Urban Mobility Towards the 15-minute city

Discussion Paper on future R&I topics for Urban Mobility and the 15mc

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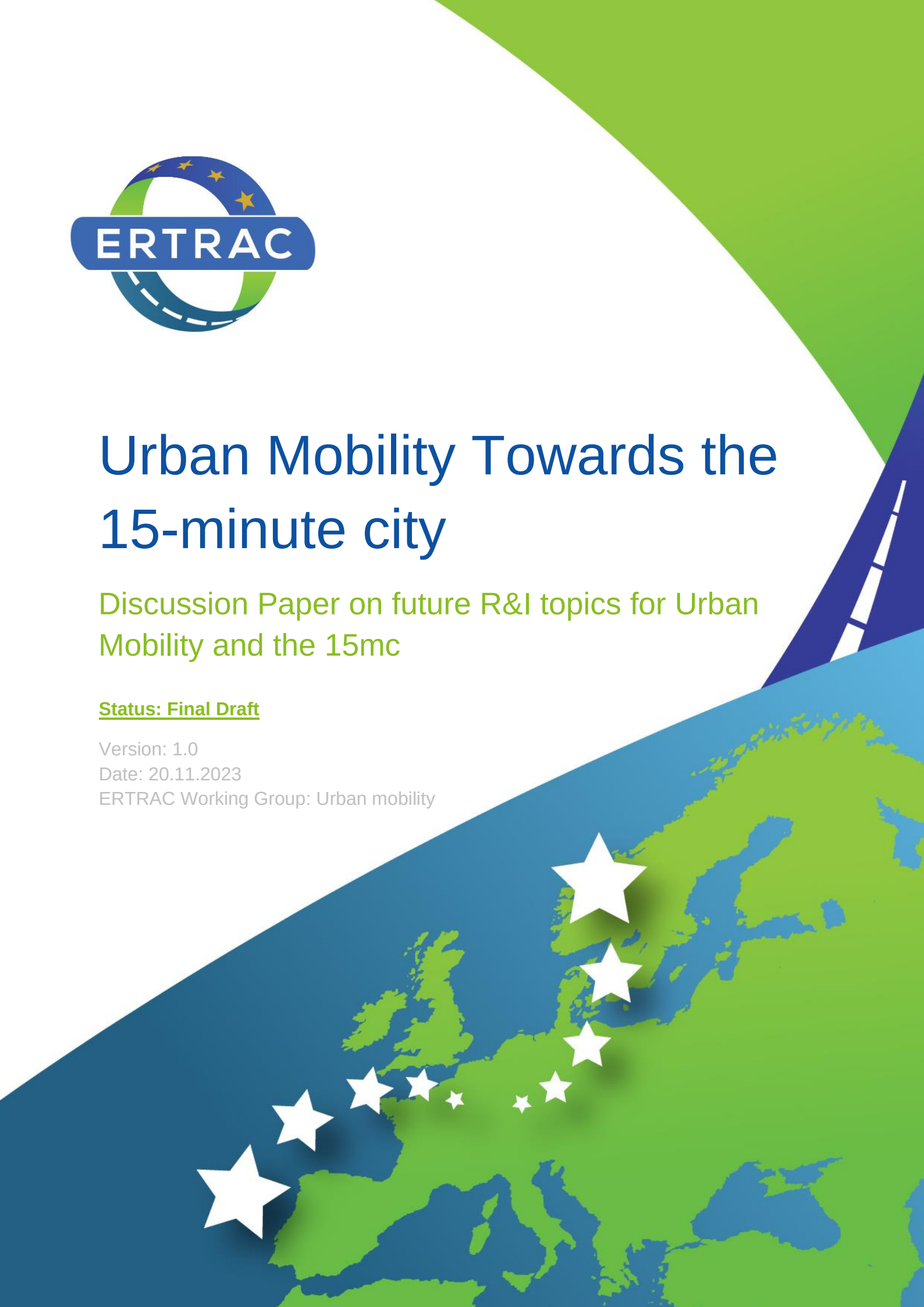

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Contributors

Secretariat: POLIS

Universidad Politécnica de Madrid
POLIS
ALICE
ERTICO
VOLVO
PNO Consult
Austrian Institute of Technology
FIT consulting
Belgian Road Research Center

Glossary

Acronym	Definition
15mc	15-minute city
AV	Autonomous Vehicle
CCAM	Connected Cooperative Automated Mobility
ERTRAC	- European Road Transport Research Advisory Council
GHG	Greenhouse Gas Emissions
MaaS	Mobility as a Service
NEB	New European Bauhaus
NMS	New Mobility Services
PT	Public Transport

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1.1 Aim of this document

Cities are responsible for 78% of global energy consumption, and 66% of Greenhouse Gas Emissions (GHG), although they only take up 2% of the planet's surface.[1] In Europe, while 75% of the population lives in cities, they take up only 4% of the land.[2] At the same time, cities are not getting smaller, and 2 out of 3 people are expected to live in cities or urban areas by 2050[3].

An important part of these emissions is directly linked to transport, urban and beyond. Accelerating the shift to sustainable, smart and inclusive mobility is also one of the European Commission's main concerns (Poppeliers and Ricci, 2013), in order to reduce transport emissions. New European policies address this issue, such as the White Paper on Transport (2011)[4] sets a reduction of at least 60% of GHGs emissions by 2050 with respect to 1990 in transportation. The European Green Deal (2019)[5] presents a package of policy initiatives for the green transition. These policies target emissions and their reductions not only in urban centres but as cities concentrate the population. They should also be leading the green transition and setting the pace for innovation to roll out beyond their physical boundaries.

This unprecedented state of climate emergency has resulted in a need to address the way we live and inhabit the planet and cities, and it becomes clear that many changes are needed and that time is scarce. Among the many challenges faced, city planning and transport of people and goods are of great importance. In the past years, many new city models have been proposed, boosted to a certain point also by the COVID-19 pandemic.

The **aim of this *discussion paper*** is to reflect on the 15-minute city (15mc) concept in relation to urban mobility and how urban mobility affects the 15mc and to inform future R&I programmes addressing the 15mc about the Urban Mobility focus needed.

For this, issues regarding personal and goods mobility are addressed in the frame of the 15mc and particularly in relation to The European Road Transport Research Advisory Council (ERTRAC) Roadmaps, in tight collaboration with partners belonging to the Urban Mobility Working Group. Moreover, the Driving Urban Transitions (DUT) European Partnership6 work, with the 15-minute City Transition Pathway and its Roadmap, also provided a reference basis for this document.

The paper is structured in five main parts. The first introduces the 15mc concept and its implications on urban mobility, and the second shows selected examples of relevant European research projects. The third and fourth part address the relationship between the 15mc and ERTRAC'S Roadmaps, on the one hand, finding synergies and conflicts between them, and on the other hand, identifying

[1] United Nations-Climate Action. https://www.un.org/en/climatechange/climate-solutions/cities-pollution
[2] European Missions – 100 Climate Neutral and Smart Cities by 20230, Implementation Plan Implementation Plan - master copy 19 05 (europa.eu))
[3] United Nations-Department of Social and Economic Affairs. https://www.un.org/en/desa/around-25-billion-more-people-will-be-living-cities-2050-projects-new-un-report
[4] EU White Paper on Transport: https://op.europa.eu/en/publication-detail/-/publication/bfaa7afd-7d56-4a8d-b44d-2d1630448855/language-en
[5] EU Green Deal: https://www.consilium.europa.eu/en/policies/green-deal/
[6] Driving Urban Transitions European Partnership: https://dutpartnership.eu/

barriers, challenges, drivers and recommendations for achieving the 15mc. The fifth and final part includes conclusions and outlines future research lines and next steps.

1.2 What is the 15-minute city?

In times of rapid urbanisation, Europe is increasingly facing dire urban challenges ranging from the rise of digitalisation and a severe energy crisis to societal inequalities, demographic changes, climate change and environmental degradation. New urban models are currently being debated by planners and policymakers as they aim to enable more **sustainable, liveable, and healthier cities**. In recent years, chrono-urbanism has welcomed a new perspective, that of the 15mc concept. The **15 minute-city** is defined by Moreno et al. as an **urban set-up** where locals are able to access all of their **essentials** (living, working, commerce, healthcare, education and entertainment) at distances that would not take them more than **15 min by foot or by bicycle** (Moreno et al., 2016). Although the 15mc concept took off after the 2020 COVID pandemic, neighbourhood planning has also been in discussion for years. It is not a new concept, with relevant examples such as Clarence Perry's neighbourhood unit[7] or the 1960s revival of neighbourhood planning. Nevertheless, 15mc, along with other city models, has recently brought it back to attention to how urban spaces influence ways of living and quality of life, with segregation of functions and extensive land use bringing a toll on some neighbourhoods and part of the urban population.

Moreover, it is also worth mentioning the human-scale approach to the city presented by the 15mc model, following the footsteps of prominent urban thinkers such as Jane Jacobs, Jan Gehl, Leon Krier and Christopher Alexander, to name a few. The 15mc inherits the human-scale approach supported by the previously mentioned and promotes human-scale-based planning to achieve more vibrant, healthy and liveable cities (Allam et al., 2022a). Focusing on the human scale allows for a reconsideration of the use and quality of the public space, where citizens and their needs are central to the discussion and planning processes. Public spaces, streets and roads are not just for the movement of people and goods but places to stay, socialise and experience the city. Therefore quality, safety and diversity of functions are essential.

Following Moreno et al. definition, the 15mc concept is built upon four pillars, which are key in making it a reality:

- **Diversity**, addressing the need to foster mixed-use planning and also social and cultural diversity within neighbourhoods.
- **Density**, as in finding the optimal people per km^2 in order to balance economic, environmental and social sustainability.
- **Proximity**, both temporal and spatial, to reduce commuting time and its economic impact and promote close-knit communities and social interaction.
- **Digitalisation**, aligned with the Smart City concept, makes it possible for the three previous pillars to become a reality.

It is worth noting that the 15mc concept is, in essence, a city of proximity, an example of proximity-based planning. As Carlos Moreno states (leading voice of the 15mc concept), 15 minutes is a proposed time but must be tailored to each city's individual nature and needs. It builds upon previous city models that suggested other time measures, such as the 20-minute cities (Da Silva et al., 2020) and

[7] https://link.springer.com/referenceworkentry/10.1007/978-94-007-0753-5_3335

the 30-minute cities (Van Vuren, 2020). It must also be considered that 15 minutes of cycling (or e-cycling) takes you further than 15 minutes on foot, highlighting the understanding of proximity in terms of time and not distance.

The 15mc is also partially inspired by the Smart City concept, for example, by improving inclusivity through digital tools that enable citizen participation. However, it addresses issues presented by the model, such as the high prices of real estate advertised as "smart" that drive certain population sectors to social exclusion (Moreno et al., 2016).

The concept's four pillars are fundamental in bringing quality of life, where people can access services, work, and leisure without the need for great displacement or risking not having access at all. It also fosters the local economy and commerce, allowing room for a circular economy and other ways of organising consumption. The 15mc and similar concepts are already naturally present in central or privileged areas in many European cities, relying on balanced land use, high-quality public spaces and good connectivity. However, the concept implementation in certain areas and cities is not as straightforward as in these established areas, and the challenge is in enabling this type of access in as many areas as possible so that every citizen can experience a city that provides all.

One of the paths to enable the city of proximity in areas that are already physically consolidated but still lack behind in terms of accessibility and mobility is by exploring urban transformation and re-purposing and multifunctioning infrastructures, buildings and areas. This is particularly relevant when considering the sustainability of the built environment and how to avoid more carbon emissions when reshaping them. Revitalisation, rehabilitation and densification of neighbourhoods and cities are in line with EU environmental and sustainable development goals and can support social cohesion and workforce transformation. Underuse spaces in urban and peri-urban areas (e.g. brownfields, abandoned industrial sites and buildings) represent an opportunity to implement and test many of the principles from the 15mc concept and a people-centred approach to urban planning and design[8]. Therefore, advancements in these aspects of urban planning and design goes beyond mobility and reach overall sustainable development, for example, with circular economy and climate neutrality.

1.2.1 Examples of 15 minute cities, cities of proximity and neighbourhoods

Groningen, NL - As a small and compact city, Groningen managed from the 70s to start with an extensive circulation plan to ensure that priority would be given to bikes and cyclists and not to private cars, especially when reaching the city centre. This approach preserved and renewed old neighbourhoods and public space, impeding the construction of motorways inside the city.

As the population grows, the city has continued this approach until today, reinforcing this prioritisation and ensuring the accessibility of essential services and amenities within a short distance from residential areas. Traffic management, with adjusted traffic light times, park and bike facilities, Groningen now uses new technologies to support their urban and mobility plans that focus on proximity, accessibility and mixed-use.

[8] How under-used space and infrastructure can become testbeds for new cities - https://futurium.ec.europa.eu/sites/default/files/2021-11/Article%208%20-How%20under-used%20space%20and%20infrastructure%20can%20become%20testbeds%20for%20new%20cities.pdf

With the cleanest air in of all big Dutch cities and a lively economic city centre, Groningen is one of the best examples of a 15mc that continues to adjust to its growth, giving priority to people and their quality of life.

Vauban District, Freiburg, DE - Freiburg is known as one of the most sustainable cities in Europe. The District of Vauban underwent a citizen participation process for its urban planning during around 1996 (Forum Vauban), that had different high ecological standards as guiding principles.

The urban plan for the district led to a city of proximity approach, with car free zones, good public transport connection to other parts of the city, pedestrian friendly streets and mixed land-use, with shops, schools, parks, community centres and other amenities. Car parking spaces are located in the periphery of the neighbourhood at high costs, incentivising walking, biking and walking. The community engagement in co-designing the neighbourhood is one of its strongest characteristics.

Portland, US – Since 2012 the city has the 20 minute neigborhoods or complete neigboorhoods strategies, and aim to have the majority of its citizens living in healthy complete neighbourhoods with safe and convenient access to the goods and services needed in daily life by 2035. Some areas of the city already are considered 20 minute ones.

Glasgow, UK – initiated in 2021, Glasgow has been in a community engagement process of implementing Liveable Neighbourhoods, that focus on healthy more resilient places that allow people, of all ages and abilities, to thrive in their local area, access their daily needs and services in a sustainable manner and ensure better connected places, making walking, cycling and public transport first choices.

Utrecht, NL – The city has been for years focusing on mixed-use developments, green spaces, heavy bike infrastructure, efficient public transport and pedestrian zones, with ambitious urban development plans that continue to support these focus. With data from 2019 to 2021 research[9] demonstrated that almost 1005 of the city population already can reach food, health care education and sports within 15 minute by bike.

1.3 Urban mobility options in the 15 minute-city

Chrono-urbanism considers that quality of life is inversely proportional to the amount of time invested in transportation and even more so by car (Moreno et al., 2016). Rethinking cities bearing this in mind calls for a shift in land use and transport planning and the integration of both.

It is key to understand transportation as accessibility and not as mobility. Access to the six essential urban functions (living, working, commerce, healthcare, education, and entertainment) in proximity and without the need for great displacement and overwhelming commuting time is the cornerstone of the 15mc concept. Complemented by the possibility of reaching these functions in more sustainable ways, prioritising walking and (e)cycling, followed by integration with new mobilities and quality public transport.

However, this is not currently possible in many cities and areas for several reasons, but primarily because of modern or functional urban planning following the Athens Charter of 1933[10]. It was not in

[9] https://www.sciencedirect.com/science/article/pii/S2667091722000310
[10] Charter of Athens (1933) - https://www.getty.edu/conservation/publications_resources/research_resources/charters/charter04.html

vain that modernist architects and planners considered the city to have four functions: dwelling, work, leisure, and circulation (transport and communications)(Charter & Lane, 2010). Car use was not considered negative at the time since congestion levels were lower than nowadays, and climate change was unspoken of. These cities have led to social alienation and high energy consumption (Allam et al., 2022a). Nonetheless, this understanding of transport as a function could not be more contrary to chrono-urbanism's views on transportation. Considering also that transportation is currently responsible for a quarter of the EU's greenhouse gas emissions[11] and traffic is the number one source of air pollution[12], it is now generally accepted that reducing time spent commuting is a pressing matter.

As well as personal mobility, goods distribution is also accountable for a percentage of GHG emissions. The 15mc model can also address logistics and proposes decentralising both production and consumption hubs within urban areas. This goes hand in hand with the idea of producing and shopping locally (Allam et al., 2022a).

All in all, the 15mc concept pursues a change in paradigm from urban planning based on vehicular flows resulting in gridlocked cities to a new model that enhances life and liveability.(Allam et al., 2022b)

The New EU Urban Mobility Framework also recognise this paradigm change and assertively emphasises that in order to achieve EU ambitious targets on climate, environment, digital, health and society, "the EU needs to take more decisive action on urban mobility to shift from the current approach based on traffic flows to an approach based on moving people and goods more sustainably. This means a stronger collective / public transport backbone, better active mobility (e.g. walking, cycling) options and efficient zero-emission urban logistics and last mile deliveries."[13] The 15mc concept and other similar approaches to urban planning and design, which rely on proximity with a better redistribution of services and prioritising quality of life and access, are only logical within this paradigm shift and the EU's ambitions.

As mentioned, the 15mc concept opens the possibility of eliminating the dependency and need for long displacements and time-consuming commuting routines. However, it does not intend to restrict movement or limit people's mobility choices. On the contrary, the aim of cities that follow these principles is to allow people and goods to move more efficiently and sustainably without burdening the availability of time and resources. 15 min is not a determinant but rather a reference of a time frame that will change depending on different individual capacities, local context, and combination of sustainable modes. Different people will walk or cycle different distances within 15 min, not meaning that they cannot reach comfortably and safely within this modes different services and basic functions in their cities. Moreover, it does not mean they cannot have active modes as a key part of their travel journey that can be composed by public transport or other modes. Or that their travel journeys become an impediment to their quality of life and, on a broader societal scale, a threat to the environment and health.

[11] https://climate.ec.europa.eu/eu-action/transport-emissions_en
[12] C40 Annual Report 2021. Available at https://www.c40.org/wpcontent/uploads/2022/03/C40_annual_report_2021_V10.pdf
[13] The New EU Urban Mobility Framework - https://op.europa.eu/en/publication-detail/-/publication/ad816b47-8451-11ec-8c40-01aa75ed71a1

The use of private vehicles needs to be reassessed if cities want to achieve climate neutrality. Apart from fleet electrification, which is already acknowledged as not enough and not the only way forward[14], making the use of cars unnecessary and, when and if necessary, more efficient is an essential part of mobility in the 15mc. Automated vehicles may pose some good possibilities in that sense. Still, their development and deployment must be in sync and interconnected with the development of 15mc and other sustainable urban planning approaches.

Furthermore, intermodality can be a more efficient response for addressing the different individual mobility needs and territorial constraints (e.g. city morphologies, rural and peri-urban connections). Improving the connectivity of active modes, public transport and micromobilities in mobility hubs increases the possibilities of access and reach without relying on private vehicles and other unsustainable modes. The relevance of mobility hubs has been progressively growing in many cities aiming to reduce emissions and improve urban life. Exploring their role in the 15mc mobility will bring more flexibility and contribute to inclusivity and other environmental benefits.

When considering goods transportation within the 15mc it is also relevant to consider new forms of production and consumption. The e-commerce transformation and circular economy are just part of this complex aspect of city life. Understanding how last-mile deliveries can work within the city of proximity is crucial and brings possibilities of exploring consolidation centres, delivery hubs and the flexible use of the curb. Managing the curbside (e.g. by Dynamic Access Controlling) might enable the prioritisation of the accessibility in the use of sidewalks and curbside, potentially lessening traffic congestion and usage conflicts (e.g. PT, logistics, micromobility, cycling, waste, parking). This could impact the liveability on the 15mc.

The 15mc is not a mobility solution, but it is a relevant approach that will shape the future of urban mobility, just as new forms of urban mobility are essential to shape and guide the 15mc and other sustainable forms of urban development and planning.

This intrinsic and indissoluble relationship between mobility and urban planning is central to achieving the EU carbon emissions, economic and social goals. While urban planning and design concepts such as the 15mc will continue to develop and explore many holistic approaches, it is relevant to understand how urban mobility will fit and support these approaches and solutions.

[14] The New EU Urban Mobility Framework – "*Urban mobility can make a major contribution, not just by reducing the sizeable amount of greenhouse gas emissions caused by it, but also by becoming less polluting, less congesting and safer. As the Union's 2030 Climate Target Plan confirms, the deployment of zero-emission vehicles in the urban context will only deliver a part of these objectives.*"

2 Towards the 15-minute city: Aligned European research projects

In recent years, there have been a number of European research projects aligned with 15mc main goals of social, environmental and economic sustainability, especially under the topic of urban mobility. Different call topics under Horizon 2020 covered issues relevant to the 15mc, showing that it was in sync and followed the shift in focus on urban mobility, already strengthening the links between transport and urban planning/land use.

The calls discussed topics of transport innovation development at the neighbourhood and urban district levels, with social and workplace innovation, people-oriented transport and mobility solutions in relation to users' needs (passenger and freight). They also included improved access to mobility solutions, healthcare, education and jobs, aiming at businesses and sustainable lifestyles.

Tackling road safety, congestion, noise pollution, car use levels, travel avoidance, reallocation or multi-modal use of road space, new uses of public space for different mobilities, dissociating economic growth and high mobility from traffic were also part of the calls. The calls intended to boost urban accessibility for people and goods, help meet more general sustainable urban transport policy goals, and examine the consequences and interactions with urban planning and design, including inputs for SUMPs development.

The 15mc concept addresses these matters by discussing proximity and accessibility, corroborating the existent interdependency between mobility and the concept. Nonetheless, these matters are not exclusive from the 15mc, but they permeated many different approaches that aim at improved urban life, including sustainable mobility. The introduction of SUMPs is a clear sign that cities needed to change their take on mobility, and the 15mc is, in a way, a response to that.

The following Horizon 2020 projects are practical examples of the mobility shift that welcomes greener, more integrated, and new modes of transport. On some level, these projects already look at mobility as accessibility and sustainability, not segregated from the urban space, and are related to the 15mc and the city of proximity.

- SUNRISE (2017 – 2021)

The SUNRISE project, Sustainable Urban Neighbourhoods – Research and Implementation Support in Europe, developed new tools to facilitate collaborative ways of addressing mobility challenges at the neighbourhood level. The SUNRISE neighbourhoods carried out a highly participatory "co-creation" process with their residents and stakeholders that identified local needs, developed new transport solutions, and implemented and evaluated them.

- Cities4People (2017 – 2020)

Cities-4-People revolved around sustainable and people-oriented transport as a solution to the many challenges linked to mobility and faced by urban and peri-urban areas today.

Aiming to implement mobility solutions developed by the people for the people, Cities-4-People taps into participatory practices of social innovation and neighbourhood governance and builds on three main pillars.

- LOOPER (2017 – 2020)

The Looper project was a European research project on finding solutions to urban problems using co-creation. The project ran from 2017 until 2020 and was funded under the JPI Urban Europe ERA-NET Co-fund Smart Urban Futures Call. The Looper Living Labs served as new models for experimental design and innovation at the urban and community level. They addressed practical problems such as air quality, road safety, noise, or green space. The Living Labs were based on the involvement of stakeholders, continuous monitoring of changes and direct consideration of their impact on the implementation process. There were Looper Living Labs in Brussels, Manchester and Verona.

- METAMORPHOSIS (2017 – 2020)

Metamorphosis aspired to transform neighbourhoods into more liveable shared spaces, with the idea that the representation of children is a key indicator of a well-designed and sustainable neighbourhood.

- MUV (2017 – 2020)

Rather than focusing on infrastructure, MUV (Mobility Urban Values) raised citizen awareness of the quality of the urban environment to promote a shift towards more sustainable and healthy mobility choices. MUV empowered communities to better translate citizen needs into new solutions, engaging end-users throughout the process to prevent the risk of low take-up.GrowSmarter (2015 – 2019)

The 12 smart city solutions in energy, infrastructure and mobility piloted in the project provide good insights on the transformations of neighbourhoods, supporting the 15mc concept. Some of the solutions were sustainable last-mile delivery with bikes, shared mobility stations with e-bikes and e-cars, low energy districts and efficient and smart climate refurbishment.

- CREATE (2015 – 2018)

The CREATE project developed new congestion and network performance indicators and qualitative and quantitative insights on how cities can make the business case for investing in sustainable mobility and Place Making infrastructure and measures. Urban congestion has major economic and social costs, and car-based cities often provide poor environments for urban living. CREATE examined both quantitative changes in policy measures and car use patterns and examined the changes in governance, administration, legislation and funding regimes that have enabled Western European capital cities to evolve from being car-based to providing liveable cities for their citizens.

- MORE (2018 – 2022)

MORE, Multimodal Optimisation of Roadspace in Europe, developed design concepts that encourage street activity and reduce traffic dominance by considering the needs of all road users. MORE explored experimental options such as flexible use of kerb space and dynamic allocation of road space to accommodate different functions. Moreover, it considered broader social, environmental and economic aspects of cities in the street design.

- ReVeAL (2019 - 2022)

The ReVeAL project, Regulating Vehicle Access for Improved Liveability, will enable cities to optimise urban space and transport network usage through new and integrated packages of urban vehicle access policies and technologies for the benefit of people living in cities. The spatial interventions to Regulate Vehicle Access are essential aspects in the deployment of the 15mc.

- Park4SUMP (2018 – 2022)

Park4SUMP aimed to reverse the status of parking as one of the most underdeveloped sections within the SUM policies by considering parking management as part of a wider strategy that can benefit urban mobility but also the overall quality of life of our cities. Park4SUMP goals include turning parking policies from being reactive and operational as today to become more strategic, effective, and holistic. Addressing parking in new ways will positively impact the 15mc implementation.

Bringing attention to the design of our cities is also aligned with the New European Bauhaus (NEB), a creative and interdisciplinary initiative intended to connect the European Green Deal to our living spaces and experiences.[15] The 15mc concept and the possibilities from NEB projects can work hand-in-hand in providing new innovative ways to improve urban mobility and quality of life.

[15] New European Bauhaus, European Union. https://new-european-bauhaus.europa.eu/about/about-initiative_en

3 Roadmap to the 15-minute city - Synergies and conflicts with ERTRAC

3.1 Roadmap selection

One of ERTRAC's many tasks is the definition of strategies and roadmaps to achieve a strategic vision for road and transport research and innovation in Europe, through the definition and update of a Strategic Research Agenda (SRA) and implementation of research roadmaps.

ERTRAC is responsible for the production of many roadmaps regarding road transport. The first part of the process has focused on scanning through all recent (2019 onwards) roadmaps in search for those addressing issues related directly to the 15mc. The following 3 roadmaps have been selected:

- Urban Mobility Resilience Roadmap (2021)
- New Mobility Services Roadmap (2021)
- Safe Road Transport Research Roadmap (2021)

Figure 1 - ERTRAC Roadmaps

3.2 Roadmap relevant elements

The approach followed with the 3 roadmaps has been twofold:

A) Examine whether the 15mc is considered, and if it is, under which section or topic.

The selected roadmaps were completed in 2021, in a postpandemic scenario where the problems of the functional city had already been brought to light, and the 15mc concept had become popular worldwide in the media. However, was it being considered seriously in other closely related fields such as transport?

B) Find synergies and conflicts between the goals of the 15mc and the roadmap

All roadmaps address topics that are key when it comes to attaining a more sustainable mobility. However, it is not guaranteed that these issues are directly aligned with the 15mc goals, especially if

it is considered that the 15mc relies primarily on active modes, and in public transport when either distances are too big or the functions being accessed does not belong to the 6 basic essential needs detailed in section **Error! Reference source not found.**. This issue can be turned around, so that instead of discarding other mobility options, they are questioned as possible support or even replacement if seen fit for the achievement of the 15mc concept. Therefore, the approach followed is to focus on the four essential pillars that enable the deployment of the 15mc model and find synergies between them and the roadmaps, so as to open the possibility of other solutions that can contribute to the 15mc.

3.2.1 Urban Mobility Resilience Roadmap

Resilience is described in the roadmap as the capacity of a system to resist, adapt itself and transform itself to recover from a shock, absorb its consequences and maintain levels of functionality. To be able to adapt, it is necessary to anticipate beforehand any possible shocks that can cause disruptions, in this case, to the mobility system. These shocks are varied in nature, but it is essential to define them, along with the contexts in which they occur and the impacts they have.

At the same time, it is not possible to separate urban mobility from the city, meaning that for a resilient mobility system, a resilient city is needed. Disruptions regarding the city have traditionally been linked to natural disasters, however these might not be the only hazards. The global pandemic, lockdowns and social distancing proved to be new types of shocks to the city and transport systems.

This roadmap was selected because resilience is directly related to the 15mc, and it was not coincidental that it took a global pandemic for it to become mainstream, although the concept dates back to 2016 and before.

The Roadmap takes the key principles characterising resilient urban mobility systems as established in the Topic Guide developed by the **CIVITAS Satellite project** and published in 2021. These topics are related to both the city and mobility. But what type of city are they related to? Do our current cities comply with the 7 principles of **reflectiveness, robustness, redundancy, flexibility, resourcefulness, inclusiveness and integrated**? What do they have in common with the 15mc?

It is worth noting that the 15mc is mentioned in the roadmap, stating the need to develop research efforts that ensure that resilience is taken into account in new city planning, since 15mc will undoubtedly bring new forms of risk management in urban mobility and logistics. It is also brought up in relation to physical infrastructure, as a recommendation to support the development of the 15-minute city with tests and pilot projects, and under space reallocation and built infrastructure. However, it is not mentioned in regard to digital services or governance. Nonetheless, proximity, digitalisation, and diversity are implicitly discussed, for instance, regarding New Mobility Services (NMS), although they are not linked to the 15mc in itself. Considering the 15mc holistic approach, in the future, it could be of added value to not limit the understanding of the concept to only actual planning or physical layer of mobility but to all the dimensions at play.

The approach followed searches for the links between resilience and the 4 main pillars that enable the 15mc, so as to obtain a preliminary view of the actions needed.

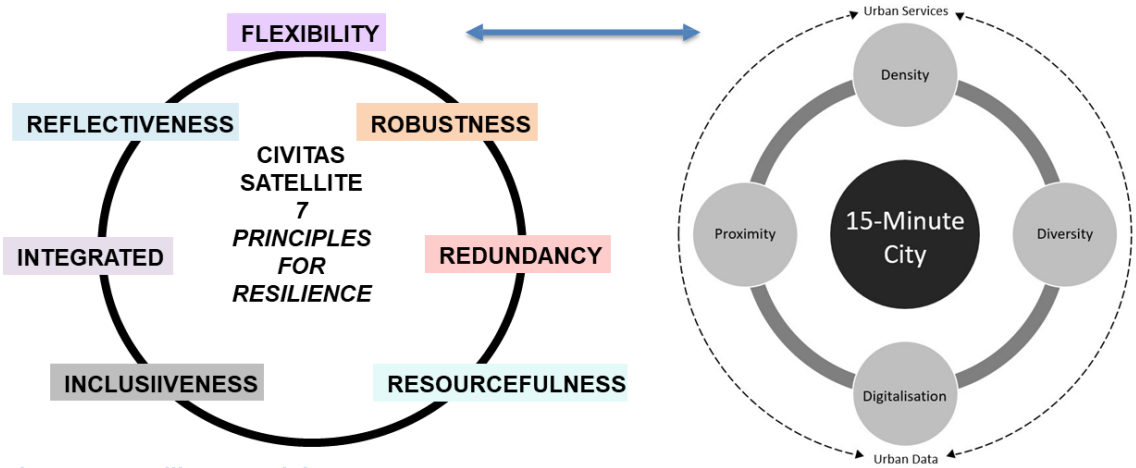


Figure 2 - Resilience and the 15mc

Civitas Satellite Principles for Resilience	Principle Definition	Principle applied to the 15mc examples	Needed 15mc pillar
REFLECTIVENESS	**Reflect** on the inherent and ever-increasing **uncertainty and changes** that affect **mobility systems**	Change in mobility patterns	**Proximity** **Diversity** **Digitalisation**
ROBUSTNESS	Robust mobility systems are **well conceived and constructed** to withstand the impacts of disruptions. Robust urban mobility is also a **robust spatial layout and structure of the city**	Developing urban mix	**Density** **Diversity** **Proximity**
REDUNDANCY	**Multiple ways** to achieve a given need or **fulfil a particular function. Intentional**, **cost-effective** and **prioritised at a city-wide scale**	Pedestrian/Cycling networks	**Diversity** **Density** **Proximity** **Digitalisation**
FLEXIBILITY	Flexible mobility systems can **change, evolve, and adapt** in response to **changing circumstances**, with **decentralised** and **modular** approaches	Multifunctional spaces	**Diversity** **Digitalisation**
RESOURCEFULNESS	Resourcefulness implies that mobility practitioners can rapidly find **different ways** to **achieve**	Clean public transport	**Proximity** **Digitalisation**

	their **goals** or meet their needs under stress or in time of shocks.		**Density**
INCLUSIVENESS	**Addressing** the **shocks or stresses** faced by **one sector, location, or community isolated from others** requires broad **consultation and engagement** of communities	Social equity	**Diversity** **Digitalisation**
INTEGRATED	**Integrate urban mobility systems** with other **city system**s for **decision making consistency** and **mutually supportive** investments	Collaboration between departments	**Diversity**

3.2.2 New Mobility Services Roadmap

New Mobility Services, inherently digital, have recently exploded in cities partly due to the growing popularisation and adoption of mobile devices by citizens. These services pose many challenges to cities and have transformed urban mobility. It is vital to ensure they are aligned with sustainability goals and that they do not pursue only commercial ends. For these reasons, the ERTRAC New Mobility Services Roadmap aims at defining the research required to reap all potential benefits of NMS and avoid possible drawbacks. To this end, when talking about NMS, the following types of mobility services are considered:

Micro-mobility

Mobility as a Service (MaaS)

Connected Cooperative Automated Mobility (CCAM)

This roadmap has proven of interest regarding the 15mc goals, as NMS are essential for allowing inter and multimodality. They can support achieving the 15mc model in many diverse contexts, where for a variety of reasons, traditional active modes may not be as attractive or convenient. However, as previously mentioned, NMS can pose threats to cities and should be carefully studied to see if they effectively align with goals of sustainability, resilience, and inclusiveness that are also central to the 15mc. NMS have also been subject to this type of analysis and in relation to actual passenger willingness to adopt NMS and the motivational factors behind their choices (Lopez-Carreiro et al., 2021).

In the first place, it is worth highlighting that the roadmap includes a section dedicated to the physical aspects of mobility, that is to say urban space and infrastructure, which includes a sub-section addressing the role of NMS in shaping the 15mc. Therefore, chapter 6 is the most relevant for the purpose of this paper, since it addresses the spatial consequences of NMS. For decades, cities have prioritised motorised traffic, allocating more space to it than active modes. At the same time, NMS require space, which was not contemplated in recent years. Therefore, reallocation of public space to

accommodate all available modes, bearing in mind sustainability and liveability goals is key. The roadmap also states the need to integrate NMS with other sectors (building, construction, energy, etc).

NMS have also proven controversial in some contexts, and it is worth bringing to attention public consultation process carried out in Paris on April 2nd where voters were asked the following question: "For or against self-service scooters?[16] Over 85% voted to ban shared e-scooters. Reasons behind this range from safety concerns to complaints over scooters taking up pedestrian space. The fact this consultation was done in the first city to implement a 15mc model is not to be ignored either.

Adequate policy-making and successful regulations are also critical for the correct use of NMS, so as to ensure their potential benefits, as well as mitigate any negative impacts on the city, and in this case, on the deployment of the 15mc.

In the same line of thought, it is necessary to understand the 15mc model not just as an urban planning strategy, but also as a more holistic approach towards how we live in cities. It might be of interest to consider NMS not only in relation to the effect they have on urban space distribution between modes but also in the impact they can have environmentally, economically and socially.

The 3 types of NMS (micro-mobility, Maas, CCAM) addressed in the Roadmap have been examined following the same process as followed with the 7 principles for resilience.

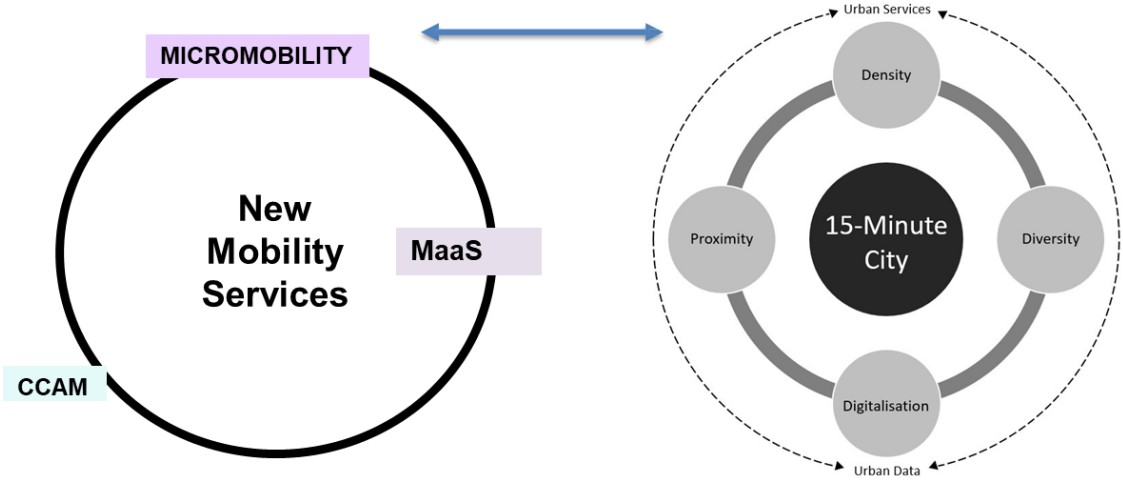


Figure 3 - NMS and the 15mc

	NMS potential in the 15mc (example)	Needed 15mc pillar
Micromobility	Reducing car use and acting as support for active modes in less dense areas with more extensive distances.	**Density** **Digitalisation** **Proximity**
MaaS	Nudging people to consider PT or other modes as an alternative to	**Digitalisation**

[16] https://www.theguardian.com/world/2023/apr/02/parisians-vote-on-banning-e-scooters-from-french-capital

	car use, in multi-modal and trip chain scenarios, and new offers of shared mobilities	**Diversity** **Proximity**
CCAM	Supporting shared multi-modal transportation, new ways of logistic services, new on-demand services and increased safety	**Diversity** **Digitalisation**

3.2.3 Safe Road Transport Research Roadmap

In the case of this roadmap, given that road safety is a vast topic, not particular to urban areas only, the focus has been the section addressing the safety of cyclists and users of micro-mobility devices, since it is a vital aspect to implement the 15mc model successfully.

Although the roadmap does not address the 15mc directly, ensuring safety for active mode users and new mobility service modes is paramount. According to the roadmap, there are five main road safety themes in an urban environment: road safety, infrastructure, user diversity, bicycles and micro-mobility. Of course, these issues are also relevant in the previous roadmaps examined, but in this roadmap, the scope is ultimately to improve safety. At the same time these topics are also related to the 15mc pillars, since it is vital to re-examine space distribution and integrate behavioural aspects to planning, aligning with diversity (such as taking into account all type of users), proximity or even digitalisation, as digital tools could also play a role in improving safety.

Improving road safety is critical for improved quality of life, and this should be done from the street and road design to new regulations to vehicle design, to cite a few. Paying particular attention to new mobility modes, pedestrians and cyclists, is becoming increasingly more relevant as travel behaviours change following increased digital lifestyles and other transformations, which are happening in parallel to 15mc deployment. Additionally, incentives for improved active modes in cities are becoming more recurrent, evidencing the need for expanded and adapted road safety.

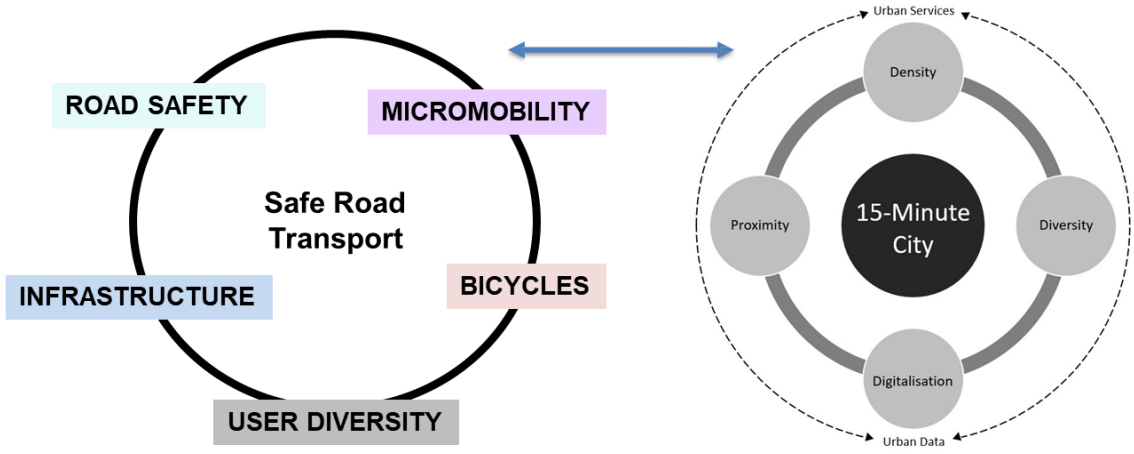
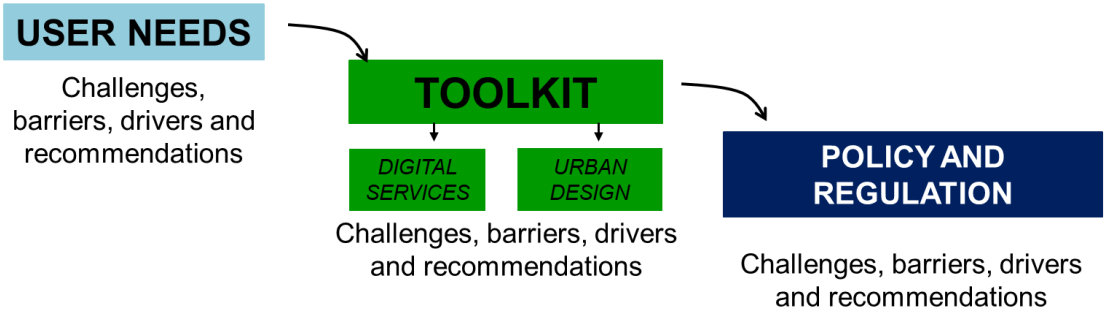


Figure 4 - Road safety and the 15mc

4 Achieving the 15-minute city

4.1 A collaborative approach

The previous section looked for synergies and conflicts between ERTRAC Roadmaps and the 15mc. This has allowed to identify what elements of the selected roadmaps are relevant to the 15mc model. The next step is to effectively identify possible barriers, challenges, drivers and recommendations in regard to these elements. This has been achieved through 2 brainstorming sessions with ERTRAC's Urban Mobility Working Group members and POLIS. By using a collaborative approach it has been possible to feed on the expertise of professionals belonging to many fields, representing the interests of the diverse sectors involved in urban mobility.



The results from the brainstorming showcased that three main areas must be addressed in order to enhance the take-up of the 15mc model across Europe. These categories are selected in alignment with the research areas found in several ERTRAC Roadmaps such as New Mobility Services: policy and regulatory frameworks, user needs and behaviour, digital infrastructure and data management and urban space and physical infrastructure. Continuing this methodology,

User needs and user behaviour. First and foremost, it is of vital importance to listen to the users. What are their needs? How do they behave? What do they want? Many of the arguments given during the sessions were related to what do citizens actually want, and how they want to move. At the same time, it is worth bringing to attention that users are addressed in all of the roadmaps examined, but it is also necessary to involve them directly concerning the 15mc.

15mc Toolkit (Digital services & Urban design). How can the 15mc be realised in both the short-term and the long-term? Many of the comments made in the brainstorming sessions are directed at the actual implementation of the 15mc and refer to two main groups of issues, those related with digital services and those related to urban design. This toolkit addresses what is needed to deploy the 15mc model, and highlights the need of futher research in implementation of the model.

Planning, Policy and regulatory frameworks. The 15mc requires a number of measures, such as changes in policy, for it to be effective. Planning and regulatory frameworks came up during the brainstorming session frequently. These planning frameworks should allow the 15mc to be implemented adequately, and ensuring it fulfils its potential and brigns the highest impact possible on citizens quality of life.

Understanding the relationship between the three categories is important, given that they are closely related. User needs are considered the first set of issues, since citizen participation and willingness is critical for the transition towards the 15mc. Once users needs and the 15mc are aligned, it is possible to outline a toolkit to develop the 15mc model. Finally, policies will have to change and enable the changes proposed in the toolkit, in alignment with what users need and want.

4.2 Barriers, challenges, drivers and recommendations identification

This section presents the results from the brainstorming which were classified according to the 3 categories, as can be seen in the following tables.

4.2.1 Barriers

Identified barriers		
User needs and user behaviour	**Toolkit: (Digital services & Urban design)**	**Planning, policy and regulatory frameworks**
Cultural attitudes	Data regulation policy	Monofunctional neighbourhoods
	Technology	Redundancy means more investment and not being used all the time

4.2.2 Challenges

Identified challenges		
User needs and user behaviour	**Toolkit: (Digital services & Urban design)**	**Planning, policy and regulatory frameworks**
Taking into account culture and attitudinal factors	Space needed to create separate lanes	Delivery city hubs
Avoid an increase in road congestion	Micro-mobility reaching all neighbourhoods	Dark stores
Avoid unwanted shift from active modes	Location of workplaces	NMS aligned with policy goals and not other interests
	Space availability	
	Financing	
	E-scooter pollution	
	Street design-rearranged so as to make sustainable modes more accessible	

	Space reallocation	

4.2.3 Drivers

Identified drivers		
User needs and user behaviour	**Toolkit: (Digital services & Urban design)**	**Planning, policy and regulatory frameworks**
Public engagement	Pedestrian/Cycling networks	Tactical measures implemented during COVID.
Research on behaviour	Multimodality	
Consumer/user engagement	Multifunctional spaces	
Reliability of active modes	MaaS Readiness of the mobility patterns	
	Clean public transport	

4.2.4 Recommendations

Identified recommendations		
User needs and user behaviour	**Toolkit: (Digital services & Urban design)**	**Planning, policy and regulatory frameworks**
Moving customers to choose most sustainable delivery option	Kerbside changing	Collaboration between departments
Design specific cases and uses that require individual automated mobility	Transferring spaces destined to mobility to other uses	Transfer strategies to outer areas
	Varying use of public buildings during the day	
	Developing urban mix	

4.3 Brainstorming overview

4.3.1 User needs and user behaviour

Based on the brainstorming's results, 3 priority areas regarding the human dimension in the 15mc model are outlined:

1. **Understanding people's needs and wants**. This requires further research on human behaviour and its consideration in the field of urban mobility and spatial planning.

2. **Proper communication of the model.** It is necessary to raise awareness on the negative consequences of certain mobility habits, and how the 15mc model can improve life quality for all. Therefore, it is critical to develop effective communication strategies.
3. **Citizen engagement.** With needs and wants identified and raised awareness, it is possible to obtain citizen engagement. This facilitates the implementation of restrictions when needed, and fosters a modal shift from motorised means to active and sustainable modes, vital to the 15mc.

4.3.2 Toolkit: (Digital services & Urban design)

Urban design and how it shapes mobility came up more frequently during the brainstorming session than digital aspects. The results can be summarised in the following points:

- **Land Use and planning**. Monofunctional neighbourhoods and low density developments hinder the city of promity. Workplaces are commonly grouped in business districts, or industrial areas, far from residential areas, as a results of the functional planning of the mid 2oth century. How well can the 15mc model perform in these cities, and what measures can be implemented to tackle these issues? Some suggestions are rotating the use of a space, fostering multipurpose spaces in the city according to the time of day.
- **Street design.** On a smaller scale, street design came up frequently. Space is often scarce, which impacts negatively on the space allocated for active modes, with poor pedestrian areas or bike lanes. In addition, NMS also take up space, competing with either motorised traffic or pedestrians, leading to conflict among groups.
- **New technologies for sustainable mobility**. In regard to digital tools, fostering multimodality through digital tools, was considered aligned with he 15mc model. However, it is necessary that novel concepts such as MaaS or micromobility foster a transition to sustainable mobility, by promoting Public Transport as the backbone of mobility, for example in areas where 15 minutes trips by active modes are not possible.

4.3.3 Planning, policy and regulatory frameworks

The brainstorming highlighted the most pressing policy issues to be addressed to deploy the 15mc model.

1. Urban planning policy. Policy changes needed to develop urban mix.
2. Freight and goods distribution policy. With the advent of e-commerce and door-to-door delivery new threats are posed to sustainable logistics and urban liveability. At the same time, the 15mc needs to dig deeper when it comes to goods distribution and how it can fit into the model.
3. New Sustainable mobility management. The previously mentioned novel concepts such as MaaS or the popularistion of NMS need to be regulated and backed by adequate policy and planning.
4. Urban design and placemaking. This scale of the city is also relevant to the model, and for correct space allocation between modes is key for the model. Citizens need for public space to use for non-mobility related purposes must not be overlooked.

5 Conclusions and future research

The identification of barriers, challenges, drivers and recommendations shows some interesting results.

In the roadmaps, digital-related aspects were quite relevant, however, the brainstorming shows more concern regarding urban design than digital services. This should not be taken lightly. Considering that in recent years, other city models such as Smart Cities have focused on the benefits of technology, it is important to reflect on the fact that the more physical aspects such as urban space planning and design came up as essential, and technology was even considered a barrier, while effects derived from digital devices such as e-scooters were identified as challenges.

Although 15mc concept is essentially an urban planning/design approach, it cannot take place without proper consideration and integration with mobility. And new forms of mobility cannot take place without integration with new urban planning/design approaches. This paper explores one of these approaches, the 15mc, but it does not limit the future of urban mobility to it. Moreover, it shows how 15mc is relevant and aligned in many parts with previous ERTRAC Roadmaps and preceding rounds of Horizon 2020-funded projects. Sustainable mobility can benefit from such new modes of urban space organisation. On the other hand, the 15mc can only happen through more sustainable urban mobility. The question is now how to capitalise on that interdependence to achieve reduced transport emissions and European sustainability goals.

Research on human behaviour, mentioned both in roadmaps and in the brainstorming should be promoted, and integrated into urban planning. By understanding cultural attitudes, preferences and needs it is possible to nudge people to cleaner modes of transportation, focusing on active modes and NMS as support. Moreover, research with increased collaboration with social sciences can support a broader understanding of accessibility and inclusivity, shining a light on the extent that the 15mc, or the city of proximity, can have in reaching peripheries, excluded communities or avoiding gentrification. And that can help to assess the outreach of active modes, the relevance to multimodality and reinforced public transport and the improvement of last-mile options.

Likewise, further interdisciplinary research to address the rural and peri-urban issues in relation to the 15mc and city of proximity is needed. Most of the praised characteristics of the 15mc are usually found in consolidated city centres, opposite to the rural and peri-urban areas. Thus, the question that can be addressed in future research is how and what attributes of the 15mc can be transposed to these areas to support more sustainable mobility choices and modes. The 15mc model should be considered flexible with optimal time (5, 10, 15, 20 minutes) depending on each city's context. Accessibility to services in peri-urban areas may be significantly improved even if trips are still longer than 15 minutes. This topic is highly relevant for achieving the European Green Deal targets since it can bring new mobility solutions to areas that are now isolated or that heavily depend on pollutant transport solutions. It also has the potential to tackle urban sprawl, degradation of agricultural land and natural landscape, and focus on sustainable growth.

The 15mc concept has recently been subject to controversy, with most critical voices claiming it is a strategy to control and limit individual freedom of movement in the city. Although this is not the case, it

brings to attention how important correct communication strategies are for the uptake of the concept, and also its measures when under implementation, to raise public acceptability when needed.

In regard to logistics in the 15mc research is called upon. The 15mc is a clean, sustainable, resilient and inclusive city, where social cohesion and liveability are essential. However, e-commerce and other delivery services can potentially have negative impact on these when not properly regulated. Therefore, effort must be put into studying the right policy for delivery hubs. On a more positive note, tactical measures applied during COVID could be a driver for implementing more long-term changes in favour of urban liveability. Furthermore, innovations in urban freight, such as flexible curbside management, should be explored in sync with the 15mc, where NMS and CCAM can be essential.

More deeply assessing road space allocation and the use and quality of public space is highly important in this scenario of new mobility modes, lifestyles and impendent crises. And also when talking about NMS, CCAM and other innovations that can support the decarbonisation of mobility. The city of proximity and 15mc concepts provide clues on how the urban space can be organised and adapted. However, much research is still needed to progress with this assessment and move from the temporary measures of COVID lockdown. Research should also examine other approaches that can complement the 15mc in organising the urban environment and mobility. For instance, how to strengthen integrated public policies, reinforce horizontal collaboration and improve organisational capacity. Moving from temporary to permanent measures in allocating road and public space demands new governance, capacity building and training, especially considering regional and local authorities.

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