SOCIETÀMUTAMENTOPOLITICA
RIVISTA ITALIANA DI SOCIOLOGIA

Citation: Gianluca Senatore, Melissa Sessa (2023). Hard and Soft Smart Cities: An Integrated Approach. Società*Mutamento*Politica 14(28):95-102. doi: 10.36253/smp-15017

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Competing Interests: The Author(s) declare(s) no conflict of interest.

Hard and Soft Smart Cities: An Integrated Approach[1]

Gianluca Senatore, Melissa Sessa

Abstract. This contribution aims to critically analyse smart city processes. The distinction between soft and hard smart cities goes in this direction. On the one hand, the smart city appears to be the result of a sustainable transition; on the other, it seems to live only thanks to technologies. This dichotomy, as will be seen, leaves out a whole series of social processes that also make up the smart city. Where then is the social dimension within this reasoning? The social dimension seems to be rediscovered not so much and not only in the interaction between all the actors of smartness, but also and above all in the complex interpretation offered by smartness, which does not seem to be referable only to technology and sustainability.

Keywords: smart city, sustainability, technology.

Riassunto. Questo contributo si propone di analizzare criticamente i processi delle smart city. La distinzione tra smart city soft e hard va in questa direzione. Da un lato, la smart city sembra essere il risultato di una transizione sostenibile; dall'altro, sembra vivere solo grazie alle tecnologie. Questa dicotomia, come si vedrà, lascia fuori tutta una serie di processi sociali che pure compongono la smart city. Dove si colloca allora la dimensione sociale all'interno di questo ragionamento? La dimensione sociale sembra essere riscoperta non tanto e non solo nell'interazione tra tutti gli attori della smartness, ma anche e soprattutto nella complessa interpretazione offerta dalla smartness, che non sembra essere riconducibile solo alla tecnologia e alla sostenibilità.

Parole chiave: smart city, sostenibilità, tecnologia.

1. INTRODUCTION

The most widely shared idea of smart cities is of cities that make the lives of businesses, public administrations and citizens more efficient by redefining roles and relationships in a given urban space. This approach, however, requires a series of considerations that immediately give rise to a number

[1] The article is the result of the joint work of the two authors. However, for the purposes of a more detailed attribution, Gianluca Senatore is responsible for drafting the introduction and the paragraphs "Smart is a synonym for sustainability" and "The complex interpretation of the sustainability transition in smart cities"; while Melissa Sessa is responsible for drafting the paragraphs "The soft smart city: what future?", "The hard smart city and its prospects" and the conclusions.

of questions, starting with simple but not trivial evaluations of the initiatives undertaken by various public entities to build new infrastructures in recent decades. Let us consider how an anthropized territory can redefine itself through technical means alone. Just consider the analyses of urban phenomena, the redesigning of the physical spaces of cities or the participation in political and administrative processes for urban modifications. Practical applications of the urban context that define its organisation for the use of space and socio-political relations. In this sphere, the literature on Smart cities pays little attention to the lack of a theoretical model enabling a precise definition of the social and cultural phenomena. This highlights the specificity of the interpretative models, almost all of which aim to transform cities through Smart technologies, considered the key to solving all problems, starting with environmental ones.

2. IS SMART A SYNONYM FOR SUSTAINABILITY?

This paper, through a critical analysis, seeks to demonstrate that the link between the idea of sustainable development conceptualised at the end of the 1980s (WCED 1987) and adopted by Agenda21 (UNCED 1992) on the one hand, and the concept of the Smart city on the other has been severed, and to make the argument that an alternative path to the solutions employed to date should be sought. We will start by observing how the transition or transformation towards sustainability (sustainability transition) has been interpreted. There are many tools that assess, through well-structured indicators, innovative urban development with reference to sustainable development, quality of life and participation. A galaxy of instruments, varied and changing over time, is available. Since 2007 these instruments have been instrumental in implementing strategies and identifying integrated public-private partnership models (Giffinger *et al*. 2007). TUWIEN, Technische Universitat WIEN, the institution that has been working on Smart Cities since 2007 and which developed the European model in use, has to date modified its ranking system four times, offering four different versions over the years (2007-2015). These tools for evaluating and analysing cities have strategic relevance and can be used in urban development decision-making as they provide assessment methodologies that reveal progress towards defined goals (Ahvenniemi *et al.* 2017). It is important to emphasise how these monitoring models have evolved over time not only as to formal and technical aspects, but above all in terms of the object of analysis, moving from an initial approach mostly focused on quality of life, environmental quality and technological tools, to models that analyse purely systemic data in order to provide more efficient services to citizens and optimise existing infrastructures.

As can be seen from the various international and European documents: UNRIC (2020), EUROPA 2020 (2010), (Senatore 2020) cities have been entrusted with a key role in the fight against climate change and the development of new smart technologies to foster sustainability, not only as a tool but also as an integrated system of creativity and innovation of human capital. On this point, the considerations to be made open up other interesting scenarios on urban planning and marketing (Vanolo 2008) which highlight the different faces and functions of smart cities. At present, there are several ideas for interpreting the smart city. Our first hypothesis, supported by several studies, is that there are at least two large families of Smart Cities. This links to our second hypothesis, namely, that not everything that is defined as Smart is also sustainable. The first category of Smart City can be defined as "soft". Already in 2013, Hiremath *et al*. (2013) had given a definition of sustainable urban development as «achieving a balance between the development of urban areas and the protection of the environment with an eye to equity in terms of income, employment, housing, basic services, social infrastructure and transport in urban areas». In this context, the environmental impacts (soil, pollution, materials) of urban areas or districts undergoing building development are considered simultaneously with the planning of interventions on transport and services (Ahvenniemi *et al.* 2017). This approach takes into account interventions on urban quality of life and liveability indicators (Economist Intelligence Unit 2005).

Other ranking systems have been developed over time and used by public administrations to guide sustainable development strategies in cities (Tanguay *et al*. 2010) or neighbourhoods. Very specific tools that often help urban engineers or energy managers to determine the energy efficiency of urban spaces by analysing or predicting the demand and respective requirements of buildings or transport, always from a sustainability perspective. It is precisely transport, responsible for some of the biggest problems in terms of pollution and logistics, that has been the focus of several monitoring and evaluation projects. One of the most interesting projects developed for densely populated Asian cities is the Partnership for Sustainable Urban Transport in Asia (PSUTA) (CAI-Asia Program 2015). It is evident from this brief overview that a broad range of approaches have been developed for sustainable city projects. This diversity can itself pose a problem, especially when looking for

an effective assessment framework to address integrated challenges (Ahvenniemi *et al.* 2017).

The most obvious observation we can make is that the transition towards sustainability is a broad and constantly evolving concept and therefore the non-specific definition of sustainability gives rise to different interpretations. From this we can infer that since the concept of sustainability is not static, but dynamic and transformative – seen as transition to sustainability – it can only be assessed in urban contexts through a systemic approach. This is an approach that simultaneously observes the social, economic and environmental impacts, which cannot be decontextualised, but must be analysed as interconnected elements influenced by the local tradition and cultural evolution of urban places: social and political relationships, economic, industrial and commercial activities, and the physical and biological environment.

On the other hand, we have the "hard" Smart city or ICT city, i.e., the technology-focused approach, which aims to use information gathered from sensors, data media and other databases to provide more efficient services and optimise existing infrastructures, increase collaboration between different economic actors and encourage innovative business models in the private and public sectors (Marsal-Llacuna and Segal 2015). In this city model, ICTs are deployed to increase the competitiveness and effectiveness of systems. Supporting this second family of smart cities, many reports and documents (IEEE 2020, ICLEI), state that the priorities in participatory governance such as that of the Smart city are investments in human, social and ICT capital. These investments produce economic growth, high quality of life and wise management of natural assets. This approach has, however, been criticised in the literature, especially with regard to its vision rather than the possible expected results. Lombardi *et al.* (2011) identified participation, safety and the cultural heritage as the major weaknesses of the Smart city. In particular, participation seems to be affected by several issues. The very emphasis placed on this notion shows that both conceptually and in substance it is the most vulnerable element. In this type of Smart city, technology and connected systems leave little room for interpretive decisions. The limited discretion in the decisions made in a fully digitised and self-sufficient reality leaves narrow margins for human intervention. In addition, the regulatory and prescriptive framework imposed from above or the governance models and indicators for carrying out the appropriate checks limit the scope of action of local decision-makers.

Continuing their critical analysis of the hard version of Smart cities, some authors (Ahvenniemi *et al.* 2017) have claimed that the purpose of Smart cities is to connect social capital and physical capital to develop better infrastructures. This approach tends to show that the main objective of the Smart city is to push the citizen to use urban services in order to increase the efficiency of these services.

At this point we can say that neither of the two schools of thought about the smart city, the soft (environmental) or the hard (technological), taken individually capture the original spirit of the idea born in 1992 through the Agenda21 programme. The evolution of models, different interventions and setbacks have spawned a galaxy of interpretations of what the role of the Smart City should be. Some of these interpretations and subsequent actions have been boosted by the European and international policies that fostered this trend by supporting models of exponential economic growth to encourage the idea of competitiveness and progress. In fact, almost all of them have lost sight of the vision of an integrated approach, which includes relationships, activities and the environment. On this last point, perhaps the most interesting, what has been lacking among Smart city actors and promoters is the ability to think of Smart cities as collectors of cultural promotion, models capable of bringing together people, nature and technology.

3. THE COMPLEX INTERPRETATION OF THE SUSTAINABILITY TRANSITION IN SMART CITIES

Today's environmental stressors indicate that our social models must adapt to more sustainable processes. It is imperative to conceptualise new systems of social transformation that include several dimensions: technological, organisational, institutional, political, economic and socio-cultural. For this reason, the transition towards sustainability must be understood as a radical and profound change towards harmonious social systems. This is the idea that defines future actions on the sustainability transition process, a process that in recent years, as far as smart cities are concerned, has indeed seen a transformation, but towards objectives that are starkly inconsistent with the initial intentions. In order to redefine these models and steer them towards a system that includes the human-nature relationship among its priorities, a clear policy push should come from major organisations such as the United Nations, other international organisations and the European Union. Decisive guidance from the supranational bodies is needed to reformulate global goals, an effort that cannot

be delegated to national States or interest groups. We are talking about not just single actions or single issues, but systemic processes, which require a complex approach. Starting from this last point, some studies such as Feola's (2015) and Audet's (2014) investigating the term "transformation" and "transition" in reference to global environmental changes, help us to understand how the interpretations of these concepts related to sustainability can help us to better understand why the vision proposed by many scholars and commentators for Smart Cities has not truly materialised to date. Today we can notice an interesting difference between public interventionism and the incentivisation of industrial deployment on the one hand, and a perhaps over-imaginative view of the world on the other.

The field of research investigating the transition towards sustainability highlights the fundamental role of the dynamics at work in the concept of transition. Today, it would be difficult to exclude environmental and sustainability considerations from political debate and economic policy-making, even just as complementary elements of any transition idea. Indeed, the debate on environmental issues in the various contexts of public and private life is helping to shape social imagination, motivations and the debate on what kind of development we want to build, what sustainability really means, and the future of society (Feola and Jaworska 2019).

The factors that negatively affect the environment and society increasingly indicate that our social models must be redefined and directed towards more sustainable processes and practices; a new vision that is also capable of challenging our traditional economic system, the structures of decision-making processes, and the role of global, national and local governance. In line with this approach, the transition towards sustainability has been described as the need to activate continuous processes of interaction that are able to interpret the complexity of the new social systems. On this point, the ongoing debate is fostering extensive and fruitful reflection on the challenges of social research, at least on an international level. While one line of enquiry is focusing on how to revise the existing literature, defining the framework for its interpretation, another is attempting to nurture new areas of research that can foster dialogue on the complementarity of the different concepts. In this area, Feola (2015) examines concepts related to the transformation of society in response to ongoing environmental crises and analyses the term "transformation" through four analytical criteria. This analysis reveals that when transformation is not used as a metaphor, the concepts employed differ according to: a) system conceptualisation; b) notions of social consciousness (deliberate/emergent); c) outcome (prescriptive/descriptive). Problem-based research tends to adopt deliberate transformation concepts with prescriptive outcome, while emergent transformation concepts without prescriptive outcome tend to inform descriptive-analytic research (Feola 2015).

It is evident that the complexity of analysing transition-related concepts leads to broad reflections and interpretations that often succeed in defining even the two thorniest aspects of the transition discussion: theory and practice. In this regard, institutional interventionism and incentives for specific industrial sectors on the one hand, and the transformation of habits, changes in society or communities on the other, have led to a constant misalignment in the interpretation of transition phases. On the one hand, massive public and private investments in technology, and on the other, the growing awareness of the role of concrete actions to counter climate change, pollution, hydrogeological disruption, desertification, etc. through collective behaviours.

In short, what has happened in recent years in the area of smart cities is precisely a profound split and differing interpretations of the transition towards sustainability. On the one hand, public intervention has fuelled a transition towards hard Smart city models, incentivising private action to provide efficient services and increase collaboration between the various economic players, and encouraging innovative business models in the private and public sectors; on the other hand, an increasingly aware civil society has continued along the road towards a soft Smart city, with considerable expenditure of energy. This dichotomy has inevitably heightened the polarisation of social conflicts.

4. THE SOFT SMART CITY: WHAT FUTURE?

As discussed so far, the smart city can interpret the transition in two different directions. The "soft" smart city, more focused on sustainability, and the "hard" smart city, more strongly based on technology. Both, the first on the side of sustainable transition and the second on the side of technological transition, would seem to leave out a whole series of processes which, in theory, shape smart cities. Both visions would seem to present the smart city only as either the hyper-technological or the hyper-sustainable version of a normal city. This tendency towards perfect storytelling brings with it the dark side of smartness: a strong impoverishment of the social dimension. It is in this regard that the criticism of soft and hard smartness can be analysed.

If we look at the discourse on soft smartness, we realise that sustainability is not only a consequence of smart development, but is, instead, a constituent element of it. However, while sustainability can be spoken of in terms of a close connection with the soft smart city, in practice this relationship falters. And it falters because what is lacking in the smart city, the perfect city for many, is precisely sustainability. Suffice it to recall the pointed criticisms of smartness made by Hollands (2008: 310), who observed that while smart cities are «drivers of economic growth, they are also great consumers of resources and creators of environmental waste». Cities, on the one hand, may be "drivers" of economic growth, and thus foster, as seen in the previous chapter, sustained economic growth; on the other hand, they are also «great consumers of resources and creators of environmental waste» (Ivi: 310).

The uneasy relationship between environmental sustainability and smartness would seem to involve three types of issues:

a) Using smartness to overcome the ecological crisis
b) The risk of an "expertisation of existence"
c) The creation of e-waste

The first critical issue we face is precisely due to the technical and technological positivism that permeates every corner of the smart society: it is the belief that in order to combat the ecological crisis, the use of smart technologies is necessary. That is to say, that the progressive use of smart and ICT technologies goes in the direction of using these resources in a sustainable sense. Smartness, in this case, is seen not only as the way of solving all kinds of problems, but especially as the only action needed to stop pollution and reduce CO2 emissions.

The second issue relates to the debate in the literature between, on the one hand, studies that highlight the benefits of smart technologies, such as the smart grids (De Santoli 2011, 2016) and their role in supporting a sustainable recession, and, on the other hand, studies that focus on the negative externalities produced by those same technologies.

Thus, the belief that smart solutions are absolutely sustainable encourages the search for increasingly smart environmental sustainability solutions. This generates a vicious circle, fuelled, as mentioned, by the belief that smartness is the solution, that it is the panacea for all ills, when in fact, it would seem far from being so.

Finally, the third criticism highlights the unsustainability of smart technology, thus undermining the first claim. If smartness was created to address environmental problems, but is itself not sustainable, we are faced with a paradox. The technologies created and designed to save the world from pollution contribute themselves to pollution. Indeed, the paradox of smart technologies arises from the fact that technological devices too have negative externalities. While, as we have seen, a large body of literature sings their praises, there is a new strand of criticism that focuses precisely on the unsustainability of smartness, not only environmental but also social, as discussed later.

Many radical (Freeman and Soete 1986) or disruptive technologies, as they are called nowadays, seem to be subject to this "law of reciprocity" (Bianco 2018). They are embraced as the solution to a problem, only to later take a different form and give rise to an even worse situation. This happens because a new technology, designed to make life easier for everyone, is adopted on a large scale until it becomes unsustainable for the community.

The unsustainability of smartness, in this context, is based on two different lines: a physical one and an intangible one. The first type of "negative externalities" of technological and digital development is represented by physical waste, the amount of which is growing. Waste is generated by the decommissioning of devices due to obsolescence, the replacement of computers, the discarding of smartphones and mobile phones, the scrapping of household appliances; this is known as WEEE waste.

Secondly, although smart technologies were intended to be sustainable and were therefore considered the main – and best – solution to the pollution problem, in reality, their expansion, especially that of smart devices, is part of the problem. Their spread is a source of environmental pollution.

In relation to the quantity of e-waste just mentioned, it must be borne in mind that as national legislation varies and is updated rapidly from country to country, the WEEE waste described above also varies in quality and quantity. In other words, the quantity and quality of this waste changes with the evolution of sectoral regulation. As Kuehr (2019: 484) cautions, in 2017 «only 67 countries in the world had official e-waste legislation», i.e., less than a third of the world's countries.

The real point that skews the perception of sustainability would seem to be the fact that technology – especially smart technology – is endowed with a sense of non-physicality, of intangibility. This absence of real materiality would therefore seem to give an erroneous perception of sustainability. As if intangible meant sustainable. We are in the presence of what would seem to be a "second modernity" – to borrow Beck's (2003) expression, as Camorrino (2018) suggests – of ICTs. Thus, ICTs, once «hailed as the sign of progress and a means of elevating the living conditions of all humanity» (Camor-

rino 2018: 111), would now appear rather to be a further «agent of destruction of the biosphere» (*Ibidem*).

5. THE HARD SMART CITY AND ITS PROSPECTS

Within the "hard" approach to smartness, as seen, technology prevails over other smartness characteristics. More broadly, technology has played a major role throughout the evolution of the concept of the smart city. A quick review of the literature on smart cities clearly identifies technology and, in particular, the use of ICTs as an essential characteristic of smartness. This link has generated numerous critical issues precisely because of the self-referential nature of smartness. First of all, the strong presence of the technological world seems to obscure the other characteristics. That is, in public perception, the smart city is framed as a technology-driven city, as indeed it is. However, this framing downplays the role of the other characteristics, as if the smart city were only technological and not, instead, sustainable, inclusive, collaborative, connected and economically advanced. Technology therefore appears to be the *conditio sine qua non* of the presence of smartness. However, this view is disputed by the paper that, more than any other and before any other, approached the smart world in a critical manner: Will the real smart city please stand up (Hollands 2008), in which Hollands reminds us that being connected is no guarantee of being smart (*Ibidem*: 310), to say that the technologies that enable interconnection between the various sub-systems of smartness and between one system and another are not the only condition of smartness. He goes on to add, that although technology is an enabling factor, it is not necessarily the most critical factor in defining the smart city[2] (*Ibidem*), thus specifying that technology is an "enabler" of smartness, but ultimately is not necessarily the "most critical" factor in defining the smart city.

Thus, the perception of the smart city as exclusively digitally driven derives, not so much from the partially fallacious association between smartness and technology, but rather from a specific view of technology. This view stems from the theory of technological determinism, which posits a direct causal link between technology and society and identifies technology as a new space of social experience and a factor transforming the organisation of society. In other words, technology is considered to be the «prime mover of history» (Chandler 1995)[3]. The logic that implicitly underlies this vision of technology as resolver depends in turn on a flawed vision of progress that sees technological innovation as the one and only answer to the needs of social actors and to the world's ills. Smart technology is expected to be decisive, fast, safe, eternal, to be always at the forefront of innovation and to cover, more and better, all the aspects of life without worrying about the consequences. This is nothing new: we are faced with what is called "technopoly" i.e., a cultural and mental condition that consists in the "deification" of technology (Postman 1970).

Seen under the lens of this technological positivism, history seems to follow a similar process to installing and updating applications on telephone devices. In other words, social changes are seen as stemming from technological changes and not vice versa. Thus, historical development is aligned with and reduced to technological development. Indeed, smart platforms operate in the time dimension (Halpern *et al.* 2017: 116) since the uncertainty of the future is managed by referring to the present as if it were «a demo or prototype of the future» (*Ibidem*). This is compounded by an operation of self-organisation, as defined by the authors, through which previous narratives about society are replaced by a «fetish for big data» (Ivi: 118) that drives development without precise goals. A logic of development and progress, as mentioned, that mirrors the development of software, in which «engineers are always working not to solve problems, but to produce new versions – which can never be completed» (Cuppini 2020: 17).

The problem with viewing history as technologically driven lies precisely in the fact that there is a tendency to disregard the social actor in the name of advancing progress. This marginalisation of the social actor is consequently also reflected in the smart world. The tangible enthusiasm for smartness is, therefore, closely linked to this vision and risks disregarding all the other qualities of the smart process that also contribute to progress.

Therefore, the decisive power given to smartness is both the reason for its great success and its great limitation.

The same utopian and uncritical results are expected from technology as from the smart society.

This saviour narrative, which almost seems a return to positivism, but in high-tech form, seems to hinge on a specific vision of history. A narrative that frames the philosophy of history not as univocal and linear, but marked by technological innovations. Thus, history is conceived not so much as a process shaped by changing social forms but as a linear, incrementally efficient path that has little to do with the social element, but instead resembles the process of updating technological devices.

[2] Translation by me.

[3] An opposing view is taken by those who, like M. Castells, believe that «history determines technology and not the other way around» (Fassio 2006: 69).

In this logic, the frontiers of technicisation are always moved a little further and, as Iannone (2007) puts it, the "digital divide" becomes a sort of bogeyman to be countered by a greater rationalisation of social experience.

6. CONCLUSIONS

As observed by Senatore (2020), studies on Smart cities offer extensive analysis of the tools that have interpreted smartness in both a sustainable and technological sense.

However, these tools have tried to solve with technology, already a major element of the smart city, a process that is not only technological or sustainable, but which, instead, includes social factors. The division between hard and soft visions helps us to understand that the smart city is a social phenomenon and not merely the result of sustainable transition or the digital use of resources. Thus, the division between hard and soft points to the need to observe the impoverishment of the social dimension rather than focusing just on the technological or sustainability aspect of the smart city.

The self-referentiality of smartness risks divorcing smart city projects from the social context. In the skyline of the perfect smart city, the social dimension seems to be left out. It would seem, then, that the smart city's most pressing problem is the "trickle-down effect" (Chiappini and Vicari Haddock 2018), i.e., the belief that smart growth automatically brings benefits to all and, consequently, is the solution to the problems of exclusion and social deprivation.

Hence the smart city is mistakenly associated with the idea of the "best" version of the city, in terms of both sustainability and technology. This view contributes to forging the idea that if you have smartness you are somehow on the right side, while if you do not have smartness you will fall into the limbo of the marginalised (Iannone 2007).

In conclusion, the attempt to bring the smart city back to the social sphere should start from trying to resolve the tensions inherent in the smart city model itself. And solving problems means, firstly, analysing them. Hence, the limitations and contradictions highlighted in this paper can help to improve a process which, as described, appears to be anything but smart. Indeed, despite the significant potential of the smart city model, criticism has been mounting in recent years. The smart city should rather be seen as a project in the making (Costa 2014), providing neither definitive rules, nor guidelines to follow, nor even a single best way of operating. The smart urban agglomeration does not present itself as a closed and recognisable entity, but rather as a set of information, economic and spatial flows.

The smart city, therefore, is a theoretical and ideal model that encourages the logic of the collective, which plays a proactive role in the search for innovative solutions that facilitate daily routines. It is a physical place that encourages projects, which have their foundations in digital technologies, in order to change the way in which social actors use technologies for problem solving.

But there is, as mentioned, no single way for technological progress to reshape the contemporary city, but rather a plurality of solutions.

REFERENCES

Ahvenniemi H., Huovila A., Pinto-Seppä I., Airaksinen M. (2017), «What are the differences between sustainable and smart cities?», in *Cities*, 60-A: 234-245.

Audet R. (2014), «The double hermeneutic of sustainability transitions», in *Environmental Innovation and Societal Transitions*, 11: 46-49.

Bianco A. (2021), «Rifiuti informatici, inquinamento digitale. Il lato insostenibile della 4° rivoluzione industriale», in *SocietàMutamentoPolitica,* 12-24: 183-192.

CAI-Asia Program (2015), *Sustainable urban transport in Asia. Making the vision a reality,* retrievable at: http://pdf.wri.org/sustainable_urban_transport_asia.pdf

Camorrino A. (2018), «La "grande narrazione ecologista". La "scoperta" dell'inquinamento digitale e il ritorno della Natura nell'immaginario della società contemporanea», in *Quaderni di Teoria Sociale*, 1: 107-136.

Chandler D. (1995), *Technological or Media Determinism*, http://www.digitaldividenetwork.org.

Chandler D. (2000), *Technological or Media Determinism*, retrievable at: http://www.digitaldividenetwork.org.

Chiappini L. Vicari Haddock S. (2018), «Smart City in Europa: a che punto siamo? Sperimentare e cocreare, il laboratorio urbano di Amsterdam», in *Sviluppo urbano e politiche per la qualità della vita*, 29-46.

Cuppini N. (2020), «Cosa si muove sotto lo skyline digitale? Storia e politica della smart city», in *Sociologia Urbana e rurale*, 22: 12-26.

De Santoli L. (2011), *Le comunità dell'energia*, Quodlibet, Macerata.

De Santoli L. (2016), *Smart grid. Strategia per le comunità dell'energia su scala urbana*, Editoriale Delfino, Roma.

Economist Intelligence Unit (2005), *The economist intelligence unit's quality of life index. The world in 2005*, pp. 1-4. http://www.economist.com/media/pdf/QUALITY_OF_LIFE.pdf.

EUROPA 2020 (2010), *Una strategia per una crescita intelligente, sostenibile e inclusiva*, Bruxelles, 3.3.2010, https://ec.europa.eu/regional_policy/it/policy/what/glossary/e/europe-2020-strategy

Fassio F. (2006), «Inclusione digitale: reti umane e tecnologiche. The Brazil case», in Ferrarsi P. (a cura di), *Network*, Carocci, Roma.

Feola G. (2015), «Societal transformation in response to global environmental change: a review of emerging concepts», in *Ambio*, 44-5: 376-390.

Feola G., Jaworska S. (2019). «One transition, many transitions? A corpus-based study of societal sustainability transition discourses in four civil society's proposals», in *Sustainability Science*, 14: 1643–1656

Freeman C., Soete L. (1986), *L'onda informatica*, Il Sole 24 ore, Milano.

Giffinger R., Fertner C., Kramar H., Meijers E, (2007), *City-ranking of European medium-sized cities*, Cent. Reg. Sci. Vienna UT, 1-12, http://www.smartcity-ranking.eu/download/city_ranking_final.pdf

Halpern O., Mitchell R., Geoghegan B.D. (2017), «The Smartness Mandate: Notes toward a Critique», in *Grey Room*, 68: 106-129.

Hiremath R. B., Balachandra P., Kumar B., Bansode S. S., Murali J. (2013), «Indicator based urban sustainability. A review», in *Eneergy for sustainable department*, 17-6: 555-563.

Hollands R. (2008), «Will the Real Smart City Please Stand Up?», in *City*, 12-3: 303-32.

Iannone R. (2007), *Società dis-connesse, La sfida del digital divide*, Armando, Roma.

IEEE Institute of Electrical and Electronics Engineers (2020), *IEEE smart cities, IEEE standards association,* https://standards.ieee.org/

Kuehr R. (2019), *Waste Electrical and Electronic Equipment*, Woodhead Publishing, Sawston.

Lombardi P., Giordano S., Caragliu A., Del Bo C., Deakin M., Nijkamp P., Kourtit K. (2011), «An advanced triple-helix network model for smart cities performance», in *Regional development: concepts, methodologies, tools, and applications,* IGI Global, pp. 1548-1562.

Marsal-Llacuna M.L., Segal M.E. (2015), «The Intelligenter Method (I) for making "smarter" city projects and plans», in *City*, 55: 127-138.

Postman N. (1992), *Technopoly. La resa della cultura alla tecnologia*, Bollati Boringhieri, Torino.

Senatore G. (2020), «Smart city: cosa rimane della sostenibilità?», in *Rivista Trimestrale di Scienza dell'Amministrazione. Studi di Teoria e Ricerca Sociale*, 4: 1-31.

Tanguay G. A., Rajaonson J., Lefebvre J. F., Lanoie P. (2010), «Measuring the sustainability of cities: An analysis of the use of local indicators», in *Ecological Indicators,* 10-2: 407-418.

UNCED United Nations Conference on Environment and Development (1992), *Agenda21*, https://sustainabledevelopment.un.org/outcomedocuments/agenda21

UNRIC Centro Regionale di Informazione delle Nazioni Unite (2020), *UN 75 – I grandi temi: Una demografia che cambia*, https://unric.org/it/un-75-i-grandi-temi-una-demografia-che-cambia/

Vanolo A. (2008), «The image of the creative city: Some reflections on urban branding in Turin», in *Cities*, 25-6: 370-382.

WCED World Commission on Environment and Development (1987), *Our Common Future*.