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The Urban Future Between AI and Ethics: Socio-Psychological Implications in Smart City Development

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Abstract: *This article examines the complex relationship between the rapid development of Smart Cities and the psychosocial and ethical implications of implementing AI and IoT technologies. While smart cities promise enhanced efficiency, sustainability, and quality of life through advanced connectivity and data collection, we can argue that this technological focus often neglects crucial psycho-social and ethical challenges. It was identified the main technological problems such as are the rapid pace of technological change, significant data privacy and security vulnerabilities, problems with system interoperability, and the vendor lock-in. Even the pursuit of technological efficiency can have significant negative psycho-social impacts on residents. Efficiency and stress (constant connectivity and the push for algorithmic efficiency can exponentially increase the rhythm of life, leading to higher levels of stress and anxiety among inhabitants), digital divide and social exclusion (digital systems often favor young, educated, and high-income individuals with high digital literacy. Vulnerable groups, such as the elderly, people with disabilities, or migrants who do not speak the local language, risk being excluded from essential services, becoming "invisible people" within the urban landscape), loss of cognitive abilities and autonomy (dependence on technology can lead to cognitive offloading and digital amnesia, progressively limiting critical thinking and complex problem-solving skills) and filter bubbles and echo chambers (search systems and applications often create "filter bubbles" and "echo chambers" that isolate users within information confirming their existing beliefs, limiting access to diverse perspectives and potentially leading to conceptual radicalization) are the most important negative effects. In the last part, it was underlined the ethical principle, based on kantian deonthology: "First, the Human being". The smart cities must prioritize human well-being and ethical behavior such as inclusivity, equity, and transparency. In conclusion, we advocate for a "Social Smart" approach, arguing that technology should act as an "infrastructure of empathy" rather than an end in itself.*

Keywords: *smart city; internet of things (IoT); data privacy; AI ethics; social inequality; human-computer interaction; human autonomy; sustainability.*

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1. Introduction

The fundamental transformations identified in urban development, supported by remarkable technological advancements, exert a major impact on human beings. Confusion, overload, fatigue, and, above all, the loss of time are among the experiences I increasingly observe in my own life, as an internet user situated at the centre of technological development. Technology makes a substantial contribution to everyday life, but at a significant psychological and social cost. The pace of development has increased exponentially, severely testing humanity's capacity for adaptation. An analysis of the effects of technology on human beings (from a physiological, psychological, and social perspective) cannot be conclusively conducted, as devices evolve before stable results can be obtained. We find ourselves fully immersed in technology without being able to anticipate its consequences. Estimates remain approximate, and the very notion of anticipation and modelling based on historical experience becomes implausible due to the unprecedented nature of the current context.

To understand this context, it is necessary to analyse technological cycles from a historical perspective. These cycles differ from biological generations, typically defined as spanning 20-30 years, and are characterised by radical technological change. In prehistoric times, technological cycles spanned hundreds of thousands or tens of thousands of years; in antiquity, thousands or hundreds of years; during the Middle Ages, hundreds of years; and in the modern era, approximately 50-100 years. By the final decades of the twentieth century, cycles had shortened to 10-20 years. Today, technological change occurs so rapidly that an entirely new cycle may emerge in less than a decade.

Until the end of modernity, individuals generally lived within a single technological cycle. Changes were incremental and affected only certain segments of society. Innovation diffused slowly, and learning occurred gradually. At the beginning of modernity, an individual could observe the evolution of a technological cycle over the course of a lifetime and evolve alongside it. After the 1980s, however, the relationship between humans and technology changed significantly, as technological cycles became increasingly compressed. Consequently, contemporary generational analysis is increasingly conducted through a technological lens (Karl Mannheim, 1952; Mark McCrindle, 2025). Differences between generations are amplified by new technological instruments (Rudolph et al., 2021). A member of Generation X experienced approximately five technological cycles, whereas a member of Generation Z may be unable to recognise or use everyday technologies familiar to Generation X. A simple example is information storage: magnetic tapes, commonplace for Generation X, are obsolete for Generation Y and unrecognisable to Generation Z.

This widening generational gap has profound sociological consequences. Following Moore's Law (Gordon E. Moore, 2006), Kurzweil's perspective (2001), and empirical observation, it can be anticipated that Generation Alpha will directly engage with change, potentially participating in more than ten complete technological cycles. At such a pace, it becomes impossible to clearly identify the physiological, psychological, or societal effects of technology. We are therefore confronted with unprecedented challenges related to our ability to manage and respond to technological transformation.

This constitutes one of the core premises of the present study. The effects of the human–technology relationship remain largely unknown and should not serve to block change but rather to guide it toward genuine human benefit. Technological development must not come to an end, fueling the greed of certain actors under the guise of efficiency, welfare, or development. Technology used in the public interest differs fundamentally from efficiency devoid of ethical substance. By addressing social and ethical consequences and limiting discrimination and manipulation, it becomes possible to build a sustainable society through technological immersion.

One of the most prominent and seemingly most transparent applications of new technologies is the development of smart cities. A smart city represents the vision of an interconnected community in which technology is employed to enhance efficiency, sustainability, and citizens' quality of life. It seeks to integrate innovative solutions capable of addressing increasingly complex urban needs, transforming how individuals interact with their environment. Through advanced technologies, smart cities can anticipate challenges and provide solutions, creating an efficient ecosystem for both residents and local administrations.

For the development of interconnectivity, the implementation of what is known as the Internet of Things (IoT) is required. IoT connects physical objects to the internet through a set of technical and functional characteristics that confer both uniqueness and transformative potential. One of the fundamental features of IoT is ubiquitous connectivity, namely the ability to interlink a wide range of devices, sensors, systems, and infrastructures regardless of their type or location within a unified and coherent network. This connectivity is supported by advanced communication technologies such as 5G networks, Low Power Wide Area Networks (LPWAN), Wi-Fi, Bluetooth, and ZigBee, each tailored to specific requirements in terms of energy consumption, bandwidth, and coverage, depending on the application context.

Another defining attribute of IoT is its capacity for real-time data collection and analysis. IoT devices are equipped with sensors capable of detecting physical environmental conditions, such as temperature, air quality, movement, noise, or traffic, and transmitting these data either through local networks or via edge computing and cloud computing infrastructures. This enables a state of continuous situational awareness, allowing decision-makers to respond promptly and effectively to changes on the ground, thereby contributing to service optimisation and the reduction of operational costs.

Finally, the vast volume of data collected by IoT technologies within a smart city is effectively leveraged through the integration of artificial intelligence into urban governance. Once processed by AI-based systems, these data become sources of advanced analytics that enable the real-time optimisation of public services. Artificial intelligence can identify patterns within large-scale datasets, anticipate emerging needs, and generate automated decisions related to public lighting, traffic management, energy distribution, or urban safety. This combination provides cities with the capacity to respond rapidly to change, prevent incidents, and allocate resources more efficiently. Thus, AI and IoT, operating in combination, transform the city into an intelligent, dynamic, and citizen-centered system.

From a theoretical perspective, these developments appear highly beneficial and well-integrated with human needs. However, the question remains whether this is truly the case. The present study seeks to juxtapose technological evolution with human necessities by analysing the potential impact of smart city development. Moving beyond the euphoria of novelty and technological enthusiasm, the analysis aims to explore the deeper implications of these transformations, using observation and critical assessment to estimate the consequences of implementing new technologies.

2. Psychosocial Limits and Digital Inequality

The development of smart cities and the implementation of increasingly advanced technologies are accompanied by a multitude of psychosocial challenges, which are often minimised or implicitly accepted as unavoidable sacrifices associated with progress. Although there are indisputable positive effects in areas such as service efficiency (Giles-Corti et al., 2016), population mental health (Lou et al., 2024; Egbosimba, 2025), environmental sustainability (Huang et al., 2024), and urban security (Visvizi & Lytras, 2020), the limitations and potential negative consequences should not be overlooked.

There is a persistent tendency, driven by social or political marketing considerations, to portray the impact of smart cities as an unequivocal success story, emphasising exclusively positive outcomes for the population. The narrative often presents a desirable future free of unintended consequences. Yet such representations risk oversimplifying complex realities. A balanced evaluation requires acknowledging both the benefits and the structural tensions embedded in technologically mediated urban development. However, it is necessary to confront the realities of technological development.

3. The "Invisible" People of the Smart City

Imagine[1] that you are an elderly person who has recently arrived in a city undergoing rapid modernisation, aspiring to meet the standards of a smart city. As part of this transformation, the local administration has deemed it essential to modify the ticketing system for public transportation. Physical tickets have been eliminated and replaced with electronic travel cards. These cards can be purchased from kiosks or automated machines. Due to increasing automation, the number of traditional service kiosks has steadily declined.

Standing in front of a ticket machine, you feel confused. You do not understand the multitude of buttons, options, and pricing structures displayed on the screen. What exactly do you need? What should you purchase, and how? Hesitantly, you ask a young passer-by for assistance. The explanation is brief: purchase a card and load it with credit. But how much credit? How many journeys? A single ride costs 4 RON. How much money might you inadvertently spend without fully understanding the system?

The more pressing question, however, extends beyond this individual situation: how many individuals have reduced or abandoned their mobility due to such changes? Who accounts for them? Do they appear in any official statistics?

A frequently encountered sarcastic response to such concerns is: "Should we halt progress for their sake?" The answer is clearly no. Technological development should not be suspended; rather, it should be conceived inclusively. The essential requirement is not to abandon innovation, but to ensure that it remains accessible to all categories of users.

A practical solution lies in the use of what may be termed *inertial*[2] or *recurrent technologies*[3], that is, maintaining parallel access mechanisms that preserve familiarity and continuity for users who are not fully integrated into digital ecosystems. A relevant example can be observed in **Japan** and **South Korea**, two of the most technologically advanced societies in the world. In both cases, although highly automated and contactless payment systems are widely implemented, including standard bank cards and specialised transportation cards, cash payment options remain available upon entry to public transport vehicles.

These cash-based alternatives are not primarily designed for tourists or foreign residents, but for older individuals who may experience difficulties adapting to new technologies or who simply prefer traditional payment methods. Such an approach demonstrates that technological advancement and inclusivity are not mutually exclusive. On the contrary, maintaining redundant or hybrid systems may serve as a deliberate strategy to prevent social exclusion and to safeguard equitable access to essential services.

In the context of a smart city, similar challenges arise across multiple domains: automation, non-intuitive user interfaces, and online integration with mobile platforms that increasingly require the installation and management of numerous applications. As can be observed, one of the most subtle yet profound consequences of the uncritical implementation of IoT technologies in smart cities is social exclusion. Although smart city initiatives promise to enhance urban life for all citizens, the reality is that access to these technologies is not distributed equitably.

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[1] The account presented above is not hypothetical. Numerous elderly individuals, and not only them, encountered difficulties in purchasing travel tickets following the transition to a digitalised ticketing system in the city of Iași, Romania. This example illustrates the tangible social impact of technological transitions when adequate adaptive mechanisms are not in place.

[2] The term *inertial technologies* may be used to designate older technologies that remain in use until a new technological system is successfully implemented and universally accessible. Such technologies continue to operate for as long as necessary to ensure information continuity, operational security, or non-discriminatory access to essential services. Examples include printed books, libraries, paper documents, manual devices, CDs, DVDs, and similar formats. Their persistence is not merely nostalgic but functional, serving as safeguards against exclusion and systemic fragility.

[3] A related concept refers to *recurrent technologies*—technologies that reappear periodically due to their distinctive qualities. These technologies are often reintroduced in modernised forms while retaining a degree of familiarity that allows them to be used comfortably across generations. A representative example is the resurgence of vinyl records, which, despite technological advancement in digital audio formats, continue to be valued and widely used.

Digital systems presuppose the existence of personal devices, permanent internet connectivity, and, most importantly, a high level of digital literacy, as well as, in some cases, the implicit acceptance of surveillance mechanisms. This configuration directly advantages younger, educated, healthy individuals with above-average incomes, precisely those groups that are already structurally privileged in urban environments. Conversely, vulnerable groups, including older adults, persons with disabilities, residents of disadvantaged neighbourhoods, migrants unfamiliar with the local language, and individuals with limited access to the internet or smart devices, risk exclusion from the benefits of urban digitalisation.

As illustrated in the previous example, if public transportation systems or medical appointment services operate exclusively through mobile applications, these citizens may be unable to access such services with equal ease, or at all (Rui & Rodrigues, 2024).

4. Loss of Individual Autonomy and Technological Dependence

The development of smart cities raises multiple psychosocial concerns. One of these, closely linked to technological advancement in general but intensified by the expansion of smart urban systems, is the erosion of personal autonomy under conditions of technological dependency. For the purposes of this discussion, autonomy may be understood as an individual's capacity to determine the course of their own life, namely, the ability to make decisions independently, without direct or indirect external interference. Autonomy is sustained by critical thinking, deep analytical capacity, the ability to solve complex problems, make informed decisions, and maintain internal motivational support.

Autonomy, however, is not an absolute phenomenon. No individual exists in complete isolation from external influences. The relevant question is therefore not whether influence exists, but rather where reasonable limits of dependency should be drawn, what types of influence are exerted, and what role such influences play in personal development.

Although insufficient time has elapsed to fully assess the long-term consequences, several concerning phenomena have already been identified and analysed. One such phenomenon is **cognitive offloading**. As social environments and urban infrastructures become increasingly complex, individuals rely on technological tools to manage new and demanding challenges. Initially, such tools function as facilitators. Over time, however, assistance may evolve into dependency. Excessive reliance on digital instruments can interfere with fundamental human cognitive processes. What begins as a form of "induced laziness", a preference for technological solutions even for simple tasks, may gradually become chronic (Ahmad et al., 2023; Skowronek et al., 2023). The brain progressively externalises both simple and complex tasks to software systems, reducing active cognitive engagement.

This progression is followed by **decisional uncertainty**, whereby individuals increasingly rely on artificial intelligence systems to make decisions on their behalf. Over time, this may contribute to the progressive limitation of critical thinking abilities and to a form of epistemic incapacity in solving complex problems independently. The final stage may be described as **digital amnesia**, a condition characterised by total dependence on GPS navigation systems, virtual assistants, and search engines (Babaoğlu et al., 2025; Lodha, 2019; Kadhiravan & James Robert, 2025).

Technology becomes the default solution for virtually all tasks: spatial orientation, information retention, text production, speech preparation, leisure planning, social communication, and even long-term life decisions. Such sustained reliance may directly affect neural processes, as cognitive functions are increasingly outsourced to digital tools, potentially leading to reduced activation of neural pathways associated with memory consolidation, spatial reasoning, and analytical processing. The ultimate consequence may be heightened vulnerability, an inability to navigate physical or informational environments in the absence of digital interfaces.

Compounding these effects is the "special relationship" that develops between individuals and technological systems. Search engines and algorithmic platforms may introduce users into self-reinforcing informational loops that restrict perception and limit exposure to diverse viewpoints. The concept of the **filter bubble**, introduced by **Eli Pariser** (2011), describes a phenomenon of informational isolation in which users predominantly receive content aligned with their existing beliefs, as inferred from behavioural profiling. Exposure to opposing or diverse perspectives becomes limited or entirely absent.

Informational isolation may further evolve into ideological isolation through the mechanism known as the **echo chamber**, a concept elaborated by **Cass R. Sunstein** (2001) and later by **Kathleen Hall Jamieson** and **Joseph N. Cappella** (2008). Within such environments, repeated exposure to homogeneous viewpoints reinforces prior beliefs and may contribute to conceptual and ideological radicalisation. In the absence of algorithmic transparency, individuals embedded within these loops often remain unaware that the information they receive is filtered and that other users may encounter entirely different search results for identical queries.

Additional psychosocial consequences may include inappropriate generalisation and excessive confidence in one's informational accuracy (Bahg et al., 2025). The filter bubble further amplifies digital amnesia by reducing the cognitive effort required for information seeking and critical evaluation, thereby reinforcing dependency on external memory systems. This process is compounded by a false sense of certainty and diminished motivation to seek supplementary information or engage in deeper learning. Over time, these mechanisms may contribute to the decline of cognitive functions associated with information processing and problem-solving.

Collectively, such dynamics risk creating a form of **digital enclosure**, a subtle yet pervasive limitation of individual autonomy in which the individual remains largely unaware of the structural constraints imposed upon their informational environment. In this sense, technological mediation may paradoxically narrow, rather than expand, the scope of personal freedom.

All of the previously identified problems become amplified within the context of a smart city. Urban life increasingly develops around technological infrastructures and their inherent dynamics. If one needs to reach a specific destination, digital maps are used. If one wishes to know when a bus will arrive, a dedicated application is consulted. To determine the closing time of a store, another application is accessed. When deciding how to spend leisure time, there is invariably an application offering recommendations; yet another suggests venues for social interaction.

This ecosystem functions because of the omnipresence of the internet, and, more recently, artificial intelligence. Urban experience becomes structured around applications, rating systems, search engines, and social media platforms. Algorithmic monitoring operates continuously, progressively diminishing the individual's perception of autonomy.

The critical issue is that technology does not provide neutral or passive support. Rather, it acts proactively, "anticipating" individual needs based on personalised data analysis. These predictive mechanisms confine users within limited virtual spaces, where filter bubbles and echo chambers function as informational walls. The individual may become enclosed within a self-reinforcing digital environment, resembling a form of invisible confinement.

The secondary effects are potentially significant. Cognitive offloading, decisional uncertainty, and digital amnesia risk becoming normalised psychosocial features of a hyper-informatised city. In such environments, technological mediation does not merely facilitate daily life; it restructures cognitive habits, informational exposure, and ultimately, the experience of autonomy itself.

5. Technological Efficiency, Urban Rhythm, Anxiety, and Stress

Let us reconstruct the image of a smart city: constant connectivity; online platforms enabling access to services; automated control of public transportation, traffic lights, and public lighting; centralised management of advertising panels; digitised access to goods through self-service systems; robots serving coffee or providing information. Beyond spatial design and visual aesthetics, these elements collectively generate a form of algorithmic efficiency that accelerates the pace of urban life exponentially.

Given that smart cities are, in most cases, already densely populated urban environments characterised by high levels of dynamism, this intensified technological mediation may render the rhythm of daily life overwhelming. Elevated levels of stress and anxiety risk becoming normalised, as residents experience cognitive overload due to continuous exposure to information streams, persistent use of digital devices, particularly among those less familiar with them, and the pressure to remain constantly "available" online.

In addition to technostress, the constant interaction with screens, even for leisure purposes, and prolonged exposure to blue light have significant physiological consequences. Such exposure may disrupt circadian rhythms and exacerbate anxiety disorders and insomnia (Gniedziejko et al., 2025). The gradual reduction of analogue human interaction may further intensify feelings of social isolation, paradoxically occurring within contexts of hyperconnectivity. These effects are compounded by sensory deprivation and the fatigue associated with continual adaptation to technological change.

Technological transformations have become so rapid that even educated individuals who actively attempt to remain informed struggle to keep pace. This phenomenon has been described as **change fatigue**, a condition characterised by emotional exhaustion, diminished motivation for engagement, resistance to further change, and a growing perception that continued learning may be futile (Magic & Breker, 2023).

We are confronted with a fundamental dilemma: efficiency or the human being. Although smart cities are promoted as an ideal model of urban life, with digital efficiency presented as a catalyst for improving everyday experience, reality suggests that as the pace of daily life accelerates, individual stress levels increase correspondingly. A further question arises: how can we determine whether the notion of efficiency is genuinely understood and meaningfully implemented in everyday life?

Under expressions such as "people are not robots" or "too efficient to be efficient," a relevant example can be considered.

Let us imagine Seoul[4], a city of approximately ten million inhabitants, surrounded by a metropolitan area hosting an additional fifteen million residents. A total of roughly twenty-five million people commute across distances that may extend up to one hundred kilometres. Public transportation must function with precision and reliability; otherwise, the city would become inert, congested, and incapable of sustaining its economic and social dynamics.

The public transportation infrastructure is exceptionally developed: nine fully operational urban subway lines, supplemented by extensive metropolitan rail connections to surrounding areas, as well as a vast network of urban, peri-urban, and intercity bus routes. The system is so complex that its management requires sophisticated big data architectures to monitor, coordinate, and optimise operations. For tourists, and even for local residents navigating unfamiliar areas, digital applications become indispensable tools. They provide guidance through what might otherwise resemble a labyrinthine transportation network, preventing disorientation and inefficiency.

Transportation applications in a city such as Seoul must process an immense volume of information. To travel from point A to point B, the number of possible route combinations is extraordinarily high. From these, the application selects approximately ten alternatives considered the most efficient at a given moment, typically in terms of estimated travel time.

At this stage, however, a fundamental issue emerges. How should the algorithm calculate the most efficient route, particularly when transfers between different modes of transportation are

[4] The example of Seoul was selected deliberately. Having lived in this city for an extended period and having become thoroughly familiar with its infrastructure, I encountered this issue repeatedly, which confirms that it is not an isolated occurrence. Similar experiences were observed in Tokyo and Osaka, where highly optimised transportation systems, while undeniably efficient, also generate dependency on digital navigation tools and may impose cognitive strain on users unfamiliar with the complexity of the network. These cases suggest that extreme infrastructural efficiency does not necessarily eliminate friction at the level of individual experience; rather, it may shift the burden from physical disorganisation to cognitive mediation through digital systems.

required? What time interval should be assigned to the transfer from one vehicle or line to another? Theoretically, the shortest possible interval would maximise efficiency. Yet human movement is not instantaneous. Transfers require physical displacement, orientation, and adaptation. Here we encounter a form of efficiency that exceeds human capabilities and introduces a new stress factor.

First scenario: the transfer occurs on the same platform. If the allocated transfer time is under one minute, the probability of missing the subsequent vehicle becomes significantly high. In practice, at least two minutes may be required to ensure a realistic and manageable transition. Synchronising two transport units located in different areas of a large metropolitan system, often separated by considerable distance and time, is complex, yet achievable within a reasonable tolerance margin.

Second scenario: the transfer takes place on a different platform. In this case, an additional variable must be considered: the time required for physical movement between platforms. This interval is relative and depends on both objective factors (distance, pedestrian traffic, traffic signals, architectural layout) and subjective factors (walking speed, familiarity with the environment, orientation skills, adaptability). A maximal and minimal reasonable time can be estimated, from which an average value may be derived. The critical question, however, remains: which time value should be embedded in the algorithm? Should it differ from the interval used in the first scenario?

This example illustrates the broader tension between algorithmic optimisation and human variability. Efficiency modeled as a fixed computational parameter may fail to capture the diversity of embodied experience, thereby transforming what is intended as facilitation into a source of pressure and uncertainty.

Third scenario: the transfer involves a change in the mode of transportation, for example, from metro or train to bus. This situation resembles the second scenario, but with greater spatial distances and increased complexity in estimating the time required for transfer. The central question remains: how efficient must the calculation of travel time be in order for the proposed route to be genuinely efficient?

Consider the moment when a connection is missed and the next vehicle is scheduled to arrive in approximately ten minutes. Within those ten minutes, dozens of alternative routes may theoretically exist. Yet personal experience suggests that the “most efficient” route proposed by the application is rarely efficient in practice. In many cases, the connection is lost because a human being is not a robot. Individuals require additional time to adapt to unfamiliar environments, orient themselves within new spatial configurations, and navigate physical obstacles.

An additional and rarely considered variable is the time required to translate virtual information into physical movement. How rapidly can one transfer a digital map, displayed abstractly on a screen, into actionable spatial orientation within the real environment? The cognitive effort involved in converting virtual representations into embodied navigation is seldom incorporated into algorithmic models of efficiency.

This example underscores a fundamental tension: computational optimisation assumes standardised human behaviour, whereas actual human mobility is variable, embodied, and context-dependent. When efficiency is defined exclusively through numerical minimisation of travel time, it may paradoxically generate inefficiency at the level of lived experience.

In conclusion, the uncritical implementation of IoT technologies contributes to social exclusion, transforming the smart city into an “elitist” environment in which certain citizens become effectively invisible within algorithmic logic. Phenomena such as cognitive offloading, the externalisation of mental tasks to software systems, decisional uncertainty, the progressive limitation of critical thinking, and digital amnesia (manifested through total dependence on GPS navigation, virtual assistants, and search engines) increase human vulnerability in contexts of continuous digital mediation.

The filter bubble and echo chamber mechanisms further intensify these effects by restricting exposure to diverse sources of information and reinforcing dependence on external memory systems, thereby constructing what may be described as a form of “digital enclosure.” At the same time, a structural tension emerges between algorithmic efficiency and human needs. Transportation algorithms, for example, often fail to account for the time required for cognitive adaptation and spatial orientation, generating additional stress rather than genuine facilitation.

If urban development is to be genuinely inclusive and human-centred, it is imperative that policymakers, designers, and administrators critically evaluate not only the promotional narratives surrounding smart cities but also their unintended psychosocial consequences. Sustainable innovation requires acknowledging both the benefits and the structural risks embedded within technologically mediated urban environments.

6. New Ethical Challenges Raised by the Existence of Smart Cities

The development of information technologies generates new challenges across all fields of the humanities. Within philosophical inquiry, significant reconfigurations occur at the level of ontology, epistemology, axiology, logic, aesthetics, and heuristics. However, the most profound societal impact emerges in the rethinking of ethics. Ethical reflection must establish new value hierarchies, redefine absolute and relative judgments, and determine the boundaries of acceptable and unacceptable behaviour.

Such a task requires technical knowledge, reflection time, and theoretical stability within newly emerging ontological and epistemological frameworks. Yet the rapid pace of technological transformation provides none of these conditions. Ethical frameworks must therefore be constructed dynamically and often without the benefit of sufficient empirical consolidation. In this sense, emerging ethical systems risk becoming projections of anticipated realities rather than analyses grounded in stable observation.

This is also the case with the ethical issues raised by smart cities. Regulatory frameworks and policy recommendations, such as those issued at the level of the European Union (2026) or by UN-Habitat (2025), primarily emphasise development objectives, often relegating ethical and social consequences to a secondary position. As we remain at an early stage of implementation, ethical challenges must be identified dynamically and anticipatorily, based on short-term empirical experience and relatively limited research (European Parliament & Council of the European Union, 2024).

At the same time, many ethical issues are structural and deep, making them unlikely to surface through empirical observation alone, statistical analysis, or predictive simulation. Rigorous scientific examination requires time, often years, to produce comprehensive and methodologically sound results. By the time such analyses are completed, peer-reviewed, and published, technological realities may have evolved significantly. Due to the rapid pace of IT development, the phenomena under study may already have transformed, rendering conclusions partially outdated.

For this reason, substantive adjustments in ethical reasoning are necessary. Ethical problems must be anticipated and prevented before their consequences become irreversible. A methodological shift is therefore required. Thought experiments and philosophical methods should assume a central role in formulating plausible hypotheses about emerging technological realities. These approaches should be complemented by modelling and simulation techniques capable of testing hypothetical scenarios.

In conclusion, it must be emphasised that we are facing serious ethical challenges whose resolution cannot be postponed, despite the fact that the available analytical instruments remain limited.

7. Premise

The technologies specific to smart cities, even when incorporating elements of artificial intelligence, do not necessitate an exhaustive examination of all ethical issues associated with advanced AI systems. Although the complexity of IoT infrastructures is substantial, contemporary artificial intelligence and machine learning algorithms do not yet exhibit a level of autonomy or independence that would justify raising questions concerning self-awareness or moral agency.

For this reason, the present study adopts a deflationary stance. Rather than engaging with speculative debates surrounding artificial systems endowed with consciousness, the analysis focuses on ethical problems that are structurally distinct from those associated with hypothetical self-aware AI. The emphasis remains on the sociotechnical and governance-related implications of existing technologies, whose ethical challenges arise not from artificial subjectivity but from their impact on human autonomy, social equity, privacy, and institutional responsibility.

8. First, the Human Being

In the context of smart cities, the principle of considering the human being as the primary priority of any developmental process constitutes the foundational axiom upon which the entire ethical framework must be constructed. The prioritisation of human well-being and the protection of fundamental rights must serve as the starting point for any form of technological urban development. The idea of viewing the human being as the central objective of a smart city finds its philosophical roots in Kantian deontology. The formulation "to treat humanity as an end in itself and never merely as a means" articulated by Immanuel Kant (1998, pp. 4:429), as an expression of the Categorical Imperative, repositions the human being at the centre of ethical deliberation.

This principle requires respect for human dignity beyond pragmatic or economic valuations defined in terms of price (Immanuel Kant, 1998, pp. 4:434–435). While in economic terms most objects may possess a price or be replaced by equivalents, rational beings, capable of moral judgment, possess dignity, which transcends market valuation. Consequently, individuals cannot be evaluated as mere instruments. At the same time, human activity aims at the production of goods, services, and resources that are used both by oneself and by others. Without such reciprocal activity, social functioning would be impossible. Thus, refraining from treating another as a mere instrument does not preclude benefiting from their services. Any service is socially acceptable provided that it is offered voluntarily, grounded in consent, and respectful of the humanity of the person providing it.

A further essential element is autonomy, understood as freedom of action (Immanuel Kant, 1998, pp. 4:429, 440, 447). Each individual must be allowed to exercise the capacity to choose and act freely. Others must not be used to achieve personal objectives, not only through coercive means such as exploitation, but also through persuasive mechanisms such as manipulation, sophistry, or deception. Only conscious and voluntary action can constitute the basis of legitimate social interaction and mutual support. Society, in its normative dimension, is grounded in moral responsibility, which requires recognition of the intrinsic value of each individual, irrespective of social, economic, or political utility. The "kingdom of ends" consists of rational beings capable of making moral decisions that may serve as the foundation of universalisable norms.

The Kantian perspective thus provides an essential reference point for conceptualising a modern urban community. For a smart city to succeed, it must remain fundamentally human-centred. From an ethical standpoint, every stage of development must continuously acknowledge that the ultimate beneficiaries are citizens. The primary objective should be to provide, through infrastructure, an improved quality of life characterised by cleanliness, environmental sustainability, and accessible high-quality services. Achieving this goal requires rigorous and substantive assessments of residents' needs and of the impact of technological implementation on all social categories.

Only on the basis of such comprehensive analysis, rather than superficial feasibility studies, should priorities be established, human-friendly technologies identified, projects designed, and physical infrastructure developed. The resulting systems must deliver services that are socially and economically efficient while remaining ethically grounded. Yet paradoxically, it is often the human being who is marginalised within technologically driven development processes. In this context, two fundamental categories of ethical failure can be identified, through which the axiom "humanity first" is undermined: general administrative deficiencies and specific violations of human rights.

9. Administrative Ethical Issues

Although administrative deficiencies may appear secondary at first glance, they often exert significant impact on individuals and communities. From the perspective of the Kantian Categorical Imperative, several forms of morally problematic conduct can be identified in which the human being is reduced to a means for achieving secondary, and sometimes superficial, objectives.

One primary issue arises when a smart system is developed within a city merely because it is "trending" or politically advantageous in terms of public image. In such cases, the principal objective is political marketing rather than genuine improvement of citizens' quality of life. Project design and implementation are frequently undertaken without rigorous documentation or substantive needs assessment. The outcomes may prove economically inefficient, generating financial losses borne by the community, while simultaneously undermining public trust in infrastructure development.

Numerous examples of this phenomenon can be documented. Dysfunctional "smart" parking systems, where embedded asphalt sensors intended to communicate space availability via mobile applications fail due to calibration errors, technical malfunctions, or lack of maintenance, are not uncommon. Similarly, solar-powered street benches equipped with Wi-Fi connectivity often become ineffective when solar panels accumulate dirt, are partially shaded, or when public Wi-Fi speeds are inferior to users' mobile data services. Interactive tourist information kiosks and digital guides have, in many contexts, become redundant following the widespread adoption of smartphones. Likewise, electronic ticketing kiosks for public transportation may represent an unnecessarily complex solution in environments where contactless bank card payments or mobile applications already provide more efficient alternatives.

In such cases, technological implementation risks prioritising symbolic modernisation over functional necessity. When infrastructure is deployed primarily to signal innovation rather than to respond to concrete human needs, individuals are implicitly instrumentalised in service of political visibility or institutional prestige. This constitutes a subtle yet significant departure from the ethical principle that human dignity and well-being must remain the primary objective of urban development.

Another problematic tendency consists in implementing technology for the sake of technological development itself. Radical proponents of the digital revolution advocate for the pervasive imposition of technological solutions across all sectors, often without systematic prior analysis and without sufficient consideration of probable social consequences. In such circumstances, the human being risks becoming the subject of an experiment conducted without informed consent. Individuals are reduced to instruments serving personal ambitions, whether pecuniary in nature or motivated by grandiosity. When the human person ceases to be an end in themselves, or even a secondary priority within the hierarchy of objectives, we are confronted with a profound ethical problem.

A third tangible danger is represented by pseudo-investments or unfinished technological projects. Between the launch of initiatives aimed at sustainable technological development and their effective implementation lies a multitude of factors capable of distorting their purpose. The concern here is not necessarily corruption or embezzlement, but rather projects undertaken merely to "absorb funds." In such cases, investments are not grounded in genuine societal needs; instead, financial resources are identified first, and artificial needs are subsequently constructed around them.

The issue is therefore not solely financial. Such investments may prove counterproductive, complicating daily life rather than improving it. They often remain incompatible with existing systems, incoherent within the broader developmental strategy of the urban area, and capable of generating structural imbalances. Frequently, these projects remain incomplete, creating bottlenecks and restricting future development possibilities. Even when inefficiency becomes evident, they are rarely dismantled due to contractual constraints or the additional costs required for removal.

Integration into future systems may also be impracticable, as doing so would amplify existing blockages.

Examples of such phenomena can be observed in everyday urban environments: “smart” traffic lights that exacerbate congestion rather than alleviate it; electronic payment systems that are counterintuitive; applications that transform simple tasks into unnecessarily complex procedures. The moral issue underlying these situations stems from the implicit prioritisation of financial expenditure over human well-being. The resulting “chain of weaknesses” continues through procurement processes focused on the lowest-cost equipment, poorly designed technical specifications, and insufficient verification of whether declared objectives have genuinely been achieved.

Administrative shortcomings, even when they appear minor or technical in nature, are often grounded in deeper moral inconsistencies. In such contexts, the human being is no longer regarded as an intelligent agent capable of generating value, but rather as a functional instrument within a technocratic system. These distortions are frequently sustained by individual greed, collective opportunism, and a narrowly defined conception of economic efficiency that prioritises financial metrics over social well-being.

Short-term, static analyses are often incapable of identifying the structural roots of these problems. While they may provide the appearance of evaluation and accountability, they frequently fail to detect long-term inefficiencies and emerging social risks. In some cases, such analyses drift away from their original purpose, namely, the identification and mitigation of social challenges, and instead become justificatory mechanisms for ineffective policies or superficial technological implementation.

When evaluation frameworks are detached from substantive ethical reflection and from authentic engagement with human needs, they cease to function as instruments of improvement. Instead, they risk legitimising inefficiency, reinforcing systemic blind spots, and perpetuating forms of development that undermine the very communities they purport to serve.

10. Protection of Human Rights within Smart Cities

The implementation of technologies within smart cities must begin from the fundamental premise that the human being alone constitutes the primary value, while all other objectives remain secondary. Amid the ethical and social relativities generated by rapid technological development, there remains a normative reference point: the **Universal Declaration of Human Rights** (United Nations General Assembly, 1948). This document, broadly recognised as a foundational ethical and social framework, establishes in its Preamble and in Articles 1 and 2 that the human being holds priority in any form of social organisation and development. The individual is to be regarded as an “end in themselves,” a “priority zero.” No technological ambition or administrative objective should interfere with this fundamental ethical axiom.

The practical question, however, remains: how can this ideal be translated into everyday reality? How can normative principles be operationalised within the technological infrastructure of a smart city?

The Universal Declaration of Human Rights provides several key benchmarks relevant to the intersection of individual rights and technological development. One provision that acquires renewed significance in the digital age is Article 12, concerning the protection of privacy. Contemporary technologies enable forms of intrusion into personal life that were unimaginable two decades ago. The accumulation and processing of personal data create the potential for sophisticated systems of tracking and identification, veritable networks of surveillance capable of mapping individual behaviour in real time.

Situations documented in Hong Kong (University of Southern California, 2025), among other contexts, demonstrate the ease with which such data can be collected, aggregated, and analysed. These examples illustrate how technological infrastructures designed for efficiency or security may simultaneously generate profound risks to privacy, autonomy, and civil liberties.

In democratic systems, the use of personal data is, or should be, subject to strict limitations. General principles governing data processing and storage are typically introduced, including data minimisation (the collection of only the minimum volume of necessary information), respect for anonymity (through anonymisation at the source, for example, facial and license plate blurring or the use of non-intrusive sensors), real-time notification of citizens, and the requirement of informed consent for data usage.

However, even when such regulations are formally respected, they often ensure only partial and superficial protection of personal rights. A relevant example concerns the requirement of consent for the processing of personal data. Regulatory frameworks mandate that any processing of personal data must occur with the individual's consent. Yet, due to the proliferation of consent requests and extensive documentation, consent frequently becomes a procedural formality rather than a meaningful act of informed decision-making. Individuals routinely provide agreement without engaging in substantive analysis of the information presented. In this context, a significant distinction emerges between formal consent and genuine, informed consent.

A second category of rights requiring reconsideration under the impact of emerging technologies concerns freedom of thought and the right to personal opinion (Articles 18 and 19). The erosion of individual autonomy and increasing dependence on technological systems, combined with mechanisms of digital manipulation and algorithmic persuasion, raise fundamental questions regarding the effective protection of these freedoms. Although overt intrusion or direct violations may not always be apparent, the structural conditions created by digital environments necessitate broader ethical scrutiny.

The filter bubble and echo chamber phenomena constitute tangible risks to freedom of thought. These mechanisms, intensified by continuous interaction with virtual environments facilitated by smart city infrastructures, may restrict exposure to diverse viewpoints and subtly influence cognitive processes. As urban life becomes increasingly mediated by algorithmic systems, the boundaries between assistance, persuasion, and constraint become ethically ambiguous.

These two directions of analysis concern the protection of negative rights, as articulated in the **Universal Declaration of Human Rights**. However, ethical challenges are not limited to safeguarding individuals against intrusion. Regulatory frameworks must also pursue the active support of persons, the protection of vulnerable groups from discrimination, and the prevention of the emergence of new forms of vulnerability generated by technological transformation.

Recent regulatory initiatives of the European Parliament and Council of the European Union (2024), as well as recommendations issued by UN-Habitat (2025), emphasise the imperative necessity of developing smart cities grounded in clear ethical principles. These include the introduction of normative safeguards designed to uphold fundamental rights and prevent discrimination.

Among the key principles to be respected are: universal accessibility and the removal of physical barriers; digital literacy programs complemented by continued availability of human (analogue) support; financial fairness and cost accessibility in relation to digital interfaces and software services; and algorithmic equity achieved through rigorous auditing, the elimination of discriminatory models, and the use of representative datasets reflecting the diversity of the entire population, not merely its most digitally active segments.

Such regulatory orientations demonstrate that ethically grounded smart city development is not only desirable but feasible. However, its success depends on a crucial condition: that human greed, whether manifested as profit maximisation at the expense of equity, political opportunism, or institutional self-interest, remains constrained by principled governance and genuine commitment to the primacy of the human person.

11. Conclusions: Advocating for the Social Intelligence of the Smart City (Social Smart – Smart City)

In recent decades, discourse on Smart Cities has been dominated by a technocentric vision in which urban success is measured through the density of IoT sensors, the speed of 5G networks, and the algorithmic optimisation of traffic flows. Yet a city cannot be genuinely "intelligent" if it neglects its human capital and social cohesion. A smart city has a positive role only insofar as it is intrinsically connected to its social intelligence (Social Smart), that is, the capacity of the urban ecosystem to employ technology not as an end in itself, but as a facilitator of equity, inclusion, and democratic participation.

A sustainable smart city must transition from the model of the "automated city" to that of the "socially augmented city." This shift entails a paradigmatic transformation in which the citizen is no longer treated as a passive data provider, but as a co-creator of urban space. Technology should therefore function as an infrastructure of empathy, reducing not only physical distance but also social distance. Monitoring systems for air quality, assistive applications for persons with disabilities, and collaborative economy platforms exemplify how raw data can be translated into experienced well-being.

What is required is a form of "empathetic urbanity," in which the design of smart solutions begins with a rigorous sociological analysis of community needs. In this framework, the city becomes a living laboratory, an ecosystem in which innovation directly serves quality of life rather than symbolic modernisation.

Such a reorientation demands methodological, institutional, and ethical recalibration. First, participatory governance mechanisms must be strengthened so that technological priorities emerge from genuine deliberation rather than technocratic imposition. Second, digital infrastructures must remain interoperable, transparent, and accountable. Third, education and digital literacy must be treated not as optional complements, but as structural components of urban policy. Finally, algorithmic systems must be subjected to continuous ethical auditing to ensure equity, proportionality, and respect for human dignity.

A Social Smart City does not reject technological progress; rather, it reframes it. Intelligence, in this context, is not synonymous with automation, but with the capacity to harmonise efficiency and humanity. The ultimate measure of a smart city is not the sophistication of its infrastructure, but the extent to which it enhances autonomy, preserves dignity, strengthens social bonds, and protects fundamental rights.

Only when technology remains subordinated to the human person, never the reverse, can the smart city fulfill its promise as a genuinely ethical and sustainable model of urban development.

Digital inclusion and civic literacy constitute intrinsic components of sustainable development and represent an imperative condition, given that technology can deepen existing social cleavages if not accompanied by universal access policies. Such policies must be complemented by continuous analogue support mechanisms through which individuals may benefit from real counseling and assistance. A smart city must guarantee that vulnerable groups are not marginalised by forms of "governance through algorithms" and must prevent the emergence of new categories of vulnerability, including technological marginals and socially "invisible" persons.

Social trust constitutes the foundation upon which such a city can function. This trust can be achieved only through transparency and the limitation of intrusive practices. The use of data must be governed by rigorous ethical principles, ensuring the protection of privacy and preventing algorithmic biases that may generate segregation or structural discrimination. Consequently, implementing the concept of Social Smart requires a trans-sectoral governance structure. Collaboration between public administration and technology companies is no longer sufficient. Long-term success depends upon the genuine integration of academia and civil society into the decision-making process. Cities that have prioritised social intelligence and adopted bottom-up strategies have proven more resilient and effective than those that implemented exclusively top-down approaches.

Another strategic dimension in operationalising a smart city concerns the development and monitoring of social key performance indicators (sKPIs). Project evaluation must not be confined to financial return on investment (ROI); it must also include measurable impacts on social isolation, urban well-being, accessibility, and equity.

In conclusion, this article does not constitute a critique of technology itself, but rather an argument for its humanisation. The city of the future is not the one with the greatest number of screens, but the one that uses information to cultivate more cohesive, resilient, and equitable communities. Identifying ethical, social, and administrative challenges contributes to the responsible implementation of technologies that support social intelligence as a form of "software" enabling urban "hardware" to function harmoniously. Without a clear social vision, the smart city risks becoming a sterile and alienating structure.

Therefore, the imperative for future research and public policy must be the pursuit of synergy between High Tech and High Touch, ensuring a future in which technology is authentically placed in the service of the human person.

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