Shared Mobility in the Process of City-Transport Coevolution: Emerging Geographies and Policy Challenges

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Abstract In the broader context of the relationship between transport and urban development, this chapter discusses the impact that shared mobility services may have on the spatial and functional organisation of cities. In the first section, we review the relationship between transport and urban development in an historical perspective, with a view to the implications that the diverse mobility systems can have on space and the environment. We then examine the cultural and technological drivers for the spreading of shared mobility in contemporary cities, as well as the response these services can provide to different mobility needs in urban areas. In the concluding section, we discuss in what circumstances shared mobility can be part of a policy-making process to promote a balanced urban development, making cities more inclusive and sustainable.

Keywords Shared mobility · Urban development · Space · Sustainability · Planning

1 Introduction

Shared mobility is playing an increasing role in the functioning of contemporary urban areas, especially those of significant demographic size. Its progress is driven by a variety of social, economic and technological factors that we cannot simply reduce to an increased environmental awareness on the part of citizens. For instance, the growth of shared mobility services in recent years would have been impossible without the spread of smartphones connected to the Internet and GPS applications, which enable people and companies to interact easily with each other, taking advantage of unlimited spatial information.

The complexity of these processes in urban areas and the hybrid character of shared mobility systems make it extremely difficult to place these services in the realm of public policy. Since they are often operated by private companies and led

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by the market, the economic viability of shared mobility appears to be as important as its impact in terms of public interest. On the other hand, as they require a certain degree of flexibility to work effectively, their planning and implementation differ significantly from the other planning tools in the hands of local government. In other words, the definition of shared mobility from a public perspective remains rather vague, raising a series of (regulatory) problems for local government as other questions emerging from the overall context of the sharing economy (McLaren and Agyeman 2015; Shareable 2018; Parker et al. 2016; Srnicek 2016).

In this context, this paper explores the different impacts of transport and mobility on the development processes of urban areas, with a view to the approaches and instruments policy-making should consider to increase the role shared mobility can play in making cities more inclusive and sustainable.

After this introduction, the second section analyses the relationship between the transport networks and the physical/functional organisation of cities in a historical perspective. In particular, we describe how urban forms have been shaped by the progress of economic development and, in turn, the ways in which urban morphology can affect the development and organisation of mobility systems. The section ends with a discussion on those contemporary planning paradigms that advocate for a more balanced relationship between transport and urban development, by giving a major role to sustainable mobility in shaping urban form and organisation.

In the third section, shared mobility is examined under the lens of the relationship it creates with cities as an interwoven system of people and places. Going beyond the reductive interpretation of urban space we often find in the transport literature, we explore the territorial dimension of shared mobility, marked by the different interactions between travellers and localities that are established compared to conventional public transport. At the same time, we point out the limits of shared mobility in responding to the needs of a broad range of potential users.

In the final section, we discuss whether (and under which conditions) shared mobility can be employed in policy-making processes to promote sustainable development in cities. In particular, we argue that an effective implementation of shared mobility in urban areas needs policy-makers to consider at least three different planning dimensions: a strategic dimension, an ‘urban design’ dimension and a management dimension. In the concluding remarks, we highlight the importance of a proper policy design to expand the benefits of shared mobility within contemporary cities, including the empowerment of different local stakeholders and the creation of good governance mechanisms.

2 Transport, Mobility and the Morphologies of Urbanisation

The growth and transformation of urban areas are processes we cannot easily separate from the evolution of their transport networks (Banister 1995). For that reason,

this intersection has always attracted huge attention in literature, with contributions ranging from historical perspectives (Hart 2001; Divall and Bond 2003) to the more recent multidisciplinary analyses (Hickman and Banister 2014; Hickman et al. 2015). The relationship between mobility and urban development is extremely relevant to contemporary debate also for its implication on policy-making in modern cities. In fact, since transport is able to affect many aspects of people's everyday life, a mobility policy is increasingly perceived not just as being about ensuring efficient connections between places and inhabitants, but also in terms of the support it can give to cities' socio-economic transition.

Therefore, evolution in the transport sector cannot simply be seen under the lens of technological innovation, but rather as the mirror of deeper cultural shifts, including change in people's lifestyles and the way they interact with/in urban space (Castells 1996; Graham and Marvin 2001; Grieco and Urry 2012; Larsen et al. 2006; Sheller and Urry 2006; Urry 2004).

In contemporary urban areas, it is rather common for inhabitants to live in one neighborhood and to have their job in another, spending free time in a series of other places that have no spatial proximity with home-work locations. What makes these activities accessible in a reasonable length of time is the existence of efficient transport networks, enabling people to move in space with a freedom never known in the past (Bertolini 2012). Behind such increased accessibility to different locations, however, there is a hidden paradox in urban mobility where (especially in the largest cities) people spend more and more time to move than the reason they are travelling for. The essence of this paradox lies in the evolving, often conflicting, relationship economy and society have established with urban space through time history. We can describe this process as a sequence of three main development stages.

The main feature of historical cities, when urban functions were bounded by urban walls, was the prevalence of travel by walking. Despite walking is the least efficient way of moving under a transport rationality, this led to all the economic activities and social interactions being constrained to within a limited spatial range, creating the premises for the main quality we now recognise in Western cities. For instance, this compactness allows the inhabitants of the historic centres of many European cities to satisfy from one to two thirds of their needs by moving on foot or by cycling (Rodrigue 2017).

The balance between socio-economic functions and urban form reached in the pre-modern city was completely subverted by the industrial revolution. During this process, the growing population and increased efficiency of transport brought the first considerable expansion of urban areas, leading to the emergence of a new spatial order within cities. By creating large suburbs outside the limits of historical settlements, urban areas started to assume their current 'polycentric' configuration, characterised by independent urban centres (often shaped on a unique function, i.e. housing) reciprocally connected by extensive transportation systems. In the late stage of this process, when in the second half of the 19th century delocalisation further moved industries away from their original settlements, core urban areas were increasingly transformed into business districts, the accessibility of which became an other powerful driver for the expansion of transport networks (Hansen 1959).

The other relevant phenomenon in the second half of the 19th century is urban sprawl deriving from mass motorisation. Initially, it was determined by the spreading of residential and working activities along the main road corridors from the core to the peripheries of urban areas. Later, when suburbanisation led to saturation of the space between the existing settlements, many of the largest cities started to take on the configuration of urban regions consisting of a multitude of low-density urban centres, partially independent from the core city. Stimulated by other socio-economic processes, such as the desire for a single-family house, urban sprawl had the consequence of quickly reversing the process of functional integration that shaped cities for centuries (Knoacher et al. 2008).

The initial response given by transport culture to these processes was the creation of major highways to connect the suburbs and to enable people to easily reach the city centres. The aim to reduce congestion, however, ended up increasing car-dependency for a large amount of the population, with the rise of journey times and—as argued by Rode et al. (2014)— a shift from a model where accessibility was ensured by 'proximity' to one requiring an increased 'mobility' of individuals in space.

From the 1960s onward, car-dependency rapidly had disrupting effects on urban form, organisation of cities, and the environment. In North American urban areas, it is estimated that the 'spatial imprint' of cars is on average higher than that of house building. In Europe, the surface covered by roads and parking slots ranges between 15 and 20% of total urbanised areas. Considering that cars remain parked for around 98% of their life cycle (Rodrigue 2017), we may conclude that in Western countries driving has turned out to be the less efficient means of transport both from an environmental and economic point of view.

After decades of being associated with crowding and congestion, since the nineties 'urban density' is no longer seen by scholars and policy-makers as a negative attribute for city development. Pioneering regeneration projects in the USA (Calthorpe 1993) showed that reducing the distance between living and working locations, as well as increasing the proximity of places for social interactions, may have a series of positive externalities for urban life, including the benefits deriving from the so-called agglomeration economies (Rode et al. 2014). Many success histories suggest, however, that the density and proximity of functions can have a positive impact on the quality of life only if greater attention is payed to accessibility through sustainable means of transport.

On this basis, in the last thirty years, we have been witnessing the emergence of new planning paradigms seeking to re-conceptualise the density-accessibility nexus in urban areas. The two best known movements in this direction must be referred to the 'Compact City' concept and the 'Transit Oriented Development' approach to city-regional planning.

The Compact City concept first circulated in the USA, where between the eighties and the nineties the *New Urbanism* movement was already playing an active role in fighting the dysfunctions given by the low-density, car-dependent development pattern of North American urban areas (Calthopre 1993). Beyond the different interpretations we can find in literature (OECD 2012), the basic principles of the Compact City concept are: (a) promoting density, proximity, and functional integration as the

main qualities in the future development of cities and neighborhoods; (b) planning the concentration of activities in close connection to the public transportation hubs, and (c) creating places characterised by high quality of public space, good accessibility to pedestrians, and great availability of green areas.

Because of their general nature, these principles have been adopted in very different ways in planning practices. In a more normative perspective, the Compact City concept has been understood as a set of standards and techniques for urban designers in order to promote the compatibility between sustainable mobility and the built environment. With reference to other planning scales (i.e. regional dimension), the Compact City concept is often used as the guiding principle for the implementation of long-term urban development strategies, inspired by the reduction of land take, the preservation of rural areas and the concentration of development only in proximity of public transit (de Roo and Miller 2000; Jenks et al. 1996).

These last aims are also central to the planning experiments that can be referred to the *Transit Oriented Development* (TOD) approach (Calthorpe 1993; Cervero 1998; Cervero and Sullivan 2010; Curtis et al. 2009). In Western countries, TOD was first conceived as a method to secure attractivity for new large-scale development projects benefiting from the existence of railway hubs and fast connections to core cities. Later, TOD began to be adopted as a more general approach to combine good accessibility and quality of the environment in a broad range of development projects, even in existing urban areas (Bernick and Cervero 1997; Cervero 1998). Therefore, in a number of urban regeneration projects across the world, the TOD approach focuses not only on increasing connectivity for central places, but also on helping the redevelopment of deprived districts where good accessibility may help socio-economic revitalisation (Curtis et al. 2009).

Both the TOD approach and the Compact City concept have their political roots in the contrast to urban sprawl affecting urban development in Western countries in the second half of the 19th century. Due to rapid suburbanisation processes also in developing countries, however, these principles are becoming the guidelines for local government in a broad range of situations across the world (Bertolini 2012; Pucci and Colleoni 2016; Suzuki et al. 2013). The New Urban Agenda adopted by the United Nations in 2016 identifies ‘an appropriate compactness and density in the built environment’, as well as ‘polycentrism’ and ‘mixed social and economic uses in built-up areas’ among the main planning challenges to prevent urban sprawl, reducing mobility issues and, consequently, to reach the Sustainable Development Goals at a global level (2016).

The growing popularity of these methods in urban planning culture does not mean they can be easily transferred from one local situation to another. In fact, as suggested by Rode et al. (2014), the structure of any urban area is the result of long-term and extremely complex development trajectories, with the result that future development can be affected and in many cases, prevented by a ‘path dependency’. In other words, the authors suggest any city is characterised by its own ‘urban accessibility pathway’, resulting from the way in which the city’s organisation and transport networks have co-evolved over time, under the influence of urban form, environmental constraints, and the planning strategies being implemented by local

government. For that reason, reshaping the relationship between transport and the built environment may be extremely critical in the short term, requiring enormous investments and implementation periods that are often longer than the time urban functions (especially business activities) require to change their location (Rode et al. 2014).

A number of successful cases across the world, however, demonstrate that the adaptation of mobility systems to urban change (and vice versa) can be more easily addressed by adopting new and proper methodological approaches to local policy. First, as argued by a number of scholars and comparative analyses (Curtis et al. 2009; Suzuki et al. 2013; UN-Habitat 2013), it is important to take an holistic approach both to transport and land-use planning, overcoming the cognitive barriers we often find in local authorities and policy-making. This means, for instance, looking at the mobility problems within urban areas under an integrated perspective that goes beyond the territorial scales and public–private separation (Banister and Marshall 2007; EC 2013; Williams 2016). Secondly, a joint consideration of mobility and urban development can help to maximise the efficiency of the existing transport networks, reducing the need for new infrastructures, especially when technological change (i.e. smart mobility) can effectively address citizens' mobility needs (Flügge 2017; Meyer and Shaheen 2017).

3 Exploring Shared Mobility in a Territorial Perspective

In history, cities are privileged places for sharing a huge amount of goods and services. It is only in the last 20 years, however, that 'formalised' sharing practices started to appear within the mobility sector, becoming a global phenomenon that involves all of the largest cities in Western countries and a growing number of urban areas also in the developing regions (2013). An other relevant process related to the spread of this kind of practice is the diversification of forms and means of transport we can now encompass within the shared mobility concept. In fact, while they were initially limited to the sharing of cars and bikes within limited parts of urban areas, shared solutions are now adopted in various aspects of transportation, including parking (Park-sharing) or freight and logistics (Arcidiacono and Duggan 2019).

As a result, the shared mobility concept now includes a wide range of transport services, targeted to a variety of users and responding to different social demands and business models (Shaheen and Chan 2015). To cite one example, by referring to car sharing, Santos (2018) identifies four different models: (1) peer-to-peer platform, where individuals can rent their cars when not in use; (2) short-term rental of vehicles managed and owned by a provider; (3) companies owning no cars themselves, but signing up ordinary car owners to act as drivers offering a taxi-like service; and (4) on-demand private cars, vans or buses and other vehicles, such as large taxis, shared by passengers going in the same direction. Translating these models into a spatial perspective, according to Cohen and Shaheen (2018), shared mobility services can be distinguished into (a) roundtrip services (motor vehicle, bicycle or other low-speed

mode is returned to its origin); (b) one-way station-based services (vehicle, bicycle or low-speed mode is returned to different designated station locations), and (c) one-way free-floating service (motor vehicle, bicycle or low-speed mode can be returned anywhere within a geographic area).

Another interesting definition can be found in Machado et al. (2018), when the authors describe shared mobility as "innovative initiatives based on the 'access to' instead of the 'ownership of', in which individuals share each other's material assets (vehicles, money, etc.), and intangible resources (personal skills, time availability, etc.) in order to provide mobility services to access places" (p. 5). This new relationship established by users among material and immaterial resources allowing transport in urban areas turns them not simply into recipients of a mobility service but into an integral part of a more complex 'mobility system' (Civitas 2016). This relevant transition in the functioning of urban transport is enabled by enormous change in modern society, of which shared mobility is one of the clearest example.

In this respect, Docherty et al. (2018) have argued that the shared mobility services we can find in our cities are basically united by two main features.

- First, to be an expression of that cultural shift, according to which a growing number of individuals is inclined to replace ownership of a vehicle with its temporary use (usership), stimulated by the easy accessibility to services (i.e. booking and payment solutions) and with other advantages offered by public authorities;
- Second, to take advantage of an enormous amount of geo-data and spatial information, partially shared by the same users, able to provide customers a variety of 'context-specific' transport options.

From this perspective, while an explanation for the recent growth of shared mobility lies in a change in social values (i.e. less importance to cars), much more importance has to be given to the disruptive advance in information and communication technology (Rode et al. 2014). Modern shared mobility services are based on the existence of powerful IT platforms, accessible from millions of smartphones connected to the web, that give the system the shape of a virtual network characterised by flexibility, interactivity and unlimited boundaries. By referring to the close relationship established within this network between different mobility operators, geographical data and user interactions, the concept of 'mobility ecosystem' is frequently found in literature (Van Audenhove et al. 2014). In a mobility ecosystem, transport is not meant as a single good/service offered to travellers, but rather as a series of different mobility services, whose integration offers users a wide range of travel options to choose from on a daily basis.

An interesting perspective to understand the impact of technological innovation on transport and, in turn, on the space-mobility relationship is offered by the semantic change underway to the concept of 'accessibility'. Accessibility is defined by Miller (2005) as a multi-faced concept that ultimately centres on an individual's ability to conduct activities within a given environment. The author says that innovation in transport and ICT are drastically changing the relationship among place, space, persons and activities, as these technologies have the power to "shape lives by changing the number and types of activities individuals can experience as well

as their distribution in time and space", while on the other hand, they can "shape cities by altering a fundamental reason for urban settlement, namely, accessibility to people activities and opportunities" (Miller 2005, p. 64). As a result, by providing a more efficient combination of demand and supply of transportation, Miller suggests that new technologies are leading to the emergence of a 'people-based' accessibility pattern in addition to a mobility organisation responding to the old 'place-based' paradigm. In other words, while the importance of 'places' such as home and work will not disappear, increased mobility of people in space and time transport should consider an approach that can "accommodate accessibility of people to people as well as people to places" (Miller 2005, p. 73).

A crucial concept to explain such a shift in the approach to transport is the concept of 'Mobility as a Service' (MaaS), firstly developed by Hietanen (2014) after experimental applications in North Europe. A model based on the MaaS notion can be described as a

> door-to-door combination of all transportation modes where a 'mobility aggregator' gathers and sells all services through a single smartphone app, allowing easy fare payment, one-stop billing and the integration of subsidies, if any. Following this logic, MaaS can dissolve the boundaries between different transport modes by providing a customer-centric experience while improving the efficiency of the entire transport system. (Civitas 2016, p. 13)

The emergence of these kinds of mechanisms clearly marks a turning point from an 'infrastructure-based' transport model to a 'user-based' mobility system, a virtual environment where different kind of mobility services are customized to users with flexibility in time and space. This process is extremely relevant to the purpose of this paper, as it is going to completely subvert the relationship between people mobility practices and the functional and material structures of cities. Low and Astle (2009) have pointed out that it is the adaptivity of smart mobility practices that makes modern society less dependent on the settings of old transport systems. In other words, while the dependency on existing physical infrastructures will not disappear in future cities, the emergence of flexible transport instruments such as shared mobility will be able to minimise the impact of their 'fixity' on the citizens' mobility needs.

A crucial role in this process is played—again—by the technology in the possession of travellers, on their being connected to an amount of relevant data to acquire knowledge during their trip. In fact, the availability of geo-data in the hands of moving individuals has drastically changed the relationship between travellers and urban spaces. Traditional places where people used to experience everyday life are flanked by a kind of virtual space, deriving from the dynamic combination of mobility networks, geographical information, interactions with service providers, and other individuals on the move (Castells et al. 2014; Wang et al. 2016).

In this perspective, the way the notion of Socio-Technical System (STS) from Geels (2012) has been adapted to the transport sector by Docherty et al. (2018) is quite interesting. They argue that due to its complexity, the mobility system cannot be explained merely through technological factors. On the contrary, its functioning "comprises technology (e.g. cars and traffic lights), infrastructure (tracks, roads, filling stations and paths), but also knowledge, markets and user practices, cultural

and symbolic meaning, policy and institutions, and the industries involved in production and operation" (Docherty et al. 2018, 115). As a result, understanding the transition of the transport sector is not "simply a matter of engineering know how, road design nor policy preference, but also a matter of negotiating social norms, customs and practices" (Docherty et al. 2018, 115).

Of this interaction among social, environmental and technological factors, modern shared mobility appears to be one of the most intriguing (and in some way ambiguous) expression. The added value of these systems, in fact, is creating a bridge between resources of different natures, but not mutually connected. For instance, they take advantage of new technologies (i.e. Internet and smartphones), but could not work without the availability of traditional infrastructures (i.e. roads). From another perspective, most shared mobility systems lie at the intersection of public interest and the market, so that the evaluation of their social impact needs to take account of a huge amount of variables. In other words, shared mobility appears to be the result of a hybridisation of different existing instruments and practices related to mobility, which cannot be investigated solely under the lens of transport culture.

Despite the increasing speculation on the impact of shared mobility on sustainable development, there are still few analyses that take an holistic perspective on these processes. An attempt to describe the potential role of shared mobility in urban areas viewed as complex 'ecosystems' has been recently made by Cohen and Shaheen (2018). In particular, they identify four main domains respect to which shared mobility impact should be evaluated: (1) for its influence on travel behaviours, (2) its impact on the environment, (3) on land use and (4) on the social dimension. Authors also enumerate the policy sectors regarding which such domains should be implemented in urban areas by means of planning instruments. These are:

- Transportation and circulation, since shared mobility can influence travel patterns, such as modal choice, vehicle occupancy and vehicle miles travelled;
- Zoning and growth management, as shared mobility can affect land use–related planning factors, including zoning requirements (i.e. parking minimums), parking demand and the use of public rights-of-way;
- Urban design, given that shared mobility can support sustainability principles by promoting walkability, cycling and public transit use, while reducing the need to own personal vehicles;
- Housing, since shared mobility can support housing strategies by reducing the parking demand and minimum parking requirements of new developments;
- Economic development, as shared mobility can create new opportunities for employment and generate revenue from underused resources;
- Environmental policy, conservation and climate action, given that shared mobility has the potential to reduce negative impacts commonly associated with surface transportation, such as greenhouse gas emissions.

The other side of the coin when approaching shared mobility impacts under such a wide policy perspective is the problem of evaluating its effects on urban development. In fact, the more these domains are interconnected each other, being related to policy affecting both the physical and socio-economic structure of cities, the less easy it is

to find evidence to legitimise the role of shared mobility in sustainable development processes. For instance, it is rather unclear how shared mobility can impact on—and, in turn, be influenced by—a series of values of urban areas, such as the quality of the built environment, the higher or lower degree of social cohesion, or the types of economic relations we can find in different neighbourhoods.

The search for an holistic approach to understanding the effects of shared mobility in urban areas, therefore, is more commonly translated into general recommendations or policy guidelines, generally drawn from good practices developed across the world. For instance, it is argued that the major impact from the implementation of shared mobility systems has to be expected in urban areas with a significant amount of population, with a highly differentiated social structure and various functions concentrated in space. The availability of public areas is also mentioned as one of the main drivers for the success of shared mobility implementation, as well as proximity to the public transit hubs, where shared mobility can give solution to the well known first-mile/last-mile (FM/LM) problem for commuters (Civitas 2016).

It is widely agreed, on the contrary, that urban suburbs are the territorial dimension where it is harder to find a balance between the social and economic sustainability of shared mobility services. Analyses on bike sharing (Shaheen et al. 2014 or Stehlin 2019) found that in the marginal districts shared mobility ends up being hindered by the existence of a vicious circle: on the one hand, due to the fewer number of expected users, the location of bike-sharing stations in low-density neighbourhoods turns out not to be effective from an economic point of view; on the other, the scarcity of bikes available makes the service unattractive to other potential users, reducing the returns to a point that even the infrastructure costs of maintenance are generally not covered. In the cases of districts where spatial marginality is combined with social problems, the spread of shared mobility is also prevented by the risks associated to bike theft or the fear that stations could be vandalised (Stehlin 2019). These factors are viewed as serious obstacles also for the spread of the car-sharing market in the suburbs.

This evidence suggests that impacts of shared mobility on urban development processes are not always relevant and they are certainly spatially uneven. This unites shared mobility to other types of (public) policy which require subsidies to work, for instance, the public transport sector. However, if we expect shared mobility to have a more limited impact on local development, it can be an important ingredient of any mobility-led urban strategy. Particularly, it seems to be crucial to increase the sinergy to other mobility systems and with the built-up environment, objectives that can be achieved by giving to planning the multiple dimensions that will be explored in the following section.

4 Why Plan Shared Mobility?

According to the literature (Banister 1995; Divall and Bond 2003; Hansen 1959; Hart 2001; Rodrigue 2017), in the course of mankind's history, we can define the relationship between transport, urban development and city planning as the sequence of the following four main stages.

- In a pre-modern period, until the industrial revolution, the greater part of people's movements took place within the narrow limits of city boundaries, often still defined by their defensive walls (Rodrigue 2017). What we now call 'transport policy' was mainly led by military interests and addressed to ensure the exchange of goods among the main cities and marketplaces. Within urban areas, there was no public transport and therefore no distinction between transport infrastructure and public space. Such a mixture, later seen as a conflict to be removed by the transport culture, resisted in many historical areas of Western (and mostly European) cities, becoming a point of strength in contemporary urban development.
- During the industrial revolution, the concentration of people and factories at the margins of old towns started that process urban scholars later defined a 'fordist' organisation of urban areas (Jessop 1992). As a consequence of urban growth and districts' functional specialisations, the largest urban areas started to assume a polycentric configuration and home-work moves of people to increase both in time and length. Since the beginning of this process, we have witnessed the spread of railroads around and within urban areas, supporting the birth of public transport and later the emergence of transport science as a recognisable body of knowledge to support local government.
- In the second half of the 20th century, large-scale motorisation and the spread of car ownership brought a second disruptive impact to cities' organisation and urban forms (Divall and Bond 2003). The flexibility of private transport and changes in lifestyle (i.e. desire for independent houses) enabled the creation of endless low-density suburbs, often detached from the public transport networks. As a response, the attention of local government was increasingly diverted to major road projects and urban plans influenced by the problem of accessibility to private vehicles, with the consequence of creating a car-dependent urban organisation in most Western cities.
- In the last twenty years, the city-transport relationship can be read as an hybridisation of the mobility systems/practices implemented over the previous two centuries. Despite the fact that urban mobility remains largely dependent on the 'infrastructure capital' inherited from the past, mobility is increasingly affected by new cultural values and societal challenges: a growing sensibility towards the environment (Givoni and Banister 2014; Hickman and Banister 2014), the transition towards a post-industrial organisation of economy and society (Amin 1995; Grieco and Urry 2012), the emergence of new concepts and paradigms to urban mobility and city planning (OECD 2012, 2013). As a result, since the nineties,

local government has turned back to consider the importance of a balanced integration of transport and urban development policy, in the light of new planning methods and innovation in decision-making processes.

To define the role shared mobility can play in contemporary urban policy, we need to consider the legacy of that historical progress, understanding the reasons why transport modes have been replaced by others in response to change in cities' economy and society. In fact, on the one side, shared mobility is a set of practices built on the use of existing—not innovative—transport equipment: material infrastructures like roads or parking areas, or vehicles such as cars or bikes. But on the other, these systems are a genuine example of the complex transition processes urban areas are facing after globalisation, and their diffusion must be read in the wake of the emergence of the so-called platform economies (Parker et al. 2016; Srnicek 2016). Since they are often run by private operators responding to the market, shared mobility services must be viewed as an expression of a range of stakeholders with different rationalities. As a result, they can be placed at the crossroads of the public interest and the market, creating quite a few problems when shared mobility is approached under the lens of public policy. These include questions such as: can shared mobility services be widely distributed in urban areas without providing negative spillovers on the public interest? To what extent can these services be planned and regulated by local government? Is shared mobility able to contribute to urban sustainability beyond transport and mobility goals (i.e. reducing social and geographic marginalities)?

To give an initial response, it is worth returning to reflect on the relationship the various transport systems tend to establish with urban space, which means—in other words—seeking to understand their 'territoriality'. Traditionally, public transport is shaped on the structure of selected infrastructure corridors (i.e. main roads or railways), which make the movement of large amount of urban dwellers faster and cost-efficient. On the contrary, modern shared mobility systems (think for instance to the *free-floating* services) are based on the assumption that it is inconvenient to be bound by the 'fixity' of a given infrastructure. By refusing the constraint of conventional transport networks, shared mobility used to establish a flexible and non-hierarchical relations both with urban space and the other transport systems, creating unexplored challenges to urban planning and city management. These challenges include issues such as regulation, insurance, business models and equity (Civitas 2016). Recognising that the implementation of innovative mobility services usually takes place without any change in the local regulatory framework, many authors have pointed out the risks for the collective interest and claimed greater control from local government. On the one hand, as pointed out by Docherty et al. (2018), one risk is losing control over public space with the consequence of creating conflicts among the different mobility operators and a reduction of citizens' right to mobility. On the other, Machado et al. (2018) have raised a problem of democracy in decision-making, given that access by new shared mobility operators in the local markets often takes place as a result of negotiations, details of which are not made public.

Most of the advantages to plan and regulate shared mobility could arise from a stronger integration both with urban development and the public transport system.

However, in spite of the huge amount of works available on sustainable mobility (i.e. EC 2013, Suzuki et al. 2013, UN-Habitat 2013, Williams 2016 or Bertolini 2017, Givoni and Banister 2014, for a more critical perspective), it is only in recent works such as Civitas (2016) or Cohen and Shaheen (2018) that this integration is treated in an explicit way. In these works, it is argued that shared mobility integration in urban development needs to be promoted by considering three main planning dimensions: a strategic dimension, an urban design dimension and a management dimension.

Under a strategic perspective, it is widely agreed that shared mobility can play a greater role when cities are able to adopt a long-term development perspective, describing how mobility interacts (or should interact) with the functional organisation of different urban areas. In terms of policy-making, it means basically to create a stronger connection among two typical planning functions under the responsibility of municipalities: one is land-use planning, and the other is public transport planning. An attempt to facilitate such cooperation in the European cities can be seen in the 'SUMP approach' developed by the EU, requiring local government to prepare Sustainable Urban Mobility Plans to identify large-scale transport challenges that can be addressed at different scales with the involvement of local stakeholders, including the shared mobility operators (EC 2013).

What we have called 'urban design dimension' refers to the challenge of providing the changes required in the built environment to make shared mobility work best in cities (Cohen and Shaheen 2018). It means that land-use plans and regeneration schemes should include infrastructure of vital importance for the shared mobility systems—i.e. park and ride areas, pick-up stations, bike-lanes or pedestrian areas—without providing conflicts with urban functions or other mobility networks. An additional difficulty to urban design arises when shared mobility has to be placed within districts characterised by density of functions or even by historical values. In that circumstance, a solution suggested in literature is concentrating shared mobility spots within 'public transport hubs' (Civitas 2016), where use of shared means can be stimulated by greater accessibility to other transport systems.

A management approach is particularly required when both the planning and the urban design dimensions do not provide effective solutions to the problem of integrating shared mobility in urban development. For instance, a proper shared mobility management can include a range of measures—including pricing policies, incentives to users or, by contrast, access restrictions to private cars in certain areas—that can play a subsidiary role in stimulating the acceptance of these innovative services (Santos 2018). Other examples include reduced or no fees for shared mobility services to public transport subscribers, as well as discounts to parking costs or free access to restricted zones.

Internationally, there are still more limited policies that seek to include incentives for the shared mobility sector within the implementation procedures of urban development projects. Some US cities, however, are providing reward mechanisms to developers that give space to shared mobility within their construction plans, including the reduction of required parking lots respect to standards. Contracts with the private sector are also crucial when local government is seeking to develop shared mobility in areas with limited market potential. For instance, investments on shared

mobility services in marginal neighbourhoods are increasingly required by cities to new operators wishing to enter the more profitable urban areas (Cabanatuan 2014).

The implementation of these policy tools needs to be accompanied by—and often are the expression of—a broader innovation process in local governance. It is agreed in the literature that innovation in urban mobility usually stems from good partnership relations with the relevant stakeholders in the transport sector (2013). This is of critical importance due to the strong asymmetry (in terms of goals, organisation and business expectation) we may find among various mobility operators. On the other side, for the impact change in urban mobility may have on the life of cities, it is essential also to widen the consultation process to local stakeholders outside the small circle of the transport operators. Specifically, decision-making processes should capture the perspectives of those directly involved in the socio-economic transformation of urban areas, including small businesses, housing associations, community leaders and the third sector. Beside that, new mobility schemes would greatly benefit from the implementation of education and communication activities, given that the success of shared mobility is strictly dependent on the ability to change the 'travel behaviours' of potential users.

With regard to the last question, some scholars have pointed out that we still lack widespread knowledge on the (social) mechanisms regulating the shared mobility phenomenon. For instance, Cohen and Shaheen (2018) suggest public policy-makers should require shared mobility operators to make data available on the use of services in urban areas. The availability of these data, it is argued, would be of great importance to achieve two relevant objectives for the public interest: first, by combining data with those available on public transit, local authorities would be in a position to better understand the impact of shared mobility services at different territorial scales; secondly, urban science will be enabled to increase the knowledge on the socio-economic transitions taking place within cities, giving back to policy-makers insight on the mechanisms affecting the mobility-urban development nexus for the near future.

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