

# TeMA

Journal of  
Land Use, Mobility and Environment

This Special Issue contains a collection of sixteen extended papers from the XXV Living and Walking in Cities International Conference. It is a bi-annual occurrence aiming to gather researchers, experts, administrators, and practitioners and offer a platform for discussion about mobility and quality life in urban areas-related topics, specifically on vulnerable road users. The aim is to exchange ideas, theories, methodologies, experiences, and techniques about policy issues, best practices, and research findings.

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*Special Issue 1.2022*

**New scenarios for safe mobility  
in urban areas**

# TeMA

Journal of  
Land Use, Mobility and Environment

*Special Issue 1.2022*

## NEW SCENARIOS FOR SAFE MOBILITY IN URBAN AREAS

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## Some reflections between city form and mobility

Dilemma between past and present

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### **Abstract**

Urban development is closely linked by a continuous cause - effect alternation of technology that finds its maximum application in the city, and in particular in the transport system to support the multiple forms of mobility.

From the historical reading of urban processes, it is in fact possible to extrapolate strengths and weaknesses, positive and negative externalities, of mobility and recognize the recurring elements in the evolution of the city form. The aim of the paper is to build a reorganization of knowledge between literature and comparisons of city forms to extrapolate from the past possible approaches to evaluate the present on the occasion of multiple and contextual transitions such as energy, digital and ecological ones.

### **Keywords**

City form; Mobility; Urban evolution.

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## 1. Introduction

In the aftermath of the most critical phases of the international health crisis, the scientific debate focuses on approaches, methods, and tools for 'safe mobility' (Barbarossa, 2020; Balletto et al., 2021) in search for answers for the post-pandemic city (Murgante et al., 2021; Florinda et al., 2021).

The present research intends to highlight how the evolutionary processes of the city are the result of a compromise between urban form and mobility. In particular, I want to highlight, through an interpretation of urban phenomena and the evolutionary progress of cities, how the outbursts of innovation have had strong influences on the mobility of people and goods, with consequent reflections on the urban form.

From the historical reading of urban processes, it is in fact possible to deduce points of strength and weaknesses - positive and negative externalities - of mobility, as well as recognizing the recurring elements.

The objective of the paper is to revise the relation among mobility and urban forms, from the point of view of the current city, recovering after the pandemic crisis, reviewing a selected literature, and comparing the form of cities, to extrapolate possible interpretations from the past to interpret the present, supporting possible choices for the current and future city.

Rereading and updating the process of transformation of the city (Toschi, 1966) in fact, allows us to recognize, above all in the current multiple transitions: energetic, digital, and ecological (Guida & Ugan, 2021; Birat, 2020), the origin of the current trends (Keith et al., 2020; Pirlone & Spadaro, 2020) and therefore to favor a harmonious and innovative governance of territory (Secchi et al., 2015; Mumford, 1994; Fera, 2002; Staricco et al., 2020; Camagni et al., 2002).

Urban development and progress have not been linear in time: the great technological and digital transformations, in fact, lead to reflect old and new paradigms of cities - water, materials energy and transport (Fransen et al., 2021; Potts, 2020).

The mobility of people and goods is the focus of this article, according to a 'past and present' temporal approach with the 'city form'.

In this brief overview, the paper does not intend to be exhaustive, but rather to draw attention to possible reading keys of the phenomenon 'Urban form and mobility'. The paper is developed in the following paragraphs: Some historical milestones of the city; Reflections between city form and mobility; City form and mobility; Old and new challenges and Conclusions.

## 2. Some historical milestones of the city

Whenever we try to study urban phenomena, or rather the complex characters of the city, we are forced to enter the events of its history. The history of the city facilitates the recognition of the relationships between the environmental, climatic, geographical, social, and economic conditions that have influenced its form (Mumford, 1994; Lynch, 1984).

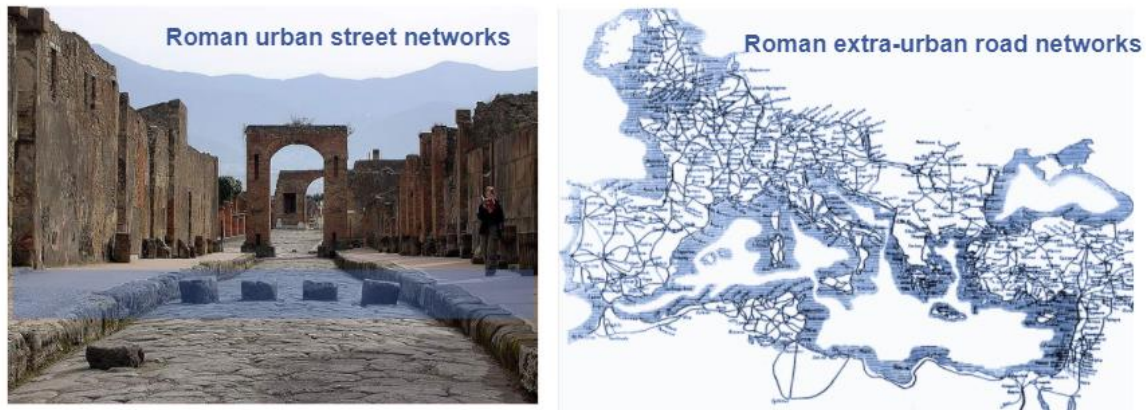
Ancient cities, with their ruins, express the organization of activities through a layered set of signs. In particular, the form of cities varies in relation to spontaneous or planned organization (Hansen, 1959).

The public space - streets and squares - of historic centers, clearly reveals close links between the urban layout and the architecture. Furthermore, cities born through a colonization policy or as military cities are often similar in their ordering mesh (Toschi, 1966).

The forerunner of planned urban space was Hippodamus of Miletus (5th century BC), Greek urban planner and architect, the first to use planimetric schemes in the design of a city, based on streets drawn at right angles, clearly delimiting residential districts, public buildings, and markets (Mazza, 2008). The Roman civilization then developed and applied this model of Greek derivation, from the nearest settlements to the most remote colonies compared to the capital city of Rome (Barbera, 2017).

The checkerboard city form was to be understood in the image and likeness of the mother city of the great empire. In this sense, examples of particular significance are the cities of Pompeii and Herculaneum (Italy), which constitute an open-air book of extraordinary importance of 'historical relevance' (Osanna, 2017).

Urban development was accompanied, in fact, by a continuous cause and effect of the development of technologies in the transport of people and goods. In particular, the origin of the mobility system through urban and extra-urban infrastructures - short and long networks - (Fig.1) must be attributed to Roman civilization (Quilici & Gigli, 1996; Von Hagen & Martone, 1978; <https://orbis.stanford.edu/>).



**Fig.1 Urban and extra-urban infrastructures - short and long networks - Roman civilization (Author: G Balletto, 2021 from Kaiser, A. (2011). Roman urban street networks: Streets and the organization of space in four cities. Routledge)**

The Romans adopted the foot (*pes romanus*) as a linear measure. At the time of Emperor Augustus, the use of the '*pes romanus*' was made mandatory throughout the empire, to ensure the measurability of transport infrastructures. However, in common language in ancient times as in contemporary times, time has always been used to indicate the duration of travel in urban and extra-urban space. A more dilated time in antiquity and measured in days and a shorter time measured in hours and minutes in the contemporary world (Figure 2).

Communities have always experienced the flow of time in an urban space that is constantly changing. The history of cities, in fact, highlights continuous transformations and correlations with the infrastructures supporting mobility (Cidell & Prytherch, 2015).

In particular, the road network of the city of Pompeii, consisting of two *decumanus* and two *cardines*, is organized in such a way as to connect the 'central places' with the gates and, therefore, with the extra-urban areas. Furthermore, the first urban commercial organizations were single-issue, which then merging gave rise to the Forum (functional mix).

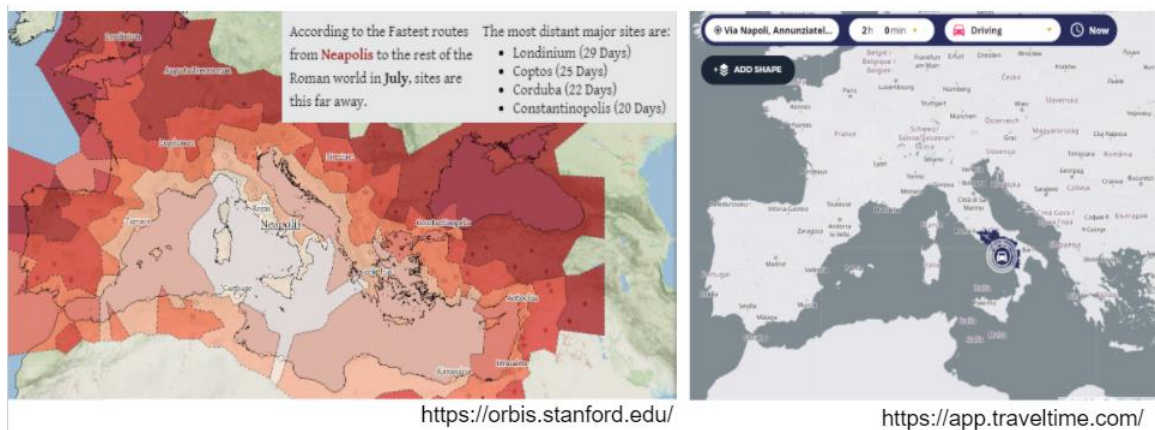
The current counterpart of the Forum is the shopping center, which also has localization similarities in proximity to the main urban-extra-urban transport infrastructures (Gruen & Smith, 1960).

Each historical phase has therefore determined a selection like the natural one, that is, only cities able to recover from wars, epidemics and catastrophic events, both with prevention and with reconstruction, have managed to resist.

However, the great changes occurring with the production of steam energy, the industrial phase and then the post-industrial one has determined the great leap of species in the cities, making it a predatory towards environmental resources (Rizzo, 2019).

New urban transformations followed in response to the growing mobility needs of people and goods, which modified and / or integrated the ancient urban form with the demolition of the city walls and urban plans during the 1860-1960 population boom (Benevolo, 1977; Hall, 1998; Giedion, 2009).

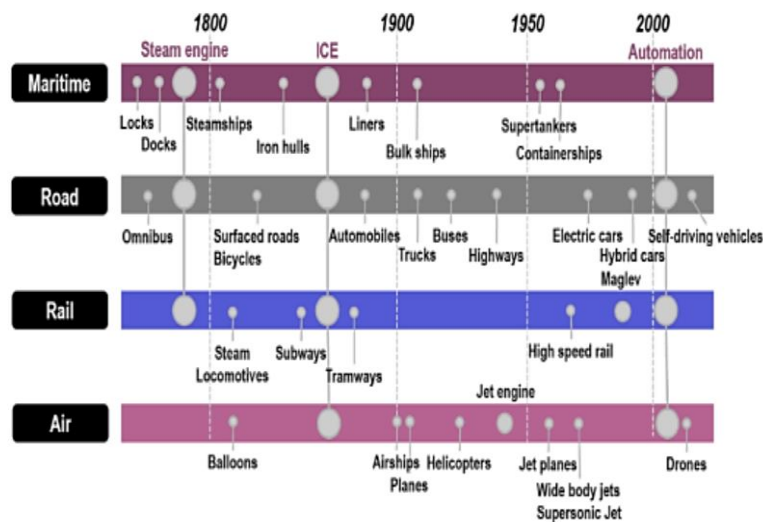




**Fig.2 Naples centroid isochrone. Left isochrones (in days) right isochrones (in hours)**  
 (Author: Balletto G, 2021 from <https://orbis.stanford.edu> and <https://app.traveltime.com/>)

### 3. Reflections between city form and mobility

New technologies have always found wide application in transport systems, with profound implications on the city, both material and immaterial. In fact, technical, technological, and digital innovations have gradually merged and hybridized, so much so that automation characterizes all mobility systems (Fig.3).



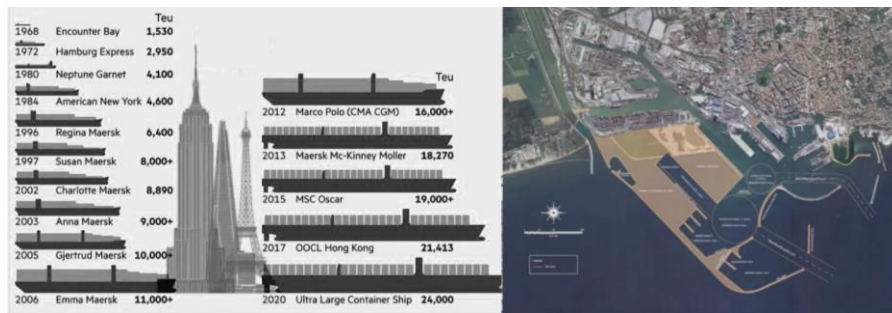
**Fig.3 Timeline evolution of transport technology since the 18th century (from: Rodrigue, J. P., Comtois, C., & Slack, B. (2016). The geography of transport systems. Routledge)**

The progressive changes introduced to mobility have determined negative externalities (low air quality and pollution, congestion, accidents) on the material part of the cities and on the community, exposed to risks and transitions. In particular, the 'Emergency' dimension (hydrogeological, climatic, and sanitary) manifests a condition that is no longer exceptional, but recurrent and continuous. Even the 'Transitional' dimension (digital, ecological, energetic) risks being no longer a temporary condition, but a permanent state (Tononi & Pietta, 2021).

Among the main and most recent changes on extra-urban mobility infrastructures are the high speed of trains (Mazzeo, 2010) and maritime-naval 'gigantism' (Haralambides, 2019) (Fig.4), where the changes occurred in the technology of transport means hold a massive impact over infrastructure (railway lines and stations; port facilities); in urban areas, infrastructures for parking, soft mobility, and local public transport (Gargiulo, 2011), including the issues and technical aspects connected to electrification.

Congestion from the transport of people and goods and the lack of urban space are in fact the new challenges for cities. In parallel, the recent and broader objective of transport infrastructures, namely, to ensure social

cohesion, competitiveness of the economic system and national security (PNRR, 2020), continues to confirm the 'constant Marchetti' (Marchetti, 1994).



**Fig.4 Naval gigantism (left side) and maritime gigantism (right side) Port of Livorno, expansion plan, Italy. (Author: Balletto G. from <https://www.portaltotirreno.it/pianificazione-e-opere/piano-regolatore-portuale-livorno/>)**

Specifically, as the means of transport progressed, the average commuting time did not decrease, but the relative distance increased. The improvement in transport performance has in fact contributed to a gradual extension of the city form and urban boundaries, with consequent commuting (Cui, 2019). The result was the merger of urban centers without redistribution of services with a consequent growth in demand for mobility. The enlargement of the boundaries of traditional municipalities to the size of the current cities subways make the new urban dimension coincide with the area affected by the greater number of home-to-work mobility. In many realities urban, the "gravitational force" expressed by the main municipality has often led to underestimate the processes of urban sprawl, helping to overlook the problems of mobility, social and economic (Wegener, 2013).

#### 4. City form and mobility: a synthetic framework of interaction

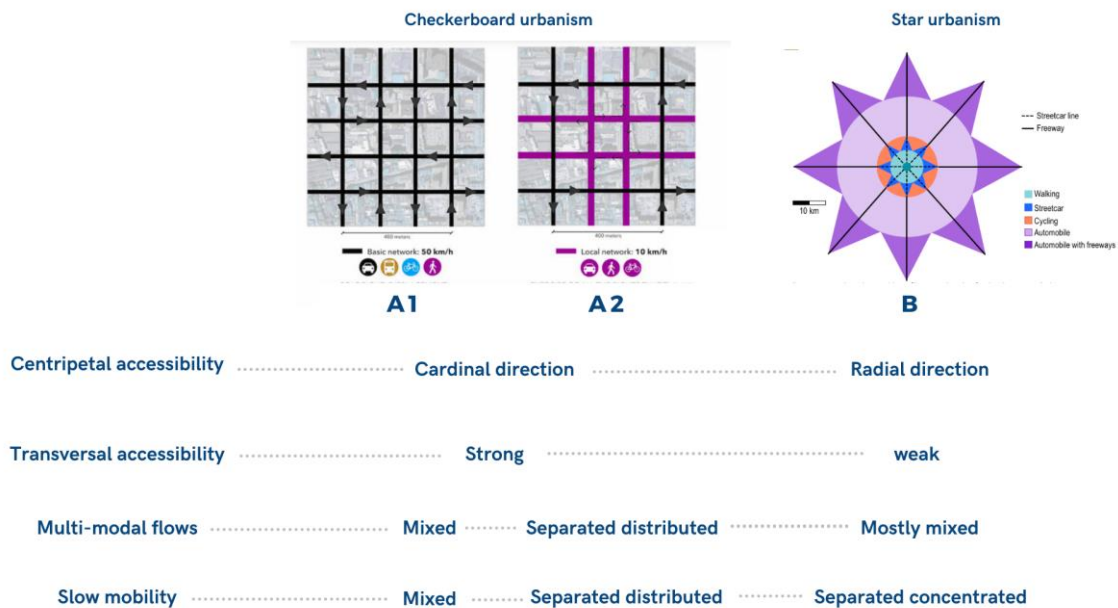
What relationship exists between city form and mobility? Is it a mutual cause and effect relationship? Questioning about the relationships between city form and mobility has always been the subject of urban geography and less of the planners, more oriented to finding cures than the causes to be solved.

The transport and mobility plans are in fact developed in an invariable rigid context, as if the city were a sequence of canyons in which mobility can be developed. Answering the questions is not easy, indeed it produces new questions in the context of the international scientific debate. We then proceeded to construct a summary scheme, which compared the main forms of the city, chessboard urbanism (planned) and star urbanism (partially planned) (Fig.5).

The scheme confirms that the planned checkerboard city form is more performing than the partially planned star urban form. In addition, since urban evolution is closely linked to the role of central places (generators) and natural and anthropic enclaves (limiters), it follows that each city is composed of a mix of forms (checkerboard, star and more) confirming that the city is an outcome both of urban planning, but also of the forces exerted by mobility (Wegener, 2013; Balletto et al., 2021).

Furthermore, urban mobility problems have increased proportionally, and in some cases, exponentially, with urbanization (planned and spontaneous). This is associated with the metropolitan city effect, as well as with mobility needs which tend to focus on specific urban areas, such as central business districts (Rodrigue, 2020). In mobility, solutions are suggested to fit into the social and urban fabric in an increasingly less traumatic way: this is the great trend of the present. Electrification, autonomous driving technology, new mobility models are on the doorstep of cities, even the smallest ones. Since ancient times, cities have been considered boosters of innovation, thanks to the density and concentration of energies produced by the citizens who live in them. Today, especially after the changes caused by the pandemic, we are once again facing a phase of profound transformation. From transport to energy, from production methods to civic participation, the technological revolution is affecting various aspects of our cities, triggering important moments of discussion and

comparison. the energy and ecological transition from the use of 4.0 technologies such as machine learning and deep learning, a renewed relationship emerges between the "city of proximity" and between nature and city (Tononi & Pietta, 2021).



**Fig.5 Synthetic scheme of comparison between two city forms (Author: Balletto G, 2021, from Rodrigue JP. (2020), The Geography of Transport Systems, 5th edition, New York: Routledge)**

## 5. Old and new challenges

In this synthetic framework, the challenges for the city of the future can be divided between hard and soft, not unlike the past. The cities of antiquity had to face wars, epidemics, and catastrophic events. All cities have had to face specific challenges to ensure their survival (Murgante & Borruso, 2015). A recent example is inland areas, those with lower population densities than metropolitan cities. They continue to lose population, services, and productive activities. The challenge is to rebalance and not give up (De Rossi, 2019; Bacci et al., 2021; Fenu, 2020). Finding effective solutions is not easy, also because each context has its own peculiar characteristics. The challenge lies precisely in not homologating policies and practices but starting from a common basis to adapt them to individual contexts through aggregation - innovative / creative - to overcome the condition of marginality (Florida, 2003).

The city and territories, to survive, require hard actions, such as urban regeneration with a functional mix, energy and sustainable mobility, circular economy, but also soft actions (renewed layouts for open spaces: parks, squares and transport infrastructures). The ancient cities proceeded in the same way, just think of the Roman city of Pompeii itself: during the epidemics the baths were strengthened, and the passage of animals was not allowed at the Forum thanks to bollards. Such ancient solutions, if updated, would correspond to buildings for health and tactical urban planning. However, what differentiates us from the past is the vision associated with the challenge. In ancient times the holistic approach was the basis of the challenges, the city was not the sum of elements, but the set of continuous flows, sequences, and processes. For the future it is therefore necessary to achieve a more effective integration between transport policy and spatial planning, within the framework of transitions (energy, ecological and digital), taking full advantage of technologies. In addition, develop the question of the density of people / goods present in the same place at the same time, at different times of the day. In fact, the recent health crisis - and not only that - requires an approach in favor of planning services distributed over time and space in order to "flatten the curve" (Rodrigue JP, 2020; Borruso & Schoier, 2004) of peak hour access to services (Borruso, 2003), as to public transport services, or to shops and public services.

## 6. Conclusions

The relation between city form and mobility dates back to the dawn of cities and still today, a mutual relation and influence can be observed among these two sides of the same coin, as the set of infrastructure (building and roads) and the people and goods with their transport means moving on them.

City form today is following the patterns drawn by the changes occurring in economy and society, particularly polarizing sites within urban regions, in a renewed centre-periphery, or rather centre - peri urban suburbs / inner areas, debate.

The right to the city appears in different forms if related to the well connected, dense and service-rich centre, or to the less connected, sparse, and service-poor peripheries, suburbs, or even inner areas. Urban policies, as well as transport policies connected to them seem tackling particularly the cores, where new forms of mobility co-exist with more traditional ones. Car, bike, electric scooter sharing, together with local public transport, seem to be receiving particular attention in the post-pandemic city, although the more traditional means seem to be under pressure after the quest for avoiding crowding. Electric mobility seems, nonetheless, living a magic moment as a potential to solve short-range mobility plans.

Mobility and City, however, represent a dichotomy that needs to be tackled in line with the major, recent challenges affecting cities. The city as a 'scrambled egg', or the polycentric city, that characterized by a strong center but also by a growing number of growing small-medium size urbanized territories, is living challenges in terms of accessibility, services supply and, in general, good quality of life, in social, environmental, and economical terms (Porqueddu, 2015).

Not by chance, the major protest movements intervened recently in many industrialized countries highlighted this kind of dilemma: the majority of Brexit supporters in the UK, the gilets jaunes in France, the lack of connectivity in peri urban and peripheral neighborhood for the distance learning as experimented, among others, in Italy during the hard lockdown period, are all examples of a deep unease of these areas, in contrast with the glittering atmosphere of the city centers.

It is not just mobility that is of course lacking in such areas. However, the 'city effect', as already observed by Lösch (Kirk, Lösch, and Berlin, 1963) in central place theory tends to make central places gravitational areas from a hinterland, with a radial set of routes converging towards the city centers. Still today, most of the arterial roads follow a radial scheme and so most of the transit systems connect mainly centers and peripherals.

Transversal routes, as well as internal mobility of suburbs and minor centers, are less relevant, particularly due to a need of local public transport companies to balance between load factors - higher in central, compact areas - and the need to provide a widespread service to remote and lower-demand locations.

The challenges for urban and transport planners are therefore, even more today, to balance the connectivity of centers and the provision of services in suburbs, inner and remote areas, coupling the advantages from density, peculiar and typical of central urban areas, with the needs of lowering the peak in the use of services, including mobility and transport, responsible of congestion, overcrowding and contacts, relevant tasks to be tackled in pandemic and epidemic times.

A rethinking of urban form and its relationship with transport systems and modes need therefore to be carried on, learning from the past, particularly in tackling such issues in a holistic and omni-comprehensive way, integrating new forms of mobility into more traditional ones.

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