The Future of Japanese Urbanization: Technological Wonderland or Robotized Dystopia?

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Abstract: Since the 1868 Meiji Restoration, Japan transformed itself from a closed late-feudal society into a modernizing state increasingly integrated in the global economic and political system. Despite the reactionary interwar expansionist momentum inspired by chauvinistic Tennoism, after 1945 Japan pursued a new path towards economic modernization becoming in less than fifty years an avant-garde of post-modernity and one of the world's wealthiest societies. This modernization, which came along with technological development and investment, deeply affected Japanese urban conception. While public and private initiative have been mobilized towards the achievement of outstanding economic growth and massive increases in standards of living, the benefits of economic growth have been undermined by persistent urban concerns like high land prices, low housing standards, and environmental pollution. However, in the future the major factor that is expected to affect Japanese urban development is demographic change, with a drop to half the current level of almost 130 million people by the end of the 21st century. The rapid ageing of Japanese society, low demographic expectations, swift decline in the workforce, and restrictions of foreign immigration are factors that project a slowdown of human urbanization in the future, with a decline in the need for new housing and other urban investment. At the same time, technological development and urban robotization in the frame of "smart city" programs will forge a new Japanese urban identity hinging on robotics. In this frame, this article wishes to investigate the impact of technological development on future Japanese urbanization asking whether robotics will have the capacity to tackle Japanese demographic decline without leading towards substantial social changes or whether it will transform Japanese cities into dystopic post-human artifacts. The creation of futuristic Japanese hyper-smart cities could boost structural vulnerabilities originating from an overdependence on cybernetic capacities and Artificial Intelligence.

Keywords: Japan; smart cities; internet of things (IoT); Artificial Intelligence (AI); transhumanism
JEL Codes: N4; O3; O4; I3; F5

1. Introduction

The 1868 Meiji Restoration represented a turning point in the path towards Japanese modernization. Thanks to this Restoration, Japan transformed from a closed late-feudal society into a modernizing state progressively integrated in the global economic and political system. Following military innovation, the adoption of the liberal-capitalist economic system, and the adoption of a Western-inspired socio-economic paradigm, Japan gradually began to take on the appearance of a modern imperial nation in search for a hegemonic role in East Asia and the Pacific Ocean. In this climate of transformation, the effects of the Industrial Revolution that had taken place in Europe in the 18th century, eventually reached Japan. The industrialization and modernization of Japan led to radical changes in the country's appearance, affecting also urban conceptual development. Starting in 1870, while pursuing the country's modernization program, the Japanese government invited different exponents of Western culture, including some famous architects, to instruct Japanese on the innovative urban plans and architectural methods and techniques that were rapidly transforming European and American cities (Leone, 1996). However, by the end of the 1920s, in tandem with the inter-war expansionist and militarist momentum inspired by chauvinistic Tennoism, the rediscovery of an awareness of Japanese national identity provoked a strong reluctance towards foreign models. This reflected also in the sphere of architecture and urbanization, where Japanese architects and urban engineers attempted to introduce a modern reinterpretation of the ancient Japanese traditions.

After the dramatic experience of the Second World War, from 1945 Japan adopted a full-fledged Western-inspired socio-economic model that would lead the country to a rapid economic modernization, becoming in less than fifty years an avant-garde of post-modernity and one of the world's wealthiest societies. In the post-war years, public and private initiative have been mobilized towards the achievement of outstanding economic growth and massive increases in standards of living, transforming Japan in one of the world's chief economies (Jorgenson and Nishimizu, 1978). With the forecast of a nominal gross domestic product (GDP) of US$5.4 trillion in 2026, Japan will remain the world's third-largest economy over the next few years (Reynolds, 2022).

However, in recent years Japanese economic performances have been offset by negative matters, including high land prices, low housing standards, environmental pollution, and a rapidly declining population. While factors like quick ageing, low demographic expectations, swift decline in the workforce, and restrictions of

foreign immigration predict a slowdown of human urbanization in the future, with a decline in the need for new housing and other urban investment, at the same time, the massive immigration of the rural population in urban environments is shaping the future identity of Japanese cities. In this sense, technological development and urban robotization in the frame of "smart city" programs are expected to forge a new Japanese urban identity that pivots on Artificial Intelligence (AI) and robotics.

In this context, this article aims at interpreting the impact of technological development on future Japanese urbanization and the enhancement of smart cities, asking whether AI and robotics will have the capacity to tackle Japan's structural deficiencies like demographic decline and a decrease in the workforce without leading towards substantial social changes or whether it will transform Japanese cities into dystopic artifacts where machines and hybrid post-humans will overcome organic humanity. In this sense, the article argues that while futuristic Japanese hyper-smart cities may represent technological wonderlands at the service of individuals, they could also embody robotized dystopias in which humans lose their "humanity" in favor of the advent of the post-human. Also, being overdependent on cybernetic capacities and on AI, smart cities, and "smart" humans, i.e., hybridized cyborgs, could become structurally vulnerable to the threats that characterize cyberspace.

The article is divided as follows. The first section offers a review of the literature on the recent development of smart cities, focusing specifically on Asian cities and, above all, Japanese ones. The second section introduces an account of the structural dilemmas that contemporary Japan needs to face, including a speedy ageing population, low demographic expectations, and a shrinking labor pool, explaining how smart city developmental plans are affecting these domestic challenges. The third section proposes the core argument of the article, stating that smart cities could epitomize a tool to enhance transhumanism and to establish a new future society based on hybridized post-humans who, through the massive use of biotechnologies and information technologies, will tend to prolong as much as possible their life expectancy, in the hope of achieving ephemeral, materialistic immortality. Finally, the conclusions suggest that social pathologies of post-modern urban environments may be overcome by the introduction of an alternative model based on a return to "organic" life, sustainable development, and ruralism.

2. Smart Cities in Japan: A Functional Review

In recent years, the notion of the smart city has become increasingly popular within the context of two remarkable developments, namely the quick expansion of novel Fourth Industrial Revolution technologies such as the Internet of Things (IoT), big data, and AI and a rapidly urbanizing planet, with more than half of the world's population now living in cities (Joo and Tan, 2020). Specifically, the Asian continent is witnessing an ever-growing rise in the number of smart city developments, especially in countries like China, India, Singapore, South Korea, and, of course, Japan. Generally, the proliferation of smart cities in Asia tends to represent a local trend connected to the characteristics of a region that is quickly urbanizing and expanding in the global economy, which does not necessarily reflect an attempt to copy smart city models from the West—chiefly the United States.

The rise of the smart city model has sparked an increasing interest due to the literature in an attempt to understand from various points of view the complexity of this reality. The scholarly debate around the concept of smart cities has witnessed an interdisciplinary effort to appreciate the multifaceted aspects of these urban ambitious initiatives. While highlighting the impact of smart cities' technical and logistical aspects on society (Carvalho, 2015), some studies raised academic and philosophical debates around the goals, ethics, potential and limitations of smart cities, which became a metaphor for urban modernity (Glasmeier and Christopherson, 2015). At the same time, some studies criticized the conducted research on smart cities, arguing that much of the writing and rhetoric on the topic has hinged on non-ideological common-sense, pragmatic considerations, omitting an all-encompassing analysis (Kitchin, 2015), and lacking a critical understanding of the phenomenon (Luque-Ayala and Marvin, 2015). Thus, the efforts to offer consistent explanations to the understanding of smart cities are still inadequate, nor does a standardized smart city index applicable to smart city evaluation exist at present, since different regions use different parameters for classification (Lai et al., 2020). Still, scholarly debate has attempted to understand what would make smart cities "smart" either in relation to variables like economy, people, governance, mobility, environment, and quality of life or to aspects linked to energy, environment, economy, security, health, mobility, education, and governance (Ogrodnik, 2020).

Even in terms of definition, the concept of the smart city has enjoyed nuanced definitions and conceptualizations (Deakin and Al Waer, 2012; Vanolo, 2014; Angelidou, 2015). Generally, in the attempt of providing a definition, the literature

associated with smart cities highlighted some typical aspects, including the active use of advanced and off-the-shelf technologies to solve urban problems (Glasmeier et al., 2015), the conception of the city as a platform where silo-based services and systems are interconnected to produce a collaborative and integrated model (Anttiroiko, 2016) and an apparatus that shifts from innovation to application based on a technical platform supported by cutting-edge technologies, including the IoT, big data and AI (Allwinkle and Cruickshank, 2011). Also, in defining the phenomenon, the literature underlined how the development of smart cities is closely linked to the activity of high-tech companies, which began to conceive urban realities as sources of revenue and business assets (Townsend, 2013). In this respect, the diffusion of the term "smart city" began to appear in 2008—following the 2007-2008 financial crisis—within the context of International Business Machines (IBM) (Söderström et al., 2014). Thus, the concept of the smart city began to combine with that of corporation and urban environments were conceived as an outcome of corporate vision and the market creation strategy of profit-driven multinational corporations like IBM, Cisco, and Intel supported by international consulting firms (Hollands, 2015; Glasmeier and Nebiolo, 2016). In this sense, a smart city has often been considered a basic form of entrepreneurial project that represents a typical milestone in today's technology-driven society and a tool for attracting footloose international capital. In this vein, a critical strand of the literature has accused smart cities of being neoliberal artefacts that poorly improve or actually aggravate the digital divide and socio-economic inequalities afflicting post-industrial and post-liberal societies (Hollands, 2015; Greenfield, 2013; Vanolo, 2014).

Smart cities are also the result of modern phenomena such as increasing population, industrial agglomeration, and climatic deterioration that have challenged urban capability (Wei et al., 2016). These challenges of post-modernity fostered the need to search for new models of urban governance that envision innovation and technological reform (Su et al., 2022).

Within this frame, a smart city can be viewed as a post-modern artifact of urban development that brings together the various sectors of society through the deployment of IoT and distributed computing technologies that offer automatized and robotized services and processes (Mahmood, 2018). Relying evermore on sophisticated algorithms and cybernetic technologies, smart cities rest upon the robotization and automatization of the urban and social environment. In this respect, a smart city is "smart" insofar as it replaces human, "organic" activity with artificial, mechanized performances promoted by the IoT and AI.

As anticipated, in recent years the Asian continent has been witnessing an ever-increasing rise in smart cities, accompanied by the proliferation of a vast literature on the topic (Calder, 2016; Mani, 2016; Yu and Xu, 2018; Hu, 2019). One of the Asian countries in which the phenomenon of rising smart cities has been more visible is Japan. The development of smart cities in Japan has been a direct consequence of the consolidation of Japan as one of the leading economies in Asia, and of Japanese economic successes, and industrialization as highlighted by developmental state theory (Johnson, 1982). Japanese smart cities are also the result of the actions of an interventionist, Keynesian state, followed by speedy industrialization. Given its initial condition of relatively limited natural resources for economic development, Japan had to rely almost entirely on human capital while massively investing on technological developments.

The massive use of information technology (IT) is particularly visible in Japanese cities, for instance, in the transport and energy sectors. Public transportation relies on geo-positioning technology that allows the real-time tracking of means of transportation, notably buses or trains. Cyberspace allows the sharing of information about means of transportation directly to smartphones of people waiting at stops. At the same time, automotive navigation systems in cars that use digital mapping in cyberspace can predict the conditions of streets to the driver and thus orient and guide the driving. Consequently, urban services integrated with systems based on IT and AI have evolved Japanese cities into smart cities and Japanese society into the so-called Society 5.0 (Deguchi et al., 2020). Now, the literature argues that while these smart systems will be increasingly advanced, not only are they supposed to make life more convenient and comfortable, but they also help resolve issues affecting modern societies, including global warming, and ageing of the population (Deguchi et al., 2020). In other words, integrating IT and AI within the structural composition of the urban environment is expected to lead to a more advanced, post-modern society, with people that will gradually dwell in smart megalopolises at the expense of a scarcely populated countryside. In these smart megalopolises, people will develop and evolve following the advances of technological evolution, experiencing in tandem with a robotization of their living space, a phenomenon which has been often described as transhumanism, which is expected to enhance post-humanism (Fukuyama, 2004; Herbrechter, 2013; Huxley, 2015; Nayar, 2018; Krüger, 2021).

In the case of Japan, it is one of the earliest and most active promoters of smart city construction (Cao, 2018). The Japanese smart city developmental program was inspired by a governmental top-down strategy that resulted into a series of

policies aimed at building an advanced digital society, including the "E-Japan" strategy (2001), the "U-Japan" strategy (2006) and the "I-Japan" strategy (2009). These policies pivoted on the idea of continuous technological, electronic, and IT development and aimed at reforming Japan's entire industrial structure. In Japan, the creation of smart cities permeated by digital technology and IT was followed by massive investment in infrastructure. Furthermore, the development of smart cities in Japan has had a deep impact in different sectors, including economy, environment, agriculture, and culture. To be sure, Japanese smart city initiatives can be divided into two broad categories, namely business-led initiatives conducted in tandem with large-scale urban developments and government-led programs anchored within the vision statements of municipalities (Deguchi et al., 2020).

Already in 2010, Keihanna Science City (Kyoto Prefecture), Toyota City (Aichi Prefecture), Yokohama City (Kanagawa Prefecture) and Kitakyushu City (Fukuoka Prefecture) were established as smart cities by the Ministry of Economy, Trade and Industry (METI) of Japan (Su, 2022). In the case of Keihanna, the city has been conceived as a national project born from scratch to serve as a center of culture, learning, and research that will open new paths into the future. As for Toyota, the city embodies a unique example in which local resources like humans, materials, and technology are being combined in a complementary way. The smart city project of Yokohama, a city located just southwest of Tokyo, also represents one of the largest scale smart city experiments in Japan. Finally, in the case of Kitakyushu, which is located at the northernmost of Kyushu Island and represents one of Japan's major industrial hubs, the development of the city was conceived to offer unique experiences especially in terms of environmental sustainability. Moreover, during the 2010s, smart city projects involved new towns, including Kashiwa-no-ha Smart City (Chiba Prefecture) and Fujisawa Sustainable Smart Town (Kanagawa Prefecture). In 2011, Kashiwa-no-ha was designated as a concrete example of a future city; since then, the literature considered the city a model for future Japanese urban development and so-called smart governance (Gornik, 2020).

3. Japan's Post-Modern Dilemmas and the Role of Smart Cities

Smart city development in Japan is directly linked to remarkable social, economic, and ecological issues that Japan faces (Wei et al., 2017). In the last years, despite public and private initiative mobilization towards the achievement of terrific economic growth, the benefits of economic development have been undercut by persistent urban concerns including high land prices, low housing standards,

and environmental pollution. Another major factor that is also expected to deeply affect Japanese urban development in the future is demographic change, which, as shown in Table 1, envisions a loss of roughly 30 percent of Japan's population of around 125 million by 2100.

Table 1: Japanese population in 2000 and 2100, minimum and maximum size up to 2300, and percentage change to these points from 2000

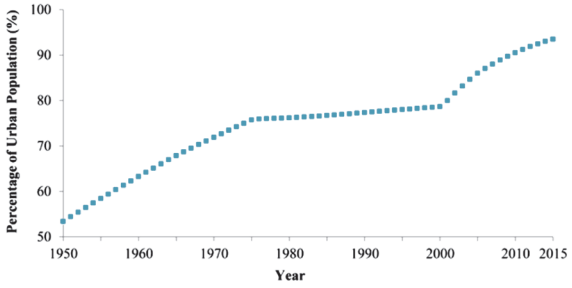
	Population (millions)						*Percentage change from 2000 to*		
Country	*2000*	*2100*	*Minimum*	*(Year)*	*Maximum*	*(Year)*	*2100*	*Minimum*	*Maximum*
Japan	127.0	89.9	89.2	(2115)	128.0	(2010)	-29	-30	1

Source: United Nations Department of Economic and Social Affairs/Population Division, *World Population to 2300*. United Nations, New York, 2004.

In this sense, forecasts indicate that the working-age population will dip as low as 52 million by 2050 (Cabinet Office, 2017). The speedy ageing of the Japanese population, low demographic expectations, a shrinking labor pool, and restrictions of foreign immigration are factors that project a slowdown of human urbanization in the future, with a decline in the need for new housing and other urban investment. In this context, technological development and urban robotization in the frame of smart city programs will forge a new Japanese urban identity that will increasingly hinge on IT, AI, and robotics.

While Japanese birth-rate is expected to fall dramatically and the population to age rapidly, Japanese people tend to concentrate in megacities, gradually abandoning rural communities, which are turning into neglected and desolate realities. As shown in Figure 1, the Japanese population living in urban areas passed from almost 55 percent to roughly 95 percent from 1950 to 2015.

Figure 1: Percentage of Japanese population living in urban areas, 1950–2015



Source: United Nations, Department of Economic and Social Affairs, Population Division (2014).

Thus, one of the major trends in Japanese future development consists in the massive urbanization of the rural population. At the same time, paradoxically, while cities are increasingly crowded, the labor market suffers from shortages that are intensified by the gradual replacement of the human workforce with a robotized one. Thus, as the workforce declines, non-regular employment soars and tax revenue shrinks, while public spending will continue to rise to maintain a deteriorating infrastructure. Moreover, issues such as the bulging welfare budget necessary for dealing with the ageing population place a burden upon the ever-decreasing working-age population. Finally, current Japanese challenges include the issue of climate change and pollution, which is highly affecting the quality of life in Asian megalopolises.

Among Japan's dilemmas of post-modernity, the issue of the shrinking birth-rate and thus of the labor pool may be considered perhaps the most worrisome. The direct consequences of this phenomenon include the overall population decline, especially in the young population, but also the loss of workforce since a sector of the working-age population will be increasingly busy in taking care for their elderly relatives—a situation exacerbated by Japan's strict laws in the sphere of migration which do not encourage the inclusion of migrant workers who take care of elderly people.

At the same time, the shift from an economic model based on manufacturing to services has created the conditions for a radical change in Japanese society. The manufacturing model guaranteed economic growth both in rural and urban areas, establishing factories and securing workforce in the former while ensuring transportation infrastructure that linked rural areas of production with urban areas of consumption, reducing the costs of distributing people and goods (Deguchi et al., 2020). This scenario changed when the industrial structure was shifted from manufacturing to services, with the relocation of many businesses' factories overseas. Thus, rural areas were deprived of job opportunities and a substantial amount of the younger population was forced to move into large cities. However, this arrival of young workers into cities did not stimulate the urban job market, because—also due to the introduction of AI and robotic technology—companies relied increasingly more on an artificial workforce rather than a human one.

The introduction of AI and robotic technology in Japanese smart cities is having tremendous impacts within the job market. The spread of unstaffed convenience stores, automated driving, and advanced forms of automatization procedures for

distributing goods and services is resulting in the loss of many jobs. In turn, the lack of job opportunities forces young people coming from rural areas to accept low-paying jobs that do not offer prospects for getting married and raising a family with obvious consequences on the birth-rate. In other words, large Japanese cities tend to absorb rural inhabitants while failing in increasing the level of population, with a gradual decline of the crammed Japanese population dwelling in cities. Moreover, the concentration of most of the Japanese population in large cities is leading to the drastic reduction of residents in smaller cities, suburbs, and countryside, creating the conditions for the rise of a country that pivots on megalopolises.

At the same time, the ageing population is another major issue that affects the socio-economic resilience of Japan. Indeed, Japan has the highest rate of ageing in the world and by 2050, it is expected that almost 40 percent of the Japanese population will be aged 65 or older (Deguchi et al., 2020). In Japan, the elderly already account for more than a third of the population. If this trend does not reverse, it is expected that by 2030 there will be only ten working-age people for every care-dependent person, and this will decrease to five by 2060. A population that lives longer that is not uniformly supported by a corresponding birth-rate will result in a financial and social burden for the younger generations that will have to support it. Also, while the elderly population gradually retires, a smaller amount of the population in the workforce will result in the stagnation of economic growth, as well as in an inferior tax revenue and thus in minor opportunities of public spending—although an older population requires higher social welfare spending. Therefore, a reduction in fiscal revenues entails a lower quality of social welfare, minor chances of addressing social inequality and assisting vulnerable members of society, a rise in intergenerational inequality, and the rapid decaying of non-urban infrastructures (Deguchi et al., 2020).

4. The Phenomenon of Transhumanism and the Future of Japanese Urbanization

The development of smart cities in Japan and more generally the application of AI and IT to the urban and social environment is closely connected to the phenomenon of transhumanism. Transhumanism has been defined as a cultural, intellectual, and scientific movement that upholds the need to improve the physical and cognitive capacities of the human species and to apply new technologies to humans in order to eliminate unwanted and unnecessary features of the human

condition such as suffering, disease, ageing, and eventually mortality (Savulescu and Bostrom, 2009). Transhumanism represents a new paradigm for the future of humanity with the goal to alter human nature by prolonging its existence through technological manipulation. The core idea is that humanity must be "enhanced" by overcoming its structural, natural flaws. But what are human structural flaws? When is a human "flawed" or "normal"? And what does it mean to be "normal"? Is the criterion of normality established on the basis of physical standards and statistics on the number of human beings who possess it?

The "transhuman" would also represent a human being in transition towards the post-human, that is, a being with physical, intellectual, and psychological enhanced capacities far superior to those of a "normal human". According to a segment of the literature on the topic, a "post-human" would be a being—natural or artificial—with life expectancies of some 500 years, cognitive abilities twice above the maximum available for contemporary humans, control of sensory input, and one deprived of psychological suffering (Ryberg et al., 2007).

According to the core assumptions of transhumanism, humanity will be radically transformed in the future thanks to technological development. Technologies will be able to re-engineer the human condition to avoid the inevitability of the ageing process, to overcome the limitations of the human, organic intellect, and to eradicate pain, sorrow, and ultimately death in human life, shifting humans, as recently highlighted by worldwide renowned scholarship, from *homo Sapiens* to *homo Deus* (Harari, 2016). Transhumanism believes that new technologies and AI allow for the expansion of human physical and intellectual capacities and the overcoming of biological limitations to which contemporary humans are linked.

From a historical and cultural point of view, transhumanist theory finds its roots in Greek classic thought and in subsequent European philosophy. Since time immemorial, humans have always wanted to improve their physical and mental conditions through different means in an attempt to be happier. Undoubtedly, the Scientific Revolution, Humanism, and modern philosophical and scientific thoughts represented a turning point for the first transhumanist theorizations. Philosophers and scientists like Hume, Newton, Bacon, and Hobbes contributed to laying the foundations of rationalist thought, emphasizing scientific development and the capacity of science to ameliorate human conditions. Later, during the Enlightenment, following Kantian rationalism, science was perceived with optimism as a tool to enhance humanity. At the same time, political theory—specifically Rousseau—contributed to questioning whether the "organic" state of

nature was preferable to the "artificial" civil society, indirectly inquiring whether science was to be encouraged or not (Pizzolo, 2019). Moreover, transhumanism has been affected by Bentham's and Mill's utilitarianist thought, as well as by the Darwinian evolutionist paradigm. In an evolutionist perspective, transhumanism believes that humans are in a constant advancement and that the "technologic" human will one day be able to change their nature through biotechnology and AI, orienting themselves towards a new posthuman species that would represent the final step of human evolution. Thus, the transhuman would be somewhere in-between the evolutionary scale that conceives humans developing from apes to post-humans. Put differently, the attempt to introduce post-humans would also legitimize and encourage social Darwinist practices like eugenics, as endorsed, for instance, by Galton—Darwin's half-cousin. Moreover, in works such as *Human, All Too Human* (1878) Nietzsche was famous for advocating the necessity to overcome the human with the superman or meta-human, i.e., the post-human. Notably, in *Thus Spoke Zarathustra* (1883), Nietzsche affirmed "What is the ape to man? A laughing stock, a thing of shame. And just the same shall man be to the Superman: a laughing stock, a thing of shame". Finally, Huxley was the first philosopher to use the term "transhumanism" in 1927. Since then, the transhumanist thesis drew strength from all studies carried out on AI in the second half of the 20th century, including those by Turing in the 1950s and by all subsequent authors belonging to the so-called "futurist" current of the 1960s and 1980s.

The basic assumptions on which the transhumanist theory rests are a great faith and optimism in the possibilities of science, human nature reduced to pure matter, and the human mind reduced to neuronal connections. To ameliorate the human conditions, transhumanism wishes to apply to society the massive use of anti-ageing medicine, genetic engineering, AI, nanotechnology, and cryonics. Thus, the advent of the post-human will save humans from their structural deficiencies, introducing a new, enhanced individual that, while ameliorating its physical and psychic conditions, will gradually reach immortality (Olsen et al., 2009). Transhumanism entails the use of embryonic and prenatal eugenics, i.e., the selection of human beings without "defects" and "pathologies" and the technical elimination of the sick. In fact, the transhumanist movement supports liberal eugenics, the necessity to select healthy embryos and eliminate through abortion those with serious and non-serious pathologies and congenital anomalies (Agar, 2004). It also involves the use of molecular nanotechnology through the introduction of microchips in different parts of the human body to activate and enhance certain capacities, specifically mental, auditory, and visual. Moreover, it

advocates the use of drugs for controlling emotional well-being like antidepressants to reduce the negative impact of certain experiences by blocking the control centers and neurotransmitters. Since the transhumanist paradigm believes that the human mind and all its activity is reduced to pure neuronal connections, to a large extent produced by physical-chemical reactions, the introduction of certain chemical substances in the human organism would modify the personality to overcome psychological limitations and increase emotional capacities. At the same time, transhumanism hinges on the possibilities of extending life expectancy using genetic therapies or biological methods that avert cellular ageing. The ultimate step would be to overcome death itself through cryopreservation and the resuscitation of patients in cryogenic suspension. Furthermore, in its mechanistic vision of human life in which the brain and its data would be reducible to the matter alone, transhumanism postulates the possibility of a post-biological existence through a sort of "scanner" of humans' synaptic matrix to reproduce it afterwards on a computer, transferring the subjective experience from a biological body (deceased by now) to another (brain transplant) in a purely material-digital substrate. Finally, transhumanism requires the evolution of humans into cyborgs, that is, hyper-intelligent quasi-organic beings in which the combination of a cybernetic part and an organic part takes place.

Obviously, the subject of transhumanism and post-humanism raises immense ethical concerns. For instance, while forging the "perfect" post-human being, what should society do with all "nonperfect men"? Who should be post-human and who not? Is it a matter of wealth and therefore connected to the access to costly biotechnologies? Could the potential coexistence of humans and post-humans in the same environment create the conditions for the establishment of an unequal society based on apartheid and discrimination? Why should a post-human live 500 years or even become immortal, while a "common" human die when they are 80 years old? And why would you also want to make flesh (be it organic or artificial) immortal? If death is continuously postponed and, at the same time, births are strictly programmed and controlled, who decides how many people a society should have? Who are the individuals so lucky to be selected for living and according to which criteria? Finally, who will establish demographic control and enhance living humans: private corporations or the state? Would the ownership of these people thus belong to these organizations, or would they be free beings? These questions and many more clearly show how transhumanism has the potential to transform the splendor of human life as it naturally is in a dehumanized, dystopic nightmare.

Japanese futuristic smart cities' development programs may be considered as part of a transhumanist agenda aimed at creating a technological wonderland, i.e., a paradise on Earth where people dwell in an artificial construct that allegedly wishes to enhance them. However, being more than technological wonderlands, smart cities could easily turn into robotized dystopias. In the case of Japan, the ageing population, the trade-off between urbanization and unemployment of the younger sector of the population, the drop in the national birth rate, the chasm between a scarcely populated countryside and crammed megalopolises are factors that make us question not only urbanization development but the deep and ultimate purpose of human existence. What is the purpose of Japanese life in a hyper-technological futuristic smart city? When robots and AI in smart cities would eventually replace most human activities, what would the aim of people be? In other words, if people no longer enjoy a social role, what is, so to speak, their ontological *raison d'être*?

In looking at the demographic and societal trends that are gradually affecting Japanese society, we may affirm that transhumanism is already *en route* and that it will become the core aspect of Japanese, Asian, and perhaps global big city life. Transhumanism is already clearly manifesting in Japanese life and society. For instance, Japan already introduced microchips that are inserted under the skin, although these are limited to such tasks as opening doors and paying for small items like drinks (The Asahi Shimbun, 2019). Still, these implants are considered the beginning of transhumanist practices in Japan, pioneered by the general incorporated group Japan Transhumanist Association. Through the insertion of microchips into human bodies and brains, humans are expected to gradually mutate into cyborgs in order to acquire capabilities beyond their normal limits (The Asahi Shimbun, 2019). We may assume that 100 years from now, huge smart cities will be the only populated environment in Japan, since most people will abandon smaller urban centers and rural settings. At the same time, while the Japanese population will drop, AI and highly sophisticated robots will undertake most social and economic tasks, including the delivery of public services and utilities. This will lead in turn to a form of coexistence between humans and machines, while at the same time hybrid beings that blend organic and artificial matter will become ever more frequent, first in the form of social experiments and then as standardized post-humans.

The robotization and automatization of "smart" societies implies high vulnerability costs. For instance, the building of intelligent cities and societies that hinge on AI and IT demands a sophisticated construction of cybersecurity systems. Apart

from the geographical area where they are located, smart cities are characterized by the so-called cyberspace, which bears no geographical or administrative borders, and which is directly connected to the IoT. Thus, highly technological cities must face the vulnerabilities stemming from potential strikes against infrastructures and devices that rely on AI and IT. In this sense, smart cities must develop a strong cybersecurity apparatus that entails the defense of computers and servers, mobile devices, electronic systems, networks, and data from malicious attacks (Schatz et al., 2017). Cyber activities may be divided into computer network attack (CNA), computer network defense (CND), and computer network exploitation (CNE) which all entail the use of deliberate actions and operations to alter, disrupt, degrade, or destroy adversary computer network systems or the information and programs therein. Being highly dependent on IT, smart societies can easily be affected by cybercrime activities, cyber-espionage, cyber-terrorism, and cyber-warfare. Specifically, cyberwar is not merely a new set of operational techniques, but an emerging new mode of warfare that will call for new approaches to plans and strategies, and new forms of doctrine and organization (Arquilla and Ronfeldt, 1993). Cyberwar also comprises several unusual features that distinguish it from conventional warfare: it is the first major new form of warfare since the development of nuclear weapons and intercontinental missiles; it is difficult to determine the responsibility of cyberattacks; many cyberattacks are not lethal and do not result in permanent damage to physical objects; any computational electronic device is a potential cyberweapon and anyone with advanced IT knowledge is a potential cyber combatant. The most common kind of cyberattack refers to the so-called Denial of Service (DoS) attack which serves the purpose of rendering impossible the access to an IT service. In terms of potential targets, cyber operations tend to tackle enterprises, financial institutions, energy infrastructures, institutions connected to economy, transportation, defense, and health. Particularly, malevolent cyber operations tend to focus on attacking vulnerable assets like sanitary machinery, sensitive data, military data, and citizens' data. Moreover, the possible future hybridization of people into semi-artificial beings could extend the risk of malicious cyber operations to the cybernetic and robotic components of post-humans. In other words, smart cities and future "smart" cyborg citizens may be constantly vulnerable to cyber operations which could destroy their structural functions, thus causing, in the former case, the collapse of service distribution and, in the latter, artificial and organic harm, or uncontrolled and unwanted behavior.

In conclusion, Japanese smart city development can ultimately lead to two outcomes. It will either introduce a technological wonderland in which citizens enjoy a pleasant life supported by technologies that guarantee high standards of living.

Through the massive use of robotics, the Japanese demographic decline can be tackled and the job market fully optimized reducing, in due time, the unemployed or underemployed urban overpopulation. At the same time, fewer "human" Japanese could result in an optimal allocation of social and economic resources which would be fully enjoyed by a longeval residual population, likely enhanced by biotechnologies. On the other hand, however, this artificial wonderland could hide nothing less than a robotized, inhuman dystopia in which people lose their "humanity" in favor of transhumanist evolution. As a social experiment, Japanese smart cities could become the model that a future, hybrid humanity will adopt, while gradually losing all "natural" features in favor of artificial constructs. In this sense, harsh as this may sound, future smart megalopolises appear like huge concentration camps where a high number of human manpower awaits its natural end, replaced by AI and heartless robotics, while a smaller group of "privileged" people enhance their transformation into post-humans. All these things considered, the likelihood that the future of urbanization in Japan will represent a technological wonderland are low; instead, the most plausible scenario suggests that Japan cities will incarnate robotized dystopias where human life could lose purpose and meaningfulness.

5. Conclusions

This article was driven by the interest for understanding the potential future outcomes of smart city developmental plans. Its attempt was to add a novel interpretation to the literature on smart cities, based on the liaison between smart city programs and transhumanist discourse. The section on the literature review offered a nuanced categorization of the main characteristic of smart cities, in the attempt to offer a definition. A subsequent empirical section briefly analyzed some of the main challenges that contemporary Japan is facing which would justify the development of smart city programs. Finally, a theoretical section wished to link Japanese urbanization to the phenomenon of transhumanism, arguing that smart cities could be one of the tools to enhance the advent of post-humanity.

While contemporary Japan represents the third biggest world economy, the country is affected by some of the most worrisome social pathologies of post-modernity, exacerbated by the rise of de-humanized smart megalopolises. A large stratum of Japanese population—especially the younger—suffers from chronical anxiety, intense depression, social inadequacy, agoraphobia, misanthropy, and compulsive introversion. Social anxiety and psychological problems are

encouraging pathological behaviors like committing suicide and practicing *hikikomori*, a trend in which individuals decide to totally withdraw from society and to find a haven on extreme degrees of social isolation and confinement (Masataka, 2002; Furlong, 2008). As anticipated, these phenomena are aggravated by the development of confusing, de-humanized and artificial "smart" urban realities. If smart cities are to be considered a technological paradise, then why would people—especially youngsters—that dwell in them be ever more depressed and sadder? Can a connection be traced between the development of futuristic cities and psycho-pathological social practices?

The rise of futuristic, de-humanized smart megalopolises could result in a full-fledged dystopia. Technological development is not a synonym for happiness and enhancement per se. Moreover, de-humanized humans that rely on AI and IT will gradually lose enthusiasm towards life, losing purpose and existential meaningfulness. To avoid the global proliferation of urban robotized dystopias, the solution could pivot on the introduction of an alternative model of future societal and urban development based on a return to "organic" life, sustainable development, and ruralism. In other words, a return to the "natural" against the "artificial", as already highlighted by Rousseau, could represent—also in the sphere of urban conception—a concrete solution to counter a confusing, hyper-technological urban environment where people have the ephemeral appearance of living a happier life but instead, lose purpose, identity, and significance.

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