MOBILITY 4 EU

EUROPEAN ACTION PLAN
FOR USER-CENTRIC AND CROSS-MODAL TRANSPORT IN 2030

EU COORDINATION AND SUPPORT ACTION H2020
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In this booklet:

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THE ACTION PLAN FOR TRANSPORT IN EUROPE IN 2030 DETAILS MEASURES THAT ADDRESS TECHNICAL TOPICS ESPECIALLY REFERRING TO SOCIETAL ASPECTS AND ISSUES FOR MULTI-STAKEHOLDER INTERACTION, AS E.G. POLICY, USER ACCEPTANCE, STANDARDIZATION, COLLABORATION AND THE INTEGRATION OF THE USER PERSPECTIVE INTO THE R&D&I PROCESS.

Multiple existing strategies and published roadmaps address these issues in its entirety or for individual modes or freight only. These initiatives are driven by the research community, the industry or policy, but only rarely from a user perspective. The Action Plan produced by Mobility4EU intends to fill this gap and provide recommendations for R&D, deployment, policy and regulatory framework and other implementation-related issues from a user-centered and cross-modal perspective. Thus, the Action Plan adds to initiatives by providing recommendations on mainstreaming of universal design and user-centric design processes, synergies and collaboration potential between modes and the combination of transport of passengers and freight. The Mobility4EU Action Plan is structured within six main action areas:

LOW / ZERO EMISSION MOBILITY

AUTOMATION AND CONNECTED TRANSPORT

SAFETY AND (CYBER-) SECURITY IN TRANSPORT

MOBILITY PLANNING

CROSS-MODAL / CROSS-BORDER TRANSPORT AND INTEGRATION OF NOVEL MOBILITY SERVICES IN PUBLIC TRANSPORT

INCLUSION: PUTTING THE USER IN THE CENTRE

For each, an individual roadmap has been compiled that details recommendations for research, innovation and implementation in transport both in technical and non-technical domains for achieving the future transport system envisioned. Proposed actions were categorised into action fields depending on whether they had a technical or societal/user-centric focus or if they principally targeted an improved collaboration of stakeholders from different domains. Actions in the roadmap have been further compiled along the following timeline: immediate (2020), short-term (2025) and medium-term (2030). Also, the stakeholder groups responsible for the implementation are listed.

The Action Plan has been put into a broad stakeholder consultation. It has been discussed within various sessions of conferences and workshops targeting different stakeholder groups. Furthermore, an online survey has been implemented to widen the reach and gather systematic feedback.

From the Action Plan, specific recommendations targeted towards the individual stakeholder groups have been compiled.

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THE ACTION PLAN FOR TRANSPORT IN EUROPE IN 2030 DETAILS MEASURES TO ACHIEVE A USER-CENTRED AND INTEGRATED TRANSPORT SYSTEM FOR PASSENGERS AND FREIGHT.

DERIVING THE VISION AND ACTION PLAN

The Action Plan for the future of transport in Europe in 2030 is based on the identification and assessment of societal challenges that will influence future transport demand and supply presented in the previously published Context Map.

A portfolio of 93 promising and innovative transport solutions across all modes answering the resulting demands has been published within the Opportunity Map. Based on these results, and by adopting a Multi-Actor Multi-Criteria Analysis (MAMCA), 4 scenarios for the development of future transport in Europe were built and ranked by stakeholders. A further prioritisation of solutions has been carried out through an adapted Extended Failure Mode and Effects Analysis (FMEA). Two scenarios emerged, moving towards personalisation and digitalisation with a rather strict regulation on carbon emissions in all mobility aspects. The results have been taken within a creative process of vision building together with all stakeholders. The Vision for transport in Europe in 2030 summarises all results and presents the goal for the Action Plan. The Action Plan has also been compiled in a participative process and has been put into a broad stakeholder consultation.

THE MOBILITY4EU ACTION PLAN IS STRUCTURED WITHIN SIX MAIN ACTION AREAS. FOR EACH AREA, A ROADMAP DETAILS RECOMMENDATIONS FOR RESEARCH, INNOVATION, AND IMPLEMENTATION IN TRANSPORT BOTH IN TECHNICAL AND NON-TECHNICAL DOMAINS FOR ACHIEVING THE FUTURE TRANSPORT SYSTEM ENVISIONED.

Proposed actions were categorised into action fields depending on whether they had a technical or societal/user-centric focus or if they principally targeted an improved collaboration of stakeholders from different domains. Actions in the roadmap have been compiled along the following timeline: immediate (2020), short-term (2025) and medium-term (2030). Furthermore, the responsible stakeholder groups for the implementation are listed. The structure of the action plan is outlined in the table below.

MAIN ACTION AREAS				
ACTION FIELDS + SUB-FIELDS	RESPONSIBLE STAKEHOLDERS	ACTION ITEMS		
		IMMEDIATE	SHORT-TERM	MEDIUM-TERM

In order to structure the complex topic of integrated and user-centred transport for passengers and freight, six action areas have been defined. They can be derived as prevalent or decisive themes within the vision. The six action areas are:

LOW / ZERO EMISSION MOBILITY

AUTOMATION AND CONNECTED TRANSPORT

SAFETY AND (CYBER-) SECURITY IN TRANSPORT

MOBILITY PLANNING

CROSS-MODAL/ CROSS-BORDER TRANSPORT AND INTEGRATION OF NOVEL MOBILITY SERVICES IN PUBLIC TRANSPORT

INCLUSION: PUTTING THE USER IN THE CENTRE

THE FOLLOWING
STAKEHOLDER GROUPS
HAVE BEEN ADDRESSED
REFERRING TO THE MAIN
LEVEL MENTIONED:

INDUSTRY

Terminal infrastructure
for freight and passengers
(construction).

Network infrastructure
for freight and passengers.

Private and commercial vehicle
manufacturers (cars, trucks,
boats, aircrafts) (including
suppliers).

Public transport vehicle
manufacturers (bus, railway,
metro, aircraft etc.).

IT/ITS solution developers
(including data collection and
management services, traffic
management).

USER REPRESENTATIVES

Representative of disabled
and/or elderly transport users.

Representative of travellers
in general (car drivers, public
transport commuters).

Representative of pedestrian,
cyclists and/or vulnerable users.

FREIGHT SERVICE OPERATORS

Logistics company, freight
forwarder, road, rail, maritime,
inland waterways, air.

ENERGY NETWORK OPERATORS

Energy providers

STANDARDISATION BODIES

EUROPEAN TRANSPORT AND MOBILITY FORUM

NGOs

SHIPPERS OF GOODS

Retailers, Wholesalers,
Goods manufacturers.

OPERATORS

Passenger service operators
(public transport and car sharing
operators, all transport modes).

Terminal infrastructure
for freight and passengers
(management, operation of
ports, airports, logistics centres).

Network infrastructure
for freight and passengers
(management, operation of
roads, railways, waterways).

POLICY MAKERS

Local policy makers, municipality
or transport authority (city or
metropolitan area).

Regional or national policy
makers, municipality or transport
authority (larger regions and central
government).

European Commission.

R&D COMMUNITY

Universities, Research institutes,
Research departments of industry.

LOW / ZERO EMISSION MOBILITY

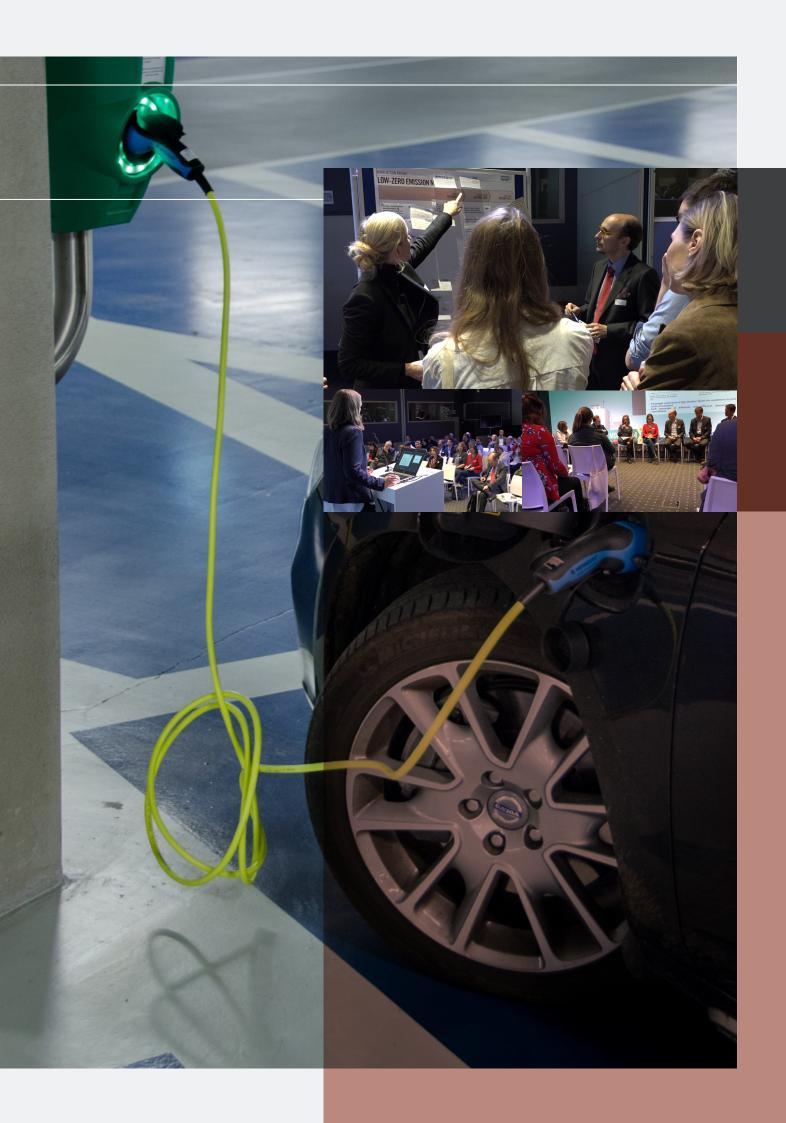**ACTION AREA** DESCRIPTION

This action area deals with electrification in all transport modes and hybridisation and the use of alternative fuels, especially for heavy duty vehicles, for water and for airborne transport.

Also, the implementation of the required charging and alternative fuels infrastructure as well as the integration of electric vehicles into the smart grid is included. Another aim is the achievement of higher energy efficiency of vehicles, infrastructures and the transport system itself.

A modal shift to the active modes walking and cycling as well as to public transport is an important factor in reducing motorised traffic and thus emissions. For freight transport, this is related to a modal shift to rail transport, inland waterways and to electrified and active modes in urban last mile delivery. Solutions for decarbonising freight transport, as e.g. combining transport of people and goods (co-modality) are considered. Last not least, the reduction of transport emissions (noise, NOx, PM10) and thus risks for health are an issue under this headline.

ACTION FIELDS AND SUB-FIELDS

#1	ACTION FIELD **TECHNICAL AND OPERATIONAL LAYERS OF MOBILITY**	RESPONSIBLE **STAKEHOLDERS**
SUB-FIELD 1.1 **VEHICLES**		Policy makers Industry R&D community Operators
		Policy makers Industry R&D community
SUB-FIELD 1.2 **INFRASTRUCTURES**		Policy makers Industry Operators
		Policy makers Operators Freight service operators R&D community Industry
		Policy makers Industry R&D community Operators
		Industry R&D community
SUB-FIELD 1.3 **TRANSPORT OFFERS**		Policy Makers Operators R&D community
		Operators Policy Makers

LOW-ZERO EMISSION MOBILITY

ACTIONS

IMMEDIATE ACTIONS 2020	SHORT-TERM ACTIONS 2025	MEDIUM-TERM ACTIONS 2030
Create policy framework supporting innovation in transport. Support the development of cost-efficient, high-capacity, reliable and safe lithium-free batteries for electric and hybrid vehicles. Support the activities for setting-up battery cell production in Europe.	Initiate large-scale technology demonstrators for electrified heavy-duty road vehicles and vehicles in air and waterborne transport as well as alternative low-emission fuels in applicable cases. Introduce low-/zero-carbon heavy duty road vehicles, and in selected cases of air and waterborne transport. Approach infrastructure for respective fuels and electricity in a synergetic manner for all modes. Integrate low environmental impact/low energy consumption autonomous air transport concepts into segregated airspace. Introduce large-scale deployment of electric ferries based on fuel cells.	Widely introduce electrified vehicles and vehicles in air and waterborne transport. Deploy electric or hybrid ferries and port vessels powered by wind and sun. Enhance electrification rate in rail targeting more than 80%. Employ drones and shared public transport services for logistics.
Reduce transport noise emissions (e.g. for freight trains).		
Increase investment in sustainable renewable fuels technologies and infrastructure. Assess needs for (urban) charging infrastructure (conductive and inductive) for all modes. Maximise share of renewable energies in the grid.	Sustain advancements by continuous support for successful investment mechanisms.	
Initiate pilots and test sites for infrastructure options for electric trucks and develop comprehensive cost-benefit analysis.	Standardise on-road charging infrastructure for electrified trucks and develop feasible business models.	
Enhance energy efficiency in rail transport.		
Develop and introduce smart recycling infrastructure for batteries and vehicle components.		
Establish urban purely electric car sharing offers integrated in public transport system. Implement and monitor short-term (non-permanent) benefits for early-adopters of electric vehicles. Research benefits of electric urban air mobility.	Establish rural purely electric car sharing offers integrated in multimodal public transport.	
	Move commuters to water transport using electrified high-speed ferries.	Foster the integration of waterways by providing seamless interfaces to other modes.

#2 ACTION FIELD
SOCIETAL ASPECTS

RESPONSIBLE
STAKEHOLDERS

SUB-FIELD 2.1
POLICY AND REGULATORY FRAMEWORK

Policy makers
Industry
NGOs
Operators
Shippers of goods
Freight service operators

Policy makers
Operators
Industry

Policy makers
Industry
R&D community

Policy makers
Industry
R&D community

Policy
Industry
R&D community
NGOs

Policy makers
Industry
R&D community
Operators

LOW-ZERO EMISSION MOBILITY

IMMEDIATE ACTIONS 2020	SHORT-TERM ACTIONS 2025	MEDIUM-TERM ACTIONS 2030
Develop directive and strict programme ensuring transport sector contribution to achievement of 1.5-2 degree target of the Paris agreement. Enact policy measures to effectively reduce harmful emissions in transport. Establish a regular control and adaptation process of emissions standards and respective executing institution. Monitor environmental footprint of transport solutions and propose strategies for an emission-based incentives scheme and feasible emission-free corridors. Fund collaborative decarbonisation of transport in all modes.	Support member states in implementation of regular control, discussion and adaption process of emission standards. Establish the emission-based incentives system and implement emission-free corridors. Enable the determination of carbon footprint in logistics and freight transport. Balance the mode share according to the real costs and sustainability aspects.	
Set-up a broad stakeholder group to plan for full electrification of rail infrastructure and support member states to derive national plans.	Implement electrification of rail infrastructure according to the plan agreed on national and EU level and promote standardised concepts.	
Reinforce development of sustainable business models for standardised charging and alternative fuels infrastructure in all modes. Support member states in implementing the Alternative fuels directive and cities in deploying infrastructure and incentivise especially electric bus fleets. Develop innovative (electrified buses) procurement processes and instruments and build competencies on local and national levels.	Explore synergies for electric and alternative fuels infrastructure with all modes and with energy networks for other sectors than transport. Identify feasible financing for charging infrastructure for buses and ensure energy supply for electric bus fleets. Connect infrastructure to urban smart grids.	Support wide implementation of alternative fuels infrastructure according to demand in all modes.
Introduce strict environmental regulations in shipping and ports. Analyze the potential of incentives for renewable fuels in air transport together with stakeholders.	Apply the best practice findings of the analysis on potential incentives.	
Install a global institution equipped with all necessary execution rights which is in charge for the balanced allocation of free carbon allowances to entities and traded certificates. Develop tools for monitoring the development of market price of emissions and number of free carbon allowances. Implement global emissions trading and offsetting measures.	Enact the obligation to monitor and report detailed data on carbon emissions. Control the allocation of carbon allowances through global standards for all emission producing entities.	
Propose common regulatory framework for decarbonising logistics. Promote best practices to connect transport of people and goods. Agree on European wide tax scheme for road and rail for freight.		

#2 ACTION FIELD
SOCIETAL ASPECTS

RESPONSIBLE
STAKEHOLDERS

SUB-FIELD 2.2
USER PERSPECTIVE

Operators
Policy
European Transport and
Mobility Forum

Policy
R&D community
User representatives

LOW-ZERO EMISSION MOBILITY

Campaign the benefits of electric road vehicles and enable users participation in the transition process through EV use in public transport and shared services etc.

Design a low-/zero emission transport system tailored to user needs by exploring user needs and expectations and then defining user profiles and mobility patterns.

Enable users to control their personal carbon footprint and incentivizing its reduction.

Support bottom-up approaches to low/zero emission mobility solutions.

Explore opportunities to adapt transport offers to user needs and mobility patterns.

Make personal carbon footprint a mandatory parameter when developing new solutions.

IMMEDIATE
ACTIONS 2020

SHORT-TERM
ACTIONS 2025

MID-TERM
ACTIONS 2030

#3 ACTION FIELD
MULTI-STAKEHOLDER INTERACTIONS AND PROCESSES

RESPONSIBLE
STAKEHOLDERS

SUB-FIELD 3.1
COLLABORATION OF STAKEHOLDERS

Policy makers
Operators
Energy network operators-
energy providers
Industry
R&D community

European Transport and
Mobility Forum
Operators
Industry
Policy makers
R&D Community

SUB-FIELD 3.2
STANDARDISATION

Policy makers
Standardization bodies
Industry
R&D community

Policy makers
Standardization bodies
R&D community

Industry
R&D community
Shippers of goods
Freight service operators

LOW-ZERO EMISSION MOBILITY

IMMEDIATE ACTIONS 2020	SHORT-TERM ACTIONS 2025	MEDIUM-TERM ACTIONS 2030
Foster information exchange between cross-modal stakeholders. Adapt push/pull measures in close cooperation of policy makers and industry.	Harmonise planning of energy and transport networks by joined working groups of energy and transport sector and of member states and regions.	
Facilitate knowledge and technology transfer between stakeholders working on electrification, alternative fuels or automation of all modes in workshops, conferences and comprehensive projects. Stimulate cross-ETP task forces and other platforms and expert groups.	Bring stakeholders from different sectors together to promote sector coupling, connecting infrastructures and common utilization.	
Standardise on-road charging for electrified trucks and wireless charging infrastructure for pan-European use.	Deploy standardised wireless and conductive charging infrastructure.	
Initiate a multi-stakeholder dialogue about EU-wide standard for dynamic urban road user charging.		
	Standardise modular containers and protocols and interfaces to enable physical internet.	

AUTOMATION AND CONNECTED TRANSPORT

ACTION AREA DESCRIPTION

Automated driving in all modes, but also other applications of automation as e.g. automated maintenance of vehicles and infrastructures, is considered. Connected and cooperative driving, smart infrastructure (c-ITS) and smart traffic management systems are included in this action area as they pave the way for automation.

The focus is on the support of benefits towards a decarbonised, integrated and user-centred transport system. These encompass higher capacity; higher efficiencies, especially in rail and waterborne transport; enhanced safety; personalisation; integration of automated vehicles and services in transport system and enabling cross-border usage. At the same time, ethical questions, issues of legal framework, harmonisation between EU member states in terms of policies and standards, user acceptance and education and qualification are integrated in this action area as they are the biggest barriers towards implementation of automation.

#1 ACTION FIELD
TECHNICAL AND OPERATIONAL LAYERS OF MOBILITY

RESPONSIBLE
STAKEHOLDERS

SUB-FIELD 1.1
VEHICLES

Industry
R&D community
Policy makers

Industry
R&D community
User representatives
Policy makers

Policy makers
Industry
R&D community
Shippers of goods
Freight operators

Industry
Operators
R&D community

SUB-FIELD 1.2
INFRASTRUCTURES

Policy makers
R&D community
Industry
Operators

SUB-FIELD 1.3
TRANSPORT OFFERS

Industry
Mobility providers
R&D community

Industry
R&D community
Operators

AUTOMATION AND CONNECTED TRANSPORT

IMMEDIATE ACTIONS 2020	SHORT-TERM ACTIONS 2025	MEDIUM-TERM ACTIONS 2030
Enable mobility everywhere for everyone through technology development of, e.g. sensors, artificial intelligence, machine learning, predictive maintenance, safe and secure vehicle software and electronics. Allow adequate testing and learning phases under real driving conditions. R&D to compensate drivers' inattentiveness.	Support innovation and testing of vehicles and infrastructure. Enable pilots creating policy framework including security and safety aspects for automated vehicles in public areas. Extensively test self-learning systems for automated and connected transport in terms of ethical compliance of its decisions. Provide training in automated driving for transportation providers, administrators, etc.	Implement automated transport across EU by means of the rollout of good practices agreed upon.
	Foster inclusive use of automated and connected vehicles by performing a comprehensive design-to-needs analysis. Prioritise research on how automation can support ageing population and implement results.	
Enhance efficiency and capacity in rail projects for automated maintenance and transfer of goods between modes.	Develop automated trains for freight and passengers based on experience in airtrain and subway solutions. Implement pilots for automated transfer of goods between modes.	Enhance impact regarding modal shift by installing full automated multi-modal logistics centre including automated (re)packaging.
	Increase degree of automated flight operations incrementally.	
Increase projects and pilot regions for testing, e.g. of infrastructure-supported automated driving and of rail tracks for autonomous trains. R&D on infrastructure for urban automated air mobility.	Intensify development and use of automated trains and road vehicles by investment and funding programmes and exploit possibilities for conversion of existing into smart infrastructure.	Evaluate pilot regions (road, rail) and provide a comprehensive cost analysis for certain user scenarios. Promote roll-out of good practices. Implement demonstrators for urban automated air mobility.
	Research and demonstrate last-mile transport by autonomous vehicles.	Improve door-to-door transport services by integrating automated vehicles in multi-modal seamless transport.
Develop smart strategies for exploitation of Big Data solutions to forecast and take into account user needs. Optimise transport system through proactive traffic management and re-routing.	Create intelligent decision support systems for passengers and transport operators enabling smart travel demand management.	

#2	ACTION FIELD **SOCIETAL ASPECTS**	RESPONSIBLE **STAKEHOLDERS**
	SUB-FIELD 2.1 **POLICY AND REGULATORY FRAMEWORK**	Policy makers Industry R&D community
		Industry R&D community User representatives Policy
		Policy makers
	SUB-FIELD 2.2 **USER PERSPECTIVE**	User representatives Operators

AUTOMATION AND CONNECTED TRANSPORT

IMMEDIATE ACTIONS 2020	SHORT-TERM ACTIONS 2025	MEDIUM-TERM ACTIONS 2030
Assess needs for regulatory framework to accommodate automated and mixed (urban) transport. Initiate discussion of ethical board/commission focussing on controversial situations as, e.g. product liability, data ownership etc. Create pilots on full automation to prepare basis for later adaptation of legal frameworks.	Develop legal and regulatory framework harmonised between member states for the safe use of automated vehicles on public roads and in mixed traffic and ensure exploitation for inclusive transport.	Adapt and optimise the legal and regulatory framework for automated and connected driving according to experiences in pilots.
Support coordination of activities in member states to implement efficient standardised 5G mobile communications network and the "5G For Europe" Action Plan. Support existing activities for legal clarification of 5G roll-out.		
Support the implementation of autonomous vehicles by enforcing car-free city centres.	Introduce dedicated roadways for automated vehicles in particular in urban areas.	
Explore conditions for users acceptance and adoption of automated vehicles and new mobility services also perspectives in terms of regulatory changes and new legal framework. Raise awareness for benefits and inform about developments especially regarding safety, security and ethical concerns. Enable experiencing automated services in public transport and sharing concepts. Provide trainings for drivers of automated vehicles. Explore impact jobs.	Support users to understand the impact of automation on sustainability and seamless transport by including automated transport in planning tools. Use automation as an incentive for public transport and shared mobility. Develop convenient sharing concepts through automated maintenance of vehicles and defining ways for implementation.	

#3 ACTION FIELD
MULTI-STAKEHOLDER INTERACTIONS AND PROCESSES

RESPONSIBLE STAKEHOLDERS

SUB-FIELD 3.1
COLLABORATION OF STAKEHOLDERS

Industry
R&D community
Operators
Policy makers
User representatives

Policy makers
Operators
Freight service operators
R&D community

SUB-FIELD 3.2
STANDARDISATION

User representatives
Operators

Industry
R&D community
Policy
User representatives
Standardization bodies

AUTOMATION AND CONNECTED TRANSPORT

Initiate dialogue between stakeholders and municipalities on the potentials and preconditions of automated driving in urban areas. Discuss issues of safety and possible social consequences of CAD with relevant stakeholder groups, municipalities and users. Create ethical board for CAD representing the entire society.	Sustain dialogue through continuously monitoring and developing issues to be discussed with broad stakeholder base.	
Initiate strategy meetings between manufacturers and cities for planning implementation and financing of automated maintenance solutions. Define roles of hubs and warehouses in automated transport.	Implement means to secure data and research improved quality of data monitoring tools. Agree on EU wide database with data on infrastructure components. Share data, techniques and methods with responsible stakeholders.	
Promote the deployment of automated transport systems by the definition of standards, e.g. harmonised standards for rail vehicles and infrastructure.		Standardise and homologate automated systems in all modes (vehicles, infrastructure, other systems as e.g. for maintenance).
Support standardisation activities for V2X Day-2 applications bringing in user perspectives. Discuss with stakeholders from all modes potential for standardised interfaces for data transfer and communication.		

| IMMEDIATE
ACTIONS 2020 | SHORT-TERM
ACTIONS 2025 | MEDIUM-TERM
ACTIONS 2030 |

SAFETY AND (CYBER-) SECURITY IN TRANSPORT

ACTION AREA DESCRIPTION

Protection of transport users, especially vulnerable road users is considered in this action area. Technology means, design of infrastructure and urban design are included.

Enhanced safety is in this context also seen as a means to motivate walking, cycling and use of public transport. (Cyber-) Security in the novel transport system is an important topic, especially in the context of automated and connected driving and the increasing deployment of digital technologies such as artificial intelligence, big data and Internet of things (IoT) in transport. Policy measures are included to ensure data security and privacy, referring to the entire transport supply chain, and on raising user-awareness for this topic.

#1 ACTION FIELD
TECHNICAL AND OPERATIONAL LAYERS OF MOBILITY

RESPONSIBLE
STAKEHOLDERS

SUB-FIELD 1.1
VEHICLES

Industry
R&D community
Policy makers

Freight service operators
Industry
R&D community

SUB-FIELD 1.2
INFRASTRUCTURES

Policy makers
R&D community
Industry
Operators

Industry
R&D community

SUB-FIELD 1.3
TRANSPORT OFFERS

Industry
R&D community
Operators
Freight service operators

Industry
R&D community
Operators
Policy makers

Industry
R&D community
Operators
Freight service operators

SAFETY AND (CYBER-) SECURITY IN TRANSPORT

Reinforce the development and deployment of driver assistance systems protecting vulnerable road users on short term especially for trucks in cities.	Promote automated functions within an initial phase especially for buses, trucks and high-end cars and C-ITS applications especially for heavy vehicles.	Address issues of mixed traffic of road users with and without assistance systems.
Enhance safety and security in logistics by interoperable tracking of containers/boxes.	Develop a framework for cyber-security in logistics and ensure IT connectivity which allows plug and play data sharing.	
Promoting research on impact of different types of infrastructure in different scenarios, e.g. use of segregated lanes.	Promote benefits of urban design of secure, safe and resilient infrastructure. Implement C-ITS infrastructure for safety applications.	
Improve safety and resilience of infrastructure by researching self-monitoring and self-healing infrastructure (smart materials, smart systems, smart connected operations).	Pilot self-monitoring and self-healing infrastructure. Identify business and financing models.	Deploy and continuously advance self-monitoring and self-healing infrastructure.
Develop assessment methods of safety and security performance of seamless journeys and digital technologies.		
Enhance safety of vulnerable road users by considering urban design/infrastructure status in routing for seamless journeys. Make vulnerable road users "digitally visible" through IoT-enabled safety devices.	Renew technical standards and conducts of co-development of different service interfaces. Increase privacy protection of applications with more detailed and universal user data specifications and standardization.	Make Mobility as a service (MaaS) safe and secure.
	Increase data security and privacy in authentication and payment processes for mobility services e.g. by concept of Trustee Roles, blockchain etc and support activities of respective initiatives.	

IMMEDIATE
ACTIONS 2020

SHORT-TERM
ACTIONS 2025

MEDIUM-TERM
ACTIONS 2030

#2 ACTION FIELD
SOCIETAL ASPECTS

RESPONSIBLE
STAKEHOLDERS

SUB-FIELD 2.1
POLICY AND REGULATORY FRAMEWORK

Policy makers
Operators
Industry
NGOs

SUB-FIELD 2.2
USER PERSPECTIVE

Policy makers
Industry
NGOs
Operators
User representatives
European Transport and
Mobility Forum

Policy makers
User representatives

SAFETY AND (CYBER-) SECURITY IN TRANSPORT

Empower EU wide harmonised security and privacy regulations for the collection, use and processing of data in transport related issues.

Ensure impact of new General Data Protection Regulation (GDPR) on all issues of data security.

Support member states to implement the European Network and Information Security Directive.

Provide a clear legal framework for usage of users data and EU-level institution monitoring compliance.

Develop and enact a new General Data Protection Regulation (GDPR) for freight, defining data ownership and access rights to collected information.

Support policy makers in the implementation of policies and regulation.

Raise user awareness on the importance of data security and privacy in transport-related applications by facilitating a PR campaign and education programmes.

Promote transparency and proper information on data collection, ownership, processing and use and making the conformity of these issues mandatory throughout the EU.

Develop common intra-EU privacy and safety statements providing a predefined set of needs with options to be shared between user and operator before travel start.

Define an acceptance envelope defining the causes of vulnerability and setting their value for acceptance.

Define KPIs from the users' perspective and the service providers' perspective in order to decide how to bridge the gap and address possible mismatches.

IMMEDIATE
ACTIONS 2020

SHORT-TERM
ACTIONS 2025

MEDIUM-TERM
ACTIONS 2030

#3 ACTION FIELD
MULTI-STAKEHOLDER INTERACTIONS AND PROCESSES

RESPONSIBLE
STAKEHOLDERS

SUB-FIELD 3.1
COLLABORATION OF STAKEHOLDERS

Policy makers
Operators
R&D community

Policy makers
Industry
R&D community

Operators
R&D community

SUB-FIELD 3.2
STANDARDISATION

Industry
R&D community
Standardization bodies

Policy makers
R&D community
Operators

SAFETY AND (CYBER-) SECURITY IN TRANSPORT

Educate mobility providers about data security, open data and application of new General Data Protection Regulation (GDPR) and share best practices.	Provide new training schemes and education curricula for the future transport workforce (i.e. automated transport drivers).	
Improve data/cyber security in transport by supporting cooperation with experts from other application fields.		
Improve safety and resilience capacity in public transport by smart staff management in risk prevention and emergency cases.		
Establish stable, standardised communication protocols for C-ITS in all application areas.		

Increase interoperability and compatibility by harmonising or developing national standards.

Achieve compliance to "The Network and Information Security Directive" (NIS Directive).

IMMEDIATE **ACTIONS 2020**	SHORT-TERM **ACTIONS 2025**	MEDIUM-TERM **ACTIONS 2030**

MOBILITY PLANNING

ACTION AREA DESCRIPTION

From the stakeholder consultation process, actions on the planning of active modes, hubs and smart city applications have been prioritised in the roadmap as they emerge as horizontal actions from other Mobility4EU topics (interoperability, energy efficiency, health, etc.).

Another issue is the participation of citizens in the design of a new transport system and the establishment of participatory forms of governance.

#1	ACTION FIELD **TECHNICAL AND OPERATIONAL LAYERS OF MOBILITY**	RESPONSIBLE **STAKEHOLDERS**
	SUB-FIELD 1.2 **INFRASTRUCTURES**	Policy makers R&D community Operators
		Industry R&D community Operators User representatives European Transport and Mobility Forum
		Policy makers Operators Industry R&D community
	SUB-FIELD 1.3 **TRANSPORT OFFERS**	Policy makers Operators Industry R&D community

MOBILITY PLANNING

IMMEDIATE ACTIONS 2020	SHORT-TERM ACTIONS 2025	MEDIUM-TERM ACTIONS 2030
Identify changing urban infrastructure needs due to novel mobility behaviour and needs of specific user groups. Create possibilities for a dynamic use of physical infrastructure as e.g. summer bike parking /winter car (sharing) parking.	Define infrastructure needs of novel personal mobility devices including potential to share existing paths.	Promote flexible solutions for lanes configuration allowing shared use of transport network according to changing mobility needs in short and longer term.
Bring stakeholders together to discuss requirements of hubs and modal interfaces of all sizes and support local + regional authorities in the planning of hubs Support local and regional authorities to plan mixed-land use and high-dense urban areas in compact cities, discouraging urban sprawl. Define main corridors to connect hubs and requirements to make them smart and sustainable. Explore the organization of hubs for accommodating automation in seamless travel.	Integrate cross-modal hubs and interfaces into the urban structure and connect them by harmonised infrastructure to smart sustainable corridors. Regenerate suburbs and ensure multiple land-use through integrated urban and regional planning. Integrate cross-modal working groups and user representatives in the whole planning and implementation process. Identify stakeholders responsible for implementation and maintenance of infrastructure.	Provide for update and maintenance of infrastructure enabling accommodation of autonomous vehicles.
Develop plans for cities and regions to deploy smart communication infrastructure also clarifying financing.		
Design new mobility concepts focusing on feasibility and financing and implement by redefining urban planning and mobility schemes. Enable co-creation of novel mobility services through crowdsourcing information from users. Develop tools and methods to integrate shared mobility as a new mode in planning and modelling.	Develop feasible business models for user-centric mobility solutions in the European transport system and incentivise investments in novel mobility solutions. Adapt public transport services and required infrastructure continuously to meet rising demand. Estimate the impact of new mobility solutions on the use of other modes and urban space. Provide tools and measures to establish and further develop co-creation concepts for the development of novel transport solutions.	Verify the effectiveness of planned cross-modal transport offers through user feedback.

ACTION FIELDS AND SUB-FIELDS

		RESPONSIBLE **STAKEHOLDERS**
#2	ACTION FIELD **SOCIETAL ASPECTS**	
	SUB-FIELD 2.1 **POLICY AND REGULATORY FRAMEWORK**	R&D community
		Policy makers Freight service operators
		User representatives Policy makers Operators
		Policy makers European Transport and Mobility Forum User representatives Operators
	SUB-FIELD 2.2 **USER PERSPECTIVE**	Policy makers User representatives

MOBILITY PLANNING

Support local and regional authorities in integrating sustainable mobility strategies in urban planning as key aspect.

Update Sustainable Urban Mobility Plans (SUMPs) based on novel forms of mobility.

Empower local governments to regulate new mobility services in terms of public policy goals and social equity.

Clearly regulate co-existence of personal mobility devices and other modes in the transport system.

Support user-centric smart city applications by creating the legal basis for harmonisation of data security and privacy laws, and by making it clear to the users how and for what purpose their data is used.

Develop concepts for a successful harmonisation of legal measures for freight transport within regions and countries.

Strengthen dialogue between advocates for active mobility and municipalities.

Allocate more resources for active modes infrastructure and widened "Copenhagenise" concepts and foster active mobility-related activities.

Develop a system of incentives and disincentives to discourage car travel and encourage alternatives (e.g. tax reduction for employees commuting to work by bike; a discounted public transport ticket; a bonus-malus system for companies to discourage private car use e.g. through parking regulations).

Discuss opportunities and barriers of online and offline co-creation methods of (urban) mobility solutions with relevant stakeholders, municipalities, and users.

Support regional and local governments in implementing participatory forms of governance for transport-related issues.

Create awareness in residents for the benefits of active modes, e.g. addressing cultural frames and potential conflicts of interests when dedicating limited spaces to different uses in urban areas.

IMMEDIATE
ACTIONS 2020

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#3 ACTION FIELD **MULTI-STAKEHOLDER INTERACTIONS AND PROCESSES**	RESPONSIBLE **STAKEHOLDERS**
SUB-FIELD 3.1 **COLLABORATION OF STAKEHOLDERS**	Industry R&D community
	Policy makers
	Policy makers R&D community

MOBILITY PLANNING

Foster the discussion of benefits, risks and opportunities of big data, connected and automated transport, transport modes in (urban) mobility solutions and requirements of cross-modal transport hubs and interfaces of all sizes among relevant stakeholders.

Foster the design and implementation of the sustainable user-centred transport system by improving communication between the urban planning and transport planning department in cities.

Foster the use of new ways of decision-making that involve a wide range of stakeholders and strive for a consensus of all actors.

Investigate new, smart ways of stakeholder involvement and collaboration through digital tools.

IMMEDIATE
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ACTIONS 2025

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ACTIONS 2030

CROSS-MODAL/ CROSS-BORDER TRANSPORT AND INTEGRATION OF NOVEL MOBILITY SERVICES IN PUBLIC TRANSPORT

This action area focuses on interoperability and harmonisation between modes and European member states to foster the integration of modes, enabling seamless multimodal transport across borders in Europe. Furthermore, the sustainable integration of user-centric mobility services such as Mobility-as-a-service, sharing concepts in existing systems while prioritising public transport are considered.

The aim is to reduce the total number of vehicles and to optimise the use of existing capacities regarding vehicles and infrastructure. Due to the focus on user perspective and cross-modality, proposed actions concentrate on the cooperation of stakeholders from different modes and countries and not on the development of vehicles.

#1	ACTION FIELD TECHNICAL AND OPERATIONAL LAYERS OF MOBILITY	RESPONSIBLE STAKEHOLDERS
	SUB-FIELD 1.1 VEHICLES	Industry R&D community Operators
		Industry R&D community Operators
	SUB-FIELD 1.2 INFRASTRUCTURES	Policy makers Operators Industry
		Policy makers Operators Freight service operators
	SUB-FIELD 1.3 TRANSPORT OFFERS	Policy makers Industry Operators Mobility providers
		Policy makers European Transport and Mobility Forum Operators R&D community User representatives

CROSS-MODAL/ CROSS-BORDER TRANSPORT AND INTEGRATION OF NOVEL MOBILITY SERVICES IN PUBLIC TRANSPORT

IMMEDIATE ACTIONS 2020	SHORT-TERM ACTIONS 2025	MEDIUM-TERM ACTIONS 2030
Develop modular public transport vehicles easily adaptable to demand and equipped to provide necessary information and billing possibilities.		
	Promote the development of train sharing concepts by R&D on autonomous rail vehicles for individual group routes.	
Renew Connecting Europe Facility (CEF) for transport or set up new funding instrument. Promote creation of holistic European concept for long distance public transport infrastructure.	Enforce implementation of EU long-distance public transport infrastructure concept also by subsidies. Define harmonised infrastructure requirements for smart and sustainable corridors within the EU and coordinated with neighbouring countries to enable cross-border transport.	Provide for update and maintenance of infrastructure enabling accommodation of autonomous vehicles.
Explore concepts combining transport of passengers and freight. Develop concept and management system for sharing of (public) transport infrastructure and fleets by different operators/providers and across borders with a focus on rail.	Implement promising use cases of combining transport of passengers and freight. Incentivise shared use of infrastructure and fleets. Exploit benefits of deploying autonomous vehicles in seamless journeys to enhance capacity.	
Support dialogue between relevant stakeholders for developing a common agenda and vision for Maas including its integration in public transport. Agree on roles of public and private stakeholders ensuring service levels and managing subsidies at all levels and create data analytics and exchange framework enabling MaaS. Support the roll-out of MaaS demonstrations.	Provide open application programming interfaces (API) and user data and statistics for all modes and providers, enabling demand-oriented and demand-responsive cross-modal transport offers. Support initiatives on the use of open data/interfaces in public transport and communication of their results. Monitor efficiency of different transport solutions with respect to time, costs, carbon footprint etc. with a focus on multimodal transport solutions or MaaS offers. Creating viable business cases and the necessary business eco-systems for MaaS, showing return of investment.	Investigate the possibilities of an EU-wide MaaS standard/service.
Provide concept for integrated data platform to aggregate demand and supply data for mobility services including means to regulate access.	Develop and demonstrate integrated platform in a suitable pilot scenario.	Support the Pan-European roll-out of this integrated data platform in public transport.

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#2 ACTION FIELD
SOCIETAL ASPECTS

RESPONSIBLE
STAKEHOLDERS

SUB-FIELD 2.1
POLICY AND REGULTORY FRAMEWORK

Industry
R&D community
Operators

Industry
R&D community
Operators

SUB-FIELD 2.2
USER PERSPECTIVE

Policy makers
R&D community
Operators

Policy makers
Operators

CROSS-MODAL/ CROSS-BORDER TRANSPORT AND INTEGRATION OF NOVEL MOBILITY SERVICES IN PUBLIC TRANSPORT

Discuss possible regulatory changes and incentives for a shift to public transport and active mobility options.	Promote implementation of incentives addressing member states and organizations supporting cities.	
Promote regulation of sensitive fields such as liability or competition and support policy makers in this regard.	Develop a uniform compendium of liabilities and responsibilities of each transport mode.	
Ensure equity through e.g. more frequent/ more affordable public transport offers or integrated mobility services. Raising public acceptance of the concept of sharing instead of ownership of vehicles.	Harmonise terms of service of transport and single ticketing solutions across EU including collective liability of operators. Introduce EU-wide harmonised airport access and processes. Enable users to take informed decisions through real-time journey planners and rerouting system for different cities/countries within single information system. Including and prioritizing active modes in travel information systems.	Sustain and incentivise operators to shift towards shared business models to reduce the economic risk. Enable and optimise activities of freight integrators.
	Introduce key figures for the resilience of the transport system, minimise risks and offer alternative transport options in case of disruption.	

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#3 ACTION FIELD
MULTI-STAKEHOLDER INTERACTION AND PROCESSES

RESPONSIBLE
STAKEHOLDERS

SUB-FIELD 3.1
COLLABORATION OF STAKEHOLDERS

Industry
Operators

SUB-FIELD 3.2
STANDARDISATION

Industry
R&D community
Operators
Standardization bodies

CROSS-MODAL/ CROSS-BORDER TRANSPORT AND INTEGRATION OF NOVEL MOBILITY SERVICES IN PUBLIC TRANSPORT

Develop common approach to interoperability in a cross-modal task force of stakeholders.

Improve usability of transport infrastructure for different modes and operators by ensuring interoperability of systems, data and interfaces through standardization and/or common specifications.

Promote the wide use of open data and develop standards.

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ACTIONS 2030

INCLUSION – PUTTING THE USER IN THE CENTRE

ACTION AREA DESCRIPTION

Inclusion within this action area refers to providing accessible and usable transport for all users. The main focus within this action field is on the mainstreaming of universal design principles for vehicles and infrastructure, so that they will be generally accessible and usable for all. Universal design allows full accessibility to vehicles in all modes and transport infrastructure as well as mobility services, in particular to facilitate the use of the transport system for persons with disability and reduced mobility (people with different disabilities or older people, but also people with children's pushchairs or heavy luggage or people with few financial resources).

Furthermore, transport equity and spatial accessibility of transport must be supported in order to enable access to essential services, employment, shopping opportunities and healthcare to everyone. Hence the geographical spread of public transport stations and other mobility services as well as the affordability of transport offers are considered.

#1 ACTION FIELD
TECHNICAL AND OPERATIONAL LAYERS OF MOBILITY

RESPONSIBLE
STAKEHOLDERS

SUB-FIELD 1.1
VEHICLES

Policy makers
Users' representatives
European Transport and
Mobility Forum
Industry
Operators
R&D community

SUB-FIELD 1.2
INFRASTRUCTURES

Policy makers
Users' representatives
European Transport and
Mobility Forum
Industry
Operators
R&D community

Policy makers

SUB-FIELD 1.3
TRANSPORT OFFERS

Policy makers
Users' representatives
European Transport and
Mobility Forum
Industry
Operators
R&D community

INCLUSION – PUTTING THE USER IN THE CENTRE

Collect existing toolkits/guides of universal design in this field and make them available to R&D projects. Create legal basis for European/national regulations making universal design precondition for future vehicle design in all modes. Advertise widely visible good practices on the application of universal design to transport. Announce a prize for good practices in applying universal design in transport. Foster cross-fertilization of best practices among modes.	Put cases of good practices into wider demonstration. Incentivise the development of best practices and minimum requirements regarding accessibility by all mobility operators. Organise annual/biannual prize award ceremony on successful universally designed transport applications.	Evaluate demonstrations and provide guidelines for universally designed vehicles in all modes based on good practices.
Create awareness with policy makers on accessibility needs to transport and communication infrastructure. Provide a toolkit on accessibility to infrastructure providers and operators. Publish the Inventory of Assets, a database of accessibility at hubs.	Improve accessibility at public transport stations based on Inventory of Assets database.	Provide for update and maintenance of infrastructure enabling accommodation of autonomous vehicles.
	Support stakeholders in achieving the EU target for full internet access across the EU.	
Investigate accessibility requirements of shared concepts/services vehicles with regards to needs of persons with disability and reduced mobility. Create awareness of opportunities to operators. Incentivise inclusion of highly accessible routes into journey planners. Collect existing toolkits on accessible and user-friendly interfaces ensuring accessibility to digital mobility services, e.g. travel planners, booking systems. Develop applications with accessible and user-friendly interfaces. Offer support to use required devices and services. Provide training in universal design to all stakeholders and foster application.	Ensure accessibility of shared services and incentivise shared fleets of personal mobility devices at hubs to facilitate mode change for persons with disability and reduced mobility. Support all users to find ways and connection points to other modes by developing cross-modal seamless internal navigation systems, e.g. in hubs, which can be used in all countries in the EU. Target full coverage of accessible multimodal transport offers.	Target full coverage of fully accessible shared services and vehicles developed according to universal design principles.

| IMMEDIATE
ACTIONS 2020 | SHORT-TERM
ACTIONS 2025 | MEDIUM-TERM
ACTIONS 2030 |

#2	ACTION FIELD SOCIETAL ASPECTS	RESPONSIBLE STAKEHOLDERS
	SUB-FIELD 2.1 **POLICY AND REGULTORY FRAMEWORK**	Policy makers Users' representatives European Transport and Mobility Forum Industry Operators R&D community
		Policy makers Users' representatives European Transport and Mobility Forum Operators R&D community
	SUB-FIELD 2.2 **USER PERSPECTIVE**	Policy makers Operators Users' representatives European Transport and Mobility Forum

INCLUSION – PUTTING THE USER IN THE CENTRE

Promote definition of specific targets on accessibility for the different transport modes. Develop funding strand aiming at supporting accessibility. Declare universal design in transport R&D&I as a precondition of financial support.	Ensure a coherent approach to transport accessibility across all modes throughout the EU. Consult EC on setup of EU agency on accessibility for transport. Reduce regulatory fragmentation in terms of accessibility through the European Accessibility Act.	Introduce evaluation and monitoring mechanism of the European Accessibility Act.
Investigate equity impact of novel mobility services. Advise regulatory bodies on how to support transport equity for novel mobility services. Organise wide stakeholder consultation on opportunities for making transport more affordable for all.	Develop appraisal methods for transport equity in transport projects. Support governments and municipalities in identifying a strategy and parameters for fair dynamic pricing systems. Explore opportunities for fair pricing of MaaS offers.	
Keeping human contacts in transport hotlines or at public transport stations. Motivate all transport providers to sign European Commissions Passenger Rights Campaign. Provide possibilities for human contact for support in transport. Consider changing population and requirements for learning processes for transport use.	Develop concepts ensuring usability of novel mobility services by all.	Monitor learning programmes and keep them constantly updated.

IMMEDIATE **ACTIONS 2020**	SHORT-TERM **ACTIONS 2025**	MEDIUM-TERM **ACTIONS 2030**

#3 ACTION FIELD
MULTI-STAKEHOLDER INTERACTION AND PROCESSES

RESPONSIBLE
STAKEHOLDERS

SUB-FIELD 3.1
COLLABORATION OF STAKEHOLDERS

Industry
Operators
R&D communnity
User representatives
European Transport and
Mobility Forum

SUB-FIELD 3.2
STANDARDISATION

Policy makers
R&D community
Industry
Standardisation bodies

INCLUSION – PUTTING THE USER IN THE CENTRE

Support activities to co-design and co-develop mobility services together with future users. Support bottom-up approaches towards reducing the personal carbon footprint.	Support the development of digital tools and platforms that allow for bottom-up co-creation of mobility services. Promote living labs in which these novel transport solutions can be experienced.	
Promote accessibility and universal design in (public) transport vehicles in all modes by the introduction of standards.	Include universal design standards in European and national regulations to make them binding.	Facilitate information campaign on standards on universal design.

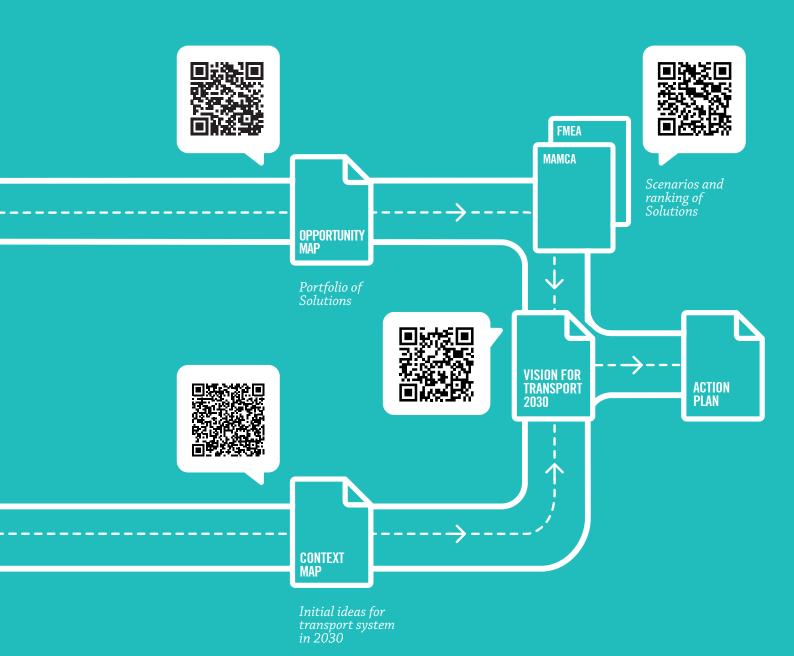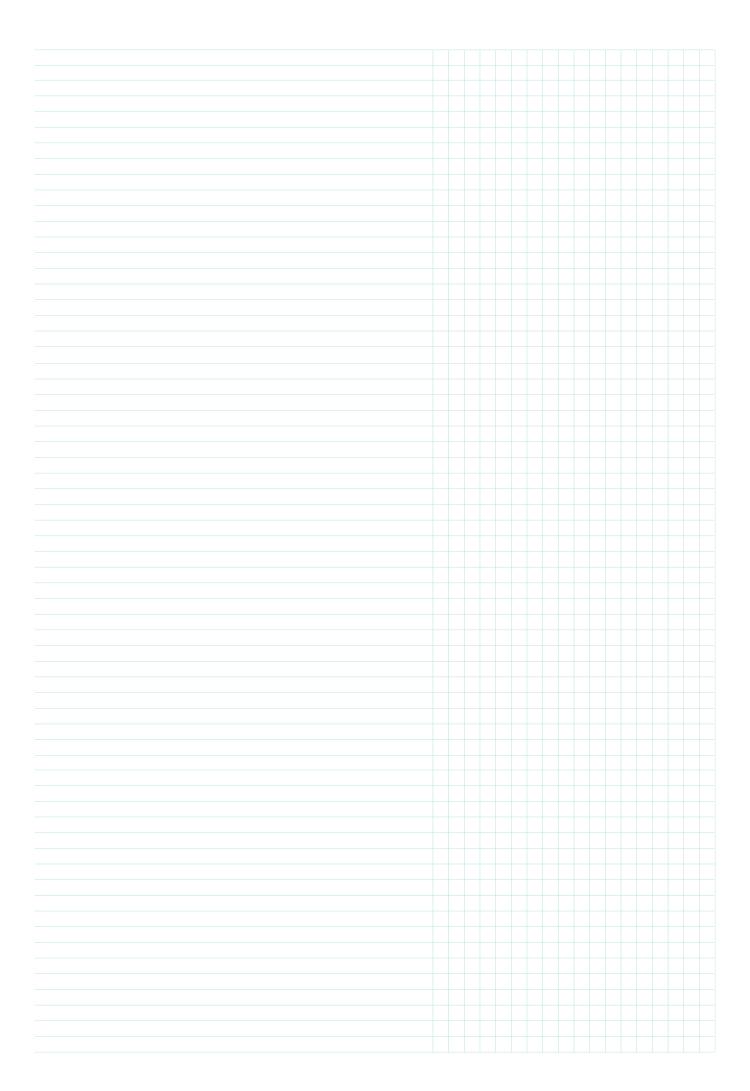| IMMEDIATE **ACTIONS 2020** | SHORT-TERM **ACTIONS 2025** | MID-TERM **ACTIONS 2030** |

RESOURCES

VISUALISATION-BASED STORY-MAPPING PROCESS IS A CORNERSTONE OF THE PROJECT. GRAPHICAL VISUALISATIONS RESULTING FROM DISCUSSIONS HELD DURING PARTICIPATORY WORKSHOPS ARE LINKED BELOW.

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FMEA

MAMCA

Scenarios and ranking of Solutions

OPPORTUNITY MAP

Portfolio of Solutions

VISION FOR TRANSPORT 2030

ACTION PLAN

CONTEXT MAP

Initial ideas for transport system in 2030

WWW.MOBILITY4EU.EU

CONSORTIUM

VDI/VDE-IT (DE) (COORD)

VRIJE UNIVERSITEIT BRUSSEL (BE)

INSTITUT FRANCAIS DES SCIENCES ET TECHNOLOGIES
DES TRANSPORTS L'AMENAGEMENT ET DES RESEAUX (FR)

CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS (GR)

DEEP BLUE (IT)

SIEMENS (DE)

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INTERNATIONAL LONGEVITY CENTRE (UK)

BUDAPEST ASSOCIATION OF PERSONS WITH PHYSICAL
DISABILITIES (HU)

VTT TECHNICAL RESEARCH CENTRE OF FINLAND (FI)

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