Mobility

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Introduction

In this chapter, we will look at daily mobility. Daily mobility is a form of spatial mobility characterised by movements within a settlement area over short periods of time. It is therefore different from residential mobility (the movement within a residential area over a long period of time), migration (movement outside a residential area over a long period of time) and travel (movement outside a residential area over a short period of time).

The initial focus will be on changes in mobility practices and the impact of technological innovations on them. This will be achieved by setting the scene, which will involve identifying the drivers, conflicts and major tradeoffs prevalent in this field. It will be followed by an examination of the cultural and political dimensions of the deployment of the car and the road in the 20th century, with a particular emphasis on *the myth* of the structuring effects of transport.

These perspectives on the past allow us to address the need for change, underlined both in terms of the reinforcement of social inequalities by current transport systems and their impact on the environment. We present opportunities and challenges posed by electrification, shared and smart mobilities and the deployment of active mobilities. The chapter goes on to clarify a few key concepts and presents successful transformations in Barcelona and Brussels.

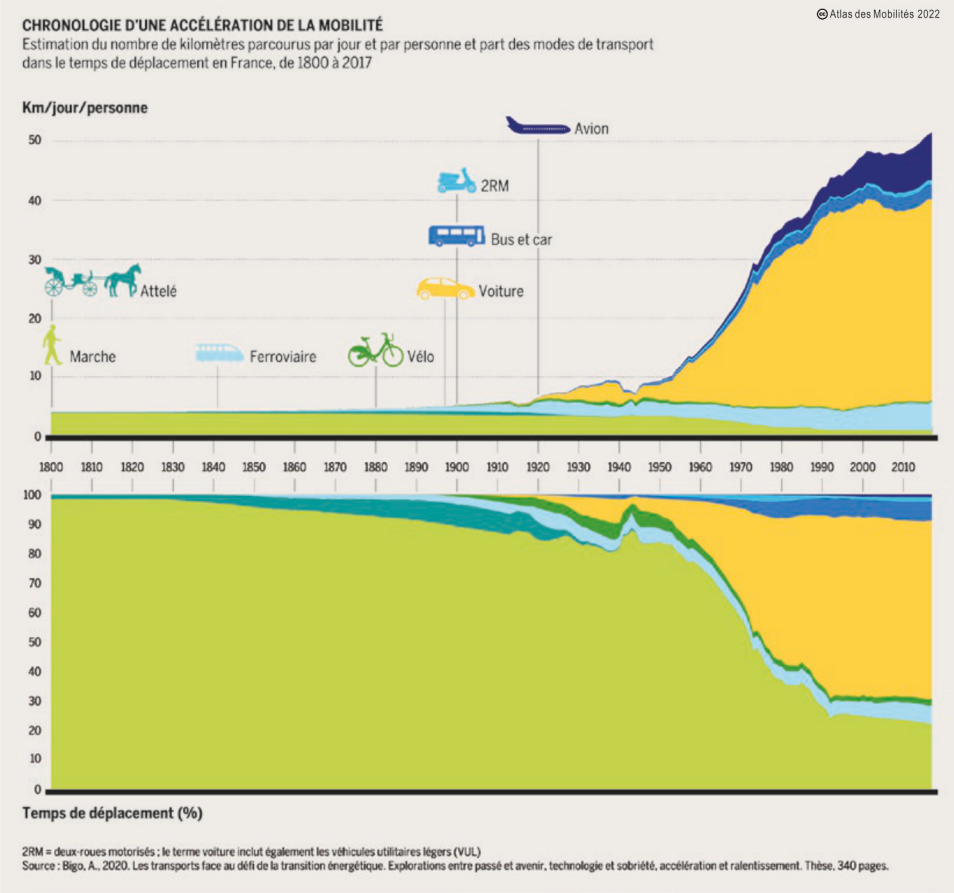
Transport evolution: Questioning the technological determinism

Daily mobility practices have changed significantly over the 20th century. We are often tempted to describe the historical development of mobility as a linear story dictated by technological innovations that successively revolutionised travel. For example, the invention of the steam engine (1769) and the appearance of the railway (1830s), which led to the first industrial revolution driven by the steam engine and coal, are regularly cited. The second industrial revolution at the end of the 19th century was driven by oil and electricity. This was the beginning of aviation and the deployment of internal combustion vehicles.

Admittedly, the development of means of transport, which lies at the heart of the disciplines of transport history and the history of technology, was marked by radical innovations such as steam and electricity, which marked a sharp break with pre-existing technical systems. At the same time, however, there have been a multitude of frequent improvements to existing products and manufacturing processes.

These changes must also be nuanced by highlighting the very slow evolution of everyday mobility, despite the development of transport technologies. For a long time, these innovations mainly concerned a minority, impacting on travel and the development of tourism as a practice for the upper classes. In the 19th

Illustration: A chronology of accelerating mobility. Estimates of the number of kilometres travelled per person per day (above), and the share of transport modes in travel time in France (below), from 1800 to 2017. From left to right: walking, horse-drawn transport, rail, cycling, car (including light commercial vehicles), bus and coach, motorised two-wheelers, airplane. Source: ***Herbet**, Jules (dir.) (2002) Atlas des mobilités. Faits et chiffres sur les mobilités en France et en Europe, p. 15.*



century, these innovations also facilitated significant population movements e.g. from Europe to the Americas and a rural exodus (residential mobility).

It wasn't until the 1950s that we really saw a sharp increase in travelled km per day. This increase was driven by gradual upward social mobility and rising living standards, which led to the spread of the car among households and accumulation of and access to individual property in the urban periphery.

Finally, the idea of a linear transition from one transport system to another is being seriously challenged by the concomitant development of several modern modes of transport: the car and public transport, for example. Rather than a succession of transport systems, we are faced with a stack of transport systems that comple-ment and compete with each other, depending on the area under consideration.

This false evidence of a linear history dictated by technological innovations (Baldasseroni et al 2022) stems from a concept known as *technological determinism,* according to which society is influenced by technology and not the other way round. This view sees technological

development as an autonomous process, independent of society, whose evolution - the success of a technology - is determined solely by the intrinsic superiority of that technology, which develops in a linear fashion. The perspective of social constructivism in the study of science and technology, on the other hand, has clearly shown the intersections between society, technology and culture.

In the early 2000s, the mobility turn highlighted the centrality of mobility in the organisation of contemporary societies. It proposes placing mobility at the heart of the human and social sciences. Rather than concentrating on the technical aspects, this turn invites us to consider the functional, sensitive and social dimensions of mobility, thus renewing the historical and social approaches to mobility. The proponents of this movement place the development of mobility infrastructure and technologies within the culture of their time, the imaginaries of mobility and the values that underpin them.

Focusing on automobility and the important role it plays in contemporary society, Sheller and Urry (2000: 738-39) described automobility as the unique combination of "*six interlocking components. It is the unique combination of these components that generates the 'specific character of domination of automobility across the globe [...]: the quintessential manufactured object produced by the leading industrial sectors and the iconic firms within 20th century capitalism [...]; the major item of individual consumption [...]; an extraordinarily powerful machinic complex constituted through the car's technical and social interlinkages with other industries [...]; the predominant global form of 'quasi-private' mobility that subordinates other 'public' mobilities; the dominant culture that sustains major discourses on what constitutes the good life [...]; the single most important cause of environmental resource-use [...].*"

The development narrative around roadbuilding and motorisation

Even if, in Europe, the motorisation of households in the post-war period is linked to upward social mobility and peri-urbanisation, the car has not been enthusiastically embraced around the world since its invention. Adopting a postcolonial reading of motorisation phenomena, scholars were able to show that car development and roadbuilding were part of the 'development' narrative of the Western block to reaffirm its superiority in the context of the Cold War and the independence of former colonies. Modernisation through road construction became indeed prominent during the Cold War, with significant impacts on local spatial arrangements and landscapes. While road construction improved accessibility for local populations, it also enhanced control over remote areas, aligning with a broader project of rural modernization and anti-communism. International organizations incorporated roadbuilding

into said *development* agendas and practices for *Third World* countries through knowledge transfer and development aids, with the expectation of growing private car ownership and reasserting their own superiority (knowledge-power) in the newly independent colonies (Mom 2020).

Two contrasting case studies, the Pan-American Highway network and road construction in the Navajo Reservation in the United States, exemplify how relations between the centre and the periphery are redefined through the lens of road infrastructure development. The Pan-American Highway project illustrates American influence on road development across the Americas. Initially conceived as an imperial project to extend US influence, it was gradually transformed by Latin American partners to meet their national and local needs. Transnational negotiations reinforced the sovereignty and modernity of Latin American nations while highlighting regional interests. Despite significant American investment, the project also reflected the strength of local partners, demonstrating a complex dynamic between the centre and the periphery. In contrast, road construction in the Navajo Reservation in the United States had adverse effects on local populations. While Navajo residents hoped for modern roads to access healthcare and education services, federal planners aimed to integrate the reservation into the regional and national economy, primarily to exploit resources such as uranium. These roads profoundly transformed rural and indigenous communities, illustrating tensions between national development goals and local interests. Road construction in the Americas and the United States illustrates complex dynamics between the centre and the periphery, as well as conflicts of interest between national development goals and local needs. These examples highlight the importance of road infrastructure in redefining geopolitical and socio-economic relations at regional and global scales.

The emergence of the car was *"only one model of mobile modernisation, spectacular and very influential, but enjoyed by a global minority"* and was only a fragment of a much diverse mobility network beyond the West (Mom 2020, 385). The market dominance by the car was the political goal. Yet, even if modernization plans, in their diversity, often involved discarding 'outdated', 'traditional', 'informal' modes of transport such as rickshaws, minibuses, etc. to implement ‘modern’ and ‘developed’ transport systems, few were successful because of lack of funding to adequately respond to users' needs and practices and provide these modern transport systems for the majority. These resulted therefore in what Gijs Mom calls *layered mobilities* (2020): the copresence of informal/traditional/old mobility systems and the car system, acknowledging huge social inequalities around the globe.

Wellbeing and economic impacts of transport infrastructures: The myths of structuring effects

Even in Europe, road construction is promoted by specific stakeholder groups with economic and social development objectives and backgrounds. In the first part of the 20th century, the modern road and the car become n*ormal*, as observed by Pierre Lannoy (1999): in the context of modern society, the phenomenon of road traffic and its associated negative effects have become so pervasive that they have become normalised and are now regarded as part of everyday life. In a political sense, a specific body of legislation and regulations relating to the road and driving (responsibility, accessibility, priority, vehicle equipment, rules of the road, signs, etc.) was developed. Driving and its infrastructure become a standardised system, socially and legally standardised. In a technical sense, the 1920s and 1930s were the years of development of the science of traffic engineering. This is a set of scientific-technical tools and knowledge standardised within the engineering community, aimed at unifying and formalising the traffic phenomenon and improving its performance.

After the Second World War, the number of cars on the road and the number of accidents were constantly rocketing. Two concerns were therefore on the agenda: the question of the road network, its size and development, and the question of how to improve road safety. Considering the seemingly inevitable increase in traffic volume, the use of traffic modelling methods originally developed in the United States was proposed to facilitate the construction of major roadways across Europe. Alternative transport technologies and policies were excluded. For instance, the alternative modernisation model by rail transport as developed in the Soviet Union was underfunded in the US as in Europe. During this period, there was a transformation in the collective representations of the environment. The automobile lobby has been successful in colonising the imaginary and naturalising motoring.

Our perception of mobility has been quite narrow since the advent of the automobile. The focus has primarily been on efficiency, speed, and the economic and urban growth associated with road infrastructure. However, this perspective often overlooks critical side effects such as air pollution, environmental damages and social inequalities. Moreover, many stakeholders fail to consider other forms of mobility, including those adopted by different user groups, public services, and alternative economic ecosystems. In reality, there exists a multitude of actors and modes of mobility that must be considered within the broader context of mobility.

It is generally accepted that transport infrastructures -whether by road or rail- support and sustain economic and social activities by connecting spatially dispersed areas and facilitating the movement of key economic inputs. All types of infrastructures,

including physical infrastructures (e.g., roads, railways, ports, and bridges), social infrastructures (e.g., educational institutions and facilities supporting health and well-being), and digital infrastructures, play a significant role in creating economic opportunities and can be argued to promote economic prosperity. Therefore, infrastructure investments have been frequently employed as policy instruments to stimulate economic growth at both the national and subnational levels, as well as to enhance national, regional, and local economies. It is in this context that the discourse on the alleged "*structuring effects of transport*" is developing.

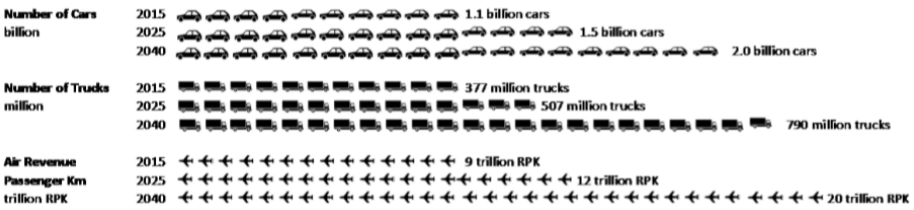
This discourse gives a positive role of transport infrastructure in solving urban problems. It makes the hypothesis of a „*mechanical consequences (i.e. repetitive and predictable) of the implementation of certain types of infrastructure on certain types of spaces"* (Offner 1993, 236). This hypothesis permits the comparison of pre- and post-deployment changes in the context of a transport infrastructure. It assumes that the infrastructure itself is the sole cause of all observed changes, including the isolation and decontextualisation of the infrastructure. It forgets the general context of urban change, in which the infrastructures are only part of: the wider structural dynamics and, more importantly, the strategies of actors who position themselves in relation to these projects. The myth of the structuring effects of transport overlooks the *"political, economic and social conditions which have made it possible to carry out the project and the phenomena of appropriation which it entails"* (Offner 1993, 238). However, what can be observed is that infrastructure development amplifies and accelerates pre-existing trends, whether or not they are favourable to the territories where they are located. Transport infrastructure impact on territorial economic development also depends on the considered scale of the territory. Moreover, the indirect and induced effects on social inequalities and the environment are often overlooked in those analyses.

Mobility tradeoffs

An economic model leading to a collapse
The number of vehicles on the road is increasing globally each year, and the problem of urban traffic congestion is a significant challenge for urban liveability and environmental sustainability. In addition, the cost of road deaths is a significant concern. As we had 1.1 billion of cars worldwide in 2015, we are expecting 1.5 billion of cars by 2025 and 2.0 billion cars by 2040, which makes a substantial growth of almost 40% every 10 years (World Economic Forum 2016). The car industry is one of the most important drivers of economic growth globally. Similar figures of growth are expected from the truck industry, while the fastest growth is expected to be in air travel, despite the different global crises.

Mobility and social equity
Mobilities are structured by social inequalities and reinforce them (Sheller 2018). Underprivileged urban populations, who make up most of the world's population and have no access to individual motorised vehicles, continue to suffer the most, particularly women (Sagaris 2019), from the development of motorised transport. In addition to air

Illustration: Amount of vehicles on the road and evolution between 2015 and 2040.
Source: *Business Insider, World Economic Forum, 2016*



pollution and traffic congestion, this prevents the development of adequate public transport solutions and infrastructure for active mobility (Cunha & Silva 2022; Sietchiping, et al. 2012). The sedentary modes of passenger transport have furthermore a deleterious effect on health (Böhm et al. 2006).

Impacts on landscape and territories

Transportation has become an indispensable aspect of modern life, facilitating the movement of individuals to and from work and educational institutions, the delivery of essential services and commodities to disparate communities, and the global connectivity of people and industries. However, the negative effects of transport extend beyond the aforementioned benefits: transport has a detrimental impact on human health and the environment. This is evidenced by the prevalence of road injuries and fatalities, air pollution, and CO_2 emissions, which contribute to climate change. Transportation accounts for approximately one-third of the total energy consumption in the member countries of the European Environment Agency and is responsible for approximately one-fifth of greenhouse gas emissions (EEA 2024). The greatest contributor to this phenomenon is road transport, followed by aviation and maritime transport. Furthermore, transport is a significant contributor to air and noise pollution in urban areas. The emission of pollutants such as nitrogen oxides (NOx) and fine particles has been demonstrated to have a detrimental impact on human health and the environment.

Landscape impacts of mobility infrastructure

Infrastructure is an integral component of the environment in which we live. It is the physical basis of modern societies, the foundation on which we travel, meet each other, make exchanges, and have new experiences. Most of us utilise multiple components of our extensive infrastructure network daily. However, many of us are unaware of the ownership of this infrastructure, the individuals responsible for its maintenance, the financial resources that fund it, the designers of the infrastructure, or the decision-makers who oversee its development. Nevertheless, infrastructure has been created by the human mind and has been constructed by people investing a significant amount of capital and effort in its development. Countries are investing billions every year for construction and maintenance of their national infrastructure.

However, the environmental impact of transportation infrastructure is strongly dependent on the correlated "hard" infrastructure, which are considerable trade-offs. The hard and "grey" infrastructures, which are mostly connected to hard surfaces and utilise concrete and cement, are carbon-intensive and have a significant impact on landscapes. They create new barriers, change natural territories into "transformed"

and "urbanised" territories, destroy habitats, and therefore result in more sealed surfaces. The consequences of sealed surfaces are manifold. Soil sealing results in the formation of heat islands, the non-infiltration of rainwater, floods and the destruction of ecosystems (EEA 2011).

The phenomenon of urban heat islands is largely attributable to the unregulated temperature within the urban fabric, which is primarily the result of soil sealing. Soil sealing is defined as the destruction or covering of the ground by an impermeable material such as asphalt or concrete, which has a detrimental impact on fertile agricultural land, endangers biodiversity, increases the risk of flooding and water scarcity, and contributes to global warming. Since the mid-1950s, the total surface area of cities in the EU, as reported by the European Environment Agency, has increased by 78%. This expansion has contributed significantly to the phenomenon of soil sealing and its associated negative consequences.

Furthermore, the production of grey infrastructure (sealed surfaces, tubes, bridges, and more) is mainly dominated by the use of concrete or asphalt, both of which are highly polluting materials. To illustrate, petroleum-based asphalt is a substance with a high volatile organic compound (VOC) content. The conversion of the product to asphalt results in the release of significant quantities of harmful gases into the atmosphere. Similarly, the production of cement for concrete necessitates the application of high levels of heat, resulting in the generation of considerable quantities of volatile organic compounds (VOCs). It has been calculated that the molecules released from asphalt could lead to higher GHG emissions than GHG emissions released by gasoline and diesel vehicles. Both sources pale in comparison to volatile chemical products, such as pesticides, coatings, adhesives, cleaning agents, and personal care products (Stokstad 2020). On average, the direct CO2 emissions of asphalt are approximately 25kg per tonne, which represents approximately 10% of the total GHG emissions worldwide. In addition to the realization of infrastructure, the extraction of raw materials, such as gravel, the transformation of underground materials, and the construction of earthworks using mechanical infrastructure, collectively contribute to a significant increase in GHG emissions.

Need for change

The 2030 Agenda of the United Nations with the 17 Sustainable Development Goals (SDGs) was adopted during the last 2016 Habitat conference in Quito: it is detailed in 169 Targets, covering the whole spectrum of human development — from the fight against poverty, to climate change, education and health, gender equality and decent work, to better institutions, justice and peace, and sustainable and liveable cities and territories. The aspects *mobility and transport* are crucial to the achievement of sustainable cities and communities and embedded in the dedicated SDG 11. Especially the SDG11.2 is

relevant to the topic of mobility: *"11.2 by 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons"*. However, according to the latest projections from the International Union of Public Transport, those figures are far from being achieved by 2030 (UITP 2019). There is therefore a real need for a mobility shift in our cities and landscapes.

Mobility shift and the emergence of *New Mobilities*
It is often assumed that electrification, automation and sharing economies are the three revolutionary trends that will transform the transport sector and the way we design streets and mobility infrastructure. We can date this understanding back to the mid-1980s with the emergence of a new technological problematisation which establishes technology (essentially telematics) as the main vector for the realisation of an acceptable, sustainable road order (Lannoy 1999). It is the promise of a new age of motoring in which optimised travel goes hand in hand with safety and user comfort (fluidity, safety, cleanliness) through the development of 'intelligent' roads and 'smart' vehicles.

However, reducing the number of kilometres travelled and developing alternatives to the car are still important as resources are limited for the electrification of vehicles as well. Switching from internal combustion engines to electric motors - the motor shift - is one of the five levers for reducing transport-related greenhouse gases emissions in Europe (Bigo 2020). However, their mass adoption poses challenges in terms of limited resources. The resources needed to produce batteries (materials such as e.g. lithium, cobalt or nickel) are limited on earth. The current search for more sustainable alternatives is therefore focusing on (1) innovations in materials to reduce dependence on rare materials: for example, cobalt-free batteries, and (2) saving resources using recycled materials and the modular design of batteries to make it easier to dismantle and recover components. Yet, battery recycling still requires a considerable improvement in recycling rates. Moreover, the motor shift solves almost none of the problems regarding local, regional and global resources.

Another alternative is to *share* vehicles and move away from the model of an ownership economy. While shared (electric) cars are becoming increasingly common in urban areas, the deployment of charging station networks for electric cars does not consider the strategic nature of this network to support a transformation of mobility system. The installation of the charging points answers the current need linked to electric car ownership, which vary across social classes, whereas they could be installed in a way that is consistent with the equal deployment of shared electric vehicles. Energy suppliers are working with local authorities to plan the development of electric

mobility based on current travel needs and spatial planning.

Over the last decades, digitalisation and the Internet of Things have profoundly reshaped the landscape of mobility and logistics in our environment. Some transport sectors are being interrupted and disrupted, with new markets emerging, while others are converging, and some are disappearing entirely. Good examples are start-ups connected to e-mobility, delivery services and more, or simply emerging services such as e-scooters, Bolt, Lime and UBER.

The benefits of these innovations lie in the replacement of our current vehicle-centric system with a more efficient, (data-enabled) ecosystem facilitating **multimodality** and the uses of more sustainable modes of transport. Mobility users will be able to switch between different types of transportation with dynamic information. The innovative concept of Mobility as a Service (MaaS) aims to provide intermodal, personalized, on-demand, and seamless transportation experiences through a single interface. Despite the growing number of shared mobility, electric mobility, and multimodal passenger transport users, the list of MaaS providers, focussing or not on electric mobility (eMaaS), remains relatively short. One reason for this scarcity lies in the difficult integration of all actors within the (e)MaaS ecosystem. Addressing integration challenges is crucial for their widespread adoption. Public actors, such as the Brussels administration in charge of mobility plans (see below the GoodMove Brussels plan), are also contributing to the effort.

However, we must not overlook the potential for deploying **active forms of mobility** (mainly cycling and walking) in dense urban areas. These forms of mobility have the advantage of combining a whole series of benefits in terms of public health, low spatial footprint and affordability, even if their experience is still strongly affected by social inequalities linked to gender, class and race.

Key concepts towards positive mobility transition

Alternative Mobilities and Technologies
The term **alternative mobilities** itself is problematic, as it implies that all other transportation systems are mere "alternatives" to the car—the latter still being considered the dominant system. This perspective overlooks the reality that a significant portion of the global population lacks access to individual motorised vehicles.

When we discuss alternative forms of transport, we refer to "soft" modes of mobility—those with minimal environmental impact. These include collective transport, and active modes such as walking and cycling. In recent decades, there has been substantial discourse promoting "active" mobility, where the human body is directly engaged (such as walking or cycling), in contrast to the more "passive" motorized modes of transportation.

The development of alternative forms of mobility draws on a proliferation of technological innovations in terms of equipment. The emergence of new equipment such as the electrically assisted bicycles now profoundly transform urban mobilities. In recent years, new terminologies have appeared to cover increasingly diverse technologies circulating on different infrastructures and corresponding to different regulations: mobility equipment (single-wheelers, scooters), micromobility (e-bike, e-scooters), also known as light electric vehicles, often presented in opposition to heavy electric vehicles such as electric cars.

Intermediate vehicles, also called light electric vehicles, is a category of vehicle between the traditional bicycle and the passenger car. This definition is still evolving as it covers an expanding technological field. Intermediate vehicles combine features from both worlds, offering an interesting alternative for urban and suburban travel (Bigo 2022; Barbier-Trauchesses et al. 2022). Although they are not yet widespread, they hold significant potential in the transition toward more sustainable mobility. Being lighter, they contribute to reducing greenhouse gas emissions compared to traditional cars, as they are more energy-efficient and integrate well with greener electric mobility. Additionally, they are resource-efficient (both in terms of materials and energy) during manufacturing and are often more affordable for households. Intermediate vehicles are part of a wider strategy to make cars greener by limiting their speed, acceleration and weight. They can accelerate the transition by providing a practical alternative for short trips, encouraging people to reduce their reliance on individual cars. However, broader adoption requires overcoming obstacles such as social perception and infrastructure adaptation.

Alternative infrastructure: Relocating lifestyle and transport-urbanism coordination by using TOD principles

In this context, the development of alternative forms of transport is also supported by better coordination between transport and urban planning, which reduces transport demand.

With the phenomenon of massive rural-urban migration occurring across numerous regions in Europe, cities and urban landscapes, as the focal points of socio-economic activities, are confronted with a considerable demand for a wide range of infrastructures, as well as commercial and residential buildings.

As regions become more interconnected, new socio-economic opportunities are created. Investment in new construction and improvements to existing buildings is needed to accommodate and support new and expanded socio-economic activities. This dynamic is particularly pronounced in urban and inner-city areas. Conversely, inner areas face depopulation and the reduction of basic services. In

such cases, infrastructure can play a key role in developing an intercommunal network and attracting new residents and tourist flows. However, there are major challenges associated with this, such as financing and the institutional framework. A key channel through which infrastructure can be financed is the real estate sector.

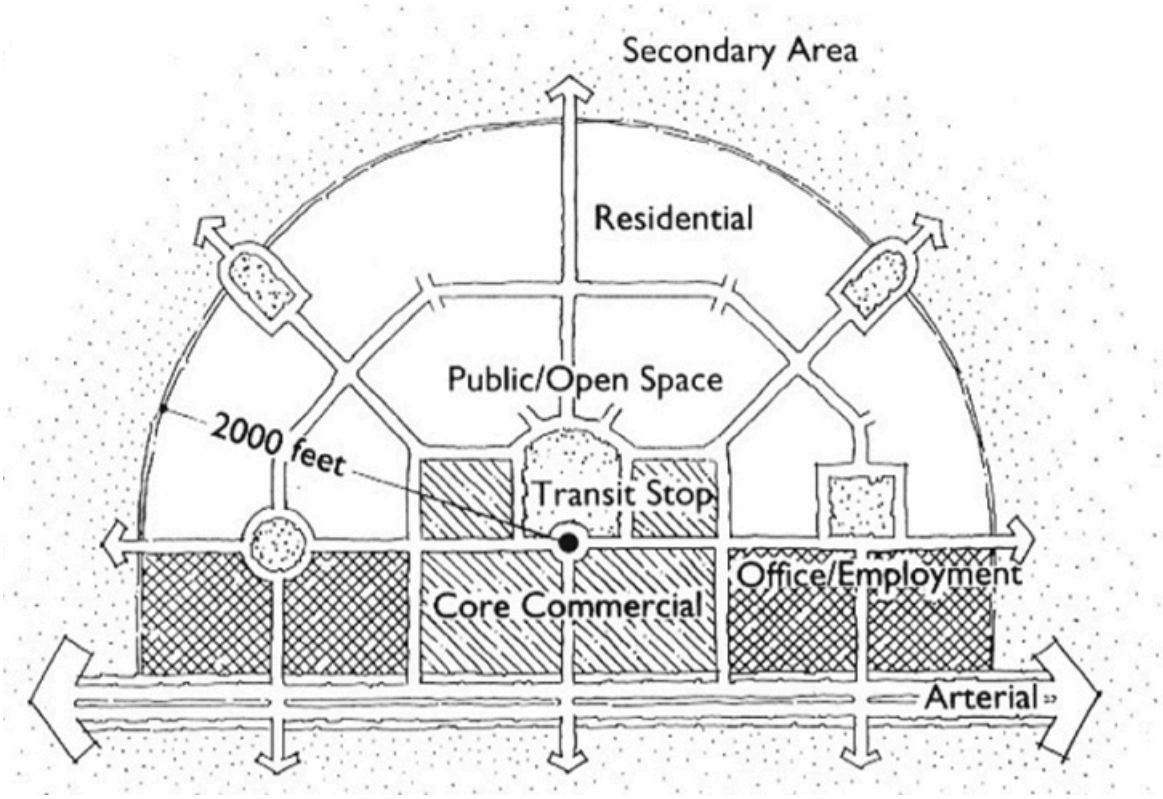
One recognised solution to this dilemma is known as **Transit-Oriented Development (TOD)** (Calthorpe 1993). Transit-Oriented Development is a concept that encompasses integrated urban areas designed to facilitate the convergence of people, activities, buildings and public spaces, with convenient pedestrian and bicycle connections between them and reliable transit service to the wider city. This strategy ensures equitable access to local and citywide opportunities and resources through the most efficient and healthiest combination of mobility modes, at the lowest financial and environmental cost, and with the highest resilience to disruptive events. Inclusive TOD is fundamental to the long-term sustainability, equity, shared prosperity and civil peace that are essential to the well-being of cities.

A global shift from sprawl to inclusive TOD is a matter of great urgency. However, despite its conceptual simplicity, it is easier to conceptualise than to implement. Achieving this shift requires the alignment and integration of many complex and interdependent elements, including infrastructure, street and building planning and design, codes, regulatory reform, and finance. The process involves a wide range of stakeholders with different worldviews and interests. These include decision-makers and policy-makers from different institutions, professional technicians from different disciplines, developers and investors, future tenants and residents, people attached to car-based suburban lifestyles, people living in communities to be transformed by redevelopment and densification, and grassroots and community organisations. In this context, a large-scale shift to TOD must begin with the development of a common understanding and conceptual framework for collaboration.

The concept of TOD is based on 8 principles, making inclusive cities and completing neighbourhoods around walking, cycling, and public transit: W*alk, Cycle, Connect, Transit, Mix, Densify, Compact, and Shift* is the core framework of the TOD Standard:

1. *Walk:* Develop neighbourhoods that promote walking.
2. *Cycle:* Prioritise non-motorised transport networks with safe spaces and facilities for cyclists, such as cycle lanes and parking.
3. *Connect:* Create dense networks of streets and paths.
4. *Transit:* Locate development near high-capacity, reliable public transit.
5. *Mix:* Plan for mixed income, uses and demographics.
6. *Density:* Optimise density, including by absorbing urban growth with taller buildings.
7. *Compact***:** Create areas or within-city regions with short transit commutes.
8. *Shift:* Increase mobility by regulating parking and road use.

Illustration: Calthorpe's Transit-Oriented Development Model
Source: Calthorpe, Peter (1993) The Next American Metropolis", New-York: Princeton.



Towards positive transformation: a current approach of the 15min city by the example of Paris

Another key concept to better coordinate transport and urban planning to reduce transport demand is the 15-minute city. The idea behind the 15-minute city is to make urban life better by creating places where everything residents need is within easy reach on foot or bike (Moreno et al. 2021). The 15-minute city means people can get around without having to travel far for housing, offices, hospitals, parks, restaurants or cultural venues. Each neighbourhood typically has six main social functions: living, working, supplying, caring, learning and enjoying. The 15-minute city concept is not new. Many experts and city planners have been chatting about it for the past hundred years. If we take the American urban planner Clarence Perry as an example: Perry came up with the idea of the *liveable neighbourhood unit* way back in the 1920s, before the mass influx of private cars and city zoning arrived in the 20th century. This made mobility in the US a concept based on cars. In the 1980s, a new urban design movement called *New Urbanism* emerged in the US. It was all about creating walkable cities. While this was a great

Rue de Rivoli, Paris Summer 2023. Source D. Vancutsem

Concept of the 15-minutes city, Carlos Moreno, being applied in Paris (illustration by Micaël, courtesy of Paris City Hall

idea, cars were still the main way of getting around.

In Paris, its first female mayor Anne Hidalgo in charge since 2014, initiated the 15-minute city transformation. Hidalgo was re-elected into power in 2020, and Paris is undergoing today a significant shift towards a more environmentally conscious approach.

The transformation of Paris into a more bicycle-friendly city is evident in the construction of dedicated bike lanes on main streets like the renowned Rue de Rivoli, which is now reserved for buses and two-wheelers. Additionally, the greening of the cityscape is evident in the proliferation of plants and parks. These changes are a testament to the city's commitment to sustainability and a more liveable environment.

Two examples of best practices

Barcelona and its Superblocks: Barcelona is a Mediterranean city with a rich architectural heritage, a mile-long seafront, extensive cultural, gastronomic and entertainment offerings, and a reputation for being green and sustainable. However, there are concerns that the city's current environmental footprint is unsustainable, with limited green space per capita and high levels of traffic, density and air pollution. By comparison, London has 27, while Amsterdam has 87.5. However, Barcelona is pursuing a strategy of urban regeneration that includes the creation of so-called "superblocks".

The superblock concept was developed by the city government in 2016 as a means of promoting sustainable mobility and restructuring the poorly structured urban layout of the city in neighbourhoods

Illustration: The city authorities' plan for the Eixample district. Source: Ajuntament de Barcelona, 2021.

in which traffic calming policies are then put in place. The concept of the superblock, or "superilles" in Catalan, involves the combination of up to nine city blocks. In these superblocks, older approaches to traffic calming are combined in order for pedestrians and cyclists to have priority over other road users. On two-lane streets, one lane is reserved for pedestrians and cyclists, while cars are banned. This allows children to play and residents to enjoy a coffee and a chat on newly installed park benches. The monochrome palette of the street is replaced by a tapestry of planted beds, flowerpots and trees. Motor traffic is restricted to 10 to 20 km/h on the remaining one-way streets. The result is that the streets become an extended living room. Instead of the noise of cars, you can hear children laughing; instead of exhaust fumes, you can breathe fresh air; and instead of the hustle and bustle of city life, you can meet relaxed residents talking to each other. The first superblock was built in 2017 in the Poble Nou neighbourhood, where it initially met with resistance from shopkeepers and motorists, but then received overwhelming support from local residents. The superblocks that have been designed and built across the city so far have not led to the predicted decline in local

businesses. On the contrary, the number of local shops has increased by up to 30 per cent.

A total of 503 superblocks are expected to be built in Barcelona, representing a 60% reduction in the number of streets used by cars. A recent study by Barcelona's BCNecologia health institute suggests that the implementation of these superblocks would have a positive impact on the health of residents. The study found that life expectancy would increase by almost 200 days. The reduction in emissions would lead to a reduction in noise and heat islands and could prevent around 300 premature deaths per year. According to the study, private car use could be reduced from 1.19 million trips per week to 230,000. This would reduce nitrogen dioxide emissions from the current 47 micrograms per cubic metre to 36 micrograms, below the World Health Organisation's guideline of 40 micrograms.

Brussels and the Good Move plan

Good Move is the Regional Mobility Plan for the Brussels-Capital Region. It was approved in 2020 by the Brussels Government and defines the main policy guidelines in the field of mobility. The plan's objective is to improve the living environment of the people of Brussels while supporting the demographic and economic development of the Brussels-Capital Region. It was the result of a participatory process involving all Brussels stakeholders, including mobility and institutional partners, municipalities, the economic and associative world, as well as citizens. The participatory process spanned a period of four years.

The Good Move plan builds upon the foundations laid by the regional mobility plans Iris I (1998) and Iris II (2010), which did not produce the change one hoped for. However, they did lay the groundwork for a culture of sustainable mobility. Significant advances have been made, which should be built upon even if they still don't quite suffice. The Good Move plan places the user at the heart of all and any ideas and thoughts on daily travel. The Good Move plan employs a cross-cutting approach to mobility, a consequence of the co-construction process. Its objective is to enhance the quality of life of the inhabitants of the region and to encourage individuals to modify their travel patterns in accordance with their needs and constraints.

The plan is resolute in its objective of creating a pleasant and safe city, comprising peaceful neighbourhoods, connected by intermodal structural corridors and focused on efficient public transport and improved traffic flow. The plan's measures are designed to provide each user with adapted, facilitated and integrated mobility solutions, enabling them to choose the most appropriate mode of travel for each of their trips, depending on their destination and needs at a given time.

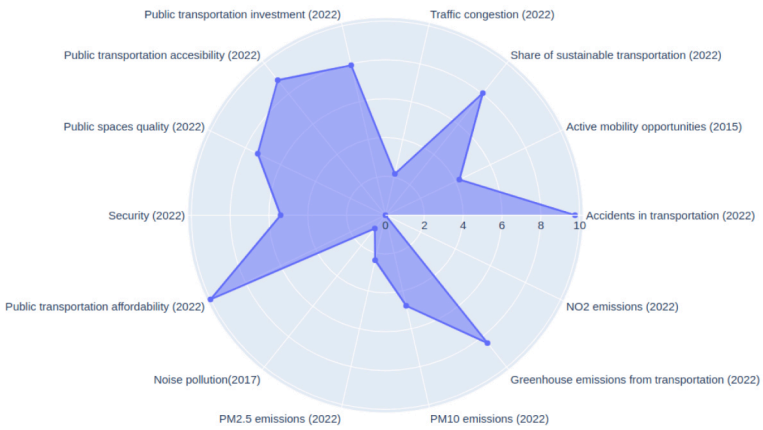
Mobility systems and indicators

In this chapter, we have said very little about the challenges of urban logistics. However, mobility and transport logistics in cities and landscapes are vital elements in the development of sustainable cities. The growth of on-demand economy and e-commerce has led to an increase in transport and mobility activities in urban and metropolitan areas. As these changes reshape urban transport, it becomes increasingly important to identify key performance indicators (hereafter KPIs) that can effectively measure the current state of mobility logistics in smart and sustainable urban areas worldwide. While these issues have received considerable attention from researchers and there are ongoing efforts to standardise KPIs for citizen mobility, a major challenge is the lack of necessary data and the quality of available indicators. Here we will briefly introduce two tools developed by the European Commission.

Firstly, the European Commission has developed a comprehensive set of practical and reliable indicators (the SUstainable Mobility Indicators - SUMI) that assist cities in conducting a standardised assessment of their mobility system and in measuring improvements resulting from new mobility practices or policies. These indicators serve as a tool to identify the strengths and weaknesses of a city's mobility system, thereby enabling the implementation of improvements and the assessment of the impact of such changes.

Secondly, the Urban Mobility Observatory, also funded by the European Commission, provides information and experiences in the field of urban mobility in Europe (https://www.eltis.org). It introduces a guide to the methodology and methods of calculating sustainable urban mobility indicators, the so-called Eltis Method.

Based on the aforementioned references, a subsequent list of KPIs pertinent to mobility can be developed and classified into distinct categories, such as those pertaining to the environment, transportation, or socio-economic development. For example, a case study focused on Barcelona was conducted and resulted in the identification of 14 KPIs for the city (Soriano-Gonzalez et al. 2023). Five of the KPIs relate to the socio-economic study, four to sustainable transportation in the city, and the remaining five assess environmental issues. The results of the KPIs defined for the study can be represented in a radar-like graph (see next figure), which allows the city’s sustainable mobility state to be observed.



KPI values for the city of Barcelona. Source: *Soriano-Gonzalez, Raquel, et al. 2023. 'Analyzing Key Performance Indicators for Mobility Logistics in Smart and Sustainable Cities: A Case Study Centered on Barcelona'. Logistics 7 (4): 75*

The graph for the city of Barcelona above indicates a need for the implementation of policies aimed at improving environmental markers, such as the KPIs for noise and particulate matter. Furthermore, transportation policies are necessary to alleviate traffic congestion in the city. These are the areas that should be the focus of change if the objective is to achieve a more sustainable city. The figure also indicates the dates on which data were updated on the Open Data Barcelona website. It would be beneficial for the city to have a higher frequency of updated data, allowing researchers to compute the KPIs on a more regular basis and quantify the improvements and changes in each area studied.

Future tasks for research

Mobility practices are undergoing a number of changes. Throughout the 20th century, a mobility system based on the car was developed and promoted by various stakeholders. This system is still causing many environmental and social problems today. Although the 20th century was marked by numerous technological innovations, they have played a small role in resolving these problems. Two fields of action are now emerging: alternative technologies (slower, lighter, less space- and energy-consuming) and alternative lifestyles, focusing on public transport and active modes of transport. The relocation of lifestyles is the solution encouraged by the approaches to traffic calming applied in Brussels and Barcelona.

As previously stated, there have been significant shifts in mobility trends over recent years, and these are likely to continue in the near future. There is a clear need for further research into how mobility patterns will evolve, the types of mobility changes that will occur soon, and how cities will adapt to these changes, particularly in relation to climate adaptation trends and open public space transformations. This research will help inform a clear political course that promotes the city, proximity and slow modes of transportation.

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