



ERTRAC Conference

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Urban Mobility WG Research Roadmaps:
Resilience
New Mobility Services

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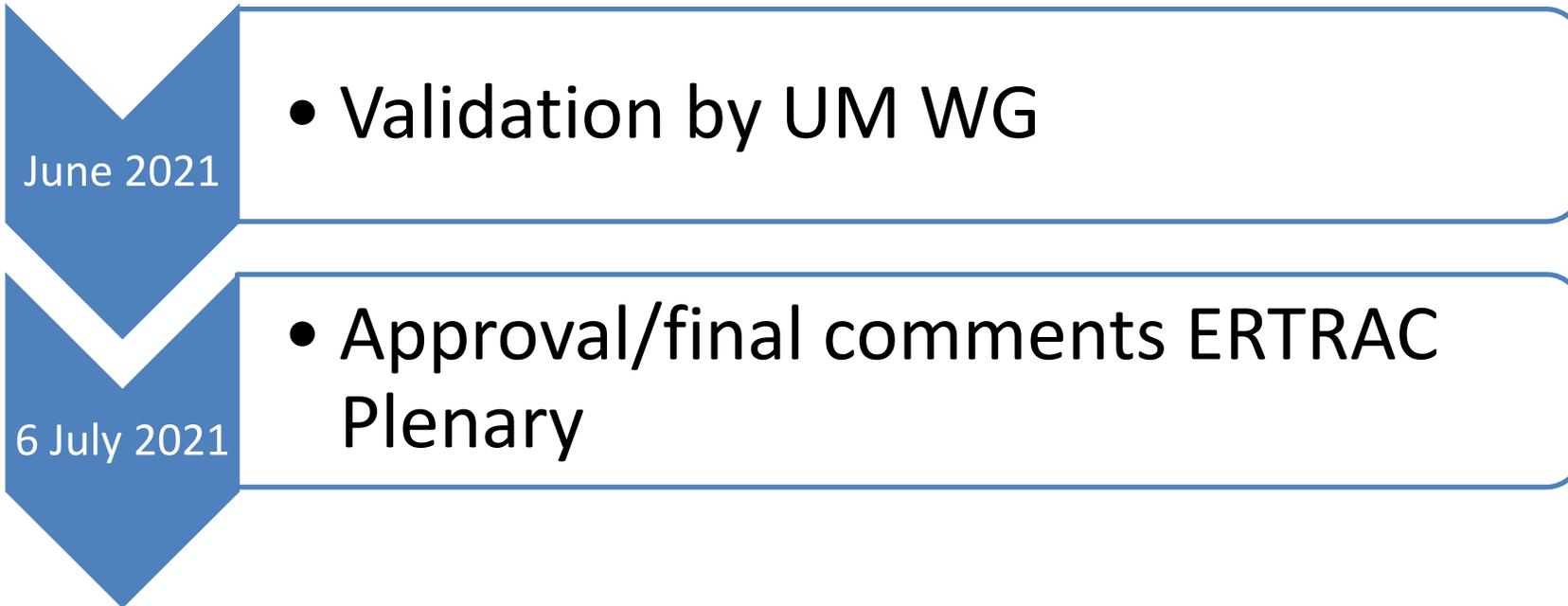
Scope & Content

- **New mobility Services R&I roadmap**
 - **Scope:** all types of NMS, including shared mobility, micromobility, drones & AVs, MaaS/TMaaS
 - **Content:** Priority recommendations for EU-level R&I to ensure NMS support public policy goals and are not detrimental to sustainable, accessible, equitable urban mobility
- **Urban Mobility Resilience R&I roadmap**
 - **Scope:** Urban Mobility ecosystem resilience to any type of crisis, i.e. natural disaster, pandemic, migration crisis, terrorist attack...
 - **Content:** Priority recommendations for EU-level R&I to improve the capacity of the Urban Mobility ecosystem to adapt and continue to fulfil its role when crises occur

Process



Process

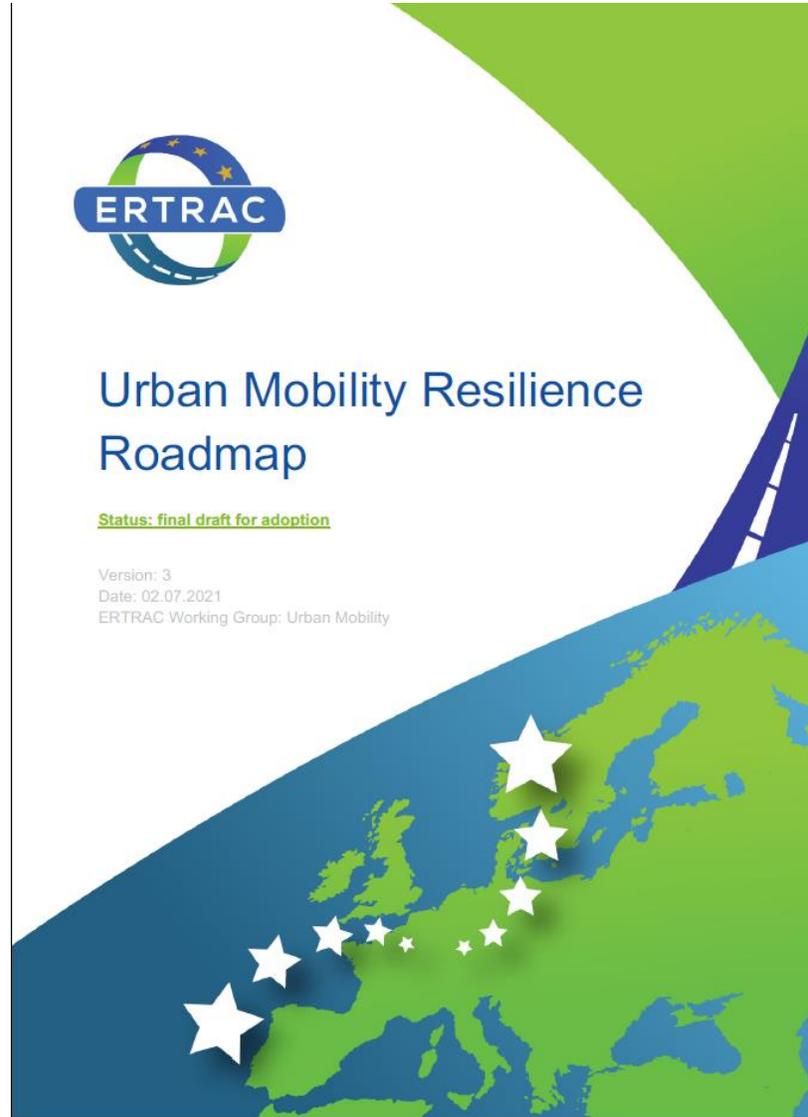




Urban Mobility Resilience Roadmap

Status: final draft for adoption

Version: 3
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ERTRAC Working Group: Urban Mobility



Why this roadmap?

Expanding the perspective of ‘COVID-19’ proof urban mobility systems, to the broader issue of understanding what it takes to plan, enable and provide urban mobility systems that can resist crises and shocks to come.



Structure of the Resilience roadmap

- Introduction
- **Defining Resilience**
 - General Definition
 - Principles for urban mobility system resilience
- **Research and Innovation Needs**
 - **Planning a resilient mobility system**
 - Establish a crises and risks typology
 - Adopt crisis- and risk-oriented planning methodologies
 - Monitor the mobility ecosystem condition to predict crises
 - **Enabling a resilient mobility system**
 - Governance models
 - Data as a resource
 - **Providing a resilient mobility system**
 - Infrastructures
 - Services
 - Traffic and Network Management
- **Research methodology, capacity-building and exchange**

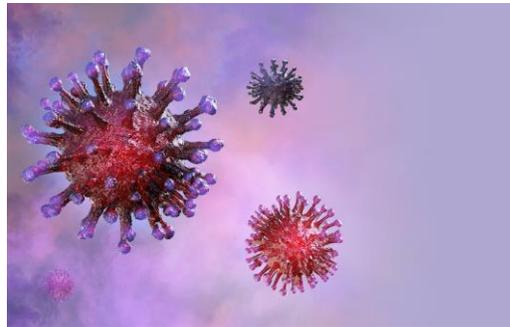


Defining resilience in the context of Urban Mobility



Resilience describes 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. It emphasises the importance of anticipating and reducing one's vulnerability in combination with the monitoring efforts, the ability to respond to and the capacity to learn from crises.

Resilient development can be defined as a development that can “anticipate, prevent, absorb and recover from shocks and stresses, in particular those brought about by rapid environmental, technological, social and demographic change, and to improve essential basic response structures and functions



Reduce vulnerability and exposure to disasters

Enable the identification, resistance, absorption, adaptation and recovering from shocks while maintaining essential functions

**Building
resilience**

Involve all stakeholders in risk reductions through co-creation

Increase capacity to respond to shocks through emergency preparedness



7 principles for building resilience

Principles	Resilience principle in the context of urban mobility	Explanation (not exhaustive)
Reflectiveness	Planners and policymakers should reflect on the inherent and ever-increasing uncertainty and changes that affect mobility systems. Mechanisms should be set up to systematically review and adapt them with learnings from past experiences.	Monitoring the quality of mobility services and infrastructures based on key indicators allows mobility planners to reflect on the continuous evolution of mobility systems.
Robustness	Robust mobility systems are well conceived and constructed to withstand the impacts of disruptions and hazard events without significant damage or loss of function. They allow anticipating potential failures. Robust urban mobility is also a robust spatial layout and structure of the city, independent from vulnerable transport systems and vehicles.	Set up solid business models and manage spatial urban organisation to reduce dependence on motorised transport. Identify the age of transportation system infrastructure, expectable remaining lifetime, and maintaining it to make it resistant to potential hazards.
Redundancy	The presence of multiple ways to achieve a given need or fulfil a particular function illustrates redundancy. It should be intentional, cost-effective and prioritised at a city-wide scale, not an externality of inefficient design.	Street and footpath networks allowing for multiple choices, reserves of resources and vehicles to provide alternatives in case one element of the system fails, cooperation plans for reallocation of resources from private transport operators for emergency purposes
Flexibility	Flexible mobility systems can change, evolve, and adapt in response to changing circumstances, with decentralised and modular approaches to transport infrastructure and ecosystem management.	Designing flexible public spaces can allow for variable use and accessibility regarding changing circumstances, from stay function to traffic places for example.
Resourcefulness	Resourcefulness implies that mobility practitioners can rapidly find different ways to achieve their goals or meet their needs under stress or in time of shocks.	Have a plan available to justify the prioritisation of the use of specific resources in case of extreme events, Promote cooperation among institutional groups and stakeholders
Inclusiveness	Addressing the shocks or stresses faced by one sector, location, or community isolated from others requires broad consultation and engagement of communities, especially the most vulnerable groups, and contributes to a sense of shared ownership and adhesion to measures.	Identify the vulnerability of certain groups in relation to certain needs, considering differences among social groups in terms of connectivity, daily travel distances, the time required for regular trips and to get out of the city, etc.
Integration	Integrate urban mobility systems with other city systems for decision-making consistency and mutually supportive investments towards a common outcome, integrate each part of the overall transport network, systematically include resilience within and between city systems.	Create joint ownership of several city government policies among different agencies helps to exchange information and data exchanges and thus to align responses across departments.

... applied to urban mobility...

A resilient transportation system is one that promotes safe, equitable and inclusive accessibility by providing sustainable, integrated, flexible, and robust mobility options – during normal times and times of crisis .

Urban mobility resilience entails the identification of key resources for mobility, and the consequence of a potential reduction of these resources, for whatever reason or crisis.

Climate

Train cables melt and roads buckle in Northwest's 46C heatwave

'Additional impact likely tomorrow with another day of extreme heat. Remain vigilant on your commutes,' warns national weather body

Clara Hill | @clara_sh | 2 days ago | 3 comments



Research and innovation needs
Planning –
Enabling –
Providing
a resilient mobility system



Planning a resilient Mobility system

Establish Typology

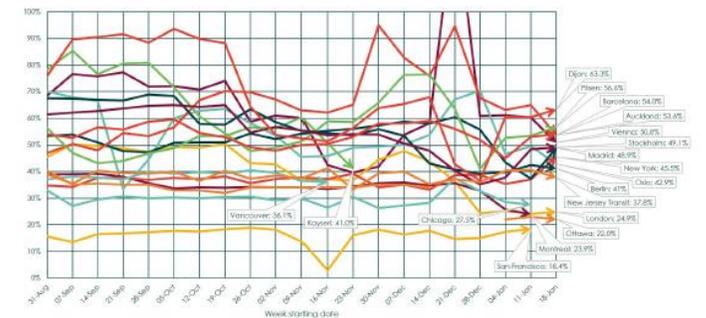
- High number and diversity of potential events
- Temporal: Short – medium and long-term crises
- Territorial: Global to (hyper-)local
- Different scale/timeline of impacts – including human behaviour

Planning methodologies

- Scenario-based planning addressing uncertain future challenges
- Integration in SUMPlanning processes and outputs
- Integration in the 15-minute city concept
- Mobility as part of overall urban resilience planning

Monitor to predict

- Indicators and critical levels must be defined to assess the status of the system and provide up-to-date crisis predictions
- Behavioural aspects should not be forgotten
- EU wide benchmark for resilience – standardization, common analytical tools



Source: Rupprecht Consult, UITP

EU Research & Innovations needs with regards to planning a resilient mobility system

Establish a crises and risks typology	1.	Map all the different trends bearing risks of acute shocks and chronic stresses
Adopt crisis- and risk-oriented planning methodologies	2.	Adopt a scenario-based approach to decision-making in urban mobility
	3.	Update and enrich research on the integration of resilience in SUMP's with use cases
	4.	Define protocols and recommendations on most efficient crisis decision-making processes in view of resilience, based on studies of previous situations
	5.	Include Resilience in definition and implementation of the 15-minutes-city concept
	6.	Integrate resilience of the mobility system in an overall resilience plan
Monitor the mobility ecosystem condition to predict crises	7.	Define indicators and critical levels to assess the status of the system and provide up-to-date crisis predictions, and provide recommendations on allocation of resources to this constant monitoring
	8.	Define new social behaviour indicators to predict crises originated or amplified by changing user practices
	9.	Study the impact of policy measures adopted in times of crisis on social behaviour, on short-term and long-term
	10.	Provide standardisation of the defined indicators, and of the data collected, based on analysis of data collection processes in cities and the efficiency the data exploitation
	11.	Develop a standardised EU wide benchmark test for resilience



Enabling a resilient Mobility system

Governance models

- Partnership models – empowering local actors to co-create solutions
- Decision support tools – throughout the entire UM decision making process (legal/strategic to operational)
- Resilience protocols

Data as a resource

- Key data enabling monitoring and preparedness
 - Documenting past crises and events
 - Monitoring (see 'planning')
 - Real-time status of the system
- Data governance: enabling access to these key-data
- AI and data science for optimal use of these data



EU Research & Innovations needs with regards to enabling a resilient mobility system

Governance models	1.	Conduct pilot projects and exchange of best practices on partnership models fostering trust and enabling empowerment of these actors
	2.	Define a model to value resilience in decision-making processes
	3.	Provide recommendations for and promote systematic scrutiny of laws, monitoring their update and suitability to currently identified risks and challenges
	4.	Enable communication and community building on processes related to resilience protocols, to optimise them
Data as a resource	5.	Support access to necessary data, based on recommendations provided in Table 2
	6.	Explore new models for data control to facilitate data sharing
	7.	Examine IP laws to avoid unreasonable barriers to data sharing and provide guidance on the responsibilities of data providers and data controllers toward the quality and traceability of their data
	8.	Create frameworks for public–private partnerships in the governance of data sharing initiatives
	9.	Define optimal organisation of governing bodies to enable data sharing
	10.	Test and further develop artificial intelligence (AI) and data science as technologies enabling the improvement of the mobility system resilience



Providing a resilient Mobility system

Infra

- Digital infrastructure: robust, secure, transparent
 - Redundant and flexibility: where / how to apply?
- Physical infrastructures: Integration in new as well as retro-fitting of existing infrastructures
 - 'Critical' urban mobility infrastructures
- Energy infrastructures for mobility



Services

- Public transport
- Active travel
- New mobility services
- Urban Freight Logistics



Network Mgmt

- Traffic management
- Urban vehicle access regulations



EU Research & Innovations needs with regards to providing a resilient mobility system

Digital Infrastructure	1.	Create a robust, secure, and transparent data infrastructure with back-end processes and standards, middle layer real-time information sharing, and front-end MaaS/TaaS seamless service for the user
	2.	Provide recommendations for redundant and flexible technical solutions, and testing of the applicability and use of current standards and protocols in crisis situations
Physical infrastructure	3.	Define models to integrate systematic planification and indicators of resilience when building infrastructure or connecting existing assets with new modes, vehicles, or uses
	4.	Support good practices exchange and living knowledge creation on what is effective in terms of prioritisation of destinations and infrastructure, and what does not help
	5.	Connect research on infrastructure resilience with research on the 15-minutes-city concept
Energy infrastructure	6.	Investigate the consequences of securing infrastructure in view of a specific threat, like terrorism
	7.	Explore and test tools to integrate energy infrastructure in urban mobility planning to guarantee critical energy supply in unforeseen crisis situations, and to systematically integrate energy considerations in the set-up of new mobility services
Public transport	8.	Identify key data to inform on the intensity of risks on public transport and the probability that they could occur, to facilitate monitoring and prevention
	9.	Support the definition of the required funding levels and governance frameworks for public transport adaptation to shocks through living labs and pilot projects
	10.	Investigate on the information required by users on services in case of disruption, and support the development of a bidirectional data infrastructure for data collection by citizens and specific data provision by authorities
Active travel	11.	Support awareness raising, reallocation of space and infrastructure building, modelling and assessment of use of urban space, to promote active travel, as recommended in Table 3
	12.	Encourage and support studies on the consequences of the sedentary lifestyle and opportunities for change, in parallel to research on the obstacles to the transformation of this lifestyle into a dynamic one based on active travel
New Mobility Services	12.	Define and test partnership and cooperation models between NMS and public transport authorities
	13.	Build capacity for the attribution of public funding and the development and maintenance of digital platforms
	14.	Develop standards for connectivity and digitalisation, and provide a framework for planning connectivity
Urban Freight Logistics	15.	Develop a scenario-based participative research to define critical needs for citizens in times of crisis and the services that should be prioritized
	16.	Improve the resilience of urban freight logistics by including new technologies and services in city logistics
	17.	Capture the impacts of crises on city logistics by integrating land use and transport planning, and by building data-driven capacity to identify, track and deploy innovative urban mobility solutions
Traffic Management as a Service	18.	Conduct pilots and capacity building actions to integrate NMS in TMaaS, and prioritise most sustainable and accessible modes
Access Regulatory measures	19.	Facilitate the pilot implementations of parking strategies in the SUMP of European cities
	20.	Raise awareness and facilitate the use of UVARs and related tools

Research Methodology, capacity building and exchange



Towards a new UM innovation culture

- Crises cannot be demonstrated.
- Qualitative research methods = quantitative / modelling
- 2017 UM Roadmap's recommendation on 'mainstreaming, transferability, upscaling UM innovation' apply.
- Peer-to-peer transfer and hands-on exchange to fully integrate resilience in the UM innovation culture

