 2025 [41].
- The global AR services market is projected to surge from ~191 billion USD in 2024 to over 1.1 trillion USD by 2029 [42].
- A digital twin driven adaptive traffic signal control framework reduced vehicle delays by up to 52% in simulations compared to conventional timing methods [43].
- In Helsinki, AR helps planners and citizens visualize proposed projects, increasing transparency. Similarly, in Oslo, AR engages youth in urban planning by letting them help choose locations for planting some of 100,000 new trees. [48].

Key Drivers

- The push for more inclusive and participatory urban planning is driving adoption of immersive technologies that make complex city projects visible and understandable to the public [44].
- Advances in connectivity, such as widespread 5G networks and edge computing, now enable high-fidelity, real-time AR/VR experiences across city environments [42], while developments in AI and spatial computing enhance the accuracy and context-awareness of digital overlays, increasing the utility of AR/VR/XR in city management [49].

Challenges

- High processing demands, costly setup and maintenance of digital twins and XR systems, and the complexity of aligning incomplete, inconsistent urban data from diverse sources in real time pose major challenges for municipalities [44, 50, 51, 52].
- Digital twins require collaboration across government, tech vendors, and communities but roles around data ownership, shared responsibilities, and decision rights are often unclear, leading to stalled or abandoned projects [53].

Impact on the Future of Urban Spaces

Immersive digital twin platforms are set to transform urban governance by making planning more interactive and inclusive. They allow officials and citizens to visualize and test proposed changes in a virtual city before implementation, enabling better informed decisions and greater resilience. Already, cities like Amsterdam, Singapore, and Houston report improved climate adaptation and more efficient infrastructure operations from digital twin systems. However, failed projects in Toronto and Portland highlight that strong stakeholder collaboration and data governance are crucial to fully realize these technologies' potential [47].

THE SURGE OF DATA COLLECTION

How Connected Infrastructure is Reshaping Urban Decision Making

Modern environments are rapidly evolving into interconnected ecosystems, powered by sensors, cameras, and IoT devices embedded in physical infrastructure [54]. These components generate a constant stream of real time data, enabling detailed monitoring of human activity and environmental conditions with high accuracy, which allows more efficient operations, smarter planning, and improved services [55].

The convergence of IoT with artificial intelligence and advanced communication networks has significantly transformed how we manage and interact with the world around us [56]. These smart technologies enable faster, more flexible responses to changing conditions, from adjusting energy usage to monitoring public spaces, contributing to more intelligent and adaptive systems.

As data collection and analysis expand, deeper insights improve decision making, resource use, and service delivery across sectors. However, profiling citizens via digital systems brings complex challenges [54]. While these insights help tailor services and predict needs, they raise concerns about privacy, ethics, and surveillance. Responsible data governance and transparency are vital to ensure technologies serve the public without infringing on individual rights [57].

Facts

- The global IoT market for smart cities grew from 300 billion USD in 2021 to an estimated 650 billion USD by 2026 [55].
- IoT data volume is expected to grow from 13.6 zettabytes in 2019 to 79.4 zettabytes by 2025 [58]. But only 1% of IoT generated data is currently being utilized [55].
- Smart city connections have grown by approximately 20% per year since 2018 and are expected to continue growing at a similar rate through this decade [59].

Key Drivers

- The falling cost and widespread availability of Internet of Things (IoT) and high speed connectivity make it economically and technically feasible to deploy them at a massive scale across a city [56, 60, 61].
- Significant advancements in big data analytics, cloud computing, and artificial intelligence provide the necessary tools to store, process, and analyze the vast and complex datasets generated by urban environments [56].
- Urbanization and environmental challenges are pushing cities to adopt data driven solutions that optimize resource allocation, reduce waste, and support sustainability efforts [57, 61].

Challenges

- As data collection grows, smart cities face major challenges in privacy, cybersecurity, and data governance. A lack of standard security measures, skilled personnel, and interoperable systems leads to data silos and greater breach risks. [55, 57].
- Storing large volumes of data requires ongoing investment, with cloud storage costing about 0.021 USD per GB/month, a significant expense at scale [62].
- Integrating data from diverse sources is challenging due to varying quality, and lack of common standards, making it difficult to share information across municipalities and applications [54, 63].

Impact on the Future of Urban Spaces

This trend is transforming urban governance by shifting decision-making from reactive, experience-based methods to predictive, data-driven strategies that anticipate and prevent problems before they occur. Cities using comprehensive data systems gain deep insight into urban dynamics, allowing for better resource use, improved public services, and enhanced environmental sustainability through real-time monitoring and optimization.
Success, however, relies on strong data governance that balances efficiency with citizen privacy. Cities that ensure transparent, rights-respecting data practices can achieve major advancements.In contrast, those that neglect public trust risk weakening smart city efforts and damaging confidence in digital transformation of urban life [54].

SOCIETAL & ENVIRONMENTAL TRENDS

FUTURE OF INNOVATION IN URBAN SPACES

Heat is the New Normal
Cities in a Hyperconnected World
Modern Family
Elderly Urbanism
Nature-Proof Cities

Karla Mariana Reséndiz 

Sergio Pérez 

Jorge Antonio Gatica 

SOCIETAL & ENVIRONMENTAL TRENDS

Future of Innovation in Urban Spaces

Mediterranean cities such as Valencia are at a pivotal moment of transformation, where the challenges of society and the environment are shaping a new vision of urban living. The evolving identities of cities are informed as much by their commitment to social inclusion and cultural vibrancy, as by their urgent responses to climate and ecological pressures. Valencia, in particular, demonstrates how environmental innovation and societal wellbeing can reinforce each other in the pursuit of a healthier, more equitable urban future.

At the core of this transformation lies a redefinition of families and the roles within them. Traditional models of parenthood are giving way to fluid arrangements, single-parent households, and blended families. Also, declining fertility rates in Europe are reshaping demographic structures, creating societies where children are fewer, yet increasingly central to public discourse and policy debates. The proliferation of technology in parenting has transformed care into a partially outsourced, data-driven experience, while also raising complex questions about emotional intimacy boundaries in childhood.

Meanwhile, the urban population is aging at an unprecedented rate. A growing proportion of residents are now elders, many of whom might face isolation within changing cities. This aging shift is not only a social challenge but an urban design imperative. Cities must begin to account for the needs of multigenerational households, age-friendly public infrastructure, and the reintegration of older adults into community life reclaiming them not as dependents, but as cultural memory keepers and active participants in civic identity. At the same time, globalization exerts pressure on cultural roots and local identity, subtly transforming family customs, language use, and intergenerational continuity. As traditions blend or vanish, cities are tasked with holding space for both innovation and rootedness.

Overlaying these social dynamics is the intensifying impact of environmental change. The rise in extreme weather events such as floods, heatwaves, and droughts is no longer an abstract projection, but a lived reality shaping how cities are planned, governed, and experienced. Events like DANA in Valencia reveal how climate volatility disrupts not only infrastructure, but also social cohesion, mental well-being, and everyday life. Urban spaces are now being reimagined through the lens of sustainability, demanding a shift toward regenerative design, circular systems, and community-based adaptation strategies.

What emerges is a complex but urgent intersection: societal transformations are unfolding within an ecological context that is both fragile and rapidly evolving. Cities are not just sites of population growth or economic exchange; they are social organisms shaped by demographic shifts, technological habits, and environmental pressures. As modern families evolve and the climate destabilizes, the question is not simply how cities can adapt but how they can anticipate and shape these forces to build inclusive, resilient, and culturally meaningful futures. Understanding these intertwined trends is essential to designing urban environments that remain not only functional, but also emotionally and ecologically sustainable for generations to come.

HEAT IS THE NEW NORMAL

Cities Trapped in Urban Heat Bubbles

As Mediterranean cities like Valencia confront escalating climate risks, extreme heat is no longer an occasional hazard; it is a structural, systemic threat [64]. Urban heat islands (UHIs) and prolonged heat waves are transforming the daily urban experience, especially for the most vulnerable populations [65]. Projections indicate that by 2100, Valencia could endure up to 132 days annually with heatwave conditions under high-emission scenarios, a dramatic increase from current trend [64]. This intensification of heatwaves and drought conditions across Spain, particularly in the Mediterranean region, will make extreme heat events far more common [66].

Conventional planning paradigms are no longer adequate to address these challenges. Valencia's urban areas already retain more heat at night during heatwaves due to dense structures, making extreme heat an escalating norm [66]. To maintain liveability, cities must rethink the design of public space, material use, and climate resilience strategies. Without aggressive and equitable adaptation, urban cores risk becoming thermally hostile environments, compromising public health, social equity, and overall quality of life for residents [65, 67]. This necessitates a paradigm shift towards integrating passive cooling and green infrastructure into urban design.

Facts

- By 2100, Valencia could face up to 132 days annually with heatwave conditions under SSP5-8.5, a dramatic increase compared to now [64].
- Heatwaves and drought conditions in Spain will intensify by the end of the century under high emission scenarios. The Mediterranean region will face more frequent and severe heat driven droughts [66].
- During heatwaves, Valencia's urban areas retain 0.1–0.9°C more heat at night due to dense structures [67].
- Prolonged heat exposure is associated with respiratory problems, heat exhaustion, and increased mortality, especially among vulnerable populations [65].

Key Drivers

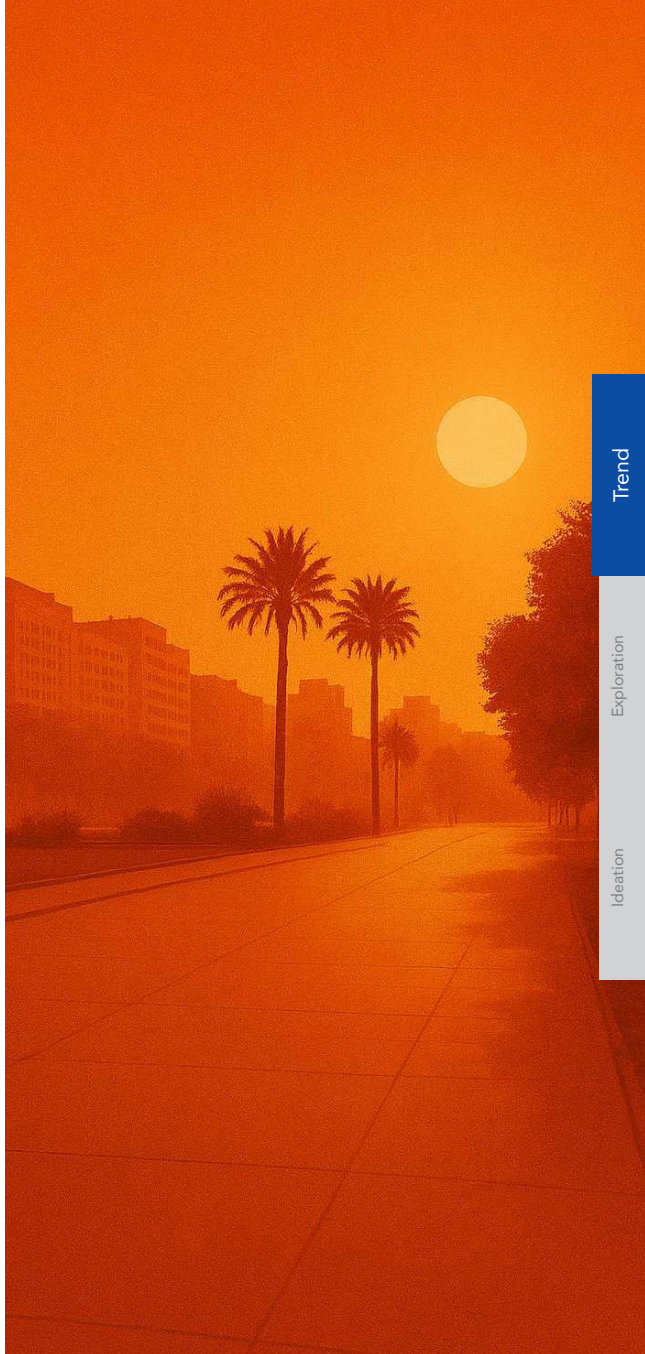
- Anthropogenic climate change is accelerating the intensity and duration of Mediterranean heatwaves. Raising baseline temperatures and health risks [66].
- Conventional urban materials, like concrete and asphalt, amplify the urban heat island effect by efficiently storing and re-emitting solar heat throughout the night, preventing natural cooling [67].
- This is problematic as vulnerable neighborhoods often lack sufficient tree cover and shading, leading to increased thermal exposure and exacerbating existing health disparities [65].
- Post-COVID urbanism has shifted public priorities toward outdoor space use, increasing the urgency for thermally comfortable, livable public areas [65].

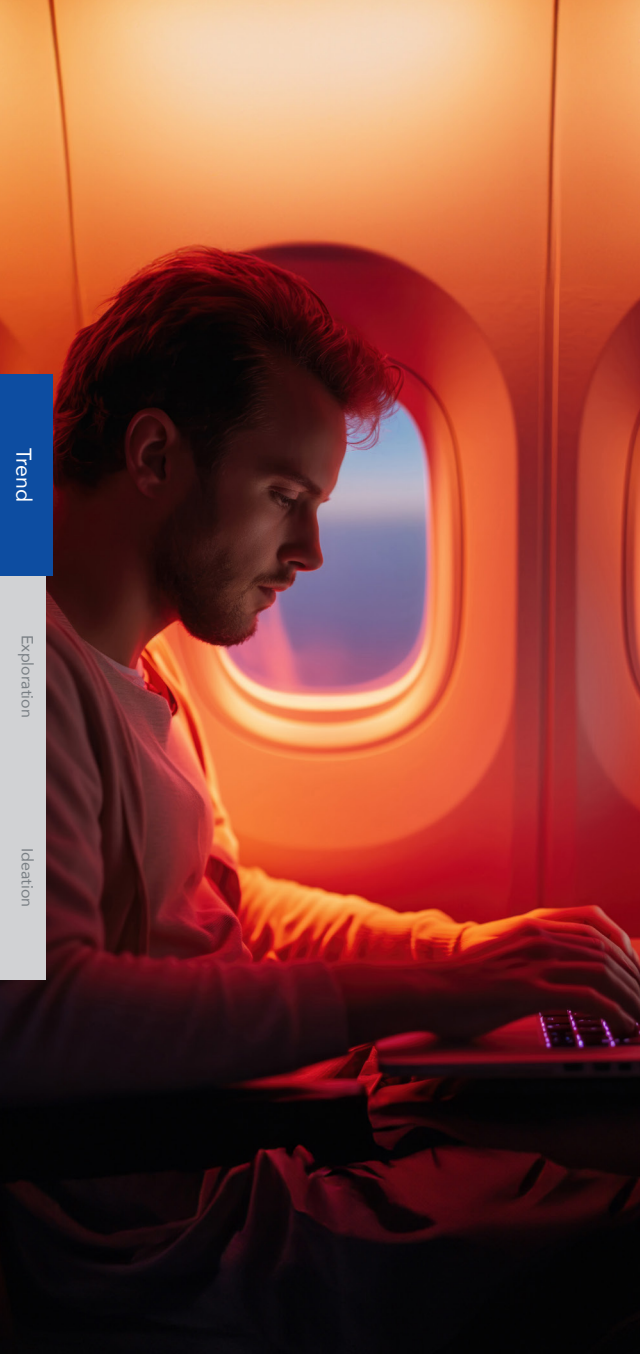
Challenges

- Urban planning and existing building codes have yet to fully integrate comprehensive climate adaptation strategies, leaving the city largely unprepared for escalating thermal stress and its consequences [65].
- Efforts to expand urban tree cover often face obstacles from existing infrastructure, such as roads, utilities, and car parking needs [67].
- High upfront costs and long term maintenance demands limit the deployment of green infrastructure, especially in lower income districts [65].
- Public health systems are increasingly strained by the cumulative effects of heat related illness, yet few cities have robust heat action plans [65].

Impact on the Future of Urban Spaces

Extreme heat will redefine Valencia's urban landscape, transforming thermal resilience from a luxury, into a survival necessity [64]. Passive cooling must guide the design of public spaces, integrating high albedo surfaces, green corridors, and shaded zones [67]. Thermal comfort cannot be treated as an aesthetic add on, but must be systemically embedded into urban design, particularly in the most affected neighborhoods. If cities fail to adapt equitably, outdoor life could be lost [65]. To preserve liveability, cities must act decisively to retrofit spaces and infrastructures for a hotter, more volatile future.





CITIES IN A CONNECTED WORLD

How Teleworking, Gentrification, and Interconnectedness Shift Cities' Role

From Ancient Mesopotamia to the modern era, cities have been cultural, religious, economic, political, academic, and military centers. In the Industrial Revolution, they became an industrial production center, fostering a massive rural urban migration [68]. Now, many of these functions have either disappeared or become deeply decentralized. In the 20th century, industrial activities would be replaced by corporate work as transportation costs declined [69]. Now, the internet (declining costs of communication) and the rise of teleworking since the pandemic have decentralized economic and academic activities, as professionals migrate outwards seeking space and affordability [70, 71].
On the other hand, city centers are intensifying as hubs for tourism and culture, leading to new challenges and realities. At the same time, gentrification of traditional neighborhoods becomes the new normal, and the city becomes a curated stage for consumption and connection, fetishizing cultural experiences for profit [72]. All these changes prove that cities are not static concepts, and in a time when changes happen faster than ever before, urban planners will have to reevaluate who cities are for and how they can serve a society that no longer needs to gather in one place to work.

Facts

- Valencia surpassed 5 million hotel nights in 2024 for the first time, reflecting a 10.3% increase from the previous year and highlighting the intense growth of its tourism sector [73].
- In 2022, Valencia city experienced a net negative internal migration of 4,350 residents, with many relocating to the metropolitan area and nearby urban centers [74].
- The number of people teleworking in the Valencian Community surpassed 300,000 in 2023, consolidating remote work as a significant factor in residential choice [75].

Key Drivers

- The rise of teleworking decouples work from a specific location, allowing residents to prioritize living space and quality of life over proximity to the urban center [71]. The COVID 19 lockdown has been a cultural and technological accelerator towards a decentralized workplace [76].
- The average rental price in Valencia city reached 15.5 EUR per square meter by June 2025, a significant 9.9% increase in just a year that pushes residents towards more affordable peripheral municipalities [77].
- Cities use symbols to attract investment and visitors, forming a symbolic economy that increasingly leads to the commodification of images and the management of public spaces by private organizations [72].

Challenges

- Valencia faces socioeconomic segregation. Central areas cater to and are inhabited by high income tourists and immigrants, whereas locals are displaced to the outskirts, changing the city's fundamental cultural fabric and identity [78].
- The value of proximity is persistent in areas of knowledge and innovation, with patent citations geographically localized and productivity being higher for firms located near the center of inventive activity in their industry [69].
- Packaging cultural legacy for short term consumption, it is stripped of its depth and context, disconnecting residents from their own heritage, flattening local identity into stereotype, and weakening the shared meanings that bind communities together [72, 78].

Impact on the Future of Urban Spaces

Urban planners must not only manage a city for its citizens, but also market a product for a global audience. Appeal becomes success, which results in intensive curation of the urban space [72]. Neighborhoods like Russafa and El Carmen are no longer organic, but a stage with historic facades restored, streets pedestrianized for café terraces, and traditional businesses replaced by tourist friendly aesthetic shops. These shops commodify local culture and traditions, turning the urban core into a large scale consumer product, and displace long standing businesses that serve residents rather than visitors. The choice, integrate tourist areas with the outskirts where the displaced working population now lives, or to accept socio economic segregation [78].

MODERN FAMILY

The New Dynamics in Families

Spanish family dynamics are marked by a transition from traditional, extended households to more diverse and complex forms, shaped by urbanization, demographic and cultural norms shifts, gender role changes, economic pressures, migration, and the integration of digital technology [79, 80, 81]. The "modern family" no longer conforms to a single model; households may include single parents, co-parenting arrangements, blended families, multigenerational living, or chosen families [82]. In addition, technology further transforms how families connect, communicate, and raise children, introducing both empowerment and new frictions [83, 84].

These changes reflect broader societal shifts. For instance, Spain's fertility rate has dropped to the lowest in Europe, with many couples delaying childbearing due to economic insecurity and work-life balance concerns [85]. Divorce legalization and the social acceptance of cohabitation have diversified family forms, increasing single-parent and blended families [86]. Moreover, the advances and incorporation of information and communication technologies (ICTs) in everyday family life have reshaped family dynamics, fostering new opportunities for learning and work while also introducing challenges like "technoference" that disrupt parent-child interactions and impact well-being [87]. Despite these transformations, strong family bonds and intergenerational support continue to play a central role, balancing tradition with new patterns of daily life [88].

Facts

- Technological change is identified as a major megatrend affecting families, influencing how they connect, communicate, and raise children, bringing both empowerment and new frictions [84].
- A key finding is that, globally, couples with children do not constitute a majority of all families (only 38% of households), underscoring the widespread nature of family diversity [85].
- Spain's fertility rate dropped to below 1.4 children per woman in 2020 [85].
- The widespread adoption of digital technologies has led to concerns about rising mental health, worsening eyes and disturbed sleep [87].

Key Drivers

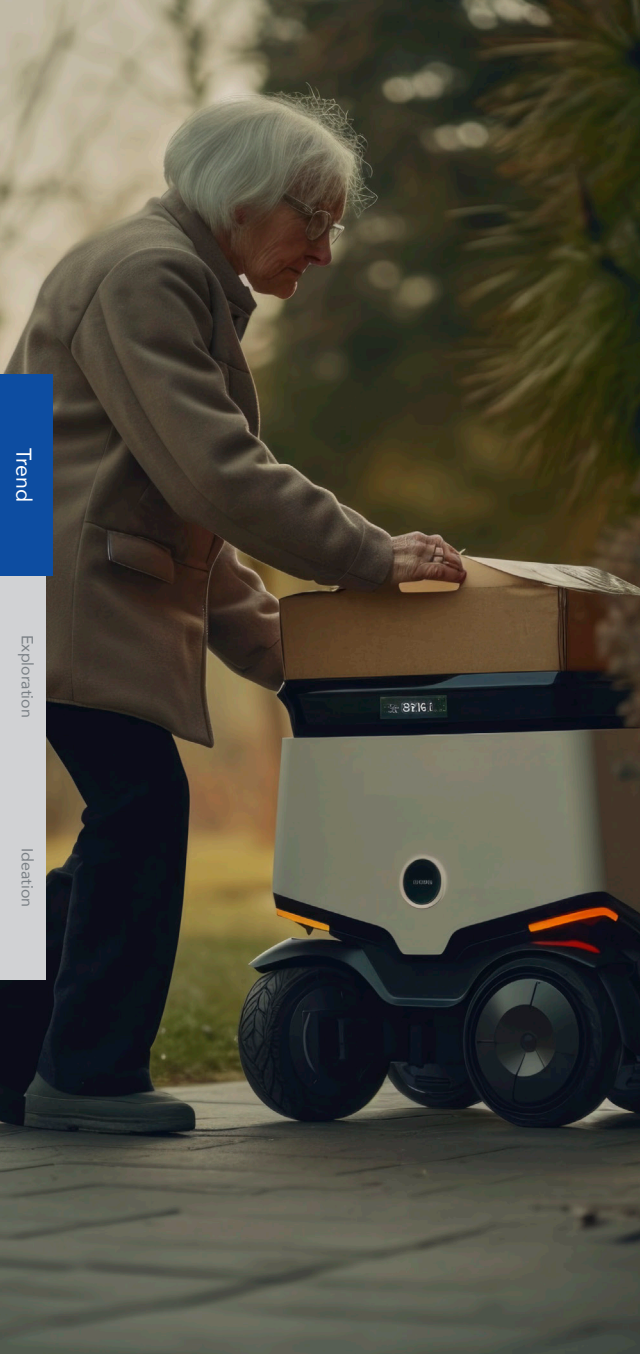
- Technological change is identified as a major megatrend affecting families, influencing how they connect, communicate, and raise children, bringing both empowerment and new frictions [84].
- Young adults in Spain cite economic uncertainty and the lack of support for work-life balance as major factors influencing their fertility and family decisions [85].
- Urban societies are characterized by cultural heterogeneity, driven by transnational migration and a "new social awareness" [89].

Challenges

- Access to affordable housing is rapidly shrinking around the world, with low-income and middle-income families being affected the most [79].
- Parental problematic technology use interferes with the quality of parent-child interactions, potentially impacting responsiveness and emotional connection, which can be linked to empathy and bonding [84].
- Urban design often fails to provide crucial public spaces for walking, cycling, recreation, and social interaction, which are especially important for marginalized or vulnerable populations, like persons with disabilities, women, and older people [90].

Impact on the Future of Urban Spaces

The evolution of modern family dynamics, marked by multigenerational households, co-parenting models, digital parenting, and diverse caregiving roles is reshaping how cities are designed. Urban environments are moving beyond the nuclear family model to embrace flexible housing typologies, such as modular and multi-access living units, and public spaces that are inclusive for all family forms. Cities are integrating digital infrastructure to support tech-savvy families while also promoting screen-free, emotionally engaging environments. Planning is shifting toward proximity-based layouts, like 15-minute cities, that make daily life more manageable for fragmented or dual-residence households [84].



ELDERLY URBANISM

How an Aging Population Will Change The Future of Cities

Spain is experiencing a clear aging population trend, and Valencia is no exception. A rise in life expectancy and decline in birth rates are creating an increasingly older population, which will in turn create new challenges that smart cities of the future will face: healthcare, the labor market, and housing, among others. Finding better ways to take care of the elderly and keeping the industry going with a smaller workforce will be decisive factors. Socially, the city must address potential isolation and mental health issues among the elderly while fostering intergenerational relationships with inclusive third spaces [91].

Technologically, intricate user interfaces and the assumption of baseline digital fluency risk creating new walls of exclusion, leaving slower, less tech-savvy elders unable to access essential services or participate fully in society. Regarding accessibility, the 15-minute city refers to a city where every service is within a 15-minute walking distance, which would be an important milestone for an age-inclusive urban space, as elders often lose their ability to drive. Other important changes regarding accessibility will go from the retrofitting of both public and private spaces to adopt elevators, more benches, and non-slip, wide pavements, resulting in an accessible city for everyone.

Facts

- The population over the age of 65 in the province of Valencia grew by 1.88% in 2021 and by another 1.65% in 2022, and this trend is expected to accelerate [92].
- Over the past decade, population aging has had an estimated negative impact of 3.4% on Spain's participation rate in 2022, a trend affecting Valencia's labor force [93].
- A significant barrier to mobility is that nearly 44% of residential buildings in Spain do not have an elevator, confining many elderly residents to their homes [94].
- An overwhelming 82% of seniors in Spain wish to continue living in their own homes as they age, making adaptation essential [95].

Key Drivers

- Low birth rates are the primary factor in population aging, with Spain's estimated fertility rate of 1.16 children per woman in 2023 being well below the replacement rate of 2.1 [96].
- Life expectancy has risen in the Valencian Community to 82.6 years on average, mostly due to advances in healthcare and quality of life [97].
- Continuous digitalization of society, such as online banking, e-commerce, online bureaucracy, and remote work, creates continuous digital-upskilling demands for all age groups [98].
- A strong social and personal preference for "aging in place" creates demand for neighborhoods equipped with accessible services and mobility options [95].

Challenges

- Retrofitting old and historic urban areas presents an immense financial and logistical challenge, as installing elevators or widening sidewalks can be complex and costly.
- There is a risk of creating social and spatial inequality if accessibility renovations are concentrated only in high-income areas or new developments, failing to reach all citizens equally [99].
- Older people in Valencia are more affected by social frailty than the broader Spanish population, as evidenced by almost double the score on the social frailty indicator (meaning, on average, elders experience double the frailty symptoms) [91].

Impact on the Future of Urban Spaces

The aging population can reshape cities like Valencia into more inclusive and human-scaled environments, with the 15-minutes city model gaining prominence, ensuring essential services are reachable without a car. Meanwhile, digital barriers must be addressed through user-friendly design and in-person alternatives. Existing urban spaces like parks and plazas should be reimagined to include age-friendly features like soft exercise equipment that promote gentle physical activity, helping older adults stay active and healthy.

NATURE-PROOF CITIES

Resilience Against Natural Disasters

Natural disasters increasingly linked to climate change encompass a range of extreme weather events, including floods, wildfires, storms, droughts, and, to a lesser extent, volcanic activity [100]. The notable rise in the frequency and intensity of these disasters is largely attributed to anthropogenic global warming, which has altered weather patterns, disrupted the hydrological cycle, and led to rising sea level [101]. While the human fingerprint on intensified precipitation events like the Valencia DANA flood is increasingly evident, there is a recognized need for robust decision-making frameworks to manage inevitable ecological transformations and build resilience [102]. Proactive climate adaptation, involving structured decision-making, stakeholder engagement, and the consideration of various future climate scenarios, is crucial for mitigating adverse impacts and fostering long-term sustainability [103].

These adaptive strategies can take myriad forms, such as investing in resilient infrastructure, restoring natural ecosystems to buffer communities from hazards, and integrating early warning systems to enhance preparedness and response capacities [104]. Importantly, adaptation needs to be context-specific, reflecting local vulnerabilities, priorities, and socio-economic conditions to achieve equitable outcomes [105]. Ultimately, prioritizing climate adaptation not only reduces immediate risks associated with natural disasters or climate events, but also strengthens societies' long-term capacity to thrive amid uncertainty [106].

Facts

- The last DANA event in southeastern Spain can mostly be ascribed to human-driven climate change [102].
- Flood risk is increasing steeply in recent decades due to global warming [107].
- Nature-based solutions offer resilience against climate risks and create more livable, healthy urban environments for people and wildlife alike [108].

Key Drivers

- Globally, there is a significant movement of people into urban environments, with projections indicating that 68% of the world's population will live in cities by 2050 [109].
- Improvement of the capacity of infrastructures to prevent damage in advance of disturbance events, alleviate suffering during the disruptive events, and improve the recovery capability after the events, beyond the concept of pure prevention and hardening [110].
- Leverage data analytics and predictions to make cities safer and resilient against physical threats and possible consequent cascade effects [111].

Challenges

- A significant challenge in assessing and planning for climate impacts is the lack of economic damage estimates for many recorded acute climate events, particularly floods [101].
- Traditional methods for risk management do not consider dependencies of events and associated cascading effects [111].
- Cities present unique challenges that must be addressed, for instance, geography and the age and structure of buildings in historical areas [111].
- Many impact models tend to underestimate the severity of extreme event impacts, highlighting the need for more research to understand and model the role of changes in extreme climate events in a warmer future [112].

Impact on the Future of Urban Spaces

The integrated resilience system for smart cities is poised to profoundly transform the future of urban spaces by fostering enhanced safety, security, and resilience against physical threats and cascading effects among critical infrastructures [111]. It marks a significant shift from reactive to proactive disaster management, enabling cities to better plan, prepare for, absorb, recover from, and adapt to disruptive events, moving beyond mere prevention [113]. By integrating diverse, real-time data from various city systems and stakeholders, the system facilitates improved decision-making and efficient resource allocation, leading to faster response times and effective incident management [111].

LEGAL & POLICY TRENDS

FUTURE OF INNOVATION IN URBAN SPACES

City Making Through Participation
Europe's Climate Neutral Cities
Redesigning Urban Mobility
Housing Market Regulation
Smart Data Privacy

Mohamed Benhaddi 

Adrián Fernández 

Juan Pablo Endrino 

Miguel Padura 

LEGAL & POLICY TRENDS

Future of Innovation in Urban Spaces

Urban areas are undergoing significant transformation, driven not only by technological innovation, but also by shifting legal frameworks and evolving policy agendas. As cities across Europe and beyond respond to challenges such as climate change, housing inequality, and digitalization, it is becoming increasingly clear that law and policy play a fundamental role in shaping the future of urban life. Urban innovation is no longer viewed solely as a matter of design or infrastructure; it is being understood as something deeply influenced by the rules, rights, and responsibilities embedded in legal systems.

In recent years, there has been a growing recognition that cities are not just physical spaces, but complex ecosystems shaped by governance and regulation. Legal and policy tools are now being used more intentionally to promote sustainability, equity, and resilience. Rather than merely responding to problems, urban regulations are being crafted to encourage proactive solutions, guiding how resources are distributed, how communities engage with local decision making, and how public and private actors are held accountable.

What is being observed is a shift toward more integrated and forward thinking approaches. Legal frameworks are increasingly designed to align social, environmental, and digital goals. This includes efforts to ensure cleaner air, more affordable housing, or stronger protections for personal data. At the same time, there is an emphasis on creating opportunities for citizen involvement and community empowerment through participatory legal mechanisms. This reflects a broader understanding of law as a tool not just for enforcement, but for enabling positive transformation.

Cities are also being recognized as key testing grounds for legal innovation. Local governments, often closer to the immediate needs of residents, are experimenting with new forms of regulation that respond to urban realities. These developments raise important questions around fairness, enforceability, and the balance between public interest and individual freedoms. Nevertheless, they signal a growing trend toward using policy as a way to design more inclusive and adaptive urban futures.

The trends being explored in this chapter offer a clear picture of this evolution. From participatory budgeting to zero emission building standards, low emission zones, housing market regulation, and smart data privacy, each reflects how legal instruments are being used to guide urban change. While distinct in focus, these trends collectively highlight a transformation in how the role of law in urban settings is being perceived. It is no longer seen simply as a constraint, but increasingly as a lever to promote innovation that serves both people and the planet.

By examining these developments, this chapter aims to provide insight into how legal and policy decisions are shaping the next generation of cities, cities that are more participatory, sustainable, and respectful of rights. Understanding these frameworks is essential for anyone looking to engage with the future of urban innovation.

CITY MAKING THROUGH PARTICIPATION

How Citizens Are Shaping Urban Spaces in Europe

Participative Budgeting (PB), a mechanism that appeared in Brazil four decades ago, has contributed to shaping urban spaces and will continue doing so in the coming years. By allowing citizens to have direct input on which projects are undertaken, public works can then appropriately reflect the needs of the individuals who live in the different districts of our cities. In Valencia, which has the VLCParticipa program, 2,777 proposals were presented and voted on in the 2025-26 period. A considerable increase from the 1,200 proposals of the 2022-23 call and a long way from the 94 proposals of 2017, the second year of the program [114].

While significant PB, is not the only way of allowing citizens to participate in the design of urban spaces. Town halls and other institutions are also requesting the input of citizens before doing renovations in areas of the city [115]. Further allowing for the city to be shaped according to the needs of its inhabitants. Such is the example of the University of Valencia, which consulted its community before renovating its Taronger campus. These tools will play major roles in urban design in the coming years, particularly in Europe, the continent with the highest number of PB initiatives ongoing [116].

Facts

- Through Participem GVA, in the year 2022, the districts of Valencia, l'Horta Nord and l'Horta Sud had 22 million EUR allocated to them. In the whole Comunidad Valenciana, 125 million EUR were allocated [117].
- VLCparticipa is a project based on participative budgeting that manifests the commitment and desire of Valencia's town hall to promote the collaboration and participation of the citizens of the city in the decisions that affect the management of the city [114].
- Important European cities are making use of citizens' opinions and tactical urbanism to shape the design of urban areas [115].

Key Drivers

- Citizens demand to have more of a say in how the budget is spent and how their municipalities are shaped by public spending [114, 116].
- Encouraging fiscal transparency and avoiding government expenditure in areas or projects that give little to no value to citizens (white elephants). Through participative budgeting and by allowing citizens to have a say in urban planning, the public sector makes sure that what is done is something that is desired by the public [118].
- The implementation of PB programs has been pushed by the World Bank, the United Nations, and the European Union [116, 118].

Challenges

- Lack of knowledge in the general population about this initiative and poor promotion by the public sector.
- Division and a political class prone to diverse political attacks could work against participative budgeting. Coming together and having debates about policy and expenditures are factors that are essential for these initiatives to work. Furthermore, it is beneficial for the project to have widespread support within the legislature. The division and tensions that the Spanish society is facing could prevent PB from working efficiently [116].
- PB has seen mixed results when previously implemented in Latin America (LATAM), failing to encourage participation and reduce poverty [118].

Impact on the Future of Urban Spaces

These methods of participation are currently shaping cities such as Valencia and others, inside and outside Spain. By allowing the voices of citizens to be heard, it helps create cities that respond to the needs of those who inhabit them. Creating shade in streets, renovating the pavement where is needed, planting trees, etc. The possibilities are endless, and that's what's great about it. Citizens can come up with some ideas that public officials could not imagine. As some city designers say, streets and squares are meant to be used. Citizens are the ones who better understand how to do that.

EUROPE'S CLIMATE NEUTRAL CITIES

A 2050 Vision Driving Urban Change Across the Continent

The European Union has embarked on a transformative journey towards having 100 zero emission cities by 2030 and for the rest of the cities of the continent to follow suit by 2050. It is a necessary step in combating climate change, according to the Commission. The objective is meant to address the fact that cities consume 65% of the world's energy and produce more than 70% of global emissions [119]. The objective is ambitious and broad in its implications. In order to achieve it, much would have to change in the urban areas where most of the continent's population lives.

From buildings, cars, and personal consumption habits, many things will have to change [120]. A less polluting housing stock will be needed and a new mobility paradigm will emerge. That is the direction the European Union is moving towards. Not without resistance, though. Forcing changes to the budgets of countries and changes to people's lifestyles is proving to be difficult. But so far, that has not deterred the Commission. Providing legislation, but also guidance and funding, the EU pushes cities towards the goal. Now, momentum is growing. Cities test new models, learn from one another, and share solutions. The transformation is underway and increasingly seen as both urgent and irreversible.

Facts

- The EU aims to have 100 climate-neutral cities by 2030 [119]. The pioneering 100 cities develop and sign a Climate City Contract, with a plan and concrete actions. If the EU approves the contract, further access to funding and financing will be given. Afterwards, the rest of the cities of the continent should follow the steps of the first 100 cities [119].
- The EU building stock should be zero emissions by 2050. Large scale renovations of already existing buildings and better new construction will be required [120].
- Efforts are being made to renovate the fleet of vehicles that roam our streets. In order to comply with the goal [121].

Key Drivers

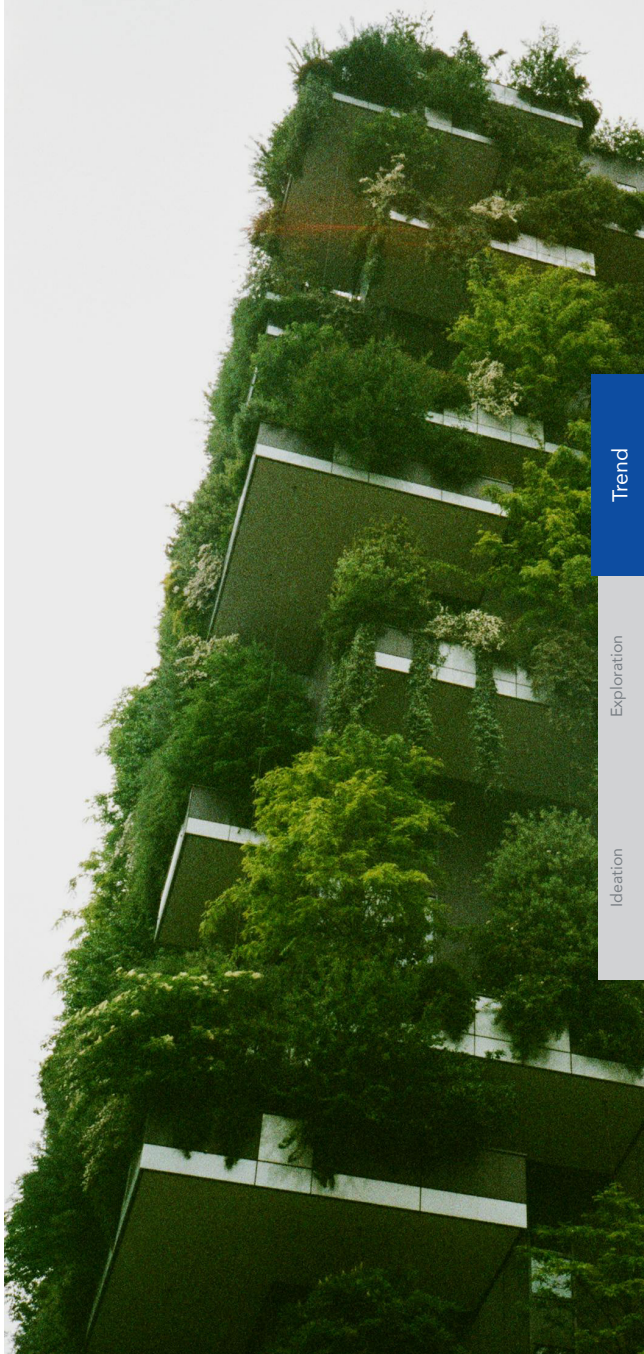
- The reality of global warming has to be faced, and reducing urban emissions is an essential step [119].
- The institutions of the European Union and the Members of the European Parliament will dictate to a great degree what is done in cities. From construction regulations to limits on non electric vehicles. Spain and the other countries of the EU will have to comply with the rules the EU dictates [120].
- Citizens can benefit from having more energy efficient buildings and vehicles. From having fewer emissions in the city where they live to reducing recurrent bills or gasoline expenses.

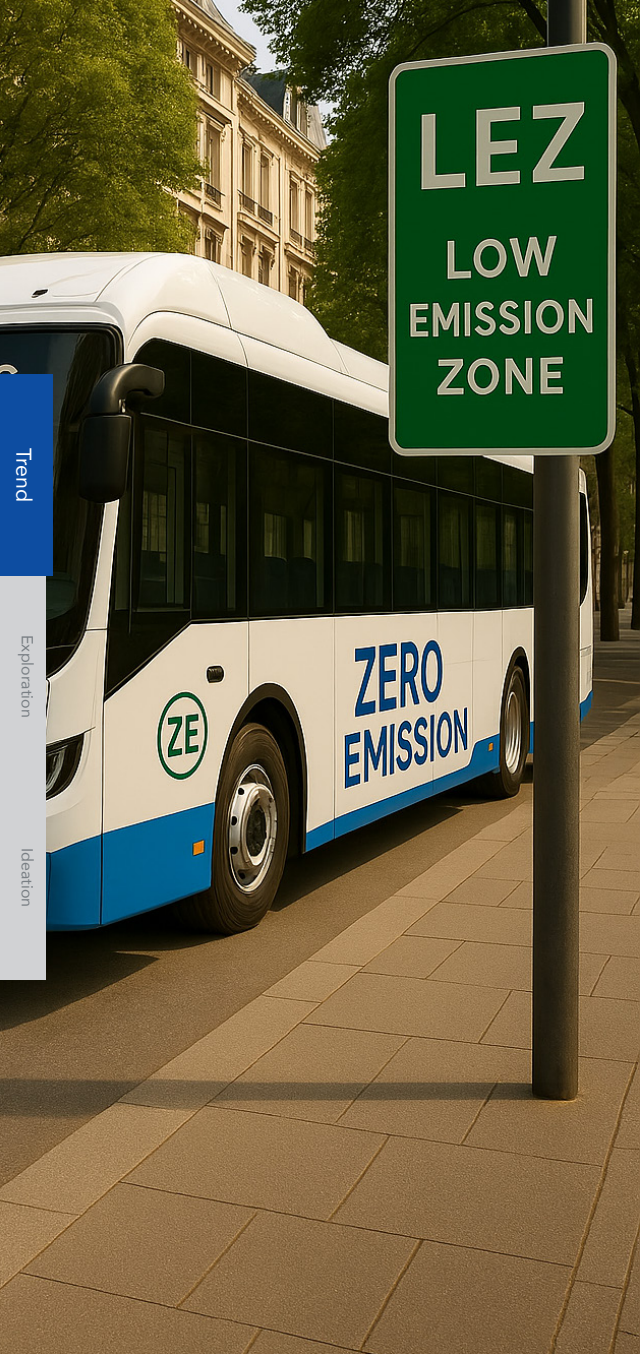
Challenges

- Currently, cities consume 65% of the world's energy and more than 70% of global emissions [119].
- Financial complications could slow down the proposals in some countries. In Spain, for example, adoption of electric vehicles has been slower than in the EU, with only around 5% of registered vehicles being electric, compared to 10% in the EU [122]. The new building rules could raise construction costs and place a financial burden on those who are already homeowners. Finding the labour for large scale renovations will also be a roadblock in countries where this part of the economy already struggles with labor shortage [123].

Impact on the Future of Urban Spaces

Legislative efforts to reduce emissions in urban areas will shape the future of life in cities. But not only that, they will also impact economic activity in sectors such as construction and automobile manufacturing. With both positive and negative consequences, Valencia and other European cities will change drastically. Less noise, fewer vehicles, better buildings, and cleaner air. However, citizens may bear the higher financial burden of renovating their homes or vehicles. EU proposals risk making the cities of the periphery of the continent even more unaffordable for lower income residents.





REDESIGNING URBAN MOBILITY

Low Emission Zones as a Path to Human Centered Urban Design

Low emission zones (LEZs) are becoming a key trend in how European cities plan for more sustainable and livable futures. These zones aim to restrict access for the most polluting vehicles (mainly older diesel and petrol models) to reduce air pollution, greenhouse gas emissions, and noise. While cities like Madrid or Milan have already implemented fully operational LEZs, Valencia is still in an informative phase, with restrictions expected to begin gradually in 2025 and reach full implementation by 2028 [124].

It reflects an important shift in the city's long term strategy for urban development, focusing on cleaner mobility and better public health. Supported by national and European environmental directives, the LEZ also creates space for innovation in urban planning. The initiative is accompanied by major investments in electric public transport and aims to encourage behavioral change through awareness and infrastructure rather than strict penalties [125,126]. Valencia's LEZ is part of a larger transformation toward people centered cities, where air quality, equity, and quality of life become central to how urban environments are designed and governed.

Facts

- In 2021, 49% of Valencia's neighborhoods exceeded legal NOx limits due to traffic emissions [124].
- Average traffic noise in the city center reached 71.6 dB(A), with 60% of residents reporting disturbance [125].
- Valencia's LEZ spans ~27.8 km² and enters a gradual phase from an informative period in 2025 to full restrictions by 2028 [126].
- In 2024, the European Investment Bank approved a 69 million EUR loan to Valencia to acquire 145 electric buses and related infrastructure, directly contributing to reduced noise and emissions [127].

Key Drivers

- Spain's Climate Change and Energy Transition Law mandates LEZs in all municipalities with more than 50,000 residents, making Valencia's LEZ a legal requirement [126].
- European directives on ambient air quality and environmental noise require local authorities to mitigate pollution levels, pushing Valencia to address NOx, PM2.5, and traffic related noise [124].
- Growing awareness of the health and quality of life impacts of air and noise pollution is increasing public demand in Valencia for cleaner, quieter, and more livable urban spaces [124, 125].

Challenges

- Ensuring equity in LEZs is challenging, as low-income residents using older vehicles may face economic burdens without adequate support or alternatives [128].
- Public acceptance of LEZs depends strongly on clear communication, visible benefits, and perceived fairness. Otherwise, citizens may see LEZs as restrictive rather than beneficial, which can reduce compliance and support for the policy [129].
- Implementing robust monitoring systems and consistent enforcement is essential. Weak or delayed enforcement during phased implementations can undermine the credibility of LEZ policies [130].
- LEZs should be paired with improved public transport to maintain mobility and reduce traffic volume [128].

Impact on the Future of Urban Spaces

Valencia's LEZ is set to reshape urban space by reducing car traffic and freeing up space for pedestrians, cyclists, and green infrastructure. This creates opportunities to redesign streets for social use, culture, and local commerce rather than vehicle flow. At the same time, investments in public transport offer cleaner and more accessible mobility options, LEZs highlight the need for more frequent, reliable and far reaching services, especially for residents in outer neighborhoods. As the LEZ progresses, the city moves toward a more sustainable, inclusive, and human scale design where clean air, quiet streets, and shared public space become daily realities instead of distant goals.

HOUSING MARKET REGULATION

Adopting New Housing Regulations to Balance Prices, Tourism, and Community Needs

Valencia is experiencing a severe housing crisis, driven by a sharp price rise and a significant drop in available homes. Since 2019, the city's housing supply has fallen by 83%, while prices have risen nearly 85% [131]. Projections show the number of households could grow by 25.8% between 2024 and 2039, further straining an already limited market. Meanwhile, short term tourist rentals now account for 35% of all city rentals, reducing long term housing options and pushing residents out of their neighborhoods. In response, national and local governments have introduced several measures. Rent controls apply in high demand areas, and new developments must include affordable housing, per Law 12/2023 [132, 133, 134]. Tourist rentals face stricter rules, and any new short term rental must be approved by the building's homeowners' association [135, 136].

These actions aim to stabilize the market and support community strength and livability. Similar initiatives are rolling out across Europe, as the European Parliament adopts new rules to regulate short term rentals and boost transparency [137]. Together, these steps reflect a commitment to residents' needs and to more sustainable, inclusive cities.

Facts

- On February 29, 2024, the European Parliament adopted new rules to harmonize short term rentals data, enhancing transparency [137].
- Law 12/2023 mandates land reserves for public housing: 40% in new urbanized areas and 20% in redeveloped land [134].
- Law 12/2023 allows for the declaration of tense housing markets, limiting rents to previous amounts, with up to 10% increases for long term contracts or improvements [134].
- Valencia limits tourist apartments to 2% of residential homes per neighborhood to prevent saturation and protect residents [136].
- Spain's Horizontal Property Law reform requires homeowner association approval for new tourist rentals [135].

Key Drivers

- Since the third quarter of 2019, available homes have dropped by 83%, while prices have increased by nearly 85% [131].
- The Valencian Community is among the autonomous regions with the highest projected relative growth in the total number of households. It is estimated that the number of households will increase by 25.8% between 2024 and 2039, rising from 2,140,660 to 2,692,997 overall [132].
- By early 2025, short term rentals comprised approximately 35% of Valencia's rental market, representing a significant 13 point increase compared to the previous quarter [133].

Challenges

- Even with a focus on massive construction of Public Protected Housing, its impact on market prices is expected to materialize only over a three year horizon [131].
- Valencia continues to face a significant shortage of readily developable land within urban areas, which, combined with slow and complex administrative processes, delays the delivery of new housing.
- The presence of over 10,000 illegal tourist homes listed on rental platforms remains a major challenge. These unregulated accommodations reduce the availability of long term housing, drive up rents, and limit access to affordable homes for residents, worsening the city's housing crisis [136].

Impact on the Future of Urban Spaces

The new housing rules aim to create neighborhoods that are fairer and more open to everyone. By regulating the number of tourist apartments, overcrowding is reduced, enhancing public spaces for both residents and visitors. Rental price limits could help maintain housing stability and preserve the cultural identity of the locals. Increasing affordable housing promotes greater social and economic diversity. Overall, the regulations seek to positively impact community cohesion and ensure housing remains accessible to all residents.

SMART DATA PRIVACY

Data Privacy in the Smart City Era: Balancing Innovation and Trust

The integration of smart technologies in urban environments has fundamentally transformed how cities operate and how citizens interact with their urban spaces [138, 139]. At the heart of this transformation lies tension between technological innovation and data privacy rights, shaping not only the physical infrastructure of cities but also the social, economic, and governance dynamics that define modern urban life [140]. Smart cities rely extensively on data collection and processing to optimize urban services and improve quality of life [141]. These systems deploy vast networks of sensors, cameras, and Internet of Things devices that continuously monitor everything, from traffic patterns and energy consumption to air quality and citizen management [141].
The data generated enables real time decision making, predictive analytics, and automated service delivery that can dramatically improve urban efi]ciency [142]. However, this data driven transformation creates challenges for privacy protection in urban spaces. This existing data collection transforms urban spaces into environments where anonymity and privacy become increasingly difficult to maintain [140]. In response, a clear European legislative trend has emerged, with frameworks like the GDPR, Data Governance Act, and upcoming AI Act aiming to regulate smart data use while ensuring fundamental rights.

Facts

- The General Data Protection Regulation (GDPR) enhances citizens' control over personal data by granting rights such as access, rectification, and erasure.
- Data minimization and purpose specification ensure smart cities only collect data strictly necessary for defined functions, reassuring citizens and building trust [138].
- Ethical, participatory governance models give citizens meaningful input, fostering a culture of trust and collaborative innovation [139].
- Human-centric design prioritizes citizens' needs, rights, and participation, addressing surveillance concerns and empowering residents to guide how their data is collected, processed, and used within smart urban environments [138, 139].

Key Drivers

- A clear majority (62%) of European citizens are concerned about not having full control over their personal data online [143].
- European citizens are more willing to share personal data for smart city applications when they perceive minimal privacy impacts, showing that data minimization and purpose limitation directly build trust [144].
- Public trust in data governance is a cornerstone for attracting talent and investment. Cities that prioritize privacy and transparency are positioned as citizen-centric environments, increasingly important for businesses and professionals seeking locations with high standards of living and digital rights [141].

Challenges

- The rapid rise of IoT technologies in smart cities has created serious security and privacy concerns. These devices collect vast amounts of personal and environmental data, making them vulnerable to cyberattacks and misused [142].
- Incidents like ransomware attacks on city systems show how public trust can quickly collapse after breaches, as citizens become more hesitant to use digital services [140].
- When privacy feels unprotected, people may change behavior to avoid monitoring, reducing engagement with smart services and creating digital divides that weaken the overall effectiveness of smart city initiatives [140, 145].

Impact on the Future of Urban Spaces

Smart technology is rapidly changing how cities function across the European Union, improving services like transport and public safety. However, these systems collect vast amounts of data, raising serious privacy concerns. In response, the EU introduced legal protections, especially the GDPR, to safeguard privacy while supporting responsible innovation. This discussion examines how data privacy shapes urban development in Europe, focusing on legal frameworks, new technologies, ethical challenges, and real-world impacts. Balancing technological progress with individual privacy rights remains a key issue as smart cities continue to expand across the EU.

ECONOMIC & BUSINESS MODEL TRENDS

FUTURE OF INNOVATION IN URBAN SPACES

Mass Tourism
Growing Private Investment
Public Debt
Unequal Grounds, Unstable Markets
New Ways of Working

Kenza Tantaoui 
Pau Sena 
Noufel Garcés 

ECONOMIC & BUSINESS MODEL TRENDS

Future of Innovation in Urban Spaces

What was once a world of predictable urban patterns, steady employment, familiar local shops, and consistent community rhythms is now being reshaped by constant motion and transformation. In cities such as Valencia, the pressures exerted by a globalized economy, the rapid advancement of new technologies, and shifting social dynamics are profoundly altering the day to day experiences of how people live, work, and engage in commerce. One can observe the surge in short term rental properties disrupting traditional housing markets, the expansion of multinational corporations establishing a presence in the city, and the redesign of public spaces, which aim to accommodate changing expectations from both residents and visitors. At the heart of this ongoing change lies a pressing and critical question: What kind of urban future are we actively building for Valencia and cities like it?

The relationship between the economy and the city is growing more intricate and multifaceted. On one hand, innovation unleashes exciting possibilities by introducing new business models that offer creative solutions to long standing urban challenges, pushing local economies in promising new directions. Yet this progress brings its own set of tensions, often manifesting as conflicts between economic growth and housing affordability, efforts to attract investment and the need to preserve neighborhoods identity, or between achieving economic progress and ensuring social inclusion. Urban innovation today transcends simply adopting new technologies or constructing smart infrastructure; it involves thoughtfully managing these contradictions and responding to change in ways that are sustainable, equitable, and fair to all members of society.

Valencia exemplifies a city facing this complex crossroads. Certain areas experience a boom driven by tourism and foreign investment, but simultaneously introducing challenges such as increasing living costs, rising social inequalities, and heightened pressure on limited public services. Simultaneously, global trends like digitalization, remote work, and automation are redefining the local economic landscape, transforming labor markets, altering how value is created and shared, and influencing how cities compete globally. In these changing circumstances, innovation becomes more than merely a tool to keep pace, as it serves as a vital mechanism for shaping and guiding the direction of change itself.

This means cities like Valencia are not passive reactors to global forces; they are active laboratories where new approaches are tested and refined. Innovation should be understood not as a fixed or final product, but as an ongoing process of adjustment, learning, and experimentation. The policies crafted, the support extended to business ecosystems, and the strategies used to manage urban spaces will determine whether the benefits of innovation become inclusive or exacerbate existing divisions. The economic and business transformations currently underway in Valencia are immediate and concrete, directly shaping how people experience life in the city. By exploring these forces and the tensions they create, urban innovation emerges not as a luxury or abstract ideal, but as a vital necessity and, most importantly, as an invaluable opportunity to build cities that function better for everyone.

MASS TOURISM

Increasing Tourist Influx Affects Valencia's Locals and Urban Spaces

Mass tourism refers to the rapid and excessive growth of visitor numbers that can overwhelm city life. Valencia, like other Spanish cities, has seen record tourism in recent years, with over 2.3 million travelers in 2023 alone [148]. A strong post pandemic travel rebound has further increased these numbers, with Spain receiving an all time high of around 94 million international visitors in 2024 [146, 149]. While this influx generates substantial income, with tourism contributing 13% of Spain's GDP, it also disrupts existing business ecosystems [151].

Many traditional services and residential buildings have shifted toward short term rental models and tourism oriented commerces, driven by higher returns per square meter [153]. This transformation offers new revenue streams for property owners and digital platforms, but it also inflates real estate prices and limits housing supply for residents. Urban economies grow more dependent on seasonal visitor spending, heightening exposure to external shocks and reducing long term economic resilience.

As tourism continues to evolve, cities like Valencia face the challenge of developing profitable and sustainable business models while maintaining quality of life for residents.

Facts

- Valencia welcomed over 2.3 million travelers in the year 2023, a record high and about 5% more than in the previous year 2022 [147, 148].
- Spain received 94 million international tourists in the year 2024 (nearly 1.8 times its population at the time), with the most visited city in the country being Barcelona [146].
- Tourism contributed 12.3% of Spain's GDP in the year 2023, a 0.9% increase from the previous year [151].
- The aggregated tourism expenditure in Spain in the year 2024 exceeded 126 billion EUR [150].

Key Drivers

- Low-cost airlines and rentals have made travel more affordable, fueling a huge increase in global tourist mobility in recent years [154].
- Online platforms like Airbnb have expanded accommodation supply by turning homes into tourist lodgings, attracting more visitors into city neighborhoods and decreasing the price of overnight stays [153].
- Tourism contributes significantly to the Spanish GDP, and provides profitable opportunities to many local businesses [151].
- Post pandemic "revenge travel" has greatly affected the increase in tourist numbers, with Spain seeing a huge tourist growth after COVID-19 restrictions were lifted [152].

Challenges

- Growing resident backlash and protest movements could pressure authorities to impose limits on tourism.
- Many locals express frustration over overcrowding, noise, and the erosion of neighborhood identity, prompting calls for stricter regulations.
- Environmental degradation and resource overuse may also lead to restrictions aimed at protecting fragile ecosystems and historical landmarks, especially in heritage-rich urban centers.
- Regulatory crackdowns on short term rentals could reduce accommodation availability for tourists, affecting affordability and accessibility, while also aiming to restore long-term housing stock for residents.
- Economic shocks, such as inflation cycles and trade wars, could reduce international tourists.

Impact on the Future of Urban Spaces

Mass tourism is restructuring Valencia's urban economy, shifting value creation toward short term rentals and tourist oriented retail [153]. These changes attract private investment and digital platform innovation, but they also displace local businesses and inflate operational costs for sectors separated from tourism. In the long term, economic reliance on mass tourism can lead to urban areas vulnerable to seasonal fluctuations and global demand shocks. To preserve economic diversity and urban resilience, cities may need to incentivize hybrid business models, regulate platform economies, and reinvest tourism revenues into local infrastructure and housing affordability.

GROWING PRIVATE INVESTMENT

Rising Foreign Investment is Reshaping Valencia's Urban Economy

Valencia is witnessing a growing entry of foreign private investment in recent years, significantly influencing the city's economic and social landscape [155], a shift that is redefining not only real estate and employment patterns, but also sparking debates about the long-term implications for cultural identity and public space usage. Global companies are increasingly choosing Valencia for its strategic Mediterranean location, skilled talent pool, and quality of life [157], which gave the region record high inflows in 2023 [156]. Urban development is adapting as international firms demand modern office spaces, logistics centers, and infrastructure upgrades, often reshaping traditional neighborhoods in the process. Socially, the city becomes more cosmopolitan, benefiting from diverse expertise and corporate social initiatives.

However, the entry of foreign investment and multinationals also raises concerns: local businesses face stronger competition, and there is potential for rising costs of living or cultural homogenization [159]. Overall, the trend of increasing foreign investment in Valencia is transforming the city into a more globally connected urban hub, while posing the challenge of ensuring inclusive and sustainable growth alongside this global integration.

Facts

- The Valencian Community received 3.34 billion EUR in investment in 2023, marking the highest volume of investment ever recorded [155].
- The Valencian Community recorded 227 million EUR in gross productive investment in the first quarter of 2024 [155].
- As of early 2024, the Valencia region hosts 2,089 foreign owned company headquarters, plus an additional 1,091 foreign affiliated branch offices [155].
- The stock of foreign investment in Valencia rose to 10 billion EUR (8.0% of regional GDP) in 2022, which is the highest level ever [155].

Key Drivers

- Valencia's position on the Mediterranean and its major port make it a leading logistics and export hub, attracting global firms seeking strategic access to European, African, and Middle Eastern markets [157].
- The region's universities and multiple science parks supply a highly qualified workforce, appealing to knowledge-intensive multinationals and facilitating R&D collaborations, innovation clusters, and startup partnerships [157, 158].
- Valencia offers an excellent quality of life, with a pleasant climate, robust healthcare, reliable infrastructure, and rich culture, which helps draw foreign professionals and shape long-term investment decisions in the city [157].

Challenges

- Shifting political tides or new regulations (e.g. higher taxes or restrictions on foreign corporations) could diminish Valencia's appeal to multinationals, curbing investment inflows.
- An influx of high paying international companies may drive up office rents and housing prices, eroding the city's cost advantage [159]. This can fuel inequality or resentment among local communities, potentially provoking opposition to further corporate expansion.
- If foreign subsidiaries import most inputs or talent without integrating with local suppliers and workforce, the broader regional economy gains less benefits [160].

Impact on the Future of Urban Spaces

Rising foreign investment will be a defining factor in Valencia's urban future. Economically, it promises growth, job creation, and technological advancement, potentially elevating Valencia into a top tier international business center [158]. This transformation could enhance Valencia's global connectivity and presence, but it poses urban planning challenges: city leaders must manage higher demand for real estate and public services to prevent congestion and affordability issues. In sum, the growing footprint of foreign investment in Valencia could drive a more dynamic and internationally connected urban environment, but the key will be in balancing corporate driven growth with quality of life for all residents in the city.

PUBLIC DEBT

A Closer Look at Public Debt: Growth or Control?

According to the information available on the official website of the Generalitat Valenciana (GVA), the public debt (PD) of the Valencian Community has shown a slight yet steady increase throughout the period spanning from 2023 to early 2025 [161]. Over this timeframe, the total debt has grown gradually each year, reflecting a consistent upward trend. This evolution points to the region's ongoing financial responsibilities, which include routine government expenditures, pressure put on the finance area, and exceptional costs related to unforeseen events. One notable contributor to this rise in debt has been the substantial investments made for recovery and reconstruction following the damage caused by the severe DANA floods [162].

Currently, the Valencian Community holds the highest public debt-to-GDP ratio among all autonomous communities in Spain, significantly exceeding the national average [161]. Additionally, the level of debt assigned to each resident is also among the highest within the country [163]. The GVA has acknowledged that public debt now consumes a considerable portion of its annual fiscal resources. The region's ratio of debt to its current revenues reached particularly high levels in the year 2024, emphasizing the significant strain this financial obligation imposes on the region's budget management and future planning efforts [164].

Facts

- In 2023, the public debt of the Valencian Community stood at 57,996 billion EUR, reflecting the financial obligations of the regional government [161].
- In 2024, the debt rose by 4.03% to 60,332 billion EUR, indicating notable annual growth [161].
- By the end of Q1 2025, the debt increased slightly again by 0.06% [161].
- The sharpest increase occurred between 2023 and 2024, primarily due to flood recovery spending that placed additional strain on regional finances [162].

Key Drivers

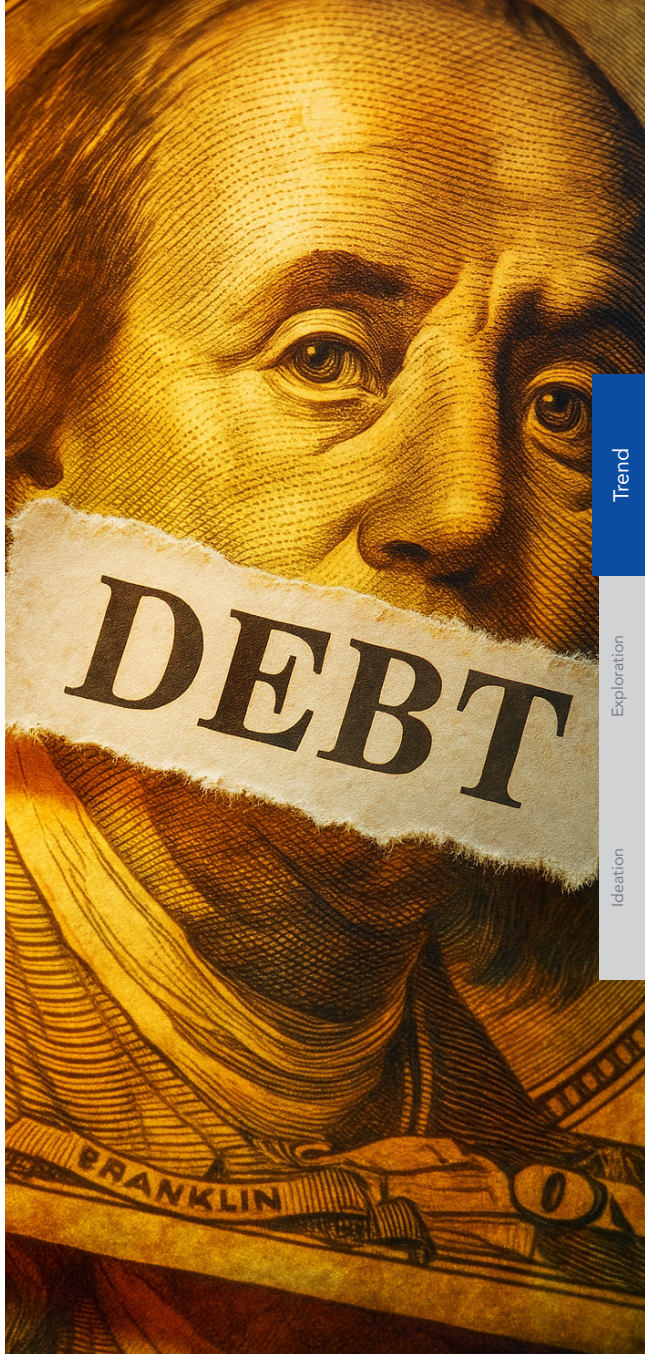
- The Valencian Community is one of the Spanish regions that receives the least financial support from the state on a per capita basis. This lack of sufficient central government funding creates significant budgetary pressure [165].
- Limited funding forces the region to rely more heavily on borrowing as a way to finance its public services and operations. This increased dependence on loans contributes to higher levels of public debt compared to other autonomous communities in Spain [165].
- The recent severe flooding caused substantial damage to infrastructure, obliging the Generalitat Valenciana to invest heavily in recovery plans. This urgent expenditure led to a further escalation of public debt [162].

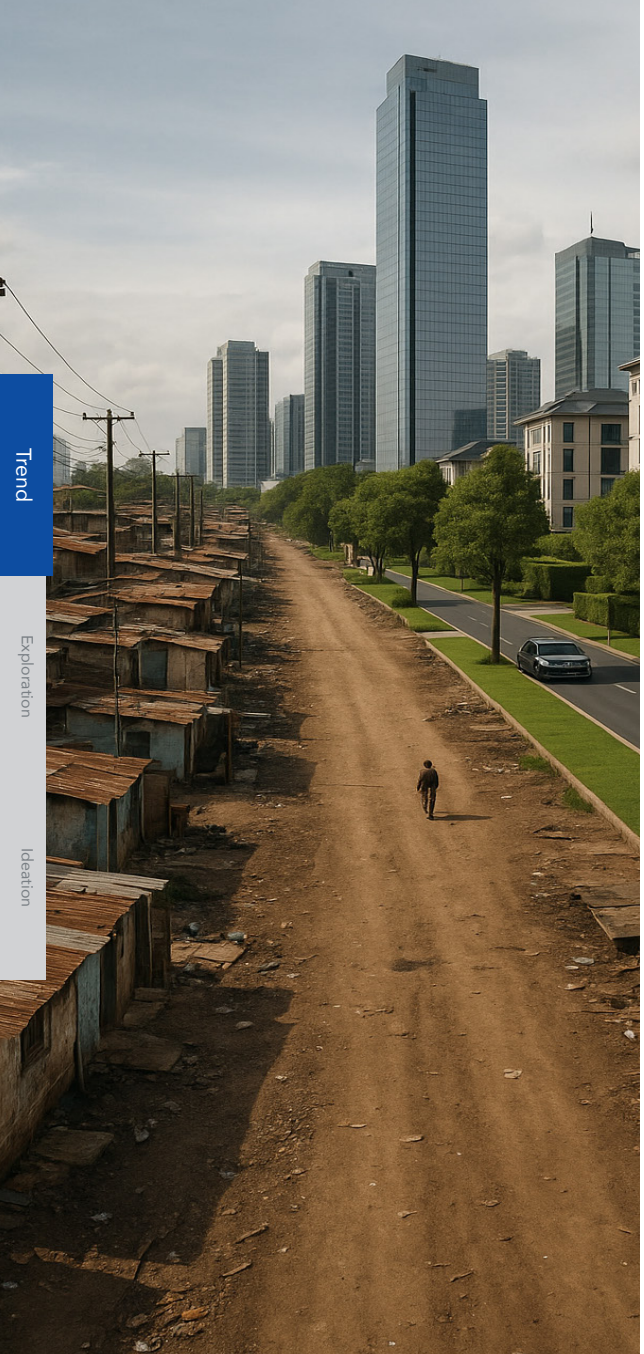
Challenges

- A significant portion of the GVA's PD is used to finance crucial public services, including the healthcare systems, educational institutions, and infrastructure, which have high and often growing expenditure requirements [164].
- Rising debt restricts the government's ability to invest in long-term development, potentially delaying or limiting funding for non-core sectors or urban spaces [161].
- Continued limited state funding given the region's status as one of the least funded per capita makes PD levels likely to rise faster than elsewhere [165].

Impact on the Future of Urban Spaces

The increase in PD significantly limits the regional government's capacity to invest in urban innovation infrastructure. A large share of its budget must go toward debt servicing, reducing funds available for transformative projects. Despite some economic resilience, the constant need to manage high debt levels constrains fiscal flexibility and hampers investment in innovative urban development. This forces the region to depend more heavily on external funding and national support to move forward with innovation-focused initiatives, especially in less central areas. These structural financial constraints make it difficult for the Valencian Community to independently prioritize ambitious urban innovation strategies [166, 167].





UNBALANCED MARKET FORCES

How Unbalanced Growth Shrinks Markets and Disrupts Investment

In the Valencian Community, inequality profoundly impacts the economy and shapes business models by altering fundamental market dynamics, consumer behavior, and labor supply. The high At Risk of Poverty or Social Exclusion (AROPE) rate indicates that almost three out of ten people are at risk of poverty or social exclusion [176]. This directly limits how much people can spend on goods and services, which affects businesses. It forces companies to either target narrower, higher-income market segments or engage in intense price competition in mass markets, potentially limiting profit margins and innovation incentives [168, 169, 170].

Furthermore, the persistent gender pay gap, where women's salaries are significantly lower than men's, reduces the overall purchasing power of a substantial portion of the workforce, impacting the size and growth potential of consumer markets and influencing product development and marketing strategies for businesses [171, 172]. Such economic disparities can also lead to inefficiencies in the labor market, as unequal access to education and opportunities may limit the availability of skilled talent and reduce overall productivity, thereby affecting the competitiveness and long-term growth prospects of businesses in the region [169].

Facts

- In 2023, the AROPE rate in the Valencian Community was 29.5%, meaning over 1.4 million people were at risk of poverty or exclusion, reducing overall consumer demand [176].
- As of April 2025, the region recorded a Consumer Price Index (CPI) of 2.5%, higher than the national average of 2.2% [178].
- In 2022, the gender pay gap was 5,385 EUR, with women earning only 79.2% of what men earned [171, 172].
- This income disparity reduces disposable household income and hinders broader economic output and consumption [171, 172].

Key Drivers

- Labor market instability marked by precarious contracts and high unemployment erodes workforce reliability, raising operational costs and making it difficult for firms to pursue sustainable, long-term business models [172].
- Heavy reliance on low-wage industries limits income growth and curtails purchasing power, forcing businesses to adjust to narrow, less predictable markets [168, 169].
- Weak social protection systems widen inequality and hollow out the middle class, polarizing demand between luxury goods and basic services. This environment complicates inclusive business growth and revenue planning [170, 171].

Challenges

- Low disposable income among a large population segment weakens aggregate demand, restricting the scalability of consumer-driven business models [169, 171].
- A shrinking middle class in the Valencian Community has resulted in downward mobility, declining job quality, and rising proximity to lower social classes fueling social polarization and tension [170, 171].
- High poverty and exclusion raise public spending needs, reducing state investment in innovation, infrastructure, and SME support. This deters private investment and complicates long-term business planning, weakening regional competitiveness [168, 170, 171].

Impact on the Future of Urban Spaces

Inequality, a rising CPI, and stagnant wages define the economic environment of the Valencian Community. These trends reduce consumer spending power and shrink market demand for innovative urban solutions [178]. For businesses, this results in limited adaptability, increased price sensitivity, and reduced motivation to invest in new products or services. With the CPI at 2.5% in April 2025 above the national rate, higher living costs are squeezing profit margins and increasing competition for a shrinking pool of affluent consumers [179]. These dynamics undermine stable revenue streams, elevate investment risks, and limit long-term commitments to urban innovation. As a result, economic growth and business model diversification are increasingly constrained across the region [168, 169, 170].

NEW WAYS OF WORKING

How Hybrid Work and Innovation Ecosystems Are Redesigning Urban Economies

The way we work is changing fast. Since the COVID-19 pandemic, remote and hybrid work models have gone from temporary solutions to long-term strategies across sectors [180]. At the same time, the rise of artificial intelligence (AI), automation, and digital platforms is increasing efficiency andreshaping business models [181, 182]. These changes are accelerating the shift toward high-skilled, tech-enabled jobs, especially in service-based economies [182, 183]. In parallel, cities like Valencia are evolving into emerging innovation hubs, with an increase in startup activity between 2018 and 2024 [184]. The city now hosts accelerators like Lanzadera, innovation spaces and growing Research and Development centers such as the Polytechnic City of Innovation [184]. These developments are attracting investment, talent, and new business models, especially in AI and deeptech.

As more people work remotely and businesses go digital, urban spaces are adapting. The demand for flexible infrastructure, reliable connectivity, and new urban mobility patterns is growing. If this trend continues, the economic geography of cities could be redefined: distributed innovation, flexible workspaces, and localized startup ecosystems will shape the next phase of urban development [181, 184].

Facts

- Generative AI increased customer service agents' productivity by an average of 14%, with a 34% improvement among novice workers [185].
- 90% of large companies have adopted hybrid work models, and over 50% of employees state they won't return to jobs lacking remote options [183].
- Global GDP could increase by up to 14% by 2030 due to AI, generating approximately 15.7 trillion USD in value [182].
- In 2023, Generative AI attracted 25.2 billion USD in private investment nearly 9 times more than in 2022 accounting for over a quarter of all AI investment [186].
- Valencia's startup ecosystem grew 6× from 2018 to 2024, surpassing 1,200 active startups and attracting record private capital [184].

Key Drivers

- A growing wave of public private investment, exceeding 250 million EUR, has positioned Valencia as a rising innovation hub, supported by R&D centers, start up accelerators, and venture capital initiatives that support a fast growing entrepreneurial ecosystem [184].
- The COVID-19 pandemic catalyzed the adoption of remote work, automation, and digital transformation across industries [180].
- Companies increasingly view AI and digital tools as long term strategic assets to reduce costs, access global talent, and rapidly scale innovation in competitive markets [181, 187].

Challenges

- While AI and automation can bring gains in productivity, they also carry the risk of displacing existing jobs and lowering wage demand in specific sectors. These effects may further widen socio economic gaps between developed and developing economies if not managed carefully [188].
- In addition, several barriers continue to limit the full implementation of AI across organizations. These include a shortage of skilled professionals, high upfront adoption and training costs, and technical limitations such as algorithmic bias that can undermine trust and performance [181, 189].

Impact on the Future of Urban Spaces

Hybrid and digital work models are transforming urban life. Reduced commuting is reshaping mobility patterns and easing pressure on central business districts [183]. In cities like Valencia, the growth of tech based firms is creating new hubs for innovation, changing how office space, housing, and local services are used [184]. Demand is rising for coworking spaces and smart infrastructure. Public investment in connectivity and talent development will be key to shaping inclusive, economically dynamic urban spaces. If managed well, this shift can boost productivity and position mid sized cities as powerful innovation engines [181, 184].

EXPLORATION

In the upcoming chapter, the outcomes of the process for validating market hypotheses and problem statements are explored. This phase primarily revolves around the discovery of white spaces and opportunity areas in the established sector of urban innovation. Through the clustering of the topic, findings are distilled into four key opportunity spaces, and the most critical problems and opportunities within the chosen domain are identified. The exploration phase places a priority on the testing and re-evaluation of hypotheses, alongside an examination of the existing landscape to pinpoint key market players..

UNLOCKING THE POTENTIAL OF SMART CITIES

DATA, PRIVACY, AND PUBLIC SPACE REINVENTION

Data Driven Decision Making

Data Privacy

Disconnected Public Spaces in an Increasingly Smart World

Pau Sena 
Miguel Padura 
Carlos Gómez 

UNLOCKING THE POTENTIAL OF SMART CITIES

Data, Privacy, and Public Space Reinvention

As urban populations grow and infrastructure strains under increasing demand, cities are turning to digital technologies to stay functional and sustainable. However, despite widespread innovation, three key opportunity areas remain underdeveloped: the systematic use of data in decision making, the protection of citizen privacy, and the digital integration of public spaces.

Firstly, data driven decision making offers a way to radically improve city governance by making policies more responsive and evidence based. Big data tools can help optimize mobility, resource allocation, emergency response, and urban planning. However, institutional inertia and fragmented systems often prevent cities from turning raw data into meaningful insights. Many municipalities still rely on outdated models, while others lack the digital infrastructure to coordinate real time information flows. In this landscape, empowering cities with powerful and accessible analytics platforms can help them significantly improve their systems' performance and efficiency.

Additionally, smart cities depend heavily on collecting personal data, from mobility patterns to behavioral trends, yet privacy governance lags far behind technological progress. Citizens often don't know who controls their data or how it is used, leading to a growing trust gap. With private companies operating much of the smart city infrastructure, inconsistent standards only worsen the issue. The market opportunity here lies in establishing transparent, citizen centered data governance systems that prioritize fairness, accountability, and consent. Emerging models like data trusts or participatory data frameworks could build legitimacy and allow smart cities to grow responsibly.

Finally, while sectors like transport or energy are becoming more connected, others, such as public spaces, which are the heart of community life remain underutilized. Parks, plazas, and urban landmarks are still designed as static environments, despite being rich in potential for interaction, data collection, and citizen services. This digital gap is often caused by very different and seemingly unrelated reasons, which fail to place the citizen as the main priority. Nevertheless, with technologies like IoT sensors and edge computing, now more affordable and scalable, we see a clear opportunity to transform these spaces into hubs of real time responsiveness, inclusion, and sustainability.

The market hypothesis here is that a new generation of smart city solutions can emerge by aligning these three vectors: data utilization, digital rights, and inclusive public space design. This approach is based on recent studies and urban innovation frameworks, and it incorporates global best practices in civic tech, privacy regulation, and urban IoT deployments. If these opportunity areas are developed together, it would be possible to create smarter, safer, and more equitable cities for everyone.

DATA DRIVEN DECISION MAKING

Improving Efficiency and Performance Through Decisions Backed by Data

Data driven decisions in the context of urban spaces represent a great opportunity to improve the utilization of empirical data to inform policies, enhance service delivery, and promote sustainable growth [190, 191]. As urban environments face increasing complexities due to economic shifts and social dynamics, the integration of data analytics has emerged as a crucial strategy for improving city governance and operational efficiency [191].

Despite this, many cities still haven't adopted data driven decision making, mainly due to institutional inertia and limited technical capacity [192]. For instance, while some municipalities leverage real time traffic data to optimize mobility, others continue to rely on outdated planning models [193]. The lack of integration across urban systems limits the potential to address interconnected challenges, such as air pollution, congestion, and energy use [194]. This lack of adoption represents a significant opportunity: integrating data analytics into governance frameworks can make urban management more effective and evidence based [195, 196].

As cities continue their digitalisation efforts, the opportunity to embed data driven decision making and practices across urban systems will only grow [196]. By investing in data solutions and integrating their insights into existing governance frameworks, urban leaders can upgrade their decision making significantly, improving policy and its long term effects.

"If we can use the data to understand what's going on in cities, we can improve them in a rational way."

Steven Koonin, Director of NYU's Center for Urban Science and Progress

Selected Players

esri
URBAN FOOTPRINT
POPULUS
sas
Palantir
STREETLIGHT DATA
+ableau

DATA PRIVACY

Balancing Innovation with Citizens' Digital Rights

Smart cities are transforming urban life by integrating data driven technologies into everyday infrastructure. From optimizing traffic flow to monitoring environmental conditions, these systems depend on the continuous collection and analysis of personal and behavioral data. While such innovations aim to boost efficiency and quality of life, they often raise concerns about individual privacy [197].

Most people don't know what data is being collected, how it is used, or who has access to it. The growing role of private companies in managing city technologies adds complexity, as they may not follow the same transparency rules as public institutions [198]. Surveillance tools, such as facial recognition or motion sensors, can also be misused for profiling or manipulation, especially where democratic protections are weak [199]. As these technologies expand, the power gap between data collectors and ordinary citizens is widening [200].

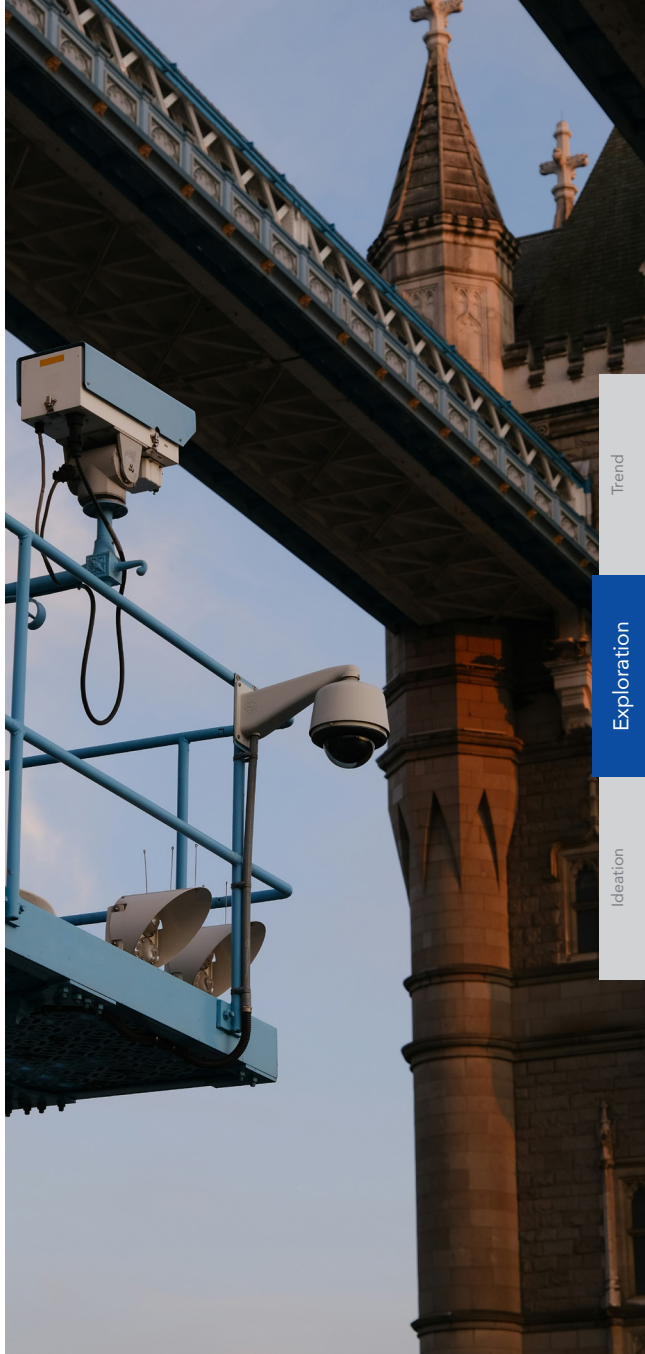
Yet, this challenge presents a major opportunity. Cities can rethink how data is governed, how citizens participate in decisions, and how trust is built. More transparent systems, clearer data rules, and stronger collaboration between governments, businesses, and communities could help ensure that smart cities create not only technical progress, but also fairness, inclusion, and public confidence [200].

"I firmly believe (and history has shown) that without trust and legitimacy, themselves products of an open, transparent, and participatory planning process, no smart city project can ever succeed."

Dr. Stefaan Verhulst, Co-Founder & Chief Research and Development Officer, The GovLab

Selected Players

HUAWEI · NYC OpenData · دبي الذكية SMART DUBAI · SMART NATION SINGAPORE · Microsoft Azure · decode · SIDEWALK LABS Part of Google



DISCONNECTED PUBLIC SPACES IN AN INCREASINGLY SMART WORLD

Bridging The Digital Gap in Urban Public Environments

Smart cities are a reality with the increase of smart solutions in many sectors, such as transportation and energy. However, many public spaces remain digitally outdated, lacking connectivity, interactivity, and real time data feedback [202, 203]. This digital lag creates missed opportunities for community engagement, safety, accessibility, and operational efficiency [205, 206].

Most problems come from factors such as high upfront costs, fragmented governance, lack of cross sector coordination, and privacy concerns. Many cities still treat public spaces as passive, rather than dynamic, data rich environments. With the growing maturity of technologies like IoT devices, edge computing, and interoperable data platforms, it makes no sense to turn a blind eye to the opportunity to transform them into interactive, efficient and citizen responsive spaces [207, 208].

Digitally integrated public areas could support not just real time alerts or adaptive lighting, but also crowd flow analysis and environmental sensing, enabling smart cities not only to help citizens optimize their time and resources, but to reimagine urban spaces as opportunities for social connection, safe leisure, and inclusive belonging, regardless of one's social group or background. It is about turning urban spaces into places of citizen engagement, going one step further [205, 209].

"The convergence between the digital and physical world is radically changing the way we can understand and design cities, and ultimately how we can live in urban spaces in a different, better way."

Jon Kabat-Zinn, Professor of Medicine at the University of Massachusetts

Selected Players

butlr · soofa · globalreach · PAVEGEN · JCDecaux · STRÖER · CISCO · MIT SCC senseable city lab · IBM

INCLUSIVE CITIES, INNOVATIVE FUTURES

THE FUTURE OF INNOVATION IN URBAN SPACES

Together, Differently
Elderly Inclusion in Cities
Urban Decisions Go Crystal Clear

Kenza Tantaoui 
Ivan Gilabert 
Adrián Fernández 

INCLUSIVE CITIES, INNOVATIVE FUTURES

Future of Innovation in Urban Spaces

In today's rapidly evolving urban landscapes, there is a pressing need to reshape how individuals, families, and communities connect, learn, and participate in public life. The increasingly digital nature of our environments has revealed significant gaps in emotional, social, and civic infrastructure. Gaps that, if left unaddressed, risk deepening isolation, eroding trust in governance, and weakening social cohesion. Yet, within these challenges lies a powerful opportunity: to develop inclusive, forward thinking solutions that actively restore real-world connection while embracing the tools and insights of a digital age. This is not simply about reversing negative trends, but about purposefully building urban systems that are more human, equitable, and emotionally intelligent.

We are entering a moment in which innovation has the chance to fundamentally transform the social fabric of cities. The opportunity is not limited to one demographic or issue; it spans across generations and sectors, from how we engage with our families and neighbors to how we shape the policies and spaces that define public life.

What emerges is an integrated problem space characterized by the fragmentation of social bonds, exclusion across age and technological lines, and declining participation in democratic processes. Responding to these intertwined issues requires more than standalone interventions; it calls for a systems level approach that designs for connection in all forms, emotional, generational, spatial, and institutional.

Our market hypothesis is built on this holistic vision. It proposes that digital tools, physical spaces, and civic culture can be realigned to foster deeper social and intergenerational connections if approached through inclusive design and community co-creation. It recognizes that technology, if intentionally applied, can re-enable face to face interaction rather than displace it. It suggests that cities can once again become places of belonging and collective purpose through new infrastructures that invite collaboration rather than passive consumption.

This view is grounded in interdisciplinary research across public health, urban planning, and political science. It draws not only from institutional reports and academic studies, but also from real world use cases where community-centered design and digital democracy tools have shown impact. This includes innovations in shared public spaces, elder inclusion programs, and participatory technological platforms that prioritize transparency and accessibility. Rather than assuming a tension between the digital and the physical, the hypothesis frames technology as a potential amplifier of empathy, engagement, and equity when implemented responsibly.

The broader opportunity is cultural as much as it is infrastructural. It is about revaluing human interaction in settings where it has eroded, rethinking participation as a shared civic practice, and resisting the fragmentation that often comes from individualistic or exclusionary systems. Cities that recognize this shift and respond with integrated, mission driven solutions will not only meet a growing need but shape the future of public life. In this context, reconnecting people across screens, generations, and decision making platforms is not a niche ambition. It is one of the most urgent and scalable challenges of our time.

TOGETHER, DIFFERENTLY

Restoring Real Connection in a Digital Age

In today's fast paced urban life, an increasing number of families are feeling emotionally and socially isolated, largely due to the deep integration of digital technology into our daily lives. Spending too much time on screens is starting to take a real toll on families. Nearly half of U.S. adults report feeling lonely, with young adults especially affected [210]. By 2024, studies found that about a quarter of young people used smartphones in ways that resemble behavioral addiction [211]. Moreover, parents often struggle to manage their children's screen time, and these digital habits can increasingly replace essential face to face interactions, ultimately harming children's development [211]. This growing issue, however, also presents an opportunity for creative solutions.

One promising opportunity is the development of tech enabled "third spaces," places outside home and work where families can connect in person while still engaging with technology in positive and enriching ways. Drawing inspiration from Creative Community Spaces (CCSs), these hubs could gradually evolve into Smart Inclusive Community Centers that offer interactive and engaging environments designed to foster connection and learning [212, 213]. With thoughtfully designed programming, such spaces can actively bring families together and significantly strengthen urban social bonds [210, 213].

"Apart from the toll it takes on individuals, families, and communities, left unaddressed, loneliness and social isolation will continue to cost society billions in terms of health care, education, and employment."

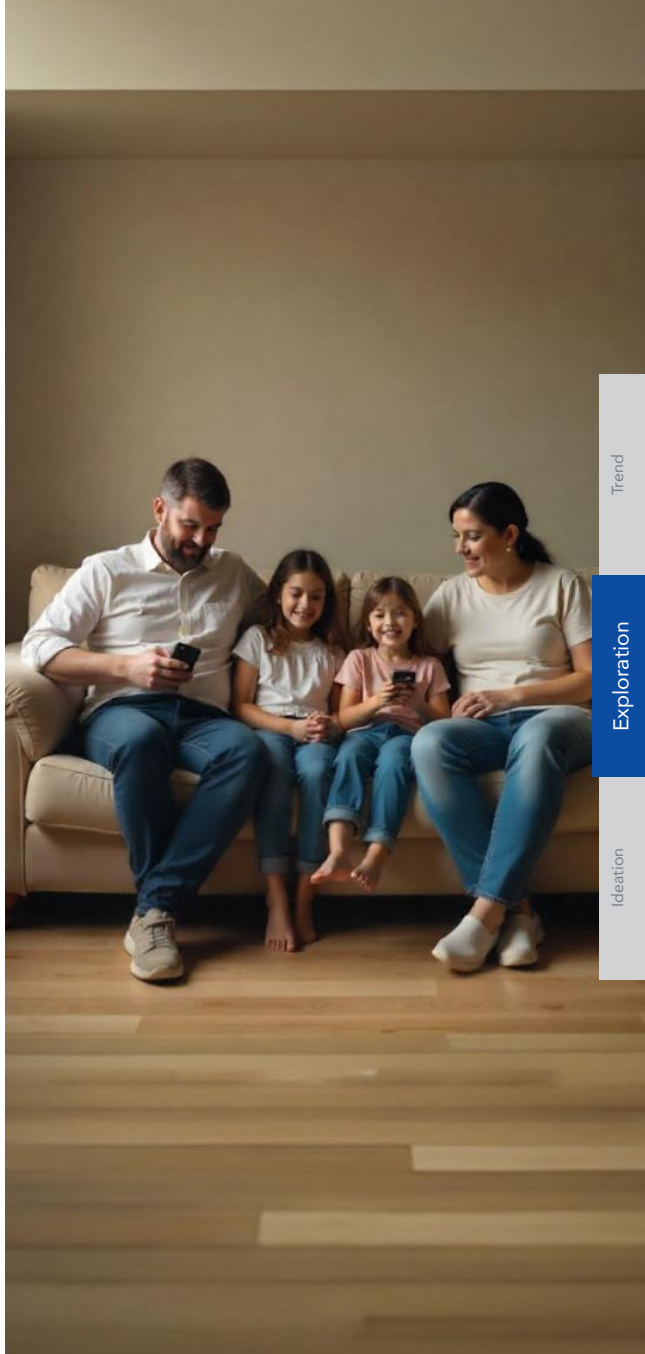
Dr. Tedros Adhanom Researcher, Politician and the Director-General of World Health Organization

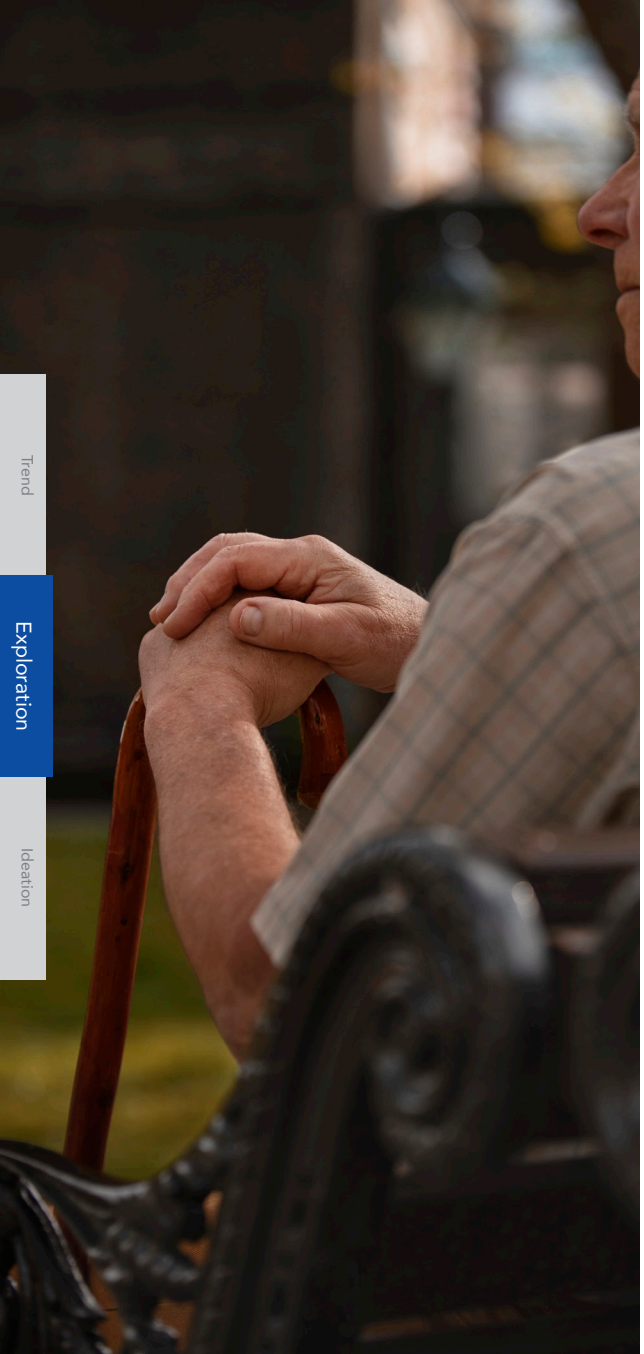
Selected Players

california wanderland

VALO MOTION

MEOW WOLF





ELDERLY INCLUSION IN CITIES

Bridging the Gap: Inclusive Cities Against Elderly Loneliness

Loneliness among older adults in Spain is a growing and complex issue. Several factors contribute to this problem, including life transitions such as retirement, the loss of loved ones, and declining physical health, all of which lead to significant social isolation [215]. This issue tends to be more severe in large urban areas, where fast paced lifestyles and social dispersion make it harder for older adults to maintain close relationships [216]. Furthermore, the digital divide worsens the problem, as many older people lack access to or the skills needed to use modern technologies that could help them communicate and receive social support [217].

As Spain's population continues to age and life expectancy increases, loneliness among older adults is expected to become even more widespread. This has serious consequences for their mental and physical health, contributing to depression, anxiety, and other health problems. Nevertheless, this challenge also presents a significant opportunity to develop inclusive solutions that promote social interaction, emotional well being, and intergenerational learning [218]. Platforms tailored to older adults, combined with community programs connecting seniors with peers and younger generations, can help reduce isolation. By fostering meaningful connections and enhancing access to technology, these initiatives could improve the quality of life and help society better support and integrate its aging population into social life.

"Unwanted loneliness in older adults is not simply a natural consequence of aging, but a social challenge that requires comprehensive attention."

Margarita Carrasco, Psychologist at BluaU Sanitas

Selected Players

Stitch · LAPPSET · amigos de los mayores · PLAY · papa · THE LONELINESS LAB · kuvu

URBAN DECISIONS GO CRYSTAL CLEAR

Making Governance More Open, Responsive, and Inclusive Through Democracy

Traditional PB models often fail to provide citizens with real time insight into what happens after voting. Without transparent tracking, proposals remain "black boxes" once selected, weakening trust in the process. In Spain, local cases demonstrated that inadequate communication of budget decisions and unclear rules eroded citizen confidence [219]. Global reviews of PB note structural barriers, including limited post vote visibility, soggy feedback loops, and unclear accountability, which hinder long term impact [220]. This transparency gap undermines the very democratic promise of participatory budgeting, as citizens can submit ideas, but seldom know if or how these ideas are executed, discouraging engagement and perpetuating skepticism.

Newly developed open source digital tools will transform PB by improving transparency, traceability, and citizen trust [221, 222]. Studies show digital PB enhances democratic legitimacy and accountability. Looking ahead, cities like Valencia could further enhance transparency in PB by integrating algorithmic audit trails and publishing voting rule metadata [223, 224]. These innovations propose real time impact indicators to track project outcomes and empower residents to track compliance and assess effectiveness as well [225, 226].

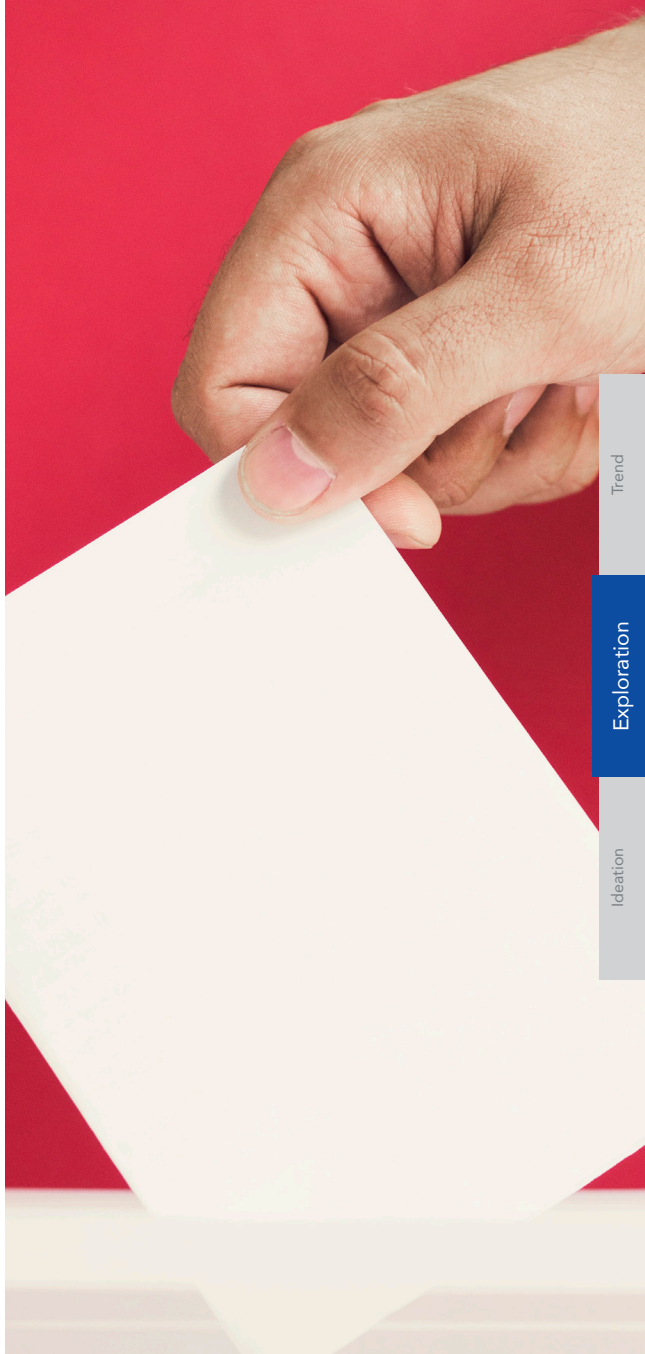
As digital democracy advances in Europe, adopting transparent, open source PB platforms offers a significant opportunity. This approach can rebuild civic trust, bolster fiscal accountability, and anchor urban governance in inclusive, traceable processes.

"Democracy is not a spectator sport; it's a participatory event. If we don't participate in it, it ceases to be a democracy."

Michael Moore, American Film Director and Social Activist

Selected Players

LiquidFeedback
OpenGov
go vocal
Formerly CitizenLab
decidim
votelab
BalancingAct
BY POLCC



ADDRESSING CLIMATE CHANGE IN URBAN SPACES

FUTURE OF INNOVATION IN URBAN SPACES

Liveable Public Spaces
Green Mobility
Urban Waste, Reimagined

Sergio Pérez 
Gonzalo Martín 
Juan Pablo Endrino 

ADDRESSING CLIMATE CHANGE IN URBAN SPACES

Future of Innovation in Urban Spaces

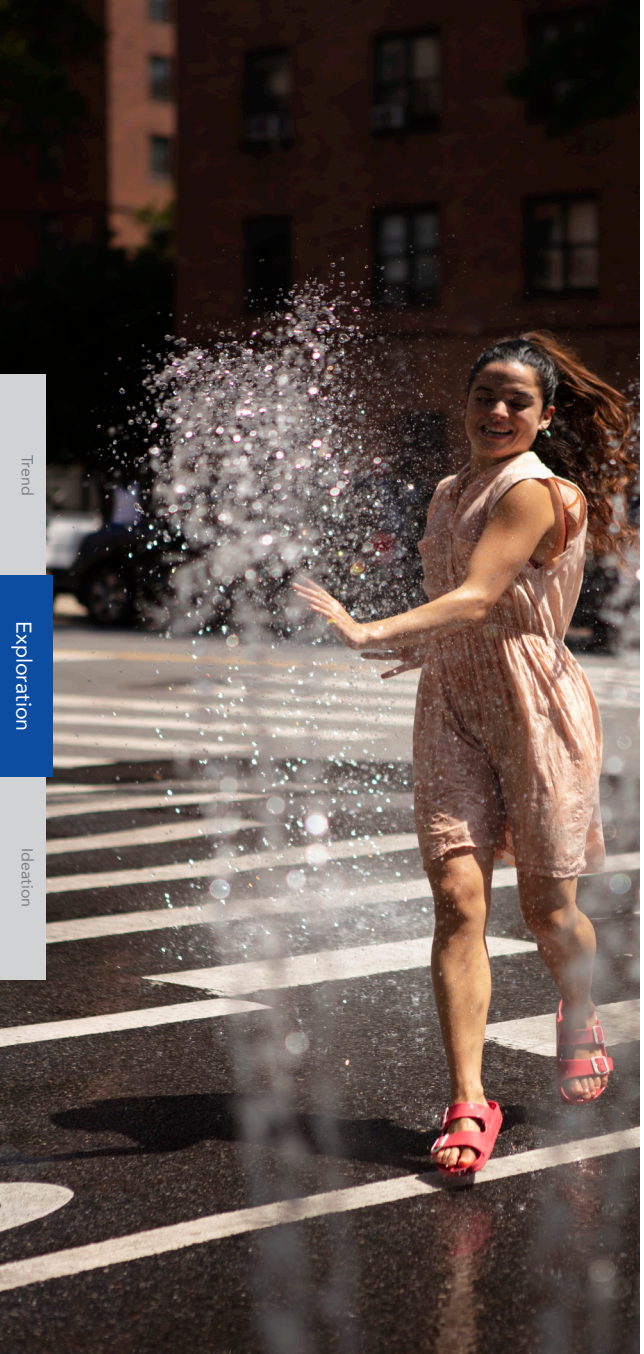
In the past years, urban centers have become a focal point of the climate crisis. Cities like Valencia offer vivid illustrations of the pressures now bearing down on public infrastructure, social spaces, and ecological balance. Climate stress is no longer a distant concern; it is a matter of everyday life. From seemingly never ending heat waves to sudden flooding episodes, such as the recent DANA events. Communities are experiencing firsthand how rising temperatures and intensified weather patterns are reshaping urban experiences. These conditions are amplified by the built environment itself, with artificial surfaces, traffic congestion, and inefficient waste systems compounding the strain.

Whilst recognizing the threats is necessary, equally important is to focus on the opportunities that arise. The increased discomfort and dysfunction of public areas highlight how critical it is to rethink the design, use, and resilience of our urban spaces. City inhabitants are finding out that what was once taken for granted, is not. Streets with shade, low temperatures, and clean pavements do not come naturally; they are the result of specific actions. Fortunately, digital technologies and data driven approaches open the door to more efficient and equitable urban planning. Computational modeling and sensor networks, for example, allow cities to dynamically adapt to thermal stress, water flow, and shifting human needs.

The area of resource management stands as one where significant improvement can be made. Cities can make better use of water, gas, electricity, and waste. Waste, even though it has long been considered a logistical nuisance, is becoming a mirror of consumption and sustainability. With European cities falling short of ambitious recycling targets, the urgency to redefine how waste is perceived and managed has grown. New systems of traceable disposal and smart monitoring point toward a future where the separation of materials and behavioral insight enable more circular and accountable urban ecosystems.

Mobility sits at the heart of climate transformation too. Transport systems fuel a considerable share of emissions and pollution, yet they also hold the potential to make cities more inclusive, healthier, and adaptive. The push for electrification, shared transit models, digitally coordinated mobility, and the 15-minute city are an opportunity to realign how citizens move through their environments, especially in places where physical infrastructure and socio economic disparities intersect.

In navigating these pressures, each challenge uncovers new possibilities. Discomfort in public spaces points to the potential for inclusive design; inefficient waste management opens the way for smarter urban ecosystems; outdated transport systems invite rethinking how we move through space. The ability to identify and understand these pain points allows cities to evolve, not just to tolerate climate disruptions, but to improve the quality of urban life for all who inhabit them.



LIVEABLE PUBLIC SPACES

Battling Heat and Heavy Rain in Urban Public Spaces

Like many Mediterranean urban centers, Valencia experiences frequent and intense heat waves, exacerbated by the urban heat island (UHI) effect, where artificial surfaces retain heat, making urban areas significantly warmer than surrounding rural ones [227]. Intensified precipitation events, like the DANA flood, are also a great cause of distress among the population [228].

Both extreme weather events are rising in frequency and intensity due to anthropogenic climate change [229]. This demonstrates the necessity of proactive climate adaptation, considering various future climate scenarios, which will be crucial for mitigating adverse impacts and fostering long term sustainability [230].

This increasingly makes public spaces uncomfortable, driving people indoors and rendering them useless. This impedes social interaction and recreation, damaging both local communities and tourism [231].

As this problem is more prevalent in our daily lives, the need and political appeal in implementing solutions will be greater. Technological advancements will allow focused initiatives to have a greater impact. Data collecting technologies could, on the one hand, allow for better targeted help where people need it, allowing efficient resource management and emergency tackling. On the other hand, computational fluid dynamics could allow both real time adaptations and local design principles to improve wind, heat, and water flow, resulting in safer cities for everyone [232].

> "Urbanism in the age of climate change means planning and designing our cities to both reduce their impact on the planet and increase their ability to withstand the coming disruptions. Sustainability and resilience are not mutually exclusive but mutually reinforcing: compact, walkable, green cities emit less carbon and are also better able to endure heat waves, storms, and floods. We have the knowledge and the tools. What we need now is the will to use them."

Peter Calthorpe, Founding member of the Congress for New Urbanism

Selected Players

GREEN URBAN DATA

ArcGIS

UrbanFootprint

ENVI_MET

GREEN MOBILITY

Tackling Air Pollution and Emissions Through Innovative and Inclusive Green Mobility

Green mobility exists as a vital response to the urgent need to reduce urban air pollution and greenhouse gas emissions. Transport alone accounts for roughly 30% of CO_2 emissions in Europe and is a leading source of urban health problems [233]. Beyond environmental gains, green mobility offers the promise of cleaner air, healthier cities, and new public spaces by shifting away from private fossil fueled vehicles toward shared mobility, public transport, and innovative low emission solutions like electrification and digital platforms [234, 235]. Aligned with the 15-minute city model, which encourages local access and less car dependency, these changes support more inclusive, sustainable urban living. Technological advances, such as smart transport systems and AI driven mobility planning, are enabling cities to become more efficient and accessible, with particular benefits for vulnerable social groups in terms of inclusion and accessibility [234].

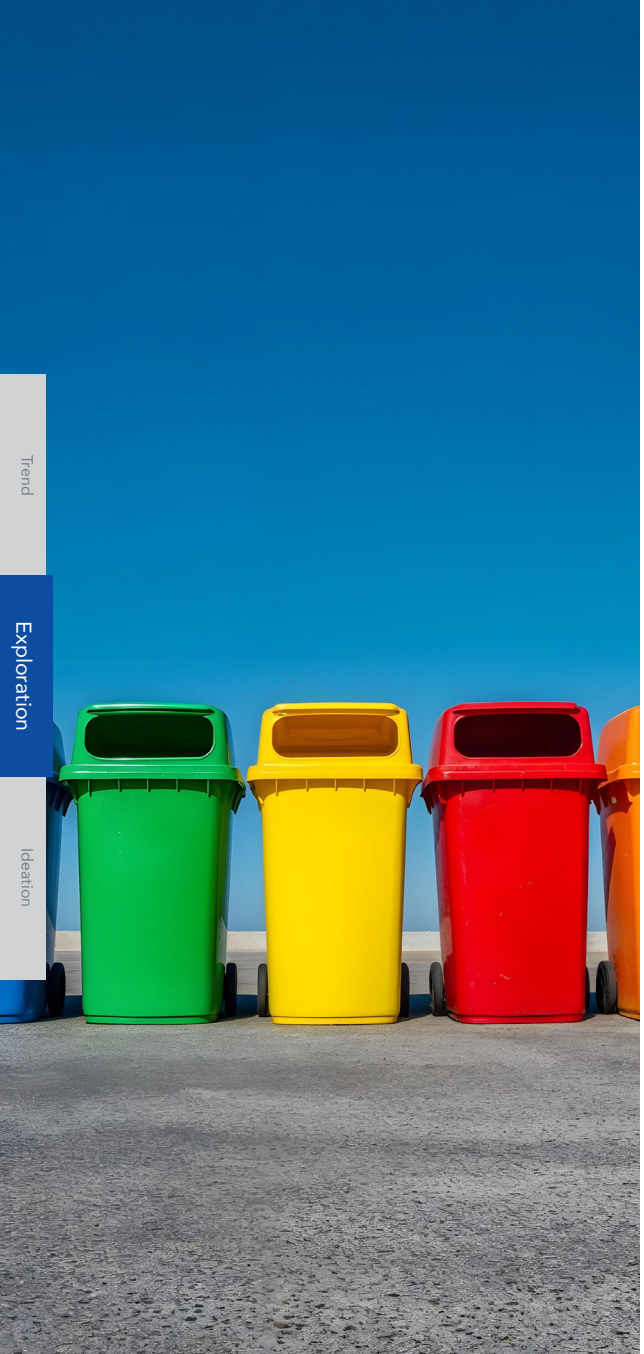
Nevertheless, the transition faces several significant challenges. The required investment in infrastructure and technology is substantial, especially for charging networks or electrified fleets, and many rural or small urban areas lag behind in service provision [237]. Long standing preferences for private car ownership and skepticism around new mobility models present obstacles to widespread adoption despite their benefits. Emerging risks also include the challenges of managing EV related hazards, such as battery fires in dense urban environments, which require new emergency response strategies [238].

"If we want our cities to remain liveable, we must drastically reduce pollution and congestion. That means making sustainable clean transport, affordable, and accessible, not the exception, but the norm."

Frans Timmermans, Executive Vice President of the European Commission (2020–2023)

Selected Players

BlaBlaCar, metrovalencia, SLATE, Uber, renfe, TESLA



URBAN WASTE, REIMAGINED

Recycling Improvements Pave the Way for Cleaner, More Sustainable Cities

Making efficient use of resources in our urban environments is essential to tackle climate change. Waste and rubbish, being one of these resources, strangely so. In some areas of Europe, the rubbish produced by the citizens spills onto the streets, the parks, and even landfills [239]. Polluting and dirtying our living spaces [239]. But this is set to change in the future, by 2030, the EU wants its member countries to recycle 60% of their municipal waste [240]. Spain, in 2022, was only able to recycle 42.9% [241]. To meet the demands of Brussels, many cities will have to implement changes.

Thankfully, we are not without options. Modern technologies can help us deal with waste. From the installation of LPWAN sensors to having digital locks that help us figure out who recycles and who does not [242]. Some of these innovative systems have already been successfully tried in some cities [243]. Now they just have to expand. Public private partnerships could shape the coming years of waste management in major European cities. This is vital to reach more sustainable urban spaces where separation and recycling become the new reality. A vital need considering the 5 metric tons of waste that the average EU citizen produces annually [240].

"Similarly, waste collection trucks would no longer have to make their fixed rounds to find half of the bins empty: sensors would indicate which bins are full, making the pick-up round more effective and dynamic."

Bas Boorsma, Founder of Urban Innovators Global and Expert on Digitalization, in its Economist Impact Article [244]

Selected Players

HELIOT EUROPE
((SENSONEO))
FCC
emgrisa
urbaser
making circularity real
VEOLIA

GLOBALIZED CITIES, FADING ROOTS

FUTURE OF INNOVATION IN URBAN SPACES

Gentrification Time

Overcrowded Urban Streets from Mass Tourism

The New Economic Urban Landscape

Mohamed Benhaddi 
Karla Mariana Reséndiz 
Noufel Garcés 

GLOBALIZED CITIES, FADING ROOTS

Future of Innovation in Urban Spaces

The rapid evolution of global cities under the pressures of globalization has brought forward a series of complex challenges that threaten the social cohesion, cultural identity, and economic balance of urban environments. As cities become increasingly interconnected through global networks of commerce, capital, and tourism, the traditional foundations of neighborhood life are progressively eroded. A primary manifestation of this change is the gradual disappearance of locally owned businesses. Small independent retailers, which historically served as key pillars of community identity and social interaction, are being displaced by large multinational corporations and global e-commerce platforms. This shift has contributed to a homogenization of urban commerce, leading to more generic streetscapes, decreased walkability, and weakened local economic circulations.

The challenges extend beyond retail. Gentrification presents a further disruption to the urban fabric, especially in low-income and culturally rich neighborhoods. The arrival of wealthier residents in these areas causes a marked increase in property values and rental costs, ultimately displacing long-term, often vulnerable populations. Long-established social networks are fractured, and neighborhoods shift to cater primarily to affluent newcomers, reducing cultural diversity and social inclusion. This displacement deepens urban inequalities, limits access to local opportunities, and exacerbates feelings of alienation among displaced groups.

Mass tourism further complicates the urban landscape. The combination of affordable travel, short-term rental platforms, and the global desire to visit iconic cities has saturated many historic districts. Residents frequently experience overcrowding in their public spaces, with streets, plazas, and cultural landmarks dominated by transient visitors. Such saturation diminishes the quality of life for local populations, places unsustainable pressure on urban infrastructure, and accelerates the commercialization of space. The collective impact of declining local businesses, displacement through gentrification, and tourist saturation creates cities that feel less authentic, less inclusive, and increasingly oriented towards external consumption rather than internal community well-being.

Despite these multifaceted problems, new opportunities are emerging to counteract these negative trends. The strategic use of digital platforms offers a promising avenue to revitalize urban life by promoting local commerce, encouraging responsible tourism, and supporting inclusive community engagement. Digital tools can increase the visibility of small businesses, help distribute tourist flows toward lesser-known but culturally significant areas, and foster experiential forms of tourism that integrate visitors into local life.

Such interventions can be further strengthened by forming partnerships between municipalities, local entrepreneurs, and cultural organizations, ensuring that urban development prioritizes social equity and cultural preservation. Community-led planning initiatives and protective policies for affordable housing and small businesses are essential complements to digital innovation. Our hypothesis is that a dual strategy combining technology with participatory governance can restore the balance in global cities, foster resilient local economies, and protect the cultural integrity of urban spaces in the face of globalization.

GENTRIFICATION TIME

Urban Upgrades, Social Downgrades

One of the greatest challenges in sustainable construction is the high cost and limited accessibility of eco-friendly materials, such as low-carbon concrete, recycled steel, and energy-efficient insulation. These materials typically command a premium price compared to traditional alternatives, making them difficult to implement in many projects, especially in developing regions or smaller-scale developments. Additionally, the decentralization of supply chains and insufficient emphasis by companies restrict both competition and the availability of these materials, further complicating procurement and hindering the scalability of green building initiatives [251].

However, as demand for sustainable materials grows and technology advances, costs are expected to decrease. Innovations in material science, hold significant potential to make these materials more affordable [252, 253]. This presents a key opportunity for businesses: by making these materials more competitively priced, their adoption in construction can accelerate, reducing environmental impact and enabling broader market scalability. Investing in research, developing cost-effective materials, making new applications in which you can see the properties of these materials, creating new applications where you can see the properties of these materials and compare them with traditional ones, making it easier to determine where and how to use these sustainable materials or creating supply chain solutions to optimize efficiency could help drive a faster transition to a greener, more accessible construction industry.

These are great opportunities to promote the use of sustainable materials, which will help reduce their cost. If new companies start buying them, there will also be a significant reduction in the emissions produced by traditional material production.

"Community participation is key to creating equitable urban development that reflects the needs and desires of existing residents. When communities are involved in planning and decision-making processes, they can better advocate for protections against displacement and ensure that revitalization benefits everyone, not just new, wealthier arrivals."

Urban Planning Expert, Dr. Loretta Lees [250]

Selected Players

CRACKING URBAN CODE

Citizen OS

Ushahidi

THE NEW ECONOMIC URBAN LANDSCAPE

The Role of Digital Platforms in Sustaining Local Businesses and Reinvigorating Urban Spaces

The decline of local businesses, driven by globalization and shifting consumer preferences, has significant implications for the configuration and vitality of urban spaces [260, 261]. Traditionally, local businesses have served as key contributors to the social and economic dynamics of urban environments, fostering vibrant streetscapes, enhancing walkability, and encouraging social interaction within neighborhoods [262]. The closure of these establishments leads to an increase in vacant storefronts, reduced pedestrian activity, and the gradual deterioration of community-oriented urban life [262].

The homogenization of commercial activities, dominated by multinational chains and e-commerce giants, contributes to the loss of unique urban identities [261, 263, 264]. This shift diminishes the diversity of goods and services available within cities, replacing culturally rich, locally rooted commerce with standardized global offerings [263, 264]. Furthermore, the decline of local businesses undermines urban resilience, as profits from global corporations are often extracted from the local economy, weakening local economic circulation [260, 261].

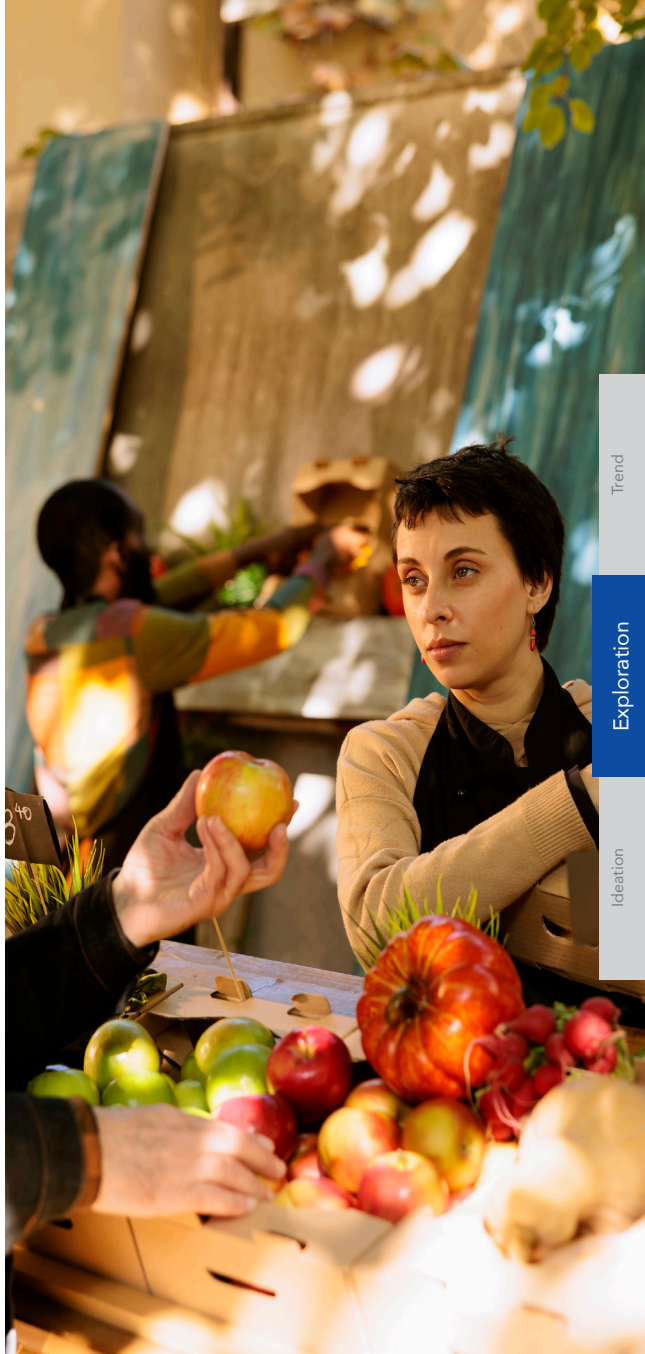
Conversely, the integration of tools and platforms presents an opportunity to reinforce the role of local businesses within urban spaces. Facilitating online visibility and customer engagement can drive foot traffic back to local retail areas, revitalizing public spaces and fostering community cohesion. This dynamic supports more sustainable and inclusive urban environments, where local commerce remains integral to urban life.

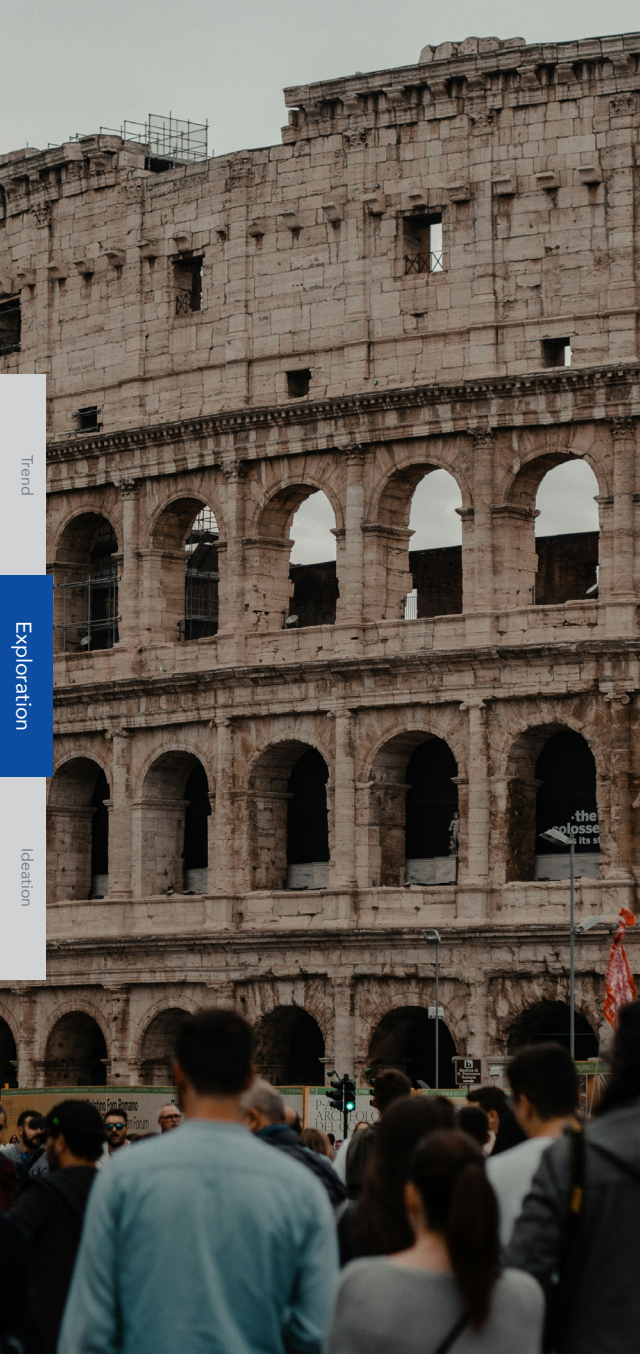
"Small businesses, which typically offer more local, diverse goods and services, also add to the identity and character of cities, which makes them appealing to both commuters and tourists. It's the unique local businesses that create an experience that can't be replicated at home."

Jason Wingard, Forbes (2022)

Selected Players

Uber Eats, Glovo, Handmade at amazon, Nearst, eventbrite, Etsy





OVERCROWDED URBAN STREETS FROM MASS TOURISM

How Public Spaces are Becoming Saturated and Unlivable

Cities are increasingly overwhelmed by the constant flow of tourists that saturate public streets, plazas, and key urban areas [251, 252, 253]. Mass tourism, driven by cheaper flights, digital platforms like Airbnb, and a growing global middle class, concentrates large volumes of visitors into small, central zones [254, 252]. This has turned public spaces into crowded corridors of movement and consumption, making it difficult for residents to enjoy or even access their own neighborhoods [251, 255, 256].

These conditions create urban tension and frustration, triggering protests and social resistance in cities like Barcelona and Venice [251, 252]. Overcrowding degrades not just physical infrastructure, but also the emotional connection between citizens and their environment. As cities reshape around tourism, they risk losing livability and long-term social cohesion [252, 256, 253]. Instead of simply redistributing visitors, the opportunity lies in shifting toward high-quality, lower-volume tourism focusing on experiential, culturally embedded activities that integrate visitors with the local community [257, 258, 259]. This model maintains economic value by attracting visitors willing to pay for unique, personalized, and sustainable experiences [259]. Such a transformation supports local economies, reduces pressure on public space, and restores balance in urban life.

"What these movements are asking for is agreed consensual planned measures tackling how we want to live and coexist... making sure that their intention is improving the life of the population."

Asunción Blanco-Romero, Professor of Geography at the Autonomous University of Barcelona [251]

Selected Players

Travel Local
Spotted by Locals
airbnb
Tiqets
MODERN ADVENTURE
withlocals
GET YOUR GUIDE
CONTEXT

IDEATION

The following chapter describes four novel business models that are of great relevance for The Future of Innovation in Urban Spaces, especially in view of the identified future trends. Each of the business models are developed to solve a specific problem in the identified problem spaces.

Pau Sena 
Miguel Padura 
Carlos Gómez 

Playlytics

Smart Data. Safe Play. Stronger Communities

In recent years, the digital transformation of urban environments has accelerated under the umbrella of smart city initiatives. However, while domains such as mobility, energy management, and environmental monitoring have received significant investment and attention, one vital component of public life has remained conspicuously analog: playgrounds. These spaces, essential for childhood development, community bonding, and neighborhood vibrancy, often lack the digital infrastructure necessary to inform city planning or improve citizen experiences. This technological gap limits both the effectiveness of public investment and the inclusivity of urban design.

Playlytics was born from the recognition that playgrounds are not just leisure spaces, they are dynamic social hubs that deserve the same data driven innovation applied to other parts of the city. The platform introduces a simple, yet powerful solution: passive infrared (PIR) sensors installed at playground entrances, combined with a user friendly mobile app. This dual system anonymously tracks real time occupancy and shares that data with both families and local governments. Families benefit from knowing when and where to go, avoiding crowded spaces. Meanwhile, city councils gain access to actionable data that can help prioritize investments, identify underutilized areas, and promote equitable distribution of resources across neighborhoods.

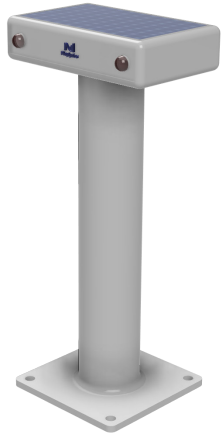
Unlike traditional surveillance based systems, Playlytics embraces a privacy first approach, which is especially critical in child centric environments such as public parks or playgrounds. Its cost effective and scalable design removes common barriers to adoption, such as high installation costs and data privacy concerns. By embedding digital visibility into playgrounds, Playlytics enhances both the spontaneity of daily park visits and the long term planning capacity of municipalities.

As cities strive to foster inclusion, sustainability, and well-being, the need for smarter public spaces becomes increasingly urgent. Playlytics addresses this challenge with a privacy first technology that empowers both families and municipalities. By placing data at the center of playground use, it transforms these spaces into measurable, dynamic assets that support evidence based planning and equitable investment. Families gain timely insights for spontaneous visits, while city councils access the information needed to improve services where they matter most. More than just a tool, Playlytics reimagines what digital infrastructure can look like in environments designed for connection, learning, and play, embedding empathy, simplicity, and intelligence into the everyday fabric of urban life.

Problem

- Studies have shown that smart city initiatives have focused heavily on transportation, energy, and utilities. Leaving playgrounds and children's recreational areas largely undigitized and without usage data for planning, limiting their ability to maintain or improve parks efficiently [265].
- Families often avoid playgrounds because they do not know if they are too crowded, well maintained, or safe. This uncertainty reduces spontaneous visits and daily use, ultimately limiting community engagement [266, 267].
- Investment in public parks is usually made without reliable usage data, leading to misaligned priorities and leaving some neighborhoods underserved, which affects social inclusion [268, 269].
- As a result, playgrounds remain isolated from the digital layer of the city, and communities lose opportunities for interaction, inclusion, and fair resource allocation [269, 270].
- Traditional "smart" solutions like video surveillance or RFID tracking raise privacy concerns and require high installation costs, making them unfeasible for many local councils [271, 272].

Lacking real time insights, public playgrounds stay off the smart city radar, curbing family visits and limiting data driven planning.



Solution

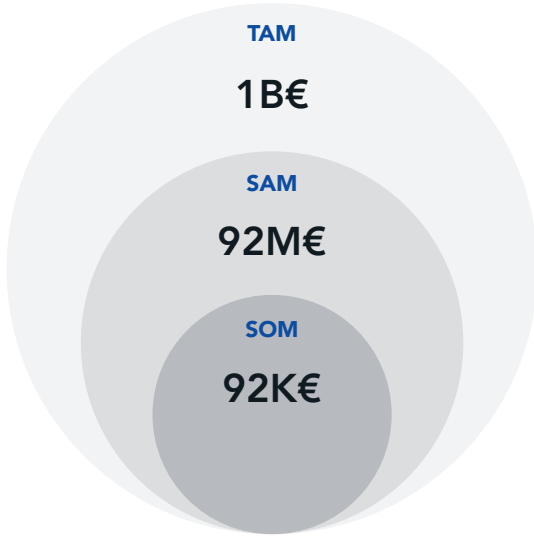
- We propose a smart, privacy friendly monitoring system, using passive infrared (PIR) sensors installed at playground entrances to anonymously track occupancy. These sensors provide reliable, real time data without capturing personal or visual information, which is key in environments designed for children, where safety and privacy must come first.
- Families can use a free mobile application to check how busy nearby playgrounds are, mark favorite locations, receive alerts when preferred parks are quiet, and provide feedback on their current condition.
- On the municipal side, city councils can access a centralized data dashboard that reveals usage patterns across all playgrounds, helping identify underused areas and prioritize investment more effectively.
- This low cost, scalable solution promotes smarter public space management, stronger citizen engagement, and more equitable, inclusive urban development, all fully respecting individual privacy.

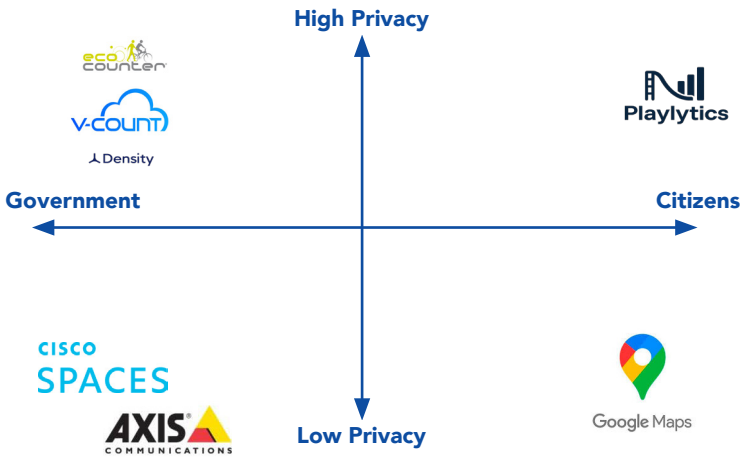
Playlytics bridges families and city councils with real time, privacy first insights that turn playgrounds into smarter and more inclusive spaces.

Market

- The global smart playground safety sensor market is currently valued at 1.0–1.3 billion EUR in 2024 (TAM) and is expected to grow to 2.8–3.7 billion EUR by 2033, with an average annual growth rate of ~13% [273]. This market is expanding rapidly, driven by the rise of smart city initiatives, increasing focus on child safety, and the adoption of low cost, privacy respecting technologies like passive infrared sensors.
- Europe, home to roughly 9–10% of the world's population, represents a 92–129 million EUR segment of that market in 2024 (SAM), expanding to 248–368 million EUR by 2033. Public investments aligned with EU digital and inclusion strategies are expected to accelerate adoption across municipalities.
- Valencia, with ~800,000 residents, represents a focused and realistic launch zone. Its proportional share of the global market translates to a 92.000–120.000 EUR initial opportunity (SOM), offering a manageable, impactful pilot city for Playlytics to validate its approach.

From parks to intelligent platforms: Playlytics enters a booming smart-city market with a focus on data analytics for family impact.





Competition

- Most urban monitoring solutions focus on traffic, energy consumption, or air quality, often overlooking how public spaces like playgrounds, plazas, or community areas are actually used.
- General smart city platforms offer centralized dashboards aimed at municipal management but lack real-time, citizen-facing features that help families make informed decisions about where and when to use public spaces.
- Camera based counters are available, but they tend to be costly, intrusive to privacy, and complex to install or maintain across multiple decentralized locations.
- Municipal decision making around public spaces is frequently reactive, driven by complaints, anecdotal evidence, or assumptions, rather than by objective and continuous data.
- Our solution fills this market gap with a low cost, scalable, and privacy friendly system that provides live occupancy information, supports data driven urban planning, and empowers citizens with timely, transparent insights about their city.

Most tools miss real time public space insight, we deliver live, privacy safe playground data for smarter cities and happier families.

Assumption Tree

Lack of Digitalisation in Urban Spaces

Most playgrounds and public parks operate without any form of digital integration. This lack of connectivity prevents city planners from monitoring usage patterns, identifying maintenance needs, or optimizing resource allocation. As a result, urban spaces remain underutilized and poorly managed in an increasingly data driven world.

Low Engagement with Playgrounds

Families often skip visiting playgrounds because they cannot easily assess real time conditions such as crowd density, cleanliness, or safety. This uncertainty discourages both spontaneous and routine visits, reducing opportunities for physical activity and social interaction among children and caregivers in urban environments.

City Councils Lack Data Usage

Decisions about renovations, upgrades, and funding are frequently based on assumptions or outdated information. Without reliable data on how and when playgrounds are used, municipalities risk misallocating budgets, overlooking high demand areas, and failing to meet citizens' actual needs in terms of infrastructure and services.

Cost Limit Smart Solutions

Many cities hesitate to deploy smart technologies due to concerns over personal privacy and high implementation costs. Solutions involving surveillance cameras or complex sensors are often rejected, especially when municipalities face tight budgets or public resistance to invasive data collection methods.

Contractual Complexity

Citizens need easy to use digital tools that provide live updates on park crowding, weather, safety, and available amenities. With this information, families can make informed choices about when and where to visit, leading to better use of public spaces and more enjoyable outdoor experiences.

Prolonged Disputes

Local governments benefit from cost effective, privacy preserving technologies that generate insights into how public spaces are used. Access to accurate, real time data supports smarter urban planning, targeted investments, and proactive maintenance, helping ensure that resources are directed where they are most needed.

AI-Driven Contract Management

A simple system using infrared sensors at entrances to track how many people are in a playground without collecting personal data. Citizens can check real-time information through an app, and councils can use the data to plan upgrades and improve services as part of a broader smart city strategy.

Kenza Tantaoui 
Ivan Gilabert 
Adrián Fernández 

Out365

Designed to Bridge the Gap Between City Governments and Citizens

In recent years, the pace of technological advancement has transformed the way we live, communicate, and spend our time. Families, once united around shared daily routines and interpersonal moments, now navigate a reality where digital screens often mediate or replace human interaction. Smartphones, tablets, televisions, and other digital devices have become central fixtures in our homes and our hands, silently reshaping our behaviors, habits, and relationships.

While digital tools have brought remarkable convenience, access to information, and new forms of entertainment, they have also introduced an unintended cost: a gradual erosion of face to face connection within households and communities. Mealtimes, family outings, and casual conversations are increasingly interrupted or altogether replaced by solitary scrolling, passive viewing, or isolated gaming sessions. Parents check work emails at the dinner table. Children retreat into the world of videos and social media. Grandparents feel more and more like silent bystanders in the lives of their younger relatives.

The rhythm of daily life, once grounded in physical presence and emotional exchange, is being recalibrated by the logic of digital consumption.

Beyond houses, this shift echoes throughout our cities. Public spaces, parks, plazas, and communal areas designed to encourage gathering, play, and exchange are often underutilized or perceived as irrelevant, in a culture that prioritizes online connection over outdoor experience. Despite the vibrancy and potential of these shared environments, their role as vital arenas for human interaction has faded. This is particularly troubling in urban environments where different generations live nearby, yet rarely interact meaningfully. The fabric of community, once woven from spontaneous encounters, shared rituals, and collective experiences, is thinning.

Moreover, these changes are not occurring in a vacuum. They reflect broader cultural and economic forces that reward attention, data generation, and screen time over real world engagement. The algorithms that shape our online lives are finely tuned to maximize retention, not reflection; consumption, not connection. As a result, a generation of children is growing up with fewer opportunities for unstructured play, intergenerational bonding, or neighborhood belonging. Similarly, many older adults are experiencing growing digital divides that isolate them from new modes of participation in civic and social life.

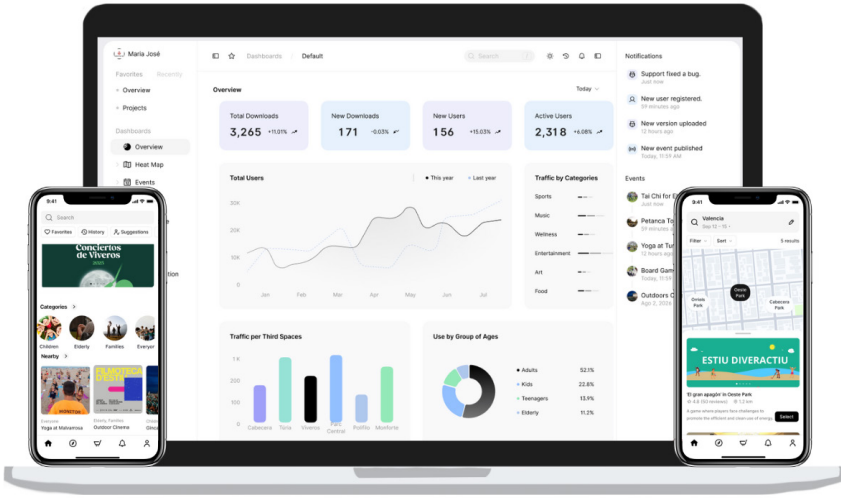
What we are witnessing is not simply a shift in lifestyle; it is a structural and psychological realignment of how people relate to one another and their environments. It affects how families function, how cities thrive, and how societies sustain the bonds that hold them together. The cost of digital overuse is not just measured in screen hours; it is measured in lost moments, fading traditions, and spaces that stand empty where laughter, conversation, and connection once lived.

Recognizing this quiet crisis is the first step. Addressing it requires creativity, intentional design, and a renewed commitment to reactivating the spaces and relationships that define human life, not in opposition to technology, but in a way that reclaims its role as a tool for real world connection, not a substitute for it.

Problem

- Modern families are growing apart as parents and children spend increasing amounts of time on digital devices, such as smartphones, tablets, and televisions [274].
- In person interactions at home are becoming increasingly shallow, as meaningful bonding moments are now frequently replaced by isolated screen time activities [275, 276].
- Urban spaces originally intended to foster connection and interaction are losing their vibrancy and purpose, with real life social encounters in these areas becoming noticeably less frequent [278, 279].
- Digital entertainment continues to pull people's attention away from physical gatherings and participation in real world social and cultural activities, weakening social cohesion [278, 279].
- Gaps between generations, children and elders, youth and parents, are deepening, leading to rising emotional isolation even among members of the same household [277].
- Public spaces are no longer perceived as attractive or welcoming to all age groups, and they are failing to serve as common grounds for genuine and inclusive human connection [279].

Modern families grow distant as kids, parents, and elders slip apart, isolated by screens, solitude, and disconnection from urban life.



Solution

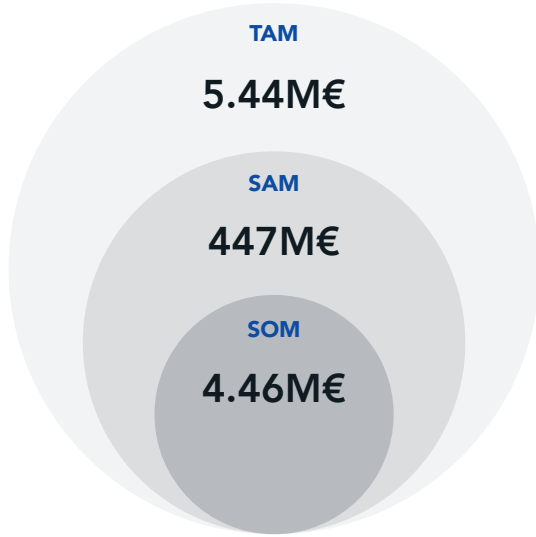
- Out365 is a smart digital platform that helps families rediscover their city by connecting them to meaningful events and vibrant public spaces. It empowers citizens to engage offline while giving city governments the tools to design more inclusive, data driven urban experiences.
- For the citizens, the platform offers curated options on events and activities which they can filter by location, type, and audience, while discovering urban spaces and getting a tailored search results that perfectly matches their preferences and interests.
- For city officials, the platform offers a data-driven feedback loop while continuously refining event and activity offerings as well as space usage, enabling cities to design inclusive initiatives that foster intergenerational connection and activate underused areas.
- By promoting outdoor engagement and meaningful in person interaction, the platform helps counter digital overuse and transforms technology into a tool for real-world social bonding and vibrant public life.

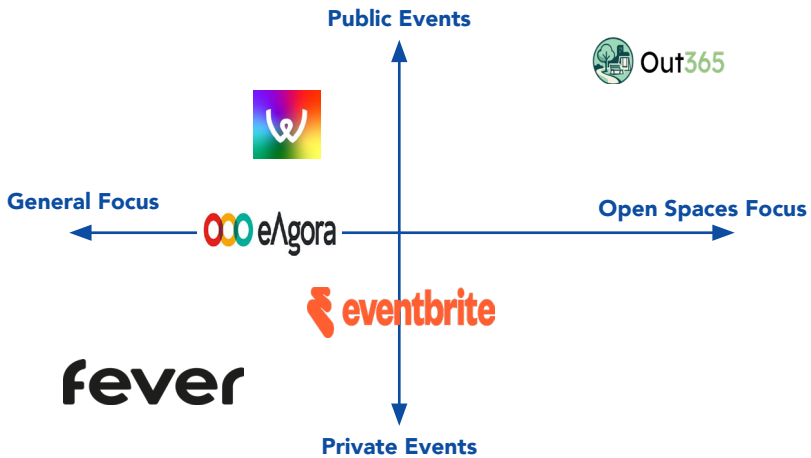
Using tech to bring people back together: families and the elderly rediscover urban spaces while the city learns what truly connects generations.

Market

- Out365 targets municipalities seeking to enhance their event management in urban spaces and gain valuable insights into participants.
- Out365 has two sources of income. The first one is a customization fee charged to municipalities, which includes branding, setup of local park data, and map integration. The second income source is an annual license based on the number of registered users, with higher fees for municipalities as citizen usage increases.
- In 2022, there were approximately 90,000 municipalities across Europe [280], representing a Total Addressable Market (TAM) of about 5.445 million EUR. This estimate is based on a 30,000 EUR one-time customization fee and a 25,000 EUR annual licensing fee per municipality on average.
- All 8,131 municipalities in Spain constitute the Serviceable Available Market (SAM) [281], with a potential revenue of approximately 447 EUR million.
- Focusing on 1% of the Spanish market (about 81 municipalities), Out365 estimates a Serviceable Obtainable Market (SOM) opportunity of approximately 4.46 million EUR.

Out365 is scalable, adaptable, and ready to serve municipalities of all sizes and contexts. Built for every city, everywhere.





Competition

- Platforms like Fever and Eventbrite allow private companies to publish events and manage registration and ticket sales, but they lack integration with local governments.
- Apps like eAgora and WeTown support communication and event listings, but don't help city councils use data to promote public spaces effectively or tailor events to specific groups like seniors or children.
- Municipal apps often display events statically, lacking features for event registration, sign ups, or user feedback.
- There is no centralized tool for cities to strategically plan, promote, and analyze public activity in urban spaces through events and citizen participation.
- No existing app provides personalized event recommendations to users based on individual interests, age, or proximity.
- Our platform fills this gap by creating a centralized, interactive hub where cities can better understand and respond to their communities, while residents can explore, register for, and participate in public life.

Smart event management transforms cities by activating urban spaces, enhancing community engagement, and connecting communities through innovation.

Assumption Tree

Uneven Urban Use Limits Engagement

Less popular urban spaces often remain underused because they receive little to no promotion or public awareness. As a result, the majority of residents and visitors flock to a few well-known parks, creating issues of overcrowding, wear and tear, and limited recreational access in those overly concentrated areas.

Digital Overuse Drains Urban Life

With families increasingly absorbed in digital screens and virtual entertainment, public spaces designed to foster connection, play, and community interaction are often overlooked and underused. This shift in behavior diminishes opportunities for shared experiences, weakens neighborhood bonds, and leaves valuable communal environments empty of the vibrant life they were built for.

Real Bonds Fade in Digital Worlds

As attention shifts away from social activities and meaningful in-person interactions, moments that once fostered bonding among family and friends are now frequently replaced by solitary screen time. This growing reliance on digital engagement erodes real-world connections, weakening emotional ties and diminishing the richness of shared human experiences.

Non-Inclusive Spaces Divide Ages

Emotional isolation is steadily increasing across all age groups, driven by modern lifestyles and digital distractions. Yet public spaces have not adapted to become inclusive, welcoming environments that encourage genuine human connection. Without thoughtful design and community-centered programming, these spaces miss the opportunity to combat loneliness and strengthen social bonds.

Screen Alternatives via Programming

Engaging activities that bring families together across generations are essential for building strong community ties. When thoughtfully designed and hosted in welcoming public spaces, these inclusive experiences foster connection, encourage interaction among age groups, and help transform urban areas into vibrant, supportive environments where everyone feels a sense of belonging.

Social Data Drives Program Insight

Implementing clear metrics to monitor usage, impact, and inclusion is essential for evaluating the effectiveness of public space programming. By collecting and analyzing this data, communities can identify what works, address gaps in engagement, and continuously refine activities to better serve diverse populations and foster more meaningful, inclusive participation.

OUT365

A dual platform can empower City Hall with real-time insights into public space usage while offering citizens personalized event discovery based on their interests and location. This integrated data loop supports smarter decision-making, encourages community participation, and drives ongoing urban revitalization by aligning programming with actual needs and engagement patterns.

Juan Pablo Endrino 
Sergio Pérez 
Gonzalo Martín 

InfoParks

Towards Better Playground Management

Urban data in Europe is abundant, but fragmented. Cities often host dozens of disconnected datasets, each in its own map, PDF, or spreadsheet, and rarely tailored to the needs of parks and playgrounds. Valencia exemplifies this: while it provides open data citywide, integrating relevant information for park-related decisions is nearly impossible without significant manual effort [282]. This fragmentation slows down urban planning and undermines proactive management.

At the same time, parks and playgrounds face growing challenges. Climate change threatens outdoor comfort and safety, especially for children. A lack of adaptive strategies could drive usage down, worsening health outcomes and social equity [283, 284]. Playgrounds are vital for urban life, yet they are insufficiently understood. Cities need a better way to track and improve them before disuse becomes decline.

This is where InfoParks comes in. InfoParks is a smart, integrated application designed to transform how city governments monitor, manage, and improve their urban parks and playgrounds. In a time of rapid urbanization and rising climate challenges, InfoParks empowers urban planners with the data they need to ensure outdoor spaces remain livable, safe, and socially vibrant for all.

The platform offers three distinct views. The Map View displays every park and playground within the city, letting users visually explore their locations and access detailed, real-time information about each site's environmental conditions (such as temperature and noise levels), green coverage, infrastructure, and demographic usage. The Dashboard View provides deeper insights, allowing users to plot correlations between variables (e.g., heat vs. usage or noise vs. child population), monitor city-wide trends, and receive scientifically based recommendations for future improvements. Finally, the Database View enables government officials to upload new data or connect external datasets, which are automatically processed and visualized throughout the platform in real time.

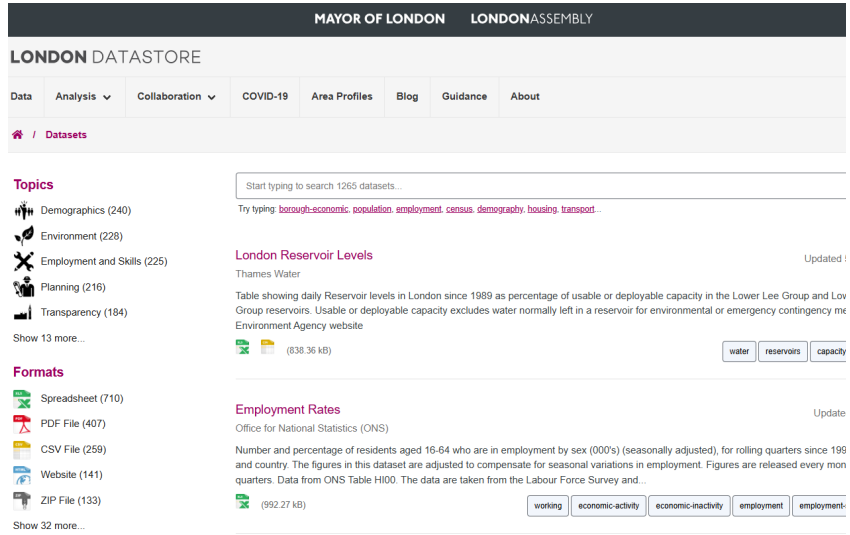
What sets InfoParks apart is its ability to turn complex data into strategic guidance. By identifying trends, correlating variables, and highlighting high-risk areas based on metrics like climate comfort, InfoParks helps cities prioritize resources where they're most needed. Rather than merely displaying information, the system actively supports decision-making by offering actionable recommendations.

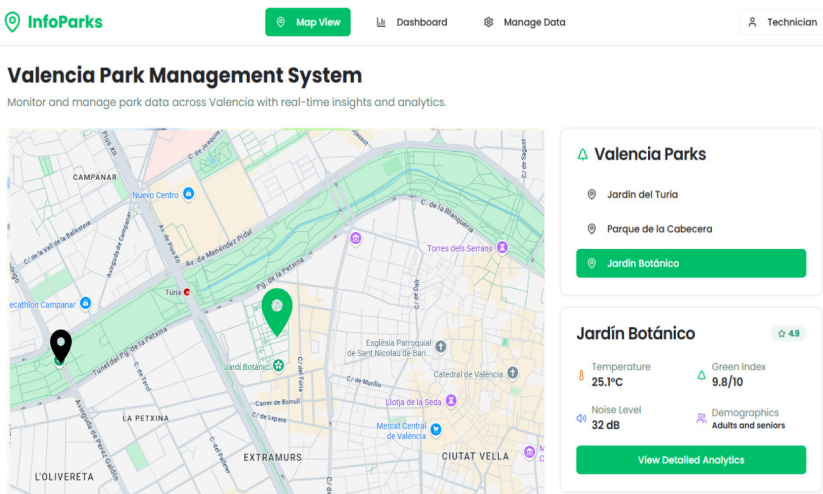
By centralizing data, simplifying visualization, and offering actionable insights, InfoParks transforms scattered urban data into a powerful tool for sustainable planning ensuring that every urban park and playground receives the attention it needs and is reimagined as a social anchor in tomorrow's climate-resilient cities.

Problem

- Most modern European cities have a wealth of data about the various aspects of urban life. But this data tends not to be integrated. Having one map for each variable, resource, or piece of infrastructure that is tracked. Having several PDFs and Excel files.
- Furthermore, this data is usually not specific to parks, but to the whole city. Valencia serves as an example of this [282]. Both these characteristics of city data make the decision making process more difficult when it comes to parks and playgrounds.
- In playgrounds, work will have to be done in the coming years. They are essential for city life, places of joy and connection. And sadly, they will be significantly affected by climate change and new societal trends.
- Ensuring that people still use them will be essential. As the Dutch NGO, Child in the City, says, the decline of playgrounds pushes children indoors, harming both their physical and mental health [283]. Bad adaptation of playgrounds will lead to lower use and worse outcomes for the youth of cities [283, 284].

The lack of integrated data about playgrounds will considerably hinder the pro-active climate adaptation process of the coming years.





Solution

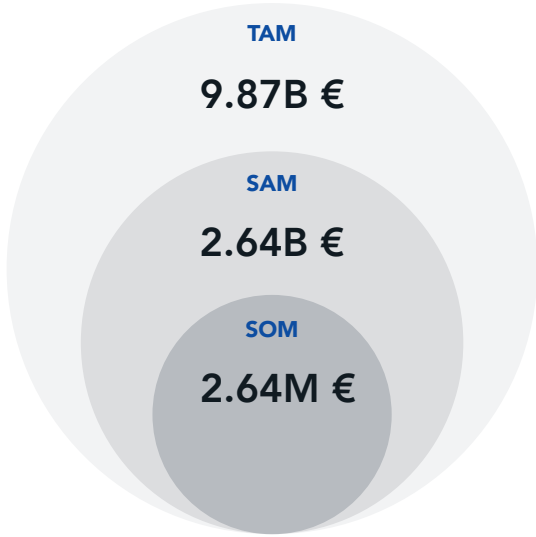
- InfoParks is a smart park management system that integrates existing data about the city and relates it to parks and playgrounds.
- Gets data from satellite imaging, INE (National Statistics Institute), open databases of different town halls and municipalities to have a comprehensive dataset including heat maps, park expected demographics, and green cover data, among others.
- Updates its data automatically through APIs (Application Programming Interface) to easily integrate with other databases and facilitates extra data collection through an intuitive interface for technicians.
- Has an interactive map in which you can select any park and see all its information.
- Automatically selects all the data pairs that could be correlated and lets you make various graphs that facilitate decision making.
- Interprets data on a scientific basis, offering metrics, like climate comfort based on temperature and humidity data, to give you the most relevant data.
- Lets you easily see the weak spots of each park and offers recommendations.

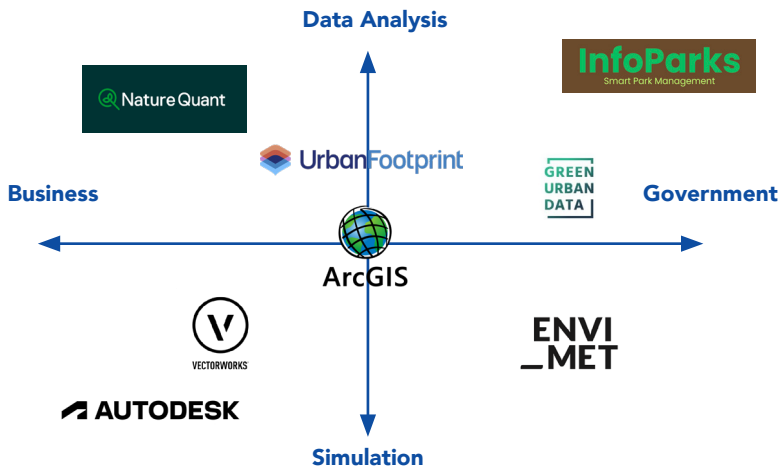
InfoParks transforms fragmented park data into useful insights that help urban planners adapt, prioritize, and invest with confidence.

Market

- The service provides governments with a unified application that monitors key factors to keep parks and playgrounds livable and well-maintained.
- It operates under a single revenue stream, offering a subscription-based Software-as-a-Service (SaaS) model, where pricing is calculated based on the number of parks or playgrounds covered.
- The solution introduces a centralized and innovative approach to environmental monitoring and decision-making, specifically designed to support urban planning and sustainability efforts.
- The global environmental software market is currently valued at 11.6 billion USD and is expected to grow at a compound annual growth rate of 9.74%, reaching 24.5 billion USD by 2033 [285].
- Within Europe, the market is estimated at 3.1 billion USD and is projected to reach 6.3 billion USD by 2033, growing at a compound annual growth rate of 9.32% [285].
- With a strategic focus solely on governments, the expected market penetration is 1%, resulting in a potential market size of approximately 63 million USD.

The environmental software market is set to double by 2033, growing at a 9.74% CAGR, driven by data, climate needs, and urban innovation [285].





Competition

- No leading platform integrates a variety of data sources, such as temperature, noise, green areas, playground location, and more, to identify the parks/playgrounds that need more resources to enhance urban livability.
- The application integrates a database to manage the data that gets visualized on a map view and on an intuitive dashboard to understand the relationship between different variables.
- Tools like ENVI-met simulate the physics of localized microclimates but are not built for city-wide analysis or for integrating multiple data sources into a single application.
- ArcGIS, NatureQuant, and UrbanFootprint focus on data analysis of urban infrastructure, but they lack the integration of different key factors crucial for parks and playgrounds. Moreover, they lack intuitive visualization for comparing the correlation of different variables.
- Green Urban Data and similar platforms focus on environmental data processing within isolated silos, lacking user-friendly interfaces and an integrated application for visually monitoring the condition of parks and playgrounds.

No leading platform integrates a variety of data sources to identify the parks/playgrounds that need more resources to enhance the quality of life.

Assumption Tree

Temperatures Will Keep Rising

From 1975 to 2025, temperatures have risen at a rate of 0.2 degrees Celsius per decade. For a total of 1 Celsius degree in 50 years. Calculations by the United Nations indicate that by the end of the century, temperatures could have risen by 2.5 degrees.

Playgrounds Might be Used Less

Increases in temperatures will lead to badly adapted public spaces being used less. High temperatures, low walkability, and low greenness are all factors that have been found to contribute to a lower use of open public spaces.

Playgrounds are Essential for Children

Playgrounds are crucial for children's development. As the Dutch NGO, Child in the City, says, the decline of playgrounds pushes children indoors, harming both their physical and mental health. These vital spaces foster social skills, creativity, and physical activity, all essential for a thriving childhood.

Data Will be Key for Decision Making

The future of urban development hinges on robust data analysis. Cities will increasingly rely on vast datasets to understand resident needs, predict trends, and optimize infrastructure. This analytical approach ensures that decisions regarding everything from transportation to sustainability are evidence-based, fostering smarter, more livable cities.

Playgrounds Will Have to be Adapted

Increases in heat are already leading to some public spaces being used less. In the following decades, it will get worse. Playgrounds, as open spaces, will be badly affected. Adapting surfaces, providing shade, and using cooling devices will ensure that children, elders, and parents keep using these spaces.

Data About Playgrounds is Needed

Data related to demographics, population density, heat, and noise levels will be required for changes to be made in playgrounds and parks. Having data about the different parks of the city will allow urban planners to have an idea about the general state of playgrounds and the specific situation of certain parks.

Integrated Data for Better Insights

InfoParks integrates data from different sources and then provides both a map and a dashboard about the playgrounds of a municipality. Allowing for quick visualization of location and relevant information of each playground, it will become an essential tool for decision making.

Noufel Garcés

Karla Mariana Reséndiz

Mohamed Benhaddi


DreamTrip

A New Approach to Personalized and Sustainable Travel

DreamTrip is an AI powered mobile application designed to transform the way individuals experience travel. Rather than focusing on mainstream tourist attractions, the platform curates hyper-personalized itineraries tailored to users' specific interests, such as gastronomy, arts, cultural heritage, sustainability, and wellness. By integrating less-known destinations, historical landmarks, and small local businesses into each journey, DreamTrip promotes authentic and immersive exploration beyond the conventional tourist path.

A key feature of the application is its real-time dynamic routing capability. Leveraging live data and contextual awareness, the app continuously adjusts travel plans based on variables such as location and user preferences. This ensures a fluid and responsive travel experience that adapts to changing conditions while uncovering unique and often overlooked points of interest. Users can also set preferences for travel pace, desired experiences (e.g., relaxation vs. adventure), and accessibility needs, allowing for greater inclusivity and control.

While the core version of DreamTrip is available at no cost and provides rich, curated content, a suite of premium features enhances the offering. These include access to exclusive thematic routes, in-depth cultural insights, and expert recommendations for those seeking a deeper connection with their destination. Premium users can also enjoy priority support, no tourist traps, early access to limited-time experiences and a personal travel log.

Sustainability is embedded at the core of DreamTrip's mission. The app features a gamification system that rewards users for making environmentally conscious and socially responsible choices. Actions such as supporting local commerce, engaging with eco-friendly services, or choosing low-impact transport options earn points and achievements, thereby encouraging sustainable behavior in a rewarding and engaging manner. Users can track their impact over time and compare achievements with others, building a community of mindful travelers.

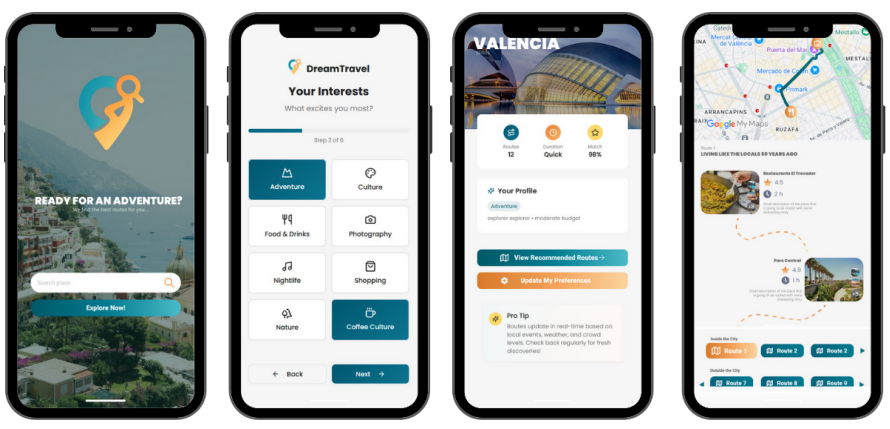
Beyond individual user benefits, DreamTrip contributes to broader goals in sustainable tourism development. By promoting under-visited areas and dispersing tourist activity more evenly, the platform helps alleviate pressure on overcrowded destinations, strengthens local economies, and supports the preservation of cultural identity.

In summary, DreamTrip offers a comprehensive solution that combines advanced personalization, adaptive technology, and sustainability-driven design. It represents a forward-thinking model for travel, enabling richer and more meaningful experiences while contributing to the long-term health and vitality of global destinations. Whether discovering hidden gems in a remote village or choosing a carbon-neutral route through a city, users are empowered to travel with purpose, curiosity, and consciousness.

Problem

- Tourists often feel overwhelmed by overcrowded attractions, leading to a diminished travel experience and missed opportunities to connect with the unique, authentic aspects that give each destination its true character [286, 287, 288].
- Most travel apps rely on popularity based algorithms that highlight the same top rated spots, resulting in repetitive, commercialized routes that overlook individual preferences and unique local experiences [289, 290, 291].
- Travelers today, especially millennials and Gen Z, are seeking more personalized, immersive, and ethical travel experiences, but lack tools to guide them in discovering the hidden side of cities [292, 293].
- Local businesses beyond main tourist hubs are often overlooked, despite offering authentic, high quality experiences. Their decline accelerates the cultural homogenization of cities, where unique local character is replaced by standardized, globalized offerings [294].
- Urban and regional authorities are under pressure to decentralize tourist flows and promote sustainable tourism that supports local economies [295].

Tourists are overwhelmed by overcrowded attractions and miss out on the authentic experiences that make travel truly meaningful.



Solution

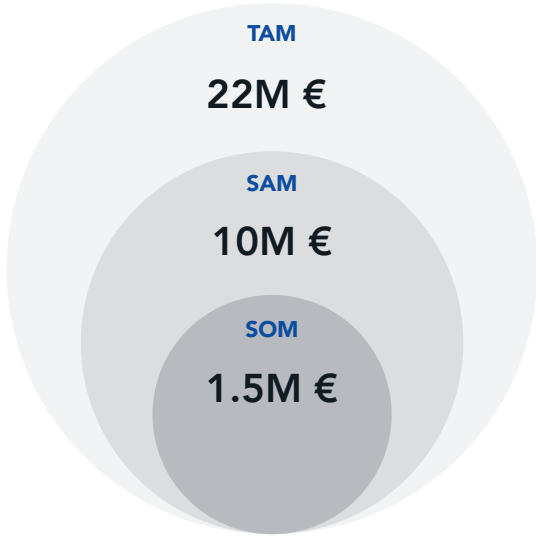
- DreamTrip is an AI powered mobile app that creates hyper personalized travel itineraries tailored to user preferences such as gastronomy, history, arts, sustainability, and wellness.
- The app integrates lesser known points of interest, cultural heritage spots, and small local businesses into each route, fostering local discovery.
- Through real time routing, users can adjust their itineraries on the go, avoiding crowds and discovering unique spots based on mood, weather, or live recommendations.
- Premium features such as exclusive routes, more personalization, gamification boosts, trip history, and personal travel log are available for a fee, while the base experience remains free and rich.
- Gamification rewards travelers for exploring sustainable options and supporting local commerce, points based ranking, badges, and eco friendly travel achievements.
- By promoting sustainable tourism, DreamTrip helps disperse tourist flows, supporting municipal efforts to balance local and traditional businesses, strengthen local economies, and protect cultural identity while offering travelers richer, more meaningful experiences.

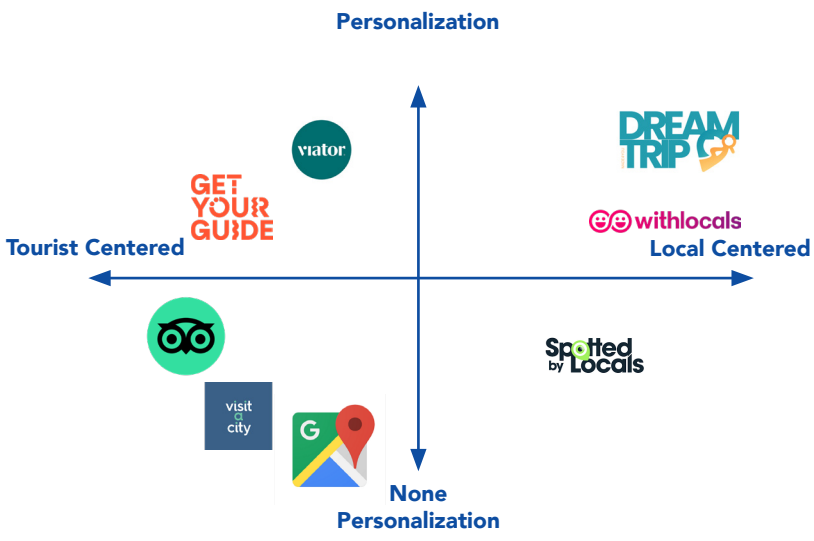
DreamTrip transforms travel into a personalized, authentic, and sustainable journey that supports local businesses and reduces tourist overcrowding.

Market

- Europe welcomes over 755.7 million international tourists annually, accounting for 51.6% of all global arrivals [296].
- In 2023, Spain was the most visited tourism destination in the EU for international tourists, with 302 million nights spent in tourist accommodation establishments, or 21.9% of the EU total [297].
- Valencia welcomes more than 2 million visitors annually, with growing municipal initiatives promoting decentralized, sustainable tourism [298, 299].
- 79% of Gen Z and Millennials consider leisure travel a priority, and 84% would rather go on a dream holiday than buy a new, luxury item. 79% also said they want to immerse themselves in the lives of the local people in the places they visit and to have authentic experiences. Local food and specialities are important to this generation [300].
- Local businesses in mid sized European cities play a vital social role by fostering vibrant, connected communities, yet they remain largely excluded from global travel apps, creating a significant gap in the digital tourism landscape [301, 302].

DreamTrip captures Europe's shift toward sustainable, personalized travel while reviving the social and cultural value of local businesses.





Competition

- Google Maps and TripAdvisor dominate the navigation and review landscape globally. They provide broad coverage of venues and comprehensive user reviews. However, their algorithms largely prioritize mainstream, popular attractions and businesses, often leading to repetitive recommendations focused on well known spots.
- Platforms like GetYourGuide and Viator offer structured tours but lack freedom, flexibility, or gamified interaction, as well as excluding small businesses without large marketing budgets.
- Withlocals and Spotted by Locals provide curated tips, but not automated, self guided itineraries and real time routing or reward based engagement.
- DreamTrip's unique value lies in AI powered personalization, flexible routing, dynamic itineraries, and direct access to local businesses, offering a seamless way to maximize cultural immersion while relieving pressure on overcrowded tourist areas.
- There is currently no travel app combining smart personalization, gamification, and local empowerment in one seamless B2C platform.

Unlike competitors, DreamTrip uniquely blends personalization, decentralization, and local business empowerment in the European tourism landscape.

Assumption Tree

Dissatisfaction in Crowded Destinations

Visitors would prefer personalized travel plans that help them discover unique destinations outside the common tourist hotspots. Growing dissatisfaction with crowded tourist attractions and generic recommendations drives demand for a service that makes travel feel more tailored and less predictable, improving quality of experience for both tourists and local communities.

Government Interest and Support

Local governments see value in encouraging sustainable tourism that alleviates overcrowding and supports economic diversity. By promoting apps like DreamTrip, authorities can better manage tourist flows, preserve cultural heritage, and boost local economies. Government endorsement and collaboration help integrate policy goals with AI-driven solutions, fostering long-term community well-being and resilience.

Gamification Enhances Engagement

Integrating gamification elements like challenges, and leaderboards motivates users to actively engage with the app, explore hidden spots, and share achievements. Gamified experiences make travel planning fun and rewarding, encouraging discovery beyond popular sites. This drives user retention, promotes sustainable tourism, and strengthens community ties through social and competitive features.

Impact on Local Business

Mass tourism often causes traditional, locally owned businesses to be replaced by large chains and franchises catering mainly to tourists. As property values and rents in popular areas rise, smaller community shops can no longer afford to operate, leading to the loss of neighborhood character and economic diversity.

Modern Travels Preferences

Modern travelers value convenience, authenticity, and personalization. They increasingly expect digital services to recommend points of interest, food, culture, and events based on personal interests, needs, budget, and schedules. People want to maximize their travel experience and minimize planning time, especially when visiting unfamiliar locations.

Technology Adoption

AI can process large datasets, such as user profiles, local events, and site capacities in real time to build custom travel itineraries. By analyzing preferences and even feedback from similar users, AI engines ensure plans are uniquely tailored and adapt instantly if user needs or circumstances change during the trip.

The New Experience in Traveling

DreamTrip uses AI to create detailed, day by day plans tailored to each visitor. The app suggests hidden gems and local favorites, balancing personal interests and real time crowd data to shift visitors away from congested areas. DreamTrip partners with local businesses, communities and government to promote under-visited places.

LIST OF CONTRIBUTORS

Adrián Fernández
Computer Engineering

Ivan Gilabert
Informatics Engineering

Kenza Tantaoui
Business Administration and Management

Noufel Garcés
Multimedia Engineering

Carlos Gómez
Aeronautical Engeneering

Karla Mariana Reséndiz
Agrifood Economics

Mohamed Benhaddi
Business Management and Law

Gonzalo Martin
Industrial Computer Science and Robotics

Jorge Antonio Gatica
Energy Technologies

Pau Sena
Computer Science and Business Management

Sergio Pérez
Physics and Mathematics

Miguel Padura
Aerospace Engineering

Juan Pablo Endrino
Economics

CDTM MANAGEMENT TEAM

Adrián Villanueva Martínez
M.Sc. Sustainability

Alicia Durán González
M.A. Conservation and Restoration of Cultural Heritage

Pedro Sáez Martínez
M.Sc. Circular Economy and Sustainable Development

Rocío Navarro Utiel
M.Sc. Analytical Science

Teresa Latorre Carrascosa
M.Sc. Agri-Food and Environmental Economy

Zoe Helbing
M.Sc. Environmental Science

BOARD OF DIRECTORS

José Alberto Conejero Casares
Vice-rector for Innovation and Transfer
Universitat Politécnica de València

Salvador Coll Arnau
Vice-rector for Innovation and Transfer
Universitat Politécnica de València

Pedro Miguel Carrasco Sorli
Director of UV's Scientific Parc
Universitat de València

Rosa Donat Beneito
Vice-rector for Innovation and Transfer
Universitat de València

OTHER PUBLICATIONS

2025

The Future of Infrastructure: Innovations Shaping the Industry

2024

The Future of Elderly Care in Nursing Homes
ISBN: 978-84-09-65658-5

2024

The Future of Software Engineering & IT Operations
ISBN: 978-3-9826340-1-2

2024

The Future of Utilities in the Era of AI
ISBN: 978-3-9826340-0-5

2023

The Future of Digital Solutions for Sustainable Aviation
ISBN: 978-3-9822669-6-1

2023

The Future of Maritime Shipping
ISBN: 978-3-9822669-7-8

2023

The Future of Communication Technology
ISBN: 978-3-9822669-5-4

2022

The Future of Mittelstand
ISBN: 978-3-9822669-4-7

2022

Tackling Climate Change in the AI Era
ISBN: 978-3-9822669-3-0

SOURCES

[1] Eduardo O, S., & Milton E, S. (2023). Empowering IoT Development with LPWAN Technology: A Case Study at the National University of Misiones. Revista de Ciencia y Tecnología, (40), 7-7. https://doi.org/10.36995/j.recyt.2023.40.007

[2] European Commission. (2020). The European Green Deal: Striving to be the first climate-neutral continent Retrieved July 3, 2025, from https://ec.europa.eu/newsroom/know4pol/items/664852

[3] Chaudhari, B. S., Zennaro, M., & Borkar, S. (2020). LPWAN technologies: Emerging application characteristics, requirements, and design considerations. Future Internet, 12(3), 46. https://doi.org/10.3390/fi12030046

[4] Mroue, M., Ramadan, A., Nasser, A., & Zaki, C. (2024). LPWAN Technologies in Smart Cities: A Comparative Analysis of LoRa, Sigfox. In Information System Design: Communication Networks and IoT: Proceedings of Eighth International Conference on Information System Design and Intelligent Applications (ISDIA 2024), Volume 2 (Vol. 2, p. 219). Springer Nature. https://doi.org/10.1007/978-981-97-4895-2_18

[5] Hossain, M. I., & Markendahl, J. I. (2021). Comparison of LPWAN technologies: Cost structure and scalability. Wireless Personal Communications, 121(1), 887-903. https://doi.org/10.1007/s11277-021-08664-0

[6] NTT Ltd. (2025). CILE boosts water conservation with IoT and LoRaWAN. [Case study]. Retrieved July 3, 2025 from https://services.global.ntt/en-us/about-us/case-studies/cile

[7] Marcul, Ł., Brzozowski, M., & Janicki, A. (2024). Using beacons with optical sensors and LoRaWAN transmission. arXiv. https://arxiv.org/abs/2406.18455

[8] Semtech Corporation. (2024). Smart energy use case: Ensuring reliable gas supply and increasing infrastructure safety—Vestitel deploying 100,000 smart gas meters across Bulgaria. Semtech. Retrieved July 3, 2025, from https://www.semtech.com/uploads/technology/LoRa/app-briefs/Semtech-UseCase-Vestitel-smart_energy.pdf

[9] Alghamdi, A. M., Khairullah, E. F., & Al Mojamed, M. M. (2022). LoRaWAN performance analysis for a water monitoring and leakage detection system in a housing complex. Sensors, 22(19), 7188. https://doi.org/10.3390/s22197188

[10] Iglesias-Rey, P. L., Martínez-Alzamora, F., & Martínez-Solano, F. J. (2024). Smart Water and Digital Transition in Water Systems. Journal of Hydroinformatics, 26(12), iii-v. https://doi.org/10.2166/HYDRO.2024.107

[11] Pagano, A., Garlisi, D., Tinnirello, I., Giuliano, F., Garbo, G., Falco, M., & Cuomo, F. (2025). A survey on massive IoT for water distribution systems: Challenges, simulation tools, and guidelines for large-scale deployment. Ad Hoc Networks, 168, 103714.

[12] Netmore Group. (2024). Yorkshire Water's smart metering transformation: A LoRaWAN® success story [Case study]. Semtech. https://www.semtech.com/uploads/customer_stories/CS-Netmore-Case-Study.pdf

[13] Khairullah, E. F., Alghamdi, A. M., Al Mojamed, M. M., & Zeadally, S. (2025). LoRaWAN-based smart water management IoT applications: a review. Journal of Information and Telecommunication, 1-27. https://doi.org/10.1080/24751839.2025.2458889 frontiersin.org+3

[14] Agostinelli, S. O. F. I. A., & Cumo, F. A. B. R. I. Z. I. O. (2022). Machine learning approach for predictive maintenance IN an advanced building management system. Energy Production and Management in the 21st Century V: The Quest for Sustainable Energy, 255, 131. DOI: 10.1007/978-3-031-29515-7_8

[15] Wu, P., Zhang, Z., Peng, X., & Wang, R. (2024). Deep learning solutions for smart city challenges in urban development. Scientific Reports, 14(1), 5176. https://doi.org/10.1038/s41598-024-55928-3

[16] Teng, S., Chen, X., Chen, G., Cheng, L., & Bassir, D. (2022). Structural damage detection based on convolutional neural networks and population of bridges. Measurement, 202, 111747. https://doi.org/10.1016/j.measurement.2022.111747

[17] Hikida, F. J. (2024). High-resolution urban heat modeling: CNN-based predictions in San Francisco. National High School Journal of Science. Retrieved July 2, 2025, from https://nhsjs.com/2024/high-resolution-urban-heat-modeling-cnn-based-predictions-in-san-francisco/

[18] Lawal, O. O., Nawari, N. O., & Lawal, O. (2025). AI-enabled cognitive predictive maintenance of urban assets using city information modeling—Systematic review. Buildings, 15(5), 690. https://doi.org/10.3390/buildings15050690

[19] Jang, H. C., & Chen, C. A. (2024). Urban Traffic Flow Prediction Using LSTM and GRU. Engineering Proceedings, 55(1), 86. https://doi.org/10.3390/engproc2023055086

[20] Mansouri, W., Alohali, M. A., Alqahtani, H., Alruwais, N., Alshammeri, M., & Mahmud, A. (2025). Deep convolutional neural network-based enhanced crowd density monitoring for intelligent urban planning on smart cities. Scientific Reports, 15(1), 5759. https://doi.org/10.1038/s41598-025-90430-4

[21] Yang, J., & Kwon, Y. (2023). Novel CNN-Based Approach for reading urban form data in 2D images: An application for predicting restaurant location in Seoul, Korea. ISPRS International Journal of Geo-Information, 12(9), 373. https://doi.org/10.3390/ijgi12090373

[22] Pan, X., Liu, Z., He, C., & Huang, Q. (2022). Modeling urban expansion by integrating a convolutional neural network and a recurrent neural network. International Journal of Applied Earth Observation and Geoinformation, 112, 102977. https://doi.org/10.1016/j.jag.2022.102977

[23] Devi, T., Alice, K., & Deepa, N. (2022). Traffic management in smart cities using support vector machine for predicting the accuracy during peak traffic conditions. Materials Today: Proceedings, 62, 4980-4984. https://doi.org/10.1016/j.matpr.2022.03.722

[24] Singh, V., Sahana, S. K., & Bhattacharjee, V. (2025). A novel CNN-GRU-LSTM based deep learning model for accurate traffic prediction. Discover Computing, 28(1), 38. https://doi.org/10.1007/s10791-025-09526-0

[25] Alqasi, M. A. Y., Alkelanie, Y. A. M., & Alnagrat, A. J. A. (2024). Intelligent infrastructure for urban transportation: the role of artificial intelligence in predictive maintenance. Brilliance: Research of Artificial Intelligence, 4, 625-637. https://doi.org/10.47709/brilliance.v4i2.4889

[26] Florian, E., Sgarbossa, F., & Zennaro, I. (2021). Machine learning-based predictive maintenance: A cost-oriented model for implementation. International Journal of Production Economics, 236, 108114 https://doi.org/10.1016/j.ijpe.2021.108114

[27] Elia. (2023, October 26). Occupancy analytics. Retrieved July 2, 2025, from https://www.elia.io/blog/occupancy-analytics

[28] Katsamenis, I., Bimpas, M., Protopapadakis, E., Zafeiropoulos, C., Kalogeras, D., Doulamis, A., ... & Lopez, R. (2022, June). Robotic maintenance of road infrastructures: The heron project. In Proceedings of the 15th International Conference on Pervasive Technologies Related to Assistive Environments (pp. 628-635). https://doi.org/10.1145/3529190.3534746

[29] Oliha, J. S., Biu, P. W., & Obi, O. C. (2024). Securing the smart city: a review of cybersecurity challenges and strategies. Open Access Research Journal of Multidisciplinary Studies, 7(1), 94-101. https://doi.org/10.53022/oarjms.2024.7.1.0013

[30] Almeida, F. (2023). Prospects of cybersecurity in smart cities. Future Internet, 15(9), 285. https://www.mdpi.com/1999-5903/15/9/285

[31] Chaudhuri, A., & Bozkus Kahyaoglu, S. (2023). Cybersecurity assurance in smart cities: A risk management perspective. Edpacs, 67(4), 1-22. https://doi.org/10.1080/07366981.2023.2165293

[32] Botella, M. G., Serrano, E . O., & Maudos, E. L. Towards a Secure City: The Contribution of the Smart City Physical Demonstrator in Threat Assessment. https://personales.upv.es/thinkmind/dl/conferences/iariacongress/iaria_congress_2023/iaria_congress_2023_1_200_50159.pdf

[33] Tok, Y. C., & Chattopadhyay, S. (2023). Identifying threats, cybercrime and digital forensic opportunities in Smart City Infrastructure via threat modeling. Forensic Science International: Digital Investigation, 45, 301540. https://doi.org/10.1016/j.fsidi.2023.301540

[34] Hossain, S. T., Yigitcanlar, T., Nguyen, K., & Xu, Y. (2025). Cybersecurity in Local Governments: A Systematic Review and Framework of Key Challenges. Urban Governance. https://doi.org/10.1016/j.ugj.2024.12.010

[35] Aslam, M., Khan Abbasi, M. A., Khalid, T., Shan, R. U., Ullah, S., Ahmad, T., ... & Ahmad, R. (2022). Getting smarter about smart cities: Improving data security and privacy through compliance. Sensors, 22(23), 9338. https://www.mdpi.com/1424-8220/22/23/9338

[36] Kidmose, B. (2024). A review of smart vehicles in smart cities: Dangers, impacts, and the threat landscape. Vehicular Communications, 100871. https://doi.org/10.1016/j.vehcom.2024.100871

[37] Ishak, K. K., Mat Razali, N. A., Malizan, N. A., Sulong, G., & Md Johar, M. G. (2024). Smart Cities' Cybersecurity and IoT: Challenges and Future Research Directions. IAENG International Journal of Computer Science, 51(7). https://www.researchgate.net/publication/390303077_Smart_Cities'_Cybersecurity_and_IoT_Challenges_and_Future_Research_Directions

[38] Happer, Carter. (2025). Cybersecurity Challenges In Smart City Infrastructure: Safeguarding Iot And Critical Urban Systems.

[39] Goupil, F., Laskov, P., Pekaric, I., Felderer, M., Dürr, A., & Thiesse, F. (2022, July). Towards understanding the skill gap in cybersecurity. In Proceedings of the 27th ACM Conference on Innovation and Technology in Computer Science Education Vol. 1 (pp. 477-483). https://dl.acm.org/doi/abs/10.1145/3502718.3524807

[40] Yedalla, J. (2025). Building cyber-Resilient Smart Cities: The role of AI and big data in urban security. International Journal of Science and Research (IJSR), 14(2), 648-652. https://www.researchgate.net/publication/389253491_Building_Cyber_-Resilient_Smart_Cities_The_Role_of_AI_and_Big_Data_in_Urban_Security

[41] Taylor, J., Culligan, P., Derrible, S., Jain, R., & Lam, D. (2019). Smart City Digital Twin Convergence Workshop.

[42] The Business Research Company. (2024). Augmented reality services global market report 2024. https://www.thebusinessresearchcompany.com/report/augmented-reality-services-global-market-report

[43] Dasgupta, S., Rahman, M., & Jones, S. (2024). Harnessing digital twin technology for adaptive traffic signal control: Improving signalized intersection performance and user satisfaction. IEEE Internet of Things Journal. doi: 10.1109/JIOT.2024.3420439.

[44] Premier Science. (2024). AI-driven smart building management systems: Enhancing the accuracy and efficiency of energy usage. Premier Journal of Data Science, 2(4). https://premierscience.com/pjds-24-271/

[45] Jahangir, M. F., Leslie Schultz, C. P., & Kamari, A. (2024). A review of drivers and barriers of Digital Twin adoption in building project development processes. Journal of Information Technology in Construction, 29. http://www.itcon.org/2024/8

[46] Kuštelega, M., Mekovec, R., & Shareef, A. (2024). Privacy and security challenges of the digital twin: systematic literature review. Journal of Universal Computer Science (JUCS), 30(13). https://doi.org/10.3897/jucs.114607

[47] Setter, R. (2024, May 23). How AI is arming cities in the battle for climate resilience. Reuters. https://www.reuters.com/sustainability/climate-energy/how-ai-is-arming-cities-battle-climate-resilience-2024-05-23/

[48] Reaver, K. (2023). Augmented reality as a participation tool for youth in urban planning processes: Case study in Oslo, Norway. Frontiers in Virtual Reality, 4, 1055930. https://doi.org/10.3389/frvir.2023.1055930

[49] Pasupuleti, M. K. (2025). Next-Generation Extended Reality (XR): A Unified Framework for Integrating AR, VR, and AI-driven Immersive Technologies. International Journal of Academic and Industrial Research Innovations (IJAIRI), 5(3). https://www.researchgate.net/publication/390056034_Next-Generation_Extended_Reality_XR_A_Unified_Framework_for_Integrating_AR_VR_and_AI-driven_Immersive_Technologies

[50] Simonofski, A., Johannessen, M. R., & Stendal, K. (2024). Extended reality for citizen participation: A conceptual framework, systematic review and research agenda. Sustainable Cities and Society, 113, 105692. https://doi.org/10.1016/j.scs.2024.105692

[51] Bibri, S. E., & Krogstie, J. (2023). Urban Digital Twin Challenges: A Systematic Review and Perspectives for Sustainable Smart Cities. Sustainable Cities and Society, 99, 104862. https://doi.org/10.1016/j.scs.2023.104862

[52] Lei, B., Janssen, P., Stoter, J., & Biljecki, F. (2023). Challenges of urban digital twins: A systematic review and a Delphi expert survey. Automation in Construction, 147, 104716. https://doi.org/10.1016/j.autcon.2022.104716

[53] Sánchez-Vaquerizo, J. A. (2025). Urban Digital Twins and metaverses towards city multiplicities: uniting or diving urban experiences? Ethics and Information Technology, 27, 4. https://doi.org/10.1007/s10676-024-09812-3

[54] Gilman, E., Bugiotti, F., Khalid, A., Mehmood, H., Kostakos, P., Tuovinen, L., Ylipulli, J., Su, X., & Ferreira, D. (2024). Addressing data challenges to drive the transformation of smart cities. ACM Transactions on Intelligent Systems and Technology, 15(5). https://doi.org/10.1145/3663482

[55] OECD (2023), Smart City Data Governance: Challenges and the Way Forward, OECD Urban Studies, OECD Publishing, Paris, https://doi.org/10.1787/e57ce301-en.

[56] (Allam, Z., & Dhunny, Z. A. (2019). On big data, artificial intelligence and smart cities. Cities, 89, 80–91. https://doi.org/10.1016/j.cities.2019.01.032

[57] Razavian, B., Hamed, S. M., Fayyaz, M., Ghasemi, P., Ozkul, S., & Tirkolaee, E. B. (2024). Addressing barriers to big data implementation in sustainable smart cities: Improved zero-sum grey game and grey best-worst method. Journal of Innovation & Knowledge, 9(4). https://doi.org/10.1016/j.jik.2024.100593

[58] IDC. (July 27, 2020). Data volume of internet of things (IoT) connections worldwide in 2019 and 2025 (in zettabytes) [Graph]. In Statista. Retrieved July 15, 2025, from https://www.statista.com/statistics/1017863/worldwide-iot-connected-devices-data-size/

[59] Statista. (September 5, 2024). Smart city connections in Europe from 2018 to 2029 (in millions) [Graph]. In Statista. Retrieved July 15, 2025, from https://www.statista.com/forecasts/1490708/smart-city-connections-in-europe

[60] Gondhalekar, G., Tewari, D., Balakrishnan, P., Bhardwaj, I., Ponnusamy, S., & Ananthi, S. (2025). Internet of Things Integration in Smart Cities Enhancing Urban Living through Connected Technologies. ITM Conferences. https://www.itm-conferences.org/articles/itmconf/pdf/2025/07/itmconf_icsice2025_03001.pdf

[61] Ezpeleta, V. R. (2024, October 21). OBS Report: Smart Cities. OBS Business School. https://www.obsbusiness.school/en/faculty-and-research/reports/obs-report-smart-cities

[62] Amazon Web Services. (n.d.). Amazon S3 Pricing - Cloud Object Storage - AWS. https://aws.amazon.com/s3/pricing/?nc1=h_ls

[63] Tarmidi, Z. (2025). Integration of spatial data infrastructures in smart city development: A review. Jurnal Kejuruteraan, 37(2), 635–646. https://doi.org/10.17576/jkukm-2025-37(2)-07

[64] AdapteCCa (2025). Visor de Escenarios de Cambio Climático. Agencia Estatal de Meteorología. https://escenarios.adaptecca.es/#&model=CMIP6-spain.

[65] Romanello et al., 2022. The 2022 report of the Lancet Countdown on health and climate change: health at the mercy of fossil fuels. The Lancet, Volume 400, Issue 10363, 1619 - 1654. https://www.thelancet.com/article/S0140-6736(22)01540-9/fulltext

[66] Spinoni et al., (2020). Future Global Meteorological Drought Hot Spots: A Study Based on CORDEX Data. Journal of Climate, 33(9), 3635-3661. https://journals.ametsoc.org/view/journals/clim/33/9/jcli-d-19-0084.1.xml

[67] Wei & Sobrino, 2024. Surface urban heat island analysis based on local climate zones using ECOSTRESS and Landsat data: A case study of Valencia city (Spain). Volume 130,103875, ISSN 1569-8432. https://www.sciencedirect.com/science/article/pii/S1569843224002292

[68] Mumford, L. (1961). The city in history: Its origins, its transformations, and its prospects. Harcourt, Brace & World.

[69] Glaeser, E. L. (2011). Triumph of the city: How our greatest invention makes us richer, smarter, greener, healthier, and happier. Penguin Press.

[70] OECD. (2021). Teleworking in the COVID-19 pandemic: Trends and prospects (OECD Policy Responses to Coronavirus (COVID-19)). OECD Publishing. https://doi.org/10.1787/72a416b6-en

[71] Rubino, M., García-Clemente, J., & Quesada, S. (2024). SAGE Open, 14(2). https://doi.org/10.1177/21582440241255634

[72] Zukin, S. (1995). The cultures of cities. Blackwell.

[73] Ayuntamiento de Valencia. (2025, February 3). València cerró 2024 con un 10,3% más de pernoctaciones pese al impacto de la dana en los meses de noviembre y diciembre. https://www.valencia.es/cas/actualidad/-/content/crecen-10-3-pernoctaciones-2024-en-val%C3%A8ncia

[74] Valencia Plaza. (2023, December 24). De València al área metropolitana: miles de vecinos dejan la capital por otro municipio de la provincia. https://valenciaplaza.com/valenciaplaza/valencia-area-metropolitana-miles-vecinos-dejan-capital-otro-municipio-provincia

[75] Valencia Plaza. (2024, August 20). El teletrabajo crece en la Comunitat: supera las 300.000 personas, pero sigue por debajo de la media. https://valenciaplaza.com/valenciaplaza/

[76] Idealista. (2025, June). Evolución del precio de la vivienda en alquiler en Valencia. Idealista Sala de prensa. https://www.idealista.com/sala-de-prensa/informes-precio-vivienda/alquiler/comunitat-valenciana/valencia-valencia/valencia/

[77] Sassen, S. (2001). The global city: New York, London, Tokyo (2nd ed.). Princeton University Press.

[78] Jacobs, J. (1961). The death and life of great American cities. Random House.

[79] Jiménez-Roger, B., & Sánchez, M. (2023). Intergenerational contact and solidarity, inside and outside the family: patterns in Spain. Ageing and Society, 43(2), 421–446. https://doi.org/10.1017/S0144686X21000659

[80] Eurostat (2023). Household composition in Europe. Retrieved July 7, 2025 from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Household_composition_statistics

[81] OECD (2019). OECD health statistics 2019 definitions, sources and methods, beds in residential long-term care facilities. Retrieved July 7, 2025 from https://stats.oecd.org/

[82] Parker, K. & Minkin, R. (2023). American Views on the Modern Family in 2023: A Pew Research Center Study, Pew Research Center. United States of America. Retrieved from https://coilink.org/20.500.12592/53btcm on 7 Jul, 2025. COI: 20.500.12592/53btcm

[83] Radesky, J. S., Schumacher, J., & Zuckerman, B. (2015). Mobile and interactive media use by young children: The good, the bad, and the unknown. Pediatrics, 135, 1-3. https://doi.org/10.1542/peds.2014-2251

[84] McDaniel, B. T., & Radesky, J. (2017). Technoference: Parent distraction by technology and associations with child behavior problems. https://doi.org/10.1111/cdev.12822

[85] Mogi R, Esteve A, Skirbekk VF. (2022). The Decline of Spanish Fertility: The Role of Religion. Eur J Population 38, 1333–1346 (2022). https://doi.org/10.1007/s10680-022-09644-1

[86] Adema, W., Clarke, C., & Thévenon, O. (2020). Family policies and family outcomes in OECD countries. Cham: Springer International Publishing. In The Palgrave handbook of family policy (pp. 193-217).

[87] UNICEF. (2025). Innocenti – Global Office of Research and Foresight. Childhood in a Digital World: Screen time, skills and mental health. UNICEF Innocenti, Florence. Retrieved July 7, 2025 from https://www.unicef.org/innocenti/reports/childhood-digital-world

[88] OECD (2022). Evolving Family Models in Spain: A New National Framework for Improved Support and Protection for Families, OECD Publishing, Paris, https://doi.org/10.1787/c27e63ab-en.

[89] Domínguez-Mujica, J. (2021). The urban mirror of the socioeconomic transformations in Spain. Urban Science, 5(13). https://doi.org/10.3390/urbansci5010013

[90] Castells, M. (2020). Space of flows, space of places: Materials for a theory of urbanism in the information age In The City Reader, 7th ed.; LeGates, R.T., Stout, F., Eds.; Routledge: London, UK, pp. 572–582. Retrieved July 8, 2025 from https://www.taylorfrancis.com/chapters/edit/10.4324/9780429261732-30/space-flows-space-places-materials-theory-urbanism-information-age-manuel-castells

[91] Pérez-Saiz, L., Ferri-Sanz, M., Canas, M., Fernandez, M., Ferrando, M., & Dix, R. (2024, December 13). Health and well-being of older people in the city of Valencia: A comprehensive study. Healthcare, 12(24), Article 2526. https://doi.org/10.3390/healthcare12242526 (PMCID PMC11675918)

[92] Instituto Nacional de Estadística. (2023). Cifras de población. Retrieved from accessing Padrón Municipal data for Valencia province for 2021, 2022, and 2023.

[93] Cuadrado, P., Fernández, A., Montero, J. M., & Rodríguez, F. J. (2023). The impact of population ageing on the labour force participation rate in Spain. Economic Bulletin 3/2023, Banco de España. https://www.bde.es/f/webbe/SES/Secciones/Publicaciones/InformesBoletinesRevistas/BoletinEconomico/23/T3/Files/be2303-art12e.pdf

[94] Fundación CENIE. (2022). La sociedad envejecida y los ascensores en España. Centro Internacional sobre el Envejecimiento. https://cenie.eu/en/ageing-society-and-elevators

[95] Organización de Consumidores y Usuarios (OCU). (2017). El 82 % de los mayores españoles quiere envejecer en su propia casa [Press release]. https://www.ocu.org/organizacion/prensa/notas-de-prensa/2017/mayores-vivienda-07122017d

[96] Instituto Nacional de Estadística. (2024, February 28). Movimiento Natural de la Población (Nacimientos, Defunciones y Matrimonios). Datos Provisionales año 2023. Press Release. https://www.ine.es/prensa/mnp_2023_p.pdf

[97] OECD. (n.d.). OECD Regional Well-Being: Valencia. Retrieved from https://oecdregionalwellbeing.org/ES52.html

[98] Cedefop. (2023, November 21). Spain: boosting tools for upskilling and reskilling citizens in digital skills. Retrieved from https://www.cedefop.europa.eu/en/news/spain-boosting-tools-upskilling-and-reskilling-citizens-digital-skills

[99] Nicoletti, L., Sirenko, M., & Verma, T. (2022). Disadvantaged communities have lower access to urban infrastructure. arXiv Preprint. https://arxiv.org/abs/2203.13784

[100] Dey R., Lewis S., (2021). Chapter 6 - Natural disasters linked to climate change. The Impacts of Climate Change. 177-193. https://doi.org/10.1016/B978-0-12-822373-4.00004-5.

[101] Yin, J., Gentine, P., Zhou, S., Sullivan, S.C., Wang, R., Zhang, Y., Guo, S., (2018). Large increase in global storm runoff extremes driven by climate and anthropogenic changes. Nat. Commun. 9 (1), 1–10.

[102] Faranda, D., Álvarez-Castro, C., Ginesta, M., Coppola, E., & Pons, F. (2024). Heavy Precipitations in South-Eastern Spain DANA mostly strengthened by human-driven climate change. (ClimaMeter Analysis).

[103] Schneider, S.H., Semenov, S., Patwardhan, A., Burton, I., Magadza, C.H.D., Oppenheimer, M., Pittock, A.B., Rahman, A., Smith, J.B., Suarez, A., Yamin, F. (2007). Assessing key vulnerabilities and the risk from climate change. In: Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J., Hanson, C.E. (eds) Climate change 2007: impacts, adaptation and vulnerability. Contribution of working group II to the fourth assessment report of the intergovernmental panel on climate change, Cambridge University Press, Cambridge, UK, pp 779–810.

[104] Sauerborn, R., Ebi, K., & Kovats, S. (2012). Climate change and natural disasters – integrating science, preparedness, and response. Global Health Action, 5, 18557. https://doi.org/10.3402/gha.v5i0.18557.

[105] Van-Aalst, M. K. (2006). The impacts of climate change on the risk of natural disasters. Disasters, 30(1), 5–18. https://doi.org/10.1111/j.1467-9523.2006.00303.x

[106] Gebreyes, M., Tesfaye, K., & Feleke, B. (2017). Climate change adaptation-disaster risk reduction nexus: case study from Ethiopia. International Journal of Climate Change Strategies and Management, 9(6), 829-845. https://doi.org/10.1108/IJCCSM-01-2016-0006.

[107] Bouska, K.L., Booker, J., Clark, S., Delaney, J., Eash, J., Post van der Burg, M., and Roop, H. (2025). Managing for tomorrow—A climate adaptation decision framework. U.S. Geological Survey Open-File Report 2025–1005, 53 p. https://doi.org/10.3133/ofr20251005.

[108] Zhou, K., Kong, F., Yin, H. et al. Urban flood risk management needs nature-based solutions: a coupled social-ecological system perspective. npj Urban Sustain 4, 25 (2024). https://doi.org/10.1038/s42949-024-00162-z.

[109] Musa, S.(2016). Smart cities—A roadmap for development. J. Telecommun. Syst. Manag. 5, 1–3.

[110] Borsekova, K.; Nijkamp, P.; Guevara, P. (2018). Urban resilience patterns after an external shock: An exploratory study. Int. J. Disaster.

[111] Elvas, L.B., Mataloto, B.M., Martins, A.L., & Ferreira, J.C. (2021). Disaster Management in Smart Cities. Smart Cities, 4(2), 819–839. https://doi.org/10.3390/smartcities4020042.

[112] Schewe, J., Gosling, S.N., Reyer, C., Zhao, F., Ciais, P., Elliott, J., Seneviratne, S.I., 2019. State-of-the-art global models underestimate impacts from climate extremes. Nat. Commun. 10 (1), 1–14.

[113] Mizrahi, S. (2016). Cascading disasters, information cascades and continuous time models of domino effects. Int. J. Disaster Risk Reduct.

[114] Ayuntamiento de Valencia. decidimvlc. decidimvlc help. Retrieved July 04, 2025, from https://decidimvlc.valencia.es/help.

[115] Interreg Central Europe. (2023, 08). Tactical Urbanism and Digital Campaigning (1). popupurbanspaces. Retrieved July 06, 2025, from https://www.interreg-central.eu/wp-content/uploads/2023/10/PopUpUrbanSpaces_BaselineStudy_final.pdf

[116] Dias Porto, H., & Rena, N. (2024). Participatory Budgeting In The Global South: Towards A New International Diffusion. Revista Brasileira De Estudos Urbanos E Regionais, 26, 13. Https://Doi.Org/10.22296/2317-1529.Rbeur.202432pt

[117] Generalitat Valenciana. (2022). participem.gva. Presupuesto del proceso. Retrieved July 04, 2025, from https://participem.gva.es/es/pressupost-del-proces

[118] Wampler, B. (2007). A Guide to Participatory Budgeting. In Participatory Budgeting (pp. 21-53). World Bank. Public Sector Governance and Accountability Series. 10.1596/978-0-8213-6923-4

[119] European Commission. (2024, February 28). EU Mission: Climate-Neutral and Smart Cities. Research and innovation. Retrieved July 06, 2025, from https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/climate-neutral-and-smart-cities_en

[120] European Union. (2024). Directive (Eu) 2024/1275 Of The European Parliament And Of The Council Of 24 April 2024 On The Energy Performance Of Buildings. Official Journal Of The European Union, (2024/1275).https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202401275

[121] European Investment Bank. (2024, December 23). Valencia Clean Urban Transport Fleet Renewal II. Retrieved June 28, 2025, from https://www.eib.org/en/projects/all/20240040

[122] Eurostat. (2025, June 18). New passenger cars by type of motor energy. Road transport data. Retrieved July 06, 2025, from https://ec.europa.eu/eurostat/databrowser/view/road_eqr_carpda__custom_14298999/bookmark/table?lang=en&bookmarkId=9f575f9d-a599-4b64-b71a-4dfe93de31ed

[123] World Economic Forum & McKinsey & Company. (2025, January). Circularity in the Built Environment: Unlocking Opportunities in Retrofits. Retrieved 01 June, from

https://www.mckinsey.com/industries/engineering-construction-and-building-materials/our-insights/circularity-in-the-built-environment-unlocking-opportunities-in-retrofits#/

[124] Lorenzo Saez, E., Oliver Villanueva, J. V., Lemus Zúñiga, L. G., Coll Aliaga, E. P., Perpiñá Castillo, C., & Lavalle, C. (2021). Assessment of an air quality surveillance network through passive pollution measurement with mobile sensors. Environmental Research Letters, 16(5), 054072. https://doi.org/10.1088/1748-9326/abf5c1

[125] Gordillo Urresta, J. P. (2021). Environmental noise evaluation produced by road traffic in one of the most populated neighborhoods of Valencia, Spain (Master's thesis, Universidad Internacional de Andalucía). UNIA Digital Repository. http://hdl.handle.net/10334/6595

[126] Ajuntament de València. (2024). Zona de bajas emisiones. Retrieved June 28, 2025, from https://www.valencia.es/cas/pagina-de-categoria/-/asset_publisher/JzpZn9jBadjS/content/zona-bajas-emisiones

[127] European Investment Bank. (2024, December 23). Valencia Clean Urban Transport Fleet Renewal II. Retrieved June 28, 2025, from https://www.eib.org/en/projects/all/20240040

[128] Kirchner, M. (2024). Analysing the distributional effects of low emission zones: A case study of the city of Barcelona (Master's thesis, Utrecht University). https://studenttheses.uu.nl/handle/20.500.12932/46238

[129] Tarriño-Ortiz, J. et al. (2021). Public Acceptability of Low Emission Zones: The Case of "Madrid Central". Sustainability, 13(6), 3251 https://doi.org/10.3390/su13063251

[130] Williamson, T., Gough, C., & Smith, K. (2022). Quantifying the impact of low- and zero-emission zones: Evidence review. Clean Cities Campaign.

[131] Cátedra Observatorio de la Vivienda de la Universitat Politècnica de València. (2024, octubre). Informe sector inmobiliario Valencia España N° 23 - Tercer trimestre 2024. https://observa.webs.upv.es/wp-content/uploads/2024/10/Informe-Final-3T-2024.pdf

[132] Instituto Nacional de Estadística. (2024, 24 de junio). Proyección de hogares: Años 2024-2039. https://www.ine.es/dyngs/Prensa/PROH20242039.htm

[133] Cátedra Observatorio de la Vivienda de la Universitat Politècnica de València. (2025, abril). Informe sector inmobiliario Valencia España N° 25 - Primer trimestre 2025. https://observa.webs.upv.es/wp-content/uploads/2025/04/Informe-Final-1T-2025.pdf

[134] Agencia Estatal Boletín Oficial del Estado. (2023). Ley 12/2023, de 24 de mayo, por el derecho a la vivienda. https://www.boe.es/eli/es/l/2023/05/24/12

[135] Ministerio de Vivienda, Administración Local y Turismo. (2025). Reforma de la Ley de Propiedad Horizontal [Nota de prensa]. https://www.mivau.gob.es/recursos_mfom/sala_prensa/250401_np_viviendas_uso_turistico.pdf

[136] valencia.es. (2025). Normativa sobre viviendas turísticas en València. Retrieved July 3, from https://www.valencia.es/cas/actualidad/-/content/normativa-viviendas-turísticas-valènci

[137] Parlamento Europeo. (2024, 29 de febrero). New rules for a responsible and transparent short-term rental sector. https://www.europarl.europa.eu/pdfs/news/expert/2024/2/press_release/20240223IPR18094/20240223IPR18094_en.pdf

[138] Mcity. (2023). Privacy frameworks for smart cities. University of Michigan. https://mcity.umich.edu/wp-content/uploads/2023/03/Privacy-Frameworks-for-Smart-Cities_White-Paper_2023.pdf

[139] Eke, D., Stahl, B. Ethics in the Governance of Data and Digital Technology: An Analysis of European Data Regulations and Policies. DISO 3, 11 (2024). https://doi.org/10.1007/s44206-024-00101-6

[140] van Twist, A., Ruijer, E., & Meijer, A. (2023). Smart cities & citizen discontent: A systematic review of the literature. Government Information Quarterly, 40(2), Article 101799. https://www.sciencedirect.com/science/article/pii/S0740624X22001356?via%3Dihub

[141] Bastos, D., Costa, N., Rocha, N. P., Fernández-Caballero, A., & Pereira, A. (2024). A Comprehensive Survey on the Societal Aspects of Smart Cities. Applied Sciences, 14(17), 7823. https://doi.org/10.3390/app14177823

[142] Ishaq, K., & Farooq, S. S. (2023). Exploring IoT in Smart Cities: Practices, Challenges and Way Forward [Preprint]. arXiv. https://arxiv.org/abs/2309.12344?utm_source

[143] European Commission. (2019). Special Eurobarometer 487a: The General Data Protection Regulation (GDPR). Directorate-General for Justice and Consumers. https://cnpd.public.lu/content/dam/cnpd/fr/actualites/international/2019/ebs487a-GDPR-sum-en.pdf

[144]Denker, A. (2021). Protection of privacy and personal data in the big data environment of smart cities. International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, XLVI-4/W5-2021, 181–186. https://doi.org/10.5194/isprs-archives-XLVI-4-W5-2021-181-2021

[145] Lucas, E., & Simpson, S. (2024). Perspectives on citizen data privacy in a smart city – An empirical case study. Convergence, 31(2), 462-478. https://doi.org/10.1177/13548565241247413 (Original work published 2025)

[146] International tourism in Spain- statistics & facts, Statista. Retrieved from https://www.statista.com/topics/6467/inbound-tourism-in-spain/#topicOverview

[147] Fundació Visit València (2022). Estadísticas de Turismo / Tourism Statistics 2022. Retrieved from https://fundacion.visitvalencia.com/en/statistics

[148] Fundació Visit València (2023). Estadísticas de Turismo / Tourism Statistics 2023. Retrieved from https://fundacion.visitvalencia.com/en/statistics

[149] Fundació Visit València (2024). Estadísticas de Turismo / Tourism Statistics 2024. Retrieved from https://fundacion.visitvalencia.com/en/statistics

[150] Instituto Nacional de Estadística (INE). (2025, January). Movimientos turísticos en fronteras (FRONTUR) y gasto turístico (EGATUR) – diciembre 2024. Ministerio de Industria y Turismo, Gobierno de España. Retrieved from https://www.mintur.gob.es/en-us/gabineteprensa/notasprensa/2025/paginas/turismo-frontur-egatur-diciembre-2024.aspx

[151] National Statistics Institute (Spain). "Tourism Satellite Account of Spain. Year 2023".

[152] Our World In Data. "Spain: International tourist trips". 17 August 2024. Retrieved from https://ourworldindata.org/grapher/international-tourist-trips?tab=chart&country=~ESP

[153] Ismael Yrigoy. (2018). Rent gap reloaded: Airbnb and the shift from residential to touristic rental housing in the Palma Old Quarter in Mallorca, Spain. Urban Studies. DOI: 10.1177/0042098018803261.

[154] Belen Rey, Rafael Sánchez & Asun. Galera. (2011). Effect of low-cost airlines on tourism in Spain. A dynamic panel data model. Journal of Air Transport Management. DOI:10.1016/j.jairtraman.2010.12.004.

[155] IVACE (2024). Foreign Investment in the Region of Valencia – Executive Summary (June 2024). Retrieved from http://sifdi.com/documents/202403%20IVACE%20-%20fDI%20in%20the%20Valencian%20Region_June2024.pdf

[156] OECD (2023), "Rethinking regional attractiveness in Spain's Valencia region", OECD Regional Development Papers, No. 117, OECD Publishing, Paris. Retrieved from https://www.oecd.org/publications/rethinking-regional-attractiveness-in-spain-s-valencia-region-94e15f25-en.htm

[157] Spain-U.S. Chamber of Commerce (2024). Spain: A Strategic Destination for U.S. Investment. Retrieved from https://spainuschamber.com/en/spain-a-strategic-destination-for-u-s-investment/

[158] Bermejo Carbonell, J., & Werner, R. A. (2018). Does Foreign Direct Investment Generate Economic Growth? A New Empirical Approach Applied to Spain. Economic Geography, 94(4), 425–456. https://doi.org/10.1080/00130095.2017.1393312

[159] Amighini, A. A., McMillan, M. S., & Sanfilippo, M. (2017). FDI and capital formation in developing economies: New evidence from industry-level data (NBER Working Paper No. 23049). National Bureau of Economic Research. http://www.nber.org/papers/w23049

[160] Alfaro, L., & Rodríguez-Clare, A. (2004). Multinationals and linkages: An empirical investigation. Harvard Business School; Inter-American Development Bank.

[161] Generalitat Valenciana. (2025). Deuda pública - Generalitat Valenciana. Retrieved from https://gvaoberta.gva.es/es/deuda-publica#deuda

[162] Comunica GVA. (n.d.). El Consell autoriza la creación de deuda pública para el ejercicio de 2025 y enero de 2026. Retrieved from https://comunica.gva.es/es/detalle?id=393712475&site=373422916

[163] Generalitat Valenciana. (2025). Deuda pública. Retrieved from https://gvaoberta.gva.es/es/deuda-publica#habitante

[164] DOGV (Diari Oficial de la Generalitat Valenciana). (2025, July 1). Acuerdo de 25 de junio de 2025, del Consell, por el que se autoriza la deuda pública de la Generalitat durante 2026. Retrieved from https://dogv.gva.es/datos/2025/07/01/pdf/2025_23704_es.pdf

[165] AIReF. (2025, March 4). AIReF endorses the macroeconomic forecasts of Valencia for 2025. Retrieved from https://www.airef.es/en/news/airef-endorses-macroeconomic-forecasts-of-valencia-for-2025/

[166] Vilaplana-Aparicio, J., Sempere-Monerris, J. J., & Martínez-Romero, D. (2023). Communication and transparency of innovation. Retrieved from https://rua.ua.es/dspace/bitstream/10045/130825/1/Vilaplana-Aparicio_etal_2023_Systems.pdf

[167] IEC. (n.d.). Valencian economy. Retrieved from https://publicacions.iec.cat/repository/pdf/00000483/00000069.pdf

[168] European Commission. (2024). Economic forecast for Spain. Retrieved from https://economy-finance.ec.europa.eu/economic-surveillance-eu-economies/spain/economic-forecast-spain_en

[169] CaixaBank Research. (2024). Autonomous community profiles: Valencian Community. Retrieved from https://www.caixabankresearch.com/en/publications/autonomous-community-profiles/valencian-ac

[170] Generalitat Valenciana. (2024). Diagnóstico estratégico y análisis económico. Retrieved from https://pegv.gva.es/auto/scpd/web/DBCV/DBCV_ENG.pdf

[171] Generalitat Valenciana, Conselleria de Hacienda y Modelo Económico. (2025). Estudios económicos: Brecha salarial género en la Comunitat Valenciana. Retrieved from https://hisenda.gva.es/documents/161328139/162728603/19_Estudios+Econ%C3%B3micos.+N%C2%BA+19_

[172] BBVA Research. (2025, January 29). Spain | Comunitat Valenciana Economic Outlook. First half 2025. Retrieved from: https://www.bbvaresearch.com/en/publicaciones/spain-comunitat-valenciana-economic-outlook-first-half-2025/

[173] Spain in front of the mirror: the evolution of inequality and the middle class. (2024, December 18). CaixaBank Research. Retrieved from: https://www.caixabankresearch.com/en/monthly-report/495/december-2024/spain-front-mirror-evolution-inequality-and-middle-class

[174] BBVA Research. (2024, May 14). Spain | Comunitat Valenciana Economic Outlook. First half 2024. Retrieved from: https://www.bbvaresearch.com/en/publicaciones/spain-comunitat-valenciana-economic-outlook-first-half-2024/

[175] INE - Instituto Nacional de Estadística. (n.d.). INEbase / Mercado laboral /Actividad, ocupación y paro /Estadística de flujos de la población activa / Últimos datos. INE. Retrieved from: https://www.ine.es/dyngs/INEbase/operacion.

[176] EAPN España. (2024). Informe AROPE 2024 Comunitat Valenciana. Retrieved from: https://www.eapn.es/estadodepobreza/ARCHIVO/documentos/Informe_AROPE2024_Comunitat_Valenciana.pdf

[177] Portal Estadístico de la Generalitat Valenciana - Generalitat Valenciana. (2024). Portal Estadístico De La Generalitat Valenciana. Retrieved from: https://pegv.gva.es/es/inicio/-/asset_publisher/CWK0IEKbs79H/content/encuesta-de-condiciones-de-vida-ecv-.-2024-1?_com_liferay_asset_publisher_web_portlet_AssetPublisherPortlet_INSTANCE_CWK0IEKbs79H_assetEntryId=390759382

[178] Instituto Nacional de Estadística. (2025, May 14). Índice de Precios de Consumo (IPC). Abril 2025 [Nota de prensa]. Retrieved from: https://www.ine.es/dyngs/Prensa/IPC0425.pdf

[179] Instituto Nacional de Estadística. (2025, May 14). Consumer Price Index (CPI). April 2025 [Press release]. Retrieved from: https://www.ine.es/dyngs/Prensa/en/IPC0425.pdf

[180] McKinsey Global Institute. (2020). The future of work after COVID-19. Retrieved June 26, 2025, from https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19

[181] Aldoseri, A., Al-Khalifa, K. N., & Hamouda, A. M. (2024). AI-powered innovation in digital transformation: Key pillars and industry impact. Sustainability, 16(5), 1790. https://doi.org/10.3390/su16051790

[182] PwC. (2018). The macroeconomic impact of artificial intelligence. Retrieved June 26, 2025, from https://www.pwc.co.uk/economic-services/assets/macroeconomic-impact-of-ai-technical-report-feb-18.pdf

[183] International Labour Organization. (2023). Working time and work-life balance around the world. Retrieved June 26, 2025, from https://www.ilo.org/global/publications/books/WCMS_864222

[184] Dealroom & GoHub. (2025). Spain tech ecosystem report 2025. Retrieved June 26, 2025, from https://gohub.vc/spain-ecosystem-report-2025/

[185] Brynjolfsson, E., Li, D., & Raymond, L. R. (2023). Generative AI at work (NBER Working Paper No. 31161). National Bureau of Economic Research. Retrieved June 26, 2025, from https://www.nber.org/papers/w31161

[186] Stanford Human-Centered Artificial Intelligence (HAI). (2024). AI Index Report 2024. Retrieved June 26, 2025, from https://aiindex.stanford.edu/report/

[187] McKinsey Global Institute. (2020). Digital service excellence: Scaling the next-generation operating model. Retrieved June 26, 2025, from https://www.mckinsey.com/~/media/mckinsey/business%20functions/operations/our%20insights/digital%20service%20excellence/digital-service-excellence--scaling-the-next-generation-operating-model.pdf

[188] Acemoglu, D., & Restrepo, P. (2019). Artificial intelligence, automation, and work. In A. Agrawal, J. Gans, & A. Goldfarb (Eds.), The economics of artificial intelligence: An agenda (pp. 197–236). University of Chicago Press. https://www.nber.org/papers/w24196

[189] World Bank. (2024). Global trends in AI governance: Evolving country approaches. Retrieved June 26, 2025, from https://openknowledge.worldbank.org/entities/publication/a570d81a-0b48-4cac-a3d9-73dff48a8f1a

[190] Cesario E. (2023). Big data analytics and smart cities: applications, challenges, and opportunities. Frontiers in big data, 6, 1149402. https://doi.org/10.3389/fdata.2023.1149402

[191] Alaa Elsherif , Mohammed Anwar Zayed , Radwa Saeed Tawfik (2025). Urban Simulation as a Data-Driven Decision-Making Tool: Analyzing the Spatial Performance of Badr City in Egypt Using SLEUTH Model. Civil Engineering and Architecture, 13(4), 2964 - 2980. DOI: 10.13189/cea.2025.130411.

[192] Kitchin, R. (2014). The real-time city? Big data and smart urbanism. GeoJournal, 79(1), 1–14. https://doi.org/10.1007/s10708-013-9516-8

[193] Dmitrieva, Ekaterina & Pathani, Ashish & Pushkarna, Gaurav & Acharya, Puja & Rana, Manju & Surekha, P.. (2024). Real-Time Traffic Management in Smart Cities: Insights from the Traffic Management Simulation and Impact Analysis. BIO Web of Conferences. 86. 10.1051/bioconf/20248601098.

[194] Wu, M., Yan, B., Huang, Y., & Sarker, M. N. I. (2022). Big Data-Driven Urban Management: Potential for Urban Sustainability. Land, 11(5), 680. https://doi.org/10.3390/land11050680

[195] Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., ... & Portugali, Y. (2012). Smart cities of the future. The European Physical Journal Special Topics, 214(1), 481–518. https://doi.org/10.1140/epjst/e2012-01703-3

[196] Elena, Vasilieva & Singh, Rajat & Sobti, Rajeev & Sharma, Kshama & Sharma, Rajat & Surekha, P.. (2024). Leveraging Big Data Analytics for Urban Planning: A Study Using the Big Data Analytics Efficiency Test. BIO Web of Conferences. 86. 10.1051/bioconf/20248601082.

[197] OECD. (2023). Smart city data governance. OECD Publishing. https://www.oecd.org/publications/smart-city-data-governance-e57ce301-en.htm

[198] Tonsager, L., & Ponder, J. (2023). Privacy frameworks for smart cities [White paper]. Mcity, University of Michigan. https://mcity.umich.edu/wp-content/uploads/2023/03/Privacy-Frameworks-for-Smart-Cities_White-Paper_2023.pdf

[199] Yulu Jin, Yu Wang. (2025). Reassessing smart city development and personal data protection: A regulatory framework, International Review of Economics & Finance, Volume 99, https://doi.org/10.1016/j.iref.2025.104022

[200] Rasoulzadeh Aghdam, S., Bababeimorad, B., Ghasemzadeh, B., Irani, M., & Huovila, A. (2025). Social smart city research: Interconnections between participatory governance, data privacy, artificial intelligence, and ethical sustainable development. Frontiers in Sustainable Cities, 6, Article 1514040. https://doi.org/10.3389/frsc.2024.1514040

[201] Verhulst, S. G. (2021, January 19). Re-use of smart city data: The need to acquire a social license through data assemblies. The GovLab.https://medium.com/data-stewards-network/re-use-of-smart-city-data-the-need-to-acquire-a-social-license-through-data-assemblies-c096c1694cfc

[202]Jarecka-Bidzińska, E. (2024). Towards smart public spaces-architectural approach: case study. Przestrzeń i Forma, (60), 233-252. https://doi.org/10.21005/pif.2024.60.C-03

[203]Ratti, C. (2022). Designing the cities of tomorrow. MIT News. Retrieved July 15, from, https://news.mit.edu/2022/designing-cities-tomorrow-carlo-ratti-1025

[204] Zhang, Y., & Gao, J. (2025). Research on smart city construction in the context of public culture. Telematics and Informatics Reports, 17, 100187. https://doi.org/10.1016/j.teler.2025.100187

[205] McKinsey Global Institute. (2018). Smart cities: Digital solutions for a more livable future. https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/smart-cities-digital-solutions-for-a-more-livable-future

[206] Languillon-Aussel, R. (2021). Digitalization of public spaces. The great urban change?. Articulo-Journal of Urban Research, (22). https://doi.org/10.4000/articulo.4859

[207] Wu, P., Zhang, Z., Peng, X., & Wang, R. (2024). Deep learning solutions for smart city challenges in urban development. Scientific Reports, 14(1), 5176. https://doi.org/10.1038/s41598-024-55928-3

[208] Bellini, P., Nesi, P., & Pantaleo, G. (2022). IoT-enabled smart cities: A review of concepts, frameworks and key technologies. Applied sciences, 12(3), 1607. https://doi.org/10.3390/app12031607

[209] Project for Public Spaces. (2025, May 2). The state of public space in 2025. Retrieved July 15, from, https://www.pps.org/state-of-public-space-2025

[210] Office of the U.S. Surgeon General. (2023). Our epidemic of loneliness and isolation: The U.S. Surgeon General's Advisory on the healing effects of social connection and community. U.S. Department of Health and Human Services. https://www.hhs.gov/sites/default/files/surgeon-general-social-connection-advisory.pdf

[211] House of Commons Education Committee. (2024). Screen time: impacts on education and wellbeing (Fourth Report of Session 2023–24). House of Commons. https://committees.parliament.uk/publications/45128/documents/223543/default/

[212] Mulas, V., Nedayvoda, A., & Zaatari, G. (2017). Creative community spaces: Spaces that are transforming cities into innovation hubs. World Bank. https://documents1.worldbank.org/curated/en/609151499428251887/pdf/117300-WP-P158681-PUBLIC-Creative-Community-Spaces.pdf

[213] Alpine Space Programme. (n.d.). Smart Community. Retrieved from https://www.alpine-space.eu/project/smartcommunity/

[214] World Health Organization: WHO. (2025, 30 junio). Social connection linked to improved health and reduced risk of early death. World Health Organization.https://www.who.int/news/item/30-06-2025-social-connection-linked-to-improved-heath-and-reduced-risk-of-early-death

[215] World Health Organization. (2021). Social isolation and loneliness among older people: Advocacy brief. https://www.who.int/publications/i/item/9789240030749

[216] Fundación ONCE & Fundación AXA. (2022). Barómetro de la soledad no deseada en España 2022. https://www.soledades.es/sites/default/files/contenidos/Informe_Barometro%20soledad-v2.pdf

[217] Observatorio Nacional de Tecnología y Sociedad (ONTSI). (2023). Uso de las tecnologías por personas mayores. https://www.ontsi.es/sites/ontsi/files/2024-07/Uso%20de%20las%20tecnolog%C3%ADas%20por%20personas%20mayores.pdf

[218] Holloway, J., James, D. L., Robillard, A., Hermer, J., Hawley, N., & Sayeed, O. (2024). Needs of social isolation, loneliness, and intergenerational interventions in the United States: A scoping review. Frontiers in Public Health, 12, 1386651. https://doi.org/10.3389/fpubh.2024.1386651

[219] Nebot, Carmen Pineda (2018-04-01). "El presupuesto participativo de Madrid: luces y sombras". Revista de Gestão e Secretariado (in Spanish). 9 (1): 265–292. doi:10.7769/gesec.v9i1.687. ISSN 2178-9010

[220] Bartocci, L., Grossi, G., Mauro, S. G., & Ebdon, C. (2022). The journey of participatory budgeting: a systematic literature review and future research directions. International Review of Administrative Sciences, 89(3), 757-774. https://doi.org/10.1177/00208523221078938 (Original work published 2023)

[221] EIPA (European Institute of Public Administration). (n.d.). Decidim: Free Open-Source participatory democracy for cities and organizations. EIPA. https://www.eipa.eu/epsa/decidim-free-open-source-participatory-democracy-for-cities-and-organizations/

[222] Participedia. (n.d.). Decidim: Participatory budgeting in Barcelona. Participedia. Retrieved [fecha de consulta: e.g., July 15, 2025], from https://participedia.net/case/decidim-participatory-budgeting-in-barcelona

[223] Ashrafuzzaman, M. (2025). Blockchain-Enabled Audit Trails for Public MIS: Enhancing Transparency in Government IT Systems. Available at SSRN 5286689.

[224] Yang, J. C., Hausladen, C. I., Peters, D., Pournaras, E., Hnggli Fricker, R., & Helbing, D. (2024). Designing digital voting systems for citizens: Achieving fairness and legitimacy in participatory budgeting. Digital Government: Research and Practice, 5(3), 1-30.

[225] Sinervo, L. M., Bartocci, L., Lehtonen, P., & Ebdon, C. (2024). Toward sustainable governance with participatory budgeting. Journal of public budgeting, accounting & financial management, 36(1), 1-19.

[226] Faliszewski, P., Flis, J., Peters, D., Pierczyński, G., Skowron, P., Stolicki, D., ... & Talmon, N. (2023). Participatory budgeting: Data, tools, and analysis. arXiv preprint arXiv:2305.11035.

[227] Oliva-Ruiz, J. M., Navarro, J. L., Estellés, J., & Galiano, V. (2017). The Urban Heat Island Effect in the City of Valencia: A Case Study for Hot Summer Days. https://www.mdpi.com/2413-8851/1/1/9

[228] Mc Mahon, M. (2025, April 29). Valencians physically, emotionally exhausted six months on from floods. Euronews. Retrieved from https://www.euronews.com/my-europe/2025/04/29/valencians-physically-emotionally-exhausted-6-months-on-from-floods

[229] Faranda, D., Álvarez-Castro, C., Ginesta, M., Coppola, E., & Pons, F. (2024). Heavy Precipitations in South-Eastern Spain DANA mostly strengthened by human-driven climate change. (ClimaMeter Analysis).

[230] Schneider, S.H., Semenov, S., Patwardhan, A., Burton, I., Magadza, C.H.D., Oppenheimer, M., Pittock, A.B., Rahman, A., Smith, J.B., Suarez, A., Yamin, F. (2007). Assessing key vulnerabilities and the risk from climate change. In: Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J., Hanson, C.E. (eds) Climate change 2007: impacts, adaptation and vulnerability. Contribution of working group II to the fourth assessment report of the intergovernmental panel on climate change, Cambridge University Press, Cambridge, UK, pp 779–810.

[231] Luo, Z. (2025). A systematic review of factors affecting user behavior in public open spaces under climate change. Sustainability, 17(6), Article 2724. https://doi.org/10.3390/su17062724

[232] Ahmed, A., Chen, X., & Zhao, W. (2024). Integrating computational fluid dynamics and sensor data for real-time microclimate adaptation in urban design. Scientific Reports, 14, 9583. https://doi.org/10.1038/s41598-024-65794-8

[233] European Environment Agency. (2025, February 10). Transport and mobility. European Environment Agency. https://www.eea.europa.eu/en/topics/in-depth/transport-and-mobility?activeTab=fa515f0c-9ab0-493c-b4cd-58a32dfaae0a

[234] United Nations Human Settlements Programme (UN-Habitat). (2022). Integration is key: The role of electric mobility for low-carbon and sustainable cities. https://unhabitat.org/sites/default/files/2022/05/the_role_of_electric_mobility_for_low-carbon_and_sustainable_cities_1.pdf

[235] Department for Transport. (2021). Decarbonising Transport: A better, greener Britain. https://assets.publishing.service.gov.uk/media/610d63ffe90e0706d92fa282/decarbonising-transport-a-better-greener-britain.pdf

[236] De Wijs, M., Muiños, P., & Corominas, F. (2024). Car-use reduction in 15-Minute Cities. A matter of modal shift or shorter travel distances? Journal of Urban Mobility, 6, 100093. https://doi.org/10.1016/j.urbmob.2024.100093

[237] EU EV Charging Masterplan. (2022, March). European EV Charging Infrastructure Masterplan: Research whitepaper. https://www.acea.auto/files/Research-Whitepaper-A-European-EV-Charging-Infrastructure-Masterplan.pdf

[238] Sun, P., Bisschop, R., Niu, H., & Huang, X. (2020). A Review of Battery Fires in Electric Vehicles. Fire Technology, 56, 1361–1410. https://doi.org/10.1007/s10694-019-00944-3

[239] Active Sustainability. (n.d.). Landfills: a serious problem for the environment. Sustainability for all. Retrieved July 17, 2025, from https://www.activesustainability.com/environment/landfills-serious-problem-environment/

[240] European Environment Agency. (2025, April 15). EU action. Waste and recycling. Retrieved July 15, 2025, from https://www.eea.europa.eu/en/topics/in-depth/waste-and-recycling?activeTab=e3e6b879-fef4-4a88-9436-5f0064698270&activeAccordion=554eebb5-4347-4f84-aba8-adf7c3987c2e

[241] Eurostat. (2025, February 13). Environment and Energy. Recycling rate of municipal waste. Retrieved July 15, 2025, from https://ec.europa.eu/eurostat/databrowser/view/cei_wm011/default/table?lang=en&category=t_env.t_env_was.t_env_wasst

[242] GAOtek. (n.d.). Applications of LoRaWAN & LPWAN in the Smart Cities. Retrieved July 15, 2025, from https://gaotek.com/applications-of-lorawan-lpwan-in-the-smart-cities/

[243] Interreg Europe. (2022). Good Practices Guide. Promoting innovation to improve waste management at the local level. Waste Management Intelligent Systems and Policies (WINPOL). Retrieved July 17, 2025, from https://projects2014-2020.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1604656595.pdf

[244] Boorsma, B. (n.d.). The network paradigm and the city. The Economist Impact. Retrieved June 30, 2025, from https://impact.economist.com/perspectives/economic-development/vibrant-economy/blog/network-paradigm-and-city/

[245] Delong, S. (2023). Urban health inequality in shifting environment: systematic review on the impact of gentrification on residents' health. Frontiers in public health, 11, 1154515. https://doi.org/10.3389/fpubh.2023.1154515

[246] Atkinson, R. & Wulff, M. (2009). Gentrification and displacement: a review of approaches and findings in the literature. Australian Housing and Urban Research Institute. ISBN: 978-1-921610-06-6.

[247] Zuk, M., Bierbaum, A., Chapple, K., Gorska, K. & Loukaitou-Sideris, A. (2018). Gentrification, Displacement, and the Role of Public Investment. Journal of Planning Literature, 33(1), 31-44.

[248] Council of Europe. (2020). Managing Gentrification. Policy brief.

[249] Gearin, E., Dunson, K. and Hampton, M. 'Greened out: mitigating the impacts of eco-gentrification through community dialogue'. Architecture_MPS 25, 1 (2023): 2. DOI: https://doi.org/10.14324/111.444.amps.2023v25i1.002.

[250] Lees, L., Slater, T. & Wyly E. (2008). Gentrification. London: Routledge, 77.

[251] Carrera Espriu, B. (2024, August 8). Overtourism: Barcelona sparks global rethinking. Green European Journal. Retrieved June 26, 2025, from https://www.greeneuropeanjournal.eu/overtourism-barcelona-sparks-global-rethinking/

[252] Peeters, P., Gössling, S., Klijs, J., Milano, C., Novelli, M., Dijkmans, C., Eijgelaar, E., Hartman, S., Heslinga, J., Isaac, R., Mitas, O., Moretti, S., Nawijn, J., Papp, B., & Postma, A. (2018). Overtourism: Impact and possible policy responses. European Parliament, Policy Department for Structural and Cohesion Policies. Retrieved June 26, 2025, from https://www.europarl.europa.eu/RegData/etudes/STUD/2018/629184/IPOL_STU(2018)629184_EN.pdf

[253] Vagena, A. (2021). Overtourism: Definition and impact. Academia Letters, 1207. https://doi.org/10.20935/AL1207

[254] Koens, K., Postma, A., & Papp, B. (2019). 'Overtourism'? Understanding and managing urban tourism growth beyond perceptions (Executive Summary). World Tourism Organization (UNWTO), CELTH, & ETFI. Retrieved June 26, 2025, from https://www.drv.de/public/Downloads_2019/2019_Studie_UNWTO_Overtourism_Urban_Tourism_Growth.pdf

[255] Kowalczyk-Anioł, J. (2023). Rethinking tourism-driven urban transformation and social tourism impact: A scenario from a CEE city. Cities, 134, 104178. https://doi.org/10.1016/j.cities.2022.104178

[256] Sami, R. T. (2024, May 28). Overtourism and sustainability: A timely intervention by the United Nations. University of Oslo Faculty of Law. Retrieved June 26, 2025, from https://www.jus.uio.no/english/research/areas/sustainabilitylaw/blog/2024/overtourism-and-sustainability-a-timely-intervention-by-the-un

[257] Camatti, N., Bertocchi, D., Carić, H., & van der Borg, J. (2020). A digital response system to mitigate overtourism: The case of Dubrovnik. Journal of Travel & Tourism Marketing, 37(8–9), 887–901. https://doi.org/10.1080/10548408.2020.1828230

[258] OECD. (2021). Managing tourism development for sustainable and inclusive recovery (OECD Tourism Papers, 2021/01). OECD Publishing. https://doi.org/10.1787/b062f603-en

[259] World Economic Forum. (2025). Travel and tourism at a turning point: Principles for transformative growth. Retrieved June 26, 2025, from https://reports.weforum.org/docs/WEF_Travel_and_Tourism_at_a_Turning_Point_2025.pdf

[260] Daunfeldt, S.-O., Mihaescu, O., & Rudholm, N. (2021). The Decline of Small Cities: Increased Competition from External Shopping Malls or Long-Term Negative Trends? International Regional Science Review, 45(2), 225-257. https://doi.org/10.1177/01600176211034133 (Original work published 2022)

[261] Sharifonnasabi, Z., Bardhi, F. & Luedicke, M. K. (2020). How globalisation affects consumers: Insights from thirty years of CCT globalisation research. Marketing Theory, 20(3), pp. 273-298. doi:10.1177/1470593119887469

[262] Billings, S. B., Rohlin, S., & Zhou, T. (2024). The death of retail and neighborhood amenities (Working Paper No. 25-01). SSRN. https://doi.org/10.2139/ssrn.4713030

[263] Grêt-Regamey, A., & Galleguillos-Torres, M. (2022). Global urban homogenization and the loss of emotions. Scientific Reports, 12, Article 21189. https://doi.org/10.1038/s41598-022-27141-7

[264] Lemoine-Rodríguez, R., Inostroza, L., & Zepp, H. (2020). The global homogenization of urban form: An assessment of 194 cities across time. Landscape and Urban Planning, 204, 103952. https://doi.org/10.1016/j.landurbplan.2020.103952

[265] Kumar, V., Gunner, S., Pregnolato, M., Tully, P., Georgalas, N., Oikonomou, G., ... & Tryfonas, T. (2024). Sense (and) the city: From Internet of Things sensors and open data platforms to urban observatories. IET Smart Cities, 6(4), 291-311. DOI: https://doi.org/10.1049/smc2.12081

[266] Whirlix. (n.d.). Preventing the preventable: Why playground maintenance matters. Whirlix. Retrieved July 22, 2025, from https://blog.whirlix.com/preventing-the-preventable-why-playground-maintenance-matters

[267] Groshong, L., Wilhelm Stanis, S. A., Kaczynski, A. T., & Hipp, J. A. (2018). Attitudes About Perceived Park Safety Among Residents in Low-Income and High Minority Kansas City, Missouri, Neighborhoods. Environment and Behavior, 52(6), 639-665. https://doi.org/10.1177/0013916518814291

[268] Daniels, Dawn Marie DNS, RN, PHCNS-BC, CPSI; Johnson, Estell Lenita MA. The Impact of Community-Built Playgrounds on the Community. The Journal of Trauma: Injury, Infection, and Critical Care 67(1):p S16-S19, July 2009. | DOI: 10.1097/TA.0b013e3181ac1400

[269] Moore, A., Lynch, H., & Boyle, B. (2022). Can universal design support outdoor play, social participation, and inclusion in public playgrounds? A scoping review. Disability and Rehabilitation, 44(13), 3304-3325. DOI: https://doi.org/10.1080/09638288.2020.185835

[270] Derose, K. P., Han, B., Williamson, S., Cohen, D. A., Marsh, T. L., & Raaen, L. (2018). Neighborhood poverty, park use, and park-based physical activity in a Southern California city. Social Science & Medicine, 198, 49–58. https://doi.org/10.1016/j.socscimed.2017.12.003

[271] Munoz-Ausecha, C., Ruiz-Rosero, J., & Ramirez-Gonzalez, G. (2021). RFID applications and security review. Computation, 9(6), 69. DOI: https://doi.org/10.3390/computation9060069

[272] D. Advincula, D. G., P. Altura, K. A., B. Blancaflor, E., C. Castillo, E. C. P., B. Rubiano, G., & D. Tobias, A. M. (2022, April). Risk Assessment of an installed CCTV System in an Open Market Place. In Proceedings of the 4th International Conference on Management Science and Industrial Engineering (pp. 455-461).DOI: https://doi.org/10.1145/3535782.3535842

[273] DataIntelo. (2024). Smart Playground Safety Sensor Market – Global Outlook and Forecast 2024–2033. Retrieved from https://dataintelo.com/report/smart-playground-safety-sensor-market

[274] OECD. (2024). How's life for children in the digital age? How children use digital media. OECD Publishing.https://www.oecd.org/en/publications/how-s-life-for-children-in-the-digital-age_0854b900-en/full-report/how-children-use-digital-media_a8d3a6d0.html

[275] (2025). Exploring parent self-efficacy for regulating children's digital device use: A mixed-methods study in Japan. International Journal of Child-Computer Interaction, 34, Article 100342. https://doi.org/10.1016/j.ijcci.2024.100342

[276] PMC (2025). The effects of parents' smartphone use on children's social and emotional development: The mediating role of parent–child interaction. Children, 12(3), Article 457. https://pmc.ncbi.nlm.nih.gov/articles/PMC11764600/

[277] PMC (2024). Digital divide among homebound and semi-homebound older adults: Analyses of 2022 National Health and Aging Trends Study (NHATS) data. International Journal of Environmental Research and Public Health, 21(6), Article 2287. https://pmc.ncbi.nlm.nih.gov/articles/PMC12059228/

[278] (2025). Urban public space development: The role of inclusive design in fostering social encounters. Frontiers in Built Environment, 11, Article 1456638. https://www.frontiersin.org/journals/built-environment/articles/10.3389/fbuil.2025.1456638/full

[279] (2024). Making time for sociability: Understanding social interactions in urban spaces. Journal & Proceedings of the Royal Society of New South Wales. https://www.royalsoc.org.au/wp-content/uploads/2024/08/157-1-17Kent.pdf

[280] European Committee of the Regions. (2023). Managing crises, bringing solutions, building the future: The Annual Report on the state of regions and cities in the EU 2023. https://feature.cor.europa.eu/soteulocal2023

[281] Instituto Nacional de Estadística (INE). (s.f.). Padrón municipal: Infografía. https://www.ine.es/infografias/infografia_padron.pdf

[282] Ayuntamiento de Valencia. (n.d.). Portal de datos abiertos de Valencia. Retrieved July 24, 2025, from https://valencia.opendatasoft.com/pages/home/

[283] Child in the city NGO. (2019, August 19). Decline of public playgrounds 'pushing children indoors'. Retrieved July 24, 2025, from https://www.childinthecity.org/2019/08/19/decline-of-public-playgrounds-pushing-children-indoors/?gdpr=deny

[284] Luo, Z. (2025). A systematic review of factors affecting user behavior in public open spaces under climate change. Sustainability, 17(6), Article 2724. https://doi.org/10.3390/su17062724

[285] Dharmadhikari, S. (2025). Global environmental software market report 2025 (Global Edition). Retrieved from: https://www.cognitivemarketresearch.com/environmental-software-market-report

[286] United Nations World Tourism Organization. (2018). Overtourism? Understanding and managing urban tourism growth beyond perceptions. https://www.e-unwto.org/doi/book/10.18111/9789284419999.

[287] Dodds, R. (2019). Overtourism: issues, realities and solutions. Journal of Heritage Tourism. https://doi.org/10.1080/1743873X.2019.1701818

[288] Cheer, J. M., Milano, C., & Novelli, M. (2019). Tourism and community resilience in the Anthropocene: accentuating temporal overtourism. Journal of Sustainable Tourism, 27(4), 554–572. https://doi.org/10.1080/09669582.2019.1578363

[289] Yalcin, Emre & Bilge, Alper. (2022). Evaluating unfairness of popularity bias in recommender systems: A comprehensive user-centric analysis. Information Processing and Management. 59. 103100. 10.1016/j.ipm.2022.103100. https://www.researchgate.net/publication/364030602_Evaluating_unfairness_of_popularity_bias_in_recommender_systems_A_comprehensive_user-centric_analysis

[290] Bellogín, A., Dietz, L. W., Ricci, F., & Sánchez, P. (2025). Point of Interest Recommendation: Pitfalls and Viable Solutions. arXiv preprint arXiv:2507.13725. https://arxiv.org/abs/2507.13725

[291] Foronda Robles, C., Galindo Pérez de Azpillaga, L. & Armario-Pérez, P. (2025). The sustainable management of overtourism via user content. Annals of Tourism Research Empirical Insights, 6 (2). https://doi.org/10.1016/j.annale.2025.100184

[292] Robinson, V.M., Schänzel, H. A. A tourism inflex: Generation Z travel experiences. Journal of Tourism Futures 18 September 2019; 5 (2): 127–141. https://doi.org/10.1108/JTF-01-2019-0014.

[293] Centre for the Promotion of Imports from developing countries (CBI). (2024). The European market potential for Gen Z tourism. Retrieved July 24, 2025, from https://www.cbi.eu/market-information/tourism/gen-z/market-potential

[294] Journal of Urbanism. (2025). Cities and globalization: The impact of tourism on local culture and business. Journal of Urbanism, 13(2), 101-112.

[295] European Urban Initiative. (2024). Sustainable Tourism Draft Action Plan. Retrieved July 24, 2025, from https://www.urbanagenda.urban-initiative.eu/sites/default/files/2024-11/2024_11_01_FINAL_ST_Action_Plan_0.pdf

[296] United Nations World Tourism Organization. (n.d.). UN Tourism data dashboard. UNWTO. https://www.unwto.org/tourism-data/un-tourism-tourism-dashboard.

[296] Eurostat. (2025, April). Tourism statistics. Statistics Explained. European Commission. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Tourism_statistics

[298] Fundación Visit Valencia. (2024). Folleto estadísticas 2024 [PDF].

https://fundacion.visitvalencia.com/sites/default/files/media/downloadable-file/files/Folleto_Estadisticas_2024_Web_Pliegos.pdf.

[299] Tourism statistics - Fundació Visit València. (2025). Retrieved July 24, 2025, from https://fundacion.visitvalencia.com/en/statistics.

[300] CBI. (2024, June 11). The European market potential for Gen Z tourism. CBI. https://www.cbi.eu/market-information/tourism/gen-z/market-potential.

[301] Diesis Network. (2023). Tourism and the social economy: Social innovation, inclusion and sustainability in the European tourism sector. https://www.diesis.coop/wp-content/uploads/2023/03/Tourism-paper_final-version-1.pdf.

[302] European Commission. (2025). Sustainable EU tourism – Shaping the tourism of tomorrow. Retrieved July 24, 2025, from https://transport.ec.europa.eu/tourism/transition-eu-tourism/sustainable-eu-tourism-shaping-tourism-tomorrow_en.

Publisher: Center for Digital Technology and Management (CDTM) in Valencia
La Harinera. C/ Joan Verdeger 116, 46024 Valencia, Spain

E-Mail: valencia@cdtm.com
www.cdtm.com

Editors: Alicia Durán González, Adrián Villanueva Martínez

Students: Gonzalo Martin (Head of Communication)
Mohamed Benhaddi, Sergio Pérez, Juan Pablo Endrino (Editing)
Jorge Gatíca, Karla Mariana Reséndiz, Ivan Gilabert (Quality Assurance)
Noufel Garcés, Kenza Tantaoui (Layout)
Adrián Fernández (Picture Manager)
Pau Sena, Miguel Padura, Carlos Gómez (Sources & Abbreviations)

Printed Copies: 70

Printing Company: Encuadernaciones Aguilar
Calle Albalat dels Tarongers 38 bajo
46021 Valencia

Photos: Freepik
Pexels
Unsplash
Microsoft Copilot
DALL-E

Year of Publication: 2025

THE FUTURE OF INNOVATION IN URBAN SPACES

Urban spaces are at the epicenter of global transformation. As cities grow more connected, digitalized, and densely populated, they also face more tensions: climate instability, fragmented communities, and a rising sense of social disconnection and isolation. Mass tourism, global migration, and economic polarization intensify these pressures, while public spaces traditionally designed for coexistence struggle to adapt to new patterns of use. In this context, innovation is no longer a matter of technology alone. It is about rethinking how we inhabit, share, and govern our urban environments.

This report investigates the future of urban spaces through the lens of innovation, digital transformation, and civic well-being. Drawing on trend analysis, exploration of the main problems and opportunities, and ideation of future-proof business ideas, CDTM students explored how emerging technologies can support smarter infrastructure to improve our life in cities.

The research highlights four key opportunity areas for shaping inclusive, livable, engaging, and climate-resilient cities. These range from redefining tourism habits to reimagining how digital tools can foster engagement and social interaction in increasingly fragmented urban environments.

Rather than offering final answers, this publication maps tensions and possibilities. It invites policymakers, urban planners, entrepreneurs, designers, and citizens to engage with critical questions: can digitalization restore, rather than erode, our sense of community? How can smart city technologies serve people, rather than just monitor them? And how can we build cities that are not only smart, but also fair, human, and regenerative?

This report is a call to rethink the role of innovation in shaping urban life. Because the future of cities is not only a technical challenge it's a socio-cultural one.

CDTM VLC

The Center for Digital Technology and Management (CDTM) offers the interdisciplinary add-on study program „Technology Management". Students from various study backgrounds with creative ideas, great motivation, and an entrepreneurial mindset are offered the tools to put their ideas into practice. As a research institution, CDTM closely cooperates with industry partners, start-ups, and the public sector concentrating on topics at the intersection of technology, innovation and entrepreneurship.

E-mail valencia@cdtm.de
Website www.cdtm.com

Alicia Durán González, Adrián Villanueva Martíne

In collaboration with:

GENERALITAT VALENCIANA | AJUNTAMENT DE VALÈNCIA | València Innovation Capital | VNIVERSITAT DE VALÈNCIA | UNIVERSITAT POLITÈCNICA DE VALÈNCIA