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Special Issue 1.2024

What transition for cities?

Scientific debate, research, approaches and good practices

This Special Issue intended to wonder about the possible transformations for cities towards the sustainability transition. Hence, contributions coming from scholars as well as from technicians have been collected around three main topics: methodologies for prefiguring possible sustainable transitions; urban policies and drivers of the transition; possible projects and applications for sustainable transition. Reflections and suggestions elaborated underline the awareness that the transition process, above all, needs cooperation among decisions, information sharing, and social behaviour changes.

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EDITORIAL PREFACE

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What transition for cities?

Scientific debate, research, approaches and good practices

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This Special Issue of TeMA - Journal of Land Use, Mobility and Environment proposes to delve into the concept of transition applied to urban and territorial systems with the aim of verifying the state of the art in scientific as well as in technical sector, also considering the effects of Covid-19pandemic crisis (Angiello, 2021).

What is urgent is the need to change both social behaviors and the use of primary resources (water, energy and soil) which is claimed by technicians and scholars as the only solution to face environmental challenges affecting nowadays cities. These challenges and the linked risks are so relevant that an in-depth change in the operative actions as well as in the theoretical approaches has become mandatory, in order to avoid negative and disruptive effects.

The current historical phase is very different from the previous ones, because of the availability of innovative technologies, enormous possibilities of connection, information production and exchange, the lack of well-defined limits among activities and sectors that Bauman (2011, pp 8-11) defined liquid modernity based on the belief that "change is the only permanent thing and that uncertainty is the only certainty". Dealing with the issue of complexity that characterises systems in which we live in requires to consider two aspects, at least, that need to be observed simoultaneously. On one hand, to study the evolution of the city as a complex system; on the other, to observe the rapid transformations that affect all sectors (social, productive, economic, cultural) to be able to drive them towards sustainable targets.

Some scholars defined this historical period as characterized by a critical transition, that has multiple dimensions (climatic, energetic, sanitary, social, economic), namely a systemic transition.

In this sense, it is needed the awareness that the systemic vision - even though it requires extreme changes in the theoretical and in decisional processes - is the most appropriate approach able to make scholars, researchers and expert able to reach adequate solutions to face the current issues (climate changes, overpopulation, social inequalities, etc.). Cities, indeed, has gained a central and strategical role both as crisis-producers and as crisis-solver; within this paradox urban and regional planning has responsibilities due to its intrinsic nature to be a science whose target is the collective well-being.

The systemic approach to the study of cities as complex entities is not recent but goes back to the General Systems Theory (GST) (von Bertlanffy, 1968) developed in the early nineteen century (Prigogine & Stegers (1984; Bertuglia & Vaio, 2005; Bai et al., 2016; Fistola et al., 2020; Gargiulo & Papa, 2021).

One of the main characteristics of complex systems is the non-linearity of the relationships between the elements. It is this characteristic that arose from Covid-19 pandemic crisis. This means that the processes within the system can be triggered by random factors, whose outcome may not be predictable, and therefore, ungovernable. Hence, the effects can be amplified, and they can multiply themselves as it happens in the theory of Lorenz (1972), expressed by the so-called "butterfly effect".

The current crisis conditions, on contrary, seem to be much closer to the adaptive capacity of complex systems, expressed by Levin (1988). This concept implies the fact that complex systems can have relationships between elements that are not always compatible. Thus, the behaviors between elements are so interconnected that they can modify both their own dynamics and those with other components of the system. This characteristic, on one hand, accentuates the condition of uncertainty, on the other, it does not prevent the search for practicable solutions that can be compatible with the complexity of the whole system.

Decision-making processes and social behaviors, therefore, must adapt to the evolutionary speediness of the system, with the awareness that there is not a single solution but a range of possible scenarios which are dynamic themselves. The concept of resilience, which, at present, is widely applied to urban sciences (Gaglione & Ayiine-Etigo, 2021), refers to the ability of a dynamic system to resist disturbances avoiding their catastrophic effects (dynamic stability) (Hunderson, 2000). At the same time, the concept of sustainability, since the Nineties, has been developed as a theoretical reference both in scientific debate and in the practices of urban and regional planning. By assigning different weights to its dimensions (environmental, economic, and social) according to the context, several other aspects have been added to sustainability that, if have enlarged its field of application (safety, risk prevention, adaptation to climate change, energy saving, load capacity, aging population), they have also generated criticisms and conflicting interpretations.

In the context of these considerations, the choice to concentrate the attention to the topic of transition of urban and territorial systems has been related to the target of indagating the interest coming from the scientific fields dealing with cities and its planning and urban evolution.

Generally speaking, and referring to physic approach, the concept of transition refers to a passage of state from a first condition "a" to a second and different condition "b"; this passage occurs in conditions of instability and originates continuous changes. In this sense, transition could be understood as the non-permanent phase that necessarily occurs to move from a state of crisis towards state in a new balance.

Referring to complex systems, such as the city and the territory are, the transition process also occurs through an exchange of energy released between one phase and another. The dispersion of such energy must be limited to guarantee the existence of the system itself. A further reflection arises within the purpose of this special issue of TeMA Journal of Land Use, Mobility and Environment the concept of transition refers to the need to distinguish the evolutionary process of the dynamic and complex system "city" from the typical transition process.

In other words, it is possible to refer to two different processes. The first one refers to an endogenous process, that is the evolutionary natural change of the system as it is dynamic and complex (evolutionary change). The second refers to an exogenous process (i.e. the transition) that leads to modification in the system moving along a designed trajectory. Both the processes arise because of the occurrence of crisis situations but are substantially different. While in the first case the change can be sudden and unpredictable, in the second case, the change can be gradual and result from a design of possible trajectories for transformation.

In this sense, urban planning assumes responsibility and the contribution of urban planners can be strategical in pursuing states of balance that can assure good levels of livability to the urban community.

This also responds to the principles of sustainability as they have been recently expressed by the International United Nations in 2030 Agenda for Sustainable Development (ONU, 2015) that it is possible to individuate as the collective moment of awareness of the need for change.
This awareness, for instance and as it concerns Europe, was induced into the Green Deal adopted by the European Commission in order to be the first climate-neutral continent (EC, 2019). In this context, the ecological transition refers to the transition from "unsustainable consumption models" towards "green" methods and lifestyles.
Within the scientific literature, *urban transition* is meant as a multidimensional and cooperative process, characterized by uncertainty; while the *urban green transition* represents an opportunity to solve "urban diseases", such as traffic jams, the dramatic increase in house prices, overpopulation (Jinpeng et al., 2017).
Actually, the search for an urban model representative of a city that is well balanced between man and nature, thus as the solution to the "urban illness" goes back to the utopian urbanism of the nineteen century (Owen, Fourier, Soria y Mata, Howard, Garnier), to contrast the industrial city model. The concept of sustainable city as a product of the paradigm of sustainable development as it has been defined in the report "Our Common Future" (Brundtland, 1987) and all its consecutive declinations, has in fact re-proposed – in a contemporary key – the objective of seeking the improvement of urban efficiency through the study of the (dynamic) relationship between different urban functions. Taking it to extreme and trying to identify the main stages that can describe the trajectory of the city's transition process towards more sustainable dimensions, five phases can be identified.

1. The "green" (ecological) phase

The first phase that can be identified as "green" refers to the shift from the ideal city, forerunner of the present sustainable city, –whose origins could be individuated in the Garden City of Howard (1898) or the later Ville Radieuse of Le Corbusier (1930) – up to the more articulated notion of "Green Urbanism". Lehmann (2011) (fig. 1), in proposing the principles of Green Urbanism, identifies two fundamental and very significant steps in the evolutionary history of the city, which summarize the emerging elements characterizing the most current urban model.
The first step can be linked to the spread of the use of the car which corresponded to a model of "dispersed city" (the de-compacted "functional city" of the 20th century or the focus of the urban sprawl theory in the same period).
The second step is characterized by the awareness of climate change which imposes a more environmentally friendly urban model for which it is needed the re-conceptualization of the cities, of their infrastructures' systems, to make them "compact" (the "dense city" theory spread in the later years to contrast the urban sprawl). Hence, the whole ongoing debate around the definition of an urban model that could withstand the challenges that, in fact, urban evolution itself has activated (climate change, depletion of primary resources, social inequalities, etc.).

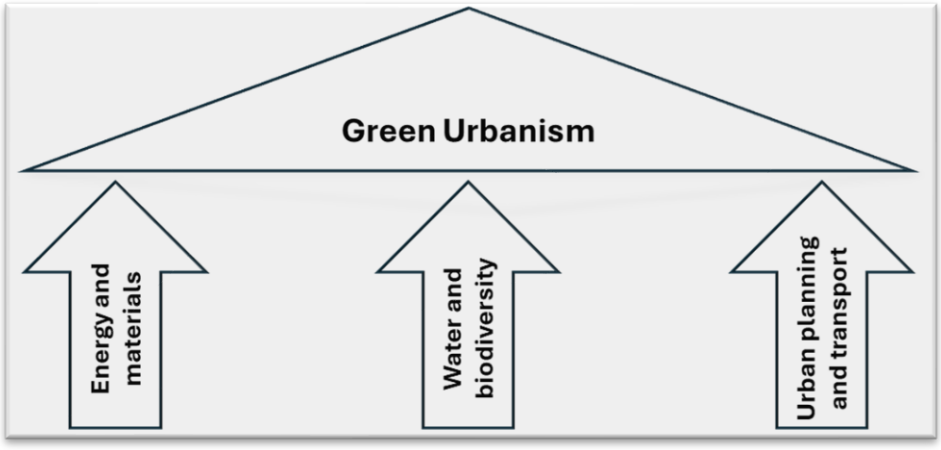

Fig. 1 The three pillars of Green Urbanism according to Lehmann (2011)

2. The phase of the Urban Ecology (UE) and eco-towns

The concept of urban ecology dates to about thirty years of studies and research which have involved the field of theories and above all those of practices and urban design. Wu (2014) delves into the aspects relating to both the sociological sector and the urban planning one, referring to the scientific research in the last ninety years (fig. 2). In his research he also clarifies the relationship between ecology and sustainability, specifying how the latter concerns a broader field of research while (also considering the several definitions coined in the last ten years) the former refers to the study of space-temporal patterns, environmental impacts, and sustainability of urbanization with emphasis on biodiversity, ecosystem processes, and ecosystem services. Socioeconomic processes and urban planning practices contributed to identification of urban ecology as a practice and a theory.

In the 2000s, within the debate about the city as an ecosystem, the concept of "ecosystem services" assumed a central role also in the scientific debate originating a specific research line. In a nutshell, also referring to Millenium Ecosystem Assessment[1] (2005) this concept refers to "the benefits people obtain from ecosystems" which include: (1) "provisioning services" (e.g., food and water), (2) "regulating services" (e.g., purification of air and water, regulation of climate, floods, diseases, hazard, and noise), (3) "cultural services" (e.g., recreational, spiritual, religious and other nonmaterial benefits), and (4) "supporting services" (e.g., soil formation, primary production, and nutrient cycling). As supporting services are really ecosystem processes or functions, ecosystem services hereafter refers only to provisioning, regulating, and cultural services.

In this framework, the notion of "green infrastructures" (GI) begins to concentrate attention within the debate about the sustainability of cities. The topic of "green infrastructure" is considered as a strategic approach to the subject of conservation of cities, fundamental for sustainability. It differs from the approach to open space planning because it proposes a system of multifunctional networks able to reduce impacts on the environmental and socio-anthropic urban systems. According to the United States Environmental Protection Agency "green infrastructure is an approach to wet weather management that is cost-effective, sustainable, and environmentally friendly. Green Infrastructure management approaches and technologies infiltrate, transpire, capture and reuse stormwater to maintain or restore natural hydrology". These technologies (green roofs, rain gardens, permeable floors, etc.) contribute to the reduction of pollution, of the energy demand, to the mitigation of the urban heat island effect. In the evolution of the concept and its application, GI becomes an important milestone for building the eco-town. Particularly, GI refers to a strategically planned and managed network of green spaces and other environmental features vital to the sustainability of any urban area. GI should be designed and managed as a multi-functional resource capable of providing the landscape, ecological services and quality of life benefits that are required by the communities it serves and needed to underpin sustainability. Its design and management should also protect and enhance the character and distinctiveness of an area regarding habitats and landscape types. The report of the Town and Country Planning Association in 2008 (The essential role of green infrastructure: eco-towns green infrastructure worksheet) indicates nine principles to create the GI in eco-town according to a specific strategy[2].

In the same period, in England, an experiment was started with the "Eco-towns" project, with an allocation by the government of around 200 million pounds for the construction of four small urban settlements, each with 2500

[1] The Millennium Ecosystem Assessment (MEA) is an international research project aimed at identifying the state of global ecosystems; evaluating the impacts of changes on human well-being and providing actions for the sustainable use of ecosystems. Started in 2001, it concluded in 2005 and involved over 1,360 experts from all over the world. The findings provided both a scientific assessment of the global ecosystems, and options for restoring, conserving or enhancing sustainable use of ecosystems. Retrived https://www.isprambiente.gov.it/it/attivita/biodiversita/documenti/millennium-ecosystem-assessment https://www.millenniumassessment.org/documents/document.356.aspx.pdf.

[2] The English eco-town initiative was launched by the UK Labour government in 2007 to address the twin challenges of growing urbanization and climate change. The experimentation, with the "Eco-towns" project, was started in England in 2008, with an allocation by the government of around 200 million pounds for the construction of four small urban settlements, each with 2500 homes built with use of energy saving technologies, to be completed by 2016. Project has not been finished also due to the change of government.

homes built using of energy saving technologies, to be completed by 2016. The project has sparked controversy and dissent also due to the change that affected the government leadership which cut funding by 50%. However, it can represent an example of "urban transition" towards modes of urban settlement different from the previous ones.

3. The Low Carbon City (LCC) phase

Initially, the concept referred to "low carbon economy", coined for the first time in 2003 (DTI, 2003) when the British Government published the "Energy White Paper" entitled "Our Future Energy: Creating a Low-Carbon Economy". A little later, in 2007, this concept was joined by "Low-carbon Society" that refers to a condition without which an economy based on low consumption cannot be achieved in the absence of behaviors and lifestyles that care of consumption of resources and energy. The low carbon city model, thus, is based on the idea of reducing polluting emissions through a city model in which citizens adopt virtuous behaviors which in turn have repercussions on the economic system. This topic has become central in the scientific context (fig. 3) evolving toward the concept of Smart Energy City.

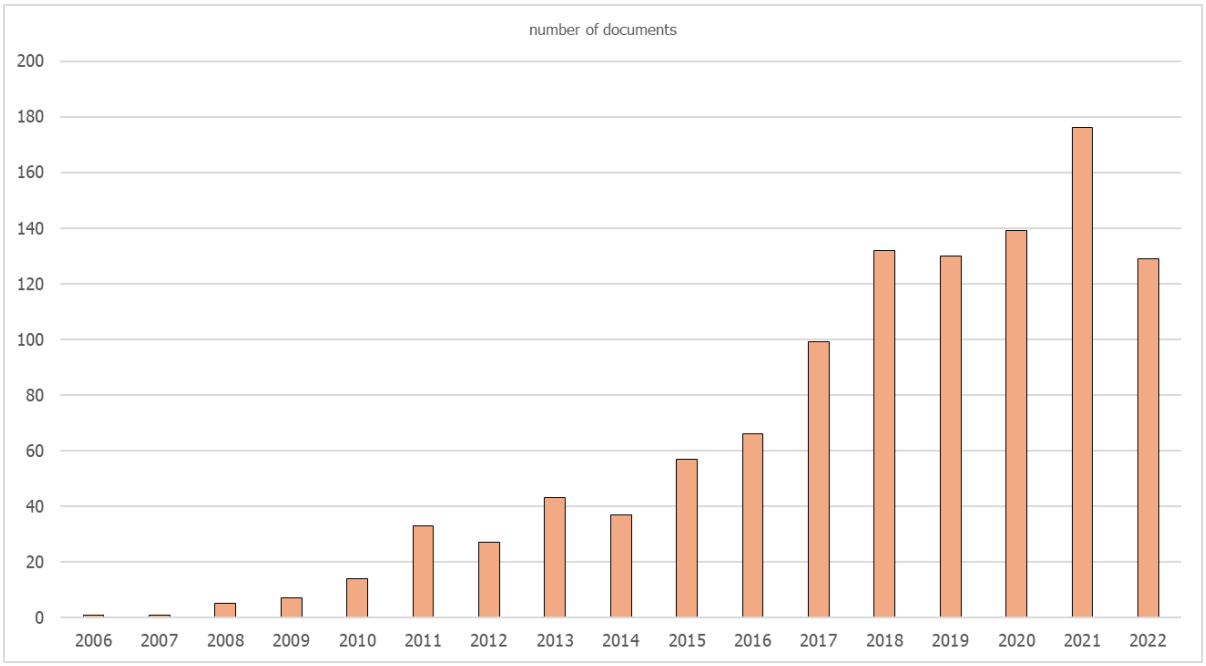

Fig. 3 Number of articles published in the period 2006-2022 on the topic of the low carbon economy (Scopus database accessed on 19th February 2023)

4. The phase of the Circular city (CC)

Based on the concept of circular economy (CE), CC imposed itself on the political and scientific scene as a possible model of sustainability based on the reuse, thus, on the reduction of consumption (Rios et al. 2022). The European Union defined the circular economy in 2019 as "an economy in which the value of products, materials and resources is maintained for as long as possible and waste production is reduced to a minimum" (Eurostat, 2019).
Many definitions have been proposed since then (Geissdoerfer, Savaget, Bocken e Hultink, 2017; Kirchherr, Reike e Hekkert, 2017; Korhonen, Honkasalo e Seppälä, 2018; Prieto-Sandoval, Jaca, & Ormazabal, 2018) without reaching a unique.
Geissdoerfer et al. (2017) underlined that the key aspects of CE typically include waste design, maintenance, repair, reuse, remanufacturing, reconditioning and recycling.

They define CE as "a regenerative system in which resource inputs, waste, emissions and energy losses are minimized by slowing, closing and restricting cycles of matter and energy". According to the researchers at Circular Cities Hub (2017), established at the Bartlett School of Planning of University College London, a circular city is based on systems integration, flexibility, intelligence, cooperative behavior, localization, recycling, and renewable resources. Within a circular city, they further write, "resources can be cycled between urban activities" and "within city regions," and "cities can be designed so that land and infrastructure can be re-used/recycled over time." Referring to the principles of '3R- reduce, reuse and recycle' and the process of 'resources- waste- renewable resources', circular city weighs the benefits against the costs, and then relieves the pressure of energy shortage and the burden on the environment.
In a nutshell, the concept of a circular city refers to the interpretation of the city as an organic system in which there is an influx of resources and an outflow of waste. This process is commonly described as urban metabolism. Therefore, metabolic rate is the key indicator that can evaluate the recycling capacity of a city. Urban metabolism can be divided into linear and circular modes. The linear one, to which most cities belong, depends on large quantities of resources and produces large quantities of waste; the circular one does not consider urban problems in isolation, but the interrelationships between the elements of the city system.
The ability to recycle resources defines the system's ability to influence environmental pollution and therefore to produce ecological damage. However, waste management and the ability to recycle it is only one aspect of reducing the polluting impact of cities. Transferring this aspect within the global governance process would help to change the entire process, allowing to move from a post-consumption phase to a pre-consumption phase, therefore to develop types of technologies to avoid or reduce initial waste. Furthermore, if we consider the urban territory as a finite and non-reproducible resource, the rational use of the territory and the containment of its consumption represent fundamental principles of the planning process of a circular city.

4. The phase of the smart city (SC)

The smart city phase, which exploded at the beginning of the 2000s and throughout the following twenty years, can now be said to be almost consolidated if not even overcome. It was clarified that this concept cannot be exclusively limited to the use of new technologies but must be based on the synergy of the elements that make up the city system, favoring a citizen-centered vision, according to which the intelligence of the city is closely related to social dimension. In this vision, quality of life and efficiency objectives become priorities in the urban development strategy towards dimensions that also associate safety, wellbeing, health and inequality overcoming with sustainability.

Referring to the considerations expressed, with this Special Issue we intended to draw the attention of technicians and scholars to the theme of urban transition which from many quarters seems to prefer the "ecological dimension" to pursue sustainability objectives. The eleven contributions received, while maintaining the underlying theme of the main theme, propose differentiated perspectives of sustainable transition which can be divided into three groups:
1. Methodologies and cognitive tools for urban transition
2. Urban policies and driver elements of the urban transition
3. Possible projects and applications for urban transition

The contributions of the first group propose analysis methodologies oriented to the knowledge of the changes affecting cities, they try to identify adaptation solutions suitable for these changes. In particular, the aspects relating to the vulnerability of cities to the effects of climate change (Palermo et al.), the need to develop adequate tools to support informed decision-making processes (Stufano Melone & Camarda), to define territorial planning tools capable of integrating the transition through the construction of a system of clear rules (Lazzarini et al.).

The contributions of the second group focus on the analysis of the effects deriving from climate change, highlighting the urgency of integrating adaptation and mitigation actions within the process of defining land use policies at different scales. Aspects relating to the framework of European "green" policies are explored in depth (Isola et al.), as well as the need for integration between urban planning and environmental assessment tools and the search for appropriate methods and tools to improve the adaptation and resilience capacity of urban systems to the need to define approaches based on a holistic and systemic vision for the knowledge of urban phenomena at different scales (Pultrone; Gisotti & Masiani; Ingaramo et al.).

The contributions of the third group allow for the building of a first cognitive framework related to research projects and/or urban planning practices aimed at identifying interventions to improve the conditions of urban sustainability, with particular attention to "fragile" territories (lagoon areas, internal areas, coastal areas).

Aspects related to the feasibility of creating zero energy emission urban districts as well as the definition of actions for the protection of urban ecosystems are always explored in depth with a view to tracing practicable and sustainable trajectories of change (Magni et al.; Caprari & Malavolta; Altay & Zencirkiran).

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