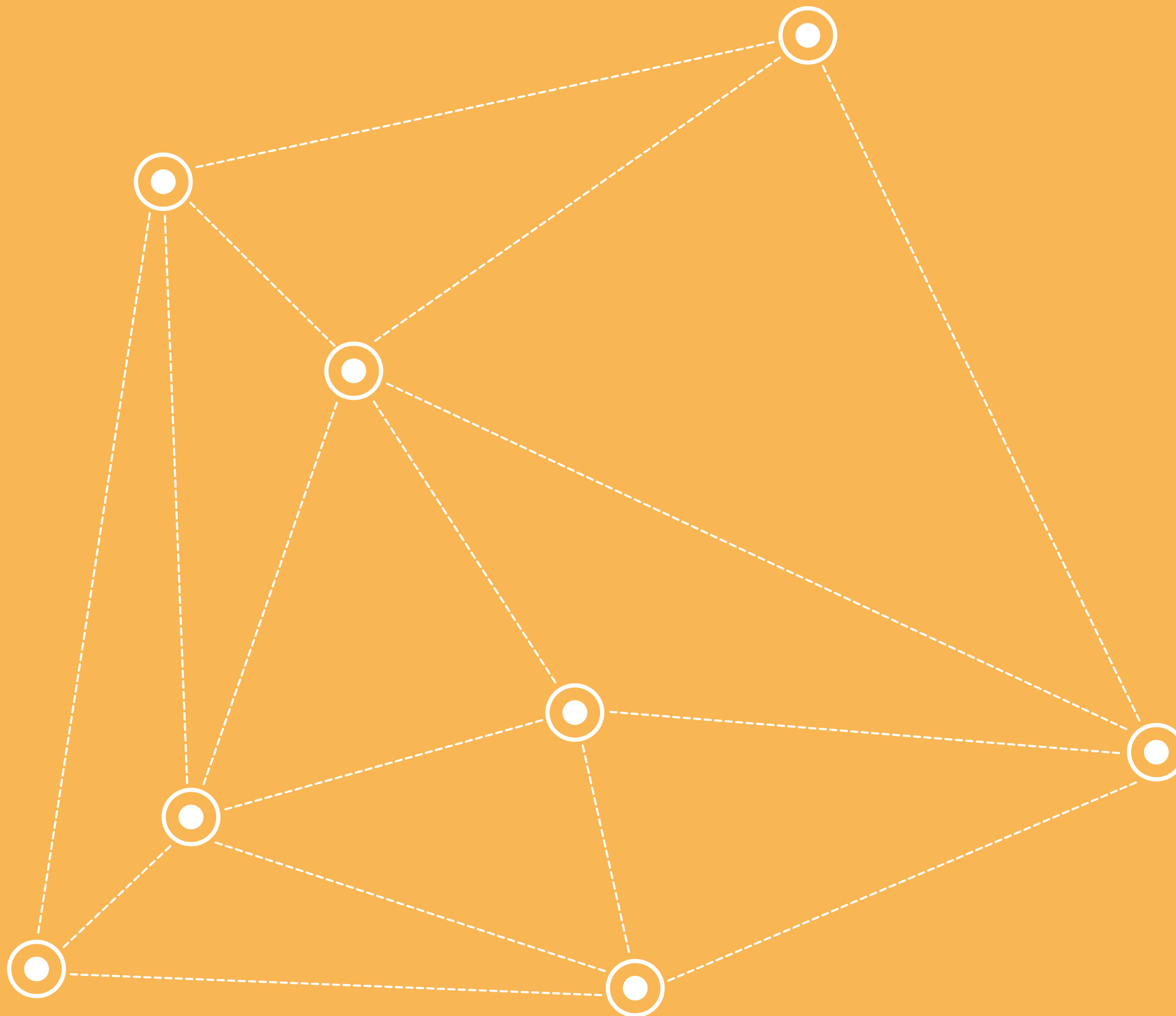




This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



SMART MOBILITY GENERAL ROADMAP

D4.2 Report - Timelines for the topics in Smart Mobility

28 August 2017

Wouter VAN GALEN, Eindhoven University of Technology

Elke DEN OUDEN & Rianne VALKENBURG, TU/e LightHouse



ROADMAPS
FOR
ENERGY®

SMART MOBILITY GENERAL ROADMAP

D4.2 Report — Timelines for the topics in Smart Mobility

Work Package title: WP4, Roadmap Smart Mobility

Task: 4.3, Roadmap interviews, and 4.4, Creating timelines per topic

WP coordinator: Eindhoven University of Technology

Submission due date: August 2017

Actual submission date: 28 August 2017.

Abstract

This report (D4.2) contains the results of the roadmap interviews held with more than 20 European experts (representing industry, knowledge institutes and governmental organisations) in the field of sustainable energy for mobility. The aspects covered are technology, behaviour and organisation. The information collected from the desk study (D4.1) and the roadmap interviews was used in an expert meeting to identify the most relevant topics and to create a timeline for each topic, showing when relevant options become available on the path to meet the needs of the cities (as described in report D2.2). The timelines of Smart Buildings (D3.2), Smart Mobility (D4.2) and Smart Urban Spaces (D5.2) were then aligned in a cross-theme expert meeting to gain understanding of the interlinking areas and potential options across several focus areas. This report presents the resulting General Roadmap Smart Mobility , together with accompanying information from the desk study and the interviews. The creation of the general roadmap is part of the WP4 Roadmap Smart Mobility for the R4E project.



The R4E project received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 649397.

Disclaimer: This report presents the views of the authors, and do not necessarily reflect the official European Commission’s view on the subject.

Versions of this report:

15 November 2016	Concept for roadmap workshops in partner cities (limited distribution)
18 January 2017	Concept for internal use by R4E partners (limited distribution)
7 February 2017	Concept for use in R4E roadmap workshops
28 August 2017	Final version for public distribution

Contents

R4E - ROADMAPS FOR ENERGY.....5

 Roadmapping 7

 The experts8

COMMON NEEDS IN THE DESIRED FUTURE SCENARIOS10

SMART MOBILITY GENERAL ROADMAP 12

 Roadmap topics Smart Mobility13

 Smart Mobility general roadmap.....14

 Smart infrastructure16

 Smart mobility modes17

 Connectivity & robotising18

 Data & traffic management systems19

 Personalised services20

 Urban logistics21

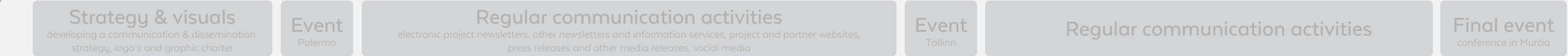
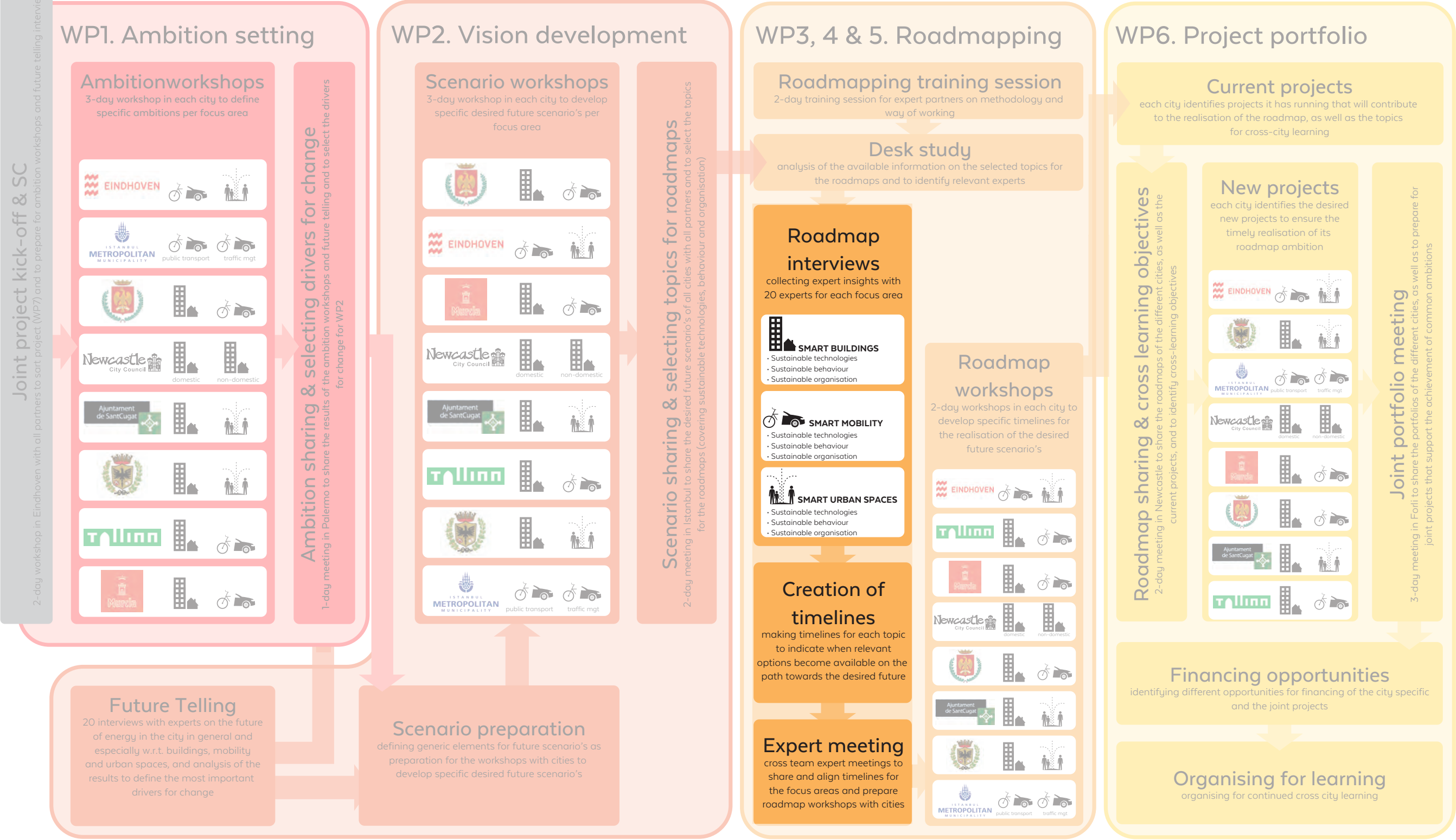
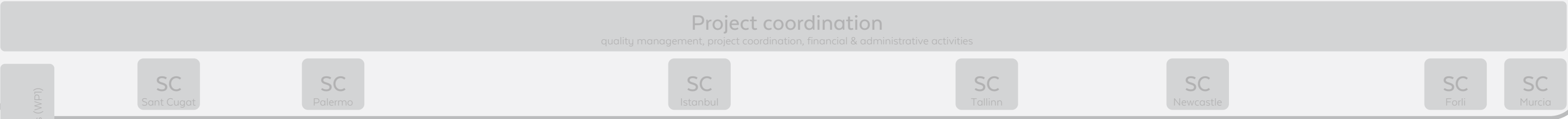
 Values, motives & behavioural change.....22

 Cooperation & innovation networks.....24

 Policies & legislation 25



WP7. Project management



WP8. Communication & dissemination

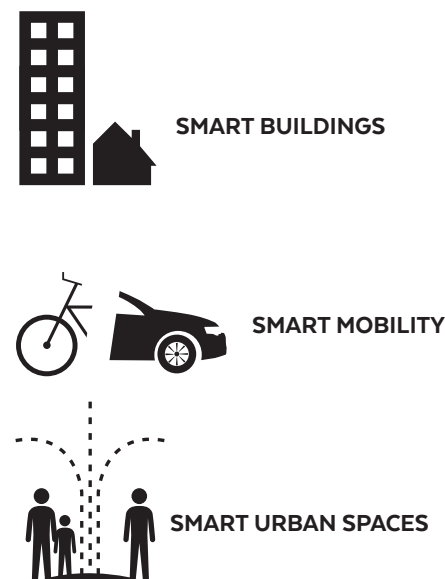
R4E - ROADMAPS FOR ENERGY

Introduction

In the Roadmaps for Energy (R4E) project, the partners will work together to develop a new energy strategy: their Energy Roadmap. The difference between the regular energy strategies and action plans and these new Energy Roadmaps is the much earlier and more developed involvement of local stakeholders. These include not only those who will benefit from the new strategy, such as the citizens, but also relevant research and industry partners. They offer a much clearer view of the future potential of the city in terms of measures and technologies, as well as of the challenges presented by today's situations in the cities. The aim is to create a shared vision, containing the desired, city-specific scenarios and the dedicated roadmaps to be embedded in each city's specific context. These will take into account the diversity in the geography, ecology, climate, society and culture of the eight partner cities in the project: Eindhoven, Forlì, Istanbul, Newcastle, Murcia, Palermo, Sant Cugat and Tallinn.

The R4E project focuses on the vision creation and roadmapping capacities of the municipalities. This includes initiating joint activities to drive the development and implementation of innovative energy solutions in cities. In this way the partners in R4E will learn the process and the roadmap structure. And they will gain the skills they need to work independently on their future roadmaps.

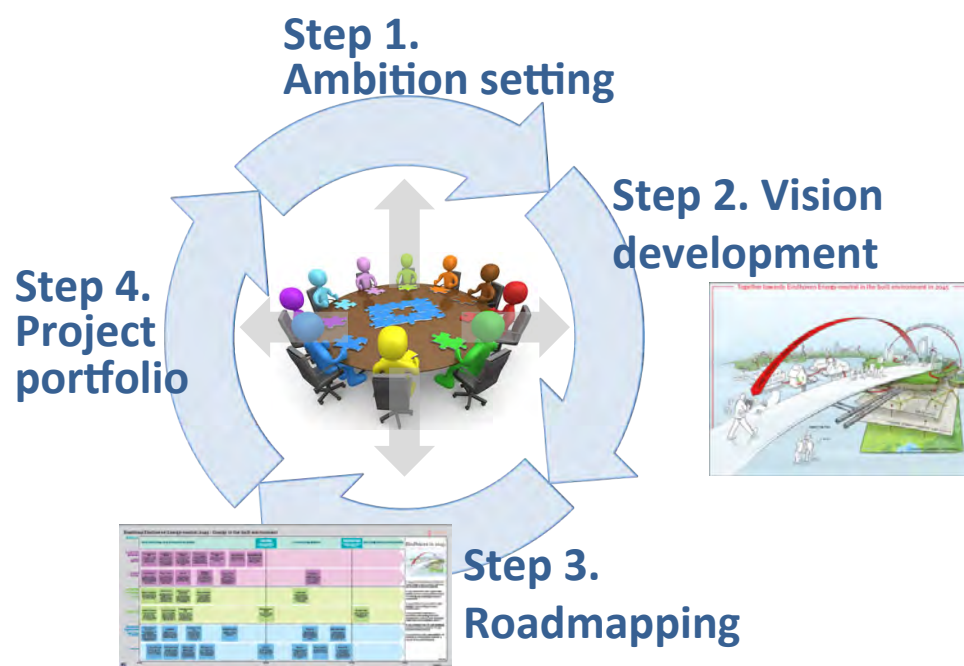
The ultimate aim is to create a process that will allow the partners to work together in developing the Energy Roadmap to achieve their 'Smart Cities' ambition. But energy and Smart Cities are too broad to cover in one project, so R4E focuses on three key areas of sustainable energy. These are closely linked to the main responsibilities of the municipalities:



Approach

In The R4E project follows a 4-step approach:

1. Set the ambitions of the participating cities on sustainable energy and Smart Cities, as well as their choice of three Smart Energy Saving focus areas: 1. Smart Buildings; 2. Smart Mobility; and 3. Smart Urban Spaces.
2. Develop scenarios for the selected focus areas.
3. Create the roadmap. Identify existing and future technologies and other developments – these will enable the desired future scenarios. Plot the opportunities and developments on a time-line to show the route and milestones towards the desired scenarios. The roadmaps contain common parts for all the partner cities, as well as specific parts for the individual cities.
4. Create a portfolio of new projects and initiatives to achieve the ambitions, visions and roadmaps of the cities. This portfolio shows the shared and individual projects, and includes a cross-city learning plan and a financial plan.



Four step approach of R4E

Step Three: Roadmapping

This report is part of Step 3 of the R4E approach, and describes the second part of Work Package 4 (WP4). The aim of WP4 is to develop the General Roadmap for Smart Mobility. The roadmaps explore the options to achieve the cities' desired future scenarios. To do this, the first step was a desk study to collect the available information on the technology options (see D4.1 – Report Future Options). The desk study was also used to identify all the relevant topics and the most important experts on Smart Mobility.

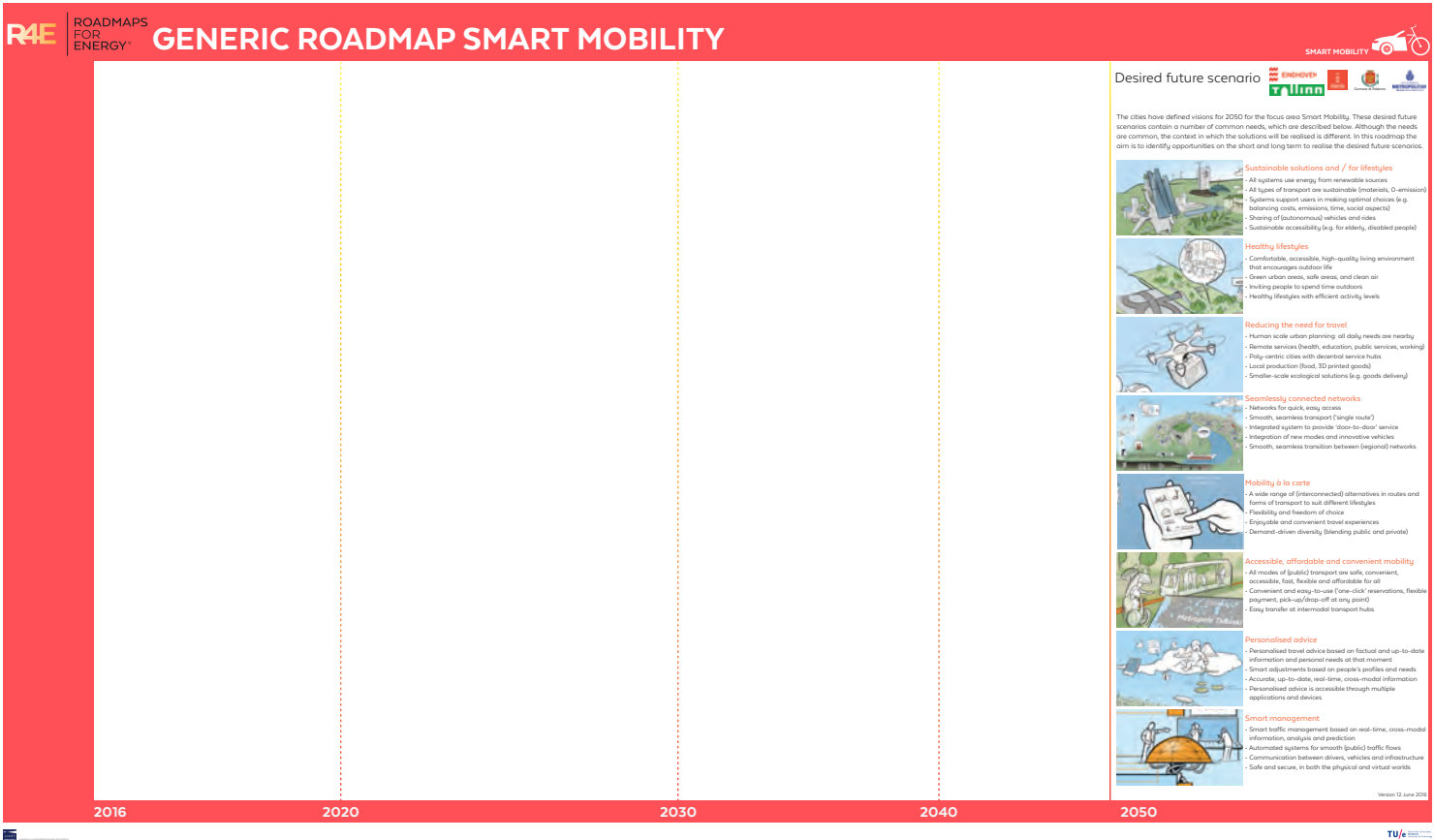
Roadmapping

The results of the desk study and the extensive networks of the R4E partners are used to select international experts and companies from different parts of Europe to collect all the required information. More than 20 experts from industry, knowledge institutes and government were invited to interviews and workshops to share their views on future opportunities. The interviews covered the roles of sustainable technologies, sustainable behaviour and sustainable organisation in achieving the ambitions of the cities as they make the transition to sustainable energy for mobility. The results of the interviews were used to create a draft roadmap for Smart Mobility. This draft roadmap was aligned with those for Smart Buildings and Smart Urban Spaces to ensure that related topics are well addressed. The resulting Smart Mobility General Roadmap is presented in this report.

The general roadmaps will be used in the next step: co-creating city-specific roadmaps in workshops in the R4E partner cities together with local stakeholders.

How to read this report

This report describes the Smart Mobility General Roadmap, and contains all the relevant information from the Roadmapping research. It starts with an introduction to the Roadmapping research, and the approach to create the general roadmap. Then the experts are introduced, with short descriptions of their contexts, backgrounds and relevant expertise areas for the research. The main part of this report starts with the Smart Mobility joint ambitions of the cities and their shared Smart Mobility needs. The general roadmap is then presented, followed by a more detailed description of the nine topics and their timelines.



Roadmap interview template



Example of a Roadmap interview



Clustering all interview results to create the concept general roadmap



Interlinking and aligning the concept general roadmaps for Smart Buildings, Smart Mobility and Smart Urban Spaces

Roadmapping

Roadmap research

A (technology) roadmap is a plan that matches the short-term and long-term goals with specific technology solutions to help meet those goals. Developing a roadmap has three major uses:

- It helps to reach a consensus on a set of needs and the technologies required to meet them;
- It provides a mechanism to help predict technology developments;
- It provides a framework to help plan and coordinate innovation and the implementation of innovative solutions.

Roadmapping represents a powerful technique to manage and plan supporting technology, especially to explore and communicate the dynamic links between technological resources, organisational goals and the changing environment.

The most common format for a roadmap is a time-based chart, with a number of layers that typically include both the business and technological perspectives. The roadmap facilitates and supports the evolution of the markets, products and technologies to be explored, together with the links and gaps between the various perspectives. The Roadmapping technique also draws together the key themes from the technology strategy and transitions literature, by the use of its layered structure together with the time dimension.

In the R4E project, the Roadmapping research method is used to develop timelines for relevant topics in sustainable solutions for Smart Buildings, Smart Mobility and Smart Urban Spaces.

Roadmapping template

The Roadmapping method uses a format with multiple layers covering different aspects, such as technologies, products and markets. The roadmap allows the evolution within each layer to be explored, together with the interlayer dependencies, facilitating the integration of technologies into products, services and systems.

The roadmaps cover different elements of sustainability that need to go hand-in-hand to achieve the desired future scenarios:

- I. Sustainable technologies
- II. Sustainable behaviour
- III. Sustainable organisation

The roadmaps plot a timeline showing the different steps that are needed and possible to achieve the desired scenarios in 2050.

The approach

This research involved 25 interviews with experts holding different views on smart and sustainable energy in cities, covering technological, behavioural and organisational aspects.

Experts

The results of the desk study and the extensive networks of the R4E partners are used to select international experts and companies from different parts of Europe to cover a broad range of perspectives. More than 20 experts from industry, knowledge institutes, consultancies and government were invited to interviews and workshops to share their views on future opportunities. These experts are introduced on the following pages.

Structured interviews

The Roadmap interviews were held with a poster showing a timeline starting in 2016 and running until 2050. The common needs of the R4E partner cities were shown at the end of the timeline. The interviewees were asked to identify relevant future options, and to indicate on the timeline when they thought these options would regularly be available. They were also invited to create a storyline showing the expected developments over time, to gain understanding of the prerequisites for specific developments to take place. All the input was collected on Post-it notes to allow easy reconfiguring of the storyline during the interview. The common needs were used to trigger the thinking of the interviewees and to inspired them to reflect on a wider range of technologies and options needed to achieve the desired future scenarios by 2050.

For these interviews, the requested expertise areas of the experts were not specifically their own innovation strategies, but rather their knowledge of important developments in their own fields. The Roadmapping method inspired the experts to use their knowledge to indicate the available options in the shorter and longer term, and to describe the potential developments over time.

Creating the general roadmap

The collected information from the desk study (D4.1) and the roadmap interviews was used in an expert meeting to identify the most relevant topics and to create a timeline for each of them showing when relevant options would become available on the path to meet the cities' needs. All the results of the interviews were used to make a rich summary of the steps on the timeline. A maximum of 15 relevant future options was described for each topic, together with a short title and explanation and where possible including an example.

Aligning the general roadmaps of the three focus areas

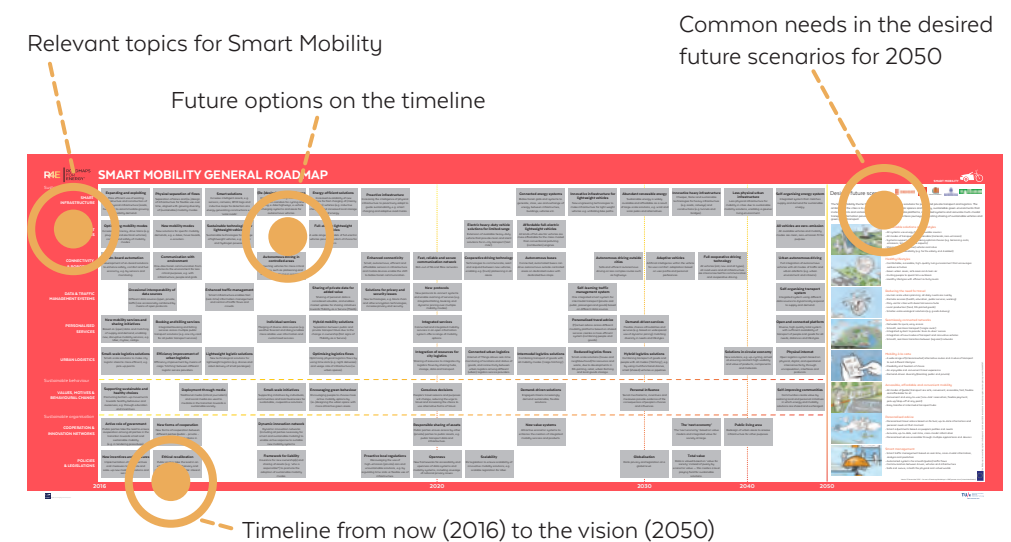
In a cross-theme expert meeting the timelines for Smart Buildings, Smart Mobility and Smart Urban Spaces were aligned to gain understanding of the interlinking areas and potential options across several focus areas.

How to read the general roadmap

The resulting Smart Mobility General Roadmap is presented in this report, together with accompanying information from the desk study and interviews. The roadmap contains four important elements:

- The time axis from now (2016) to the visions for 2050 as described in the desired future scenarios of the cities (see D2.2 – Report Vision Development for the full set of desired future scenarios).
- The eight common needs in the desired future scenarios as described by the cities in the Joint Vision Workshop (see also D2.2.) are indicated at the end of the timeline in 2050 as the goal of the roadmap.
- The relevant topics for Smart Mobility on which developments are required to achieve the desired future scenarios. These topics cover sustainable technologies, sustainable behaviour and sustainable organisations.
- The options that will become available in the shorter or longer term for each of the topics. Each topic has a timeline showing the developments that are relevant to that topic.

The image below shows the elements of the general roadmap for Smart Mobility.



Elements of the Smart Mobility General Roadmap

Note: the general roadmap contains the options that were identified in the desk study and the roadmap interviews. However, there will also be future developments; these are not included in the roadmap. The roadmap is not a 'blueprint' towards the desired future scenario – its purpose is to indicate relevant possible future developments that should be taken into account in the development of projects to ensure sufficient flexibility for future-proof cities.

The general roadmaps will be used in the R4E partner cities to co-create city-specific roadmaps together with local stakeholders.



The experts

The experts were selected for their expertise and knowledge on future options. The interviewees work across Europe at knowledge institutes, companies, consultancies and profit or non-profit organisations. Their expertise varies from technology oriented to human or social oriented. They are introduced through their expertise and the main criteria for selecting them for the R4E Roadmapping research:



Fatih Gündogan is Deputy General Manager, Yusuf Tufan Erenay is Deputy General Manager Finance and Marketing, and Mustafa Erucar is Smart City Coordinator at ISBAK Istanbul IT and Smart City Technologies Inc. ISBAK is a company that provides complete telecommunications services in the field of smart transportation systems. We invited them specifically because of their work to transfer their experience in Intelligent Transportation Systems to smart city solutions, to apply their in-depth knowledge to design smart cities, and to use their experience in designing alternative solutions to traffic challenges.



Dr. Norbert Koppenhagen is Vice President at SAP SE, where he drives the research agendas for areas including Smart Cities, Urban Platforms and Distributed Architectures. He is co-founder of the big data innovation lab at the University of Mannheim, industry chair of the Design Science Research in Information Systems Conference (DESRIST), and industry lead of the MoU for Open Urban Platforms at the EC. We invited him specifically because of his experience and extensive knowledge of smart cities and urban platforms, designing Rapid Deployment Solutions (RDS) for big data, concept cars, and supply management development, in which he drove major product innovations and launched initiatives working from engineering labs in Germany, the USA and India.



Ben Kaner is Head of Digital Strategy for the North Tyneside Council – ENGIE partnership. His role is to transform the way the council coordinates and optimises its joint services around the needs of citizens and businesses in North Tyneside. We invited him specifically because of his current role in the North Tyneside Council – ENGIE partnership and his professional background as an enterprise architect/CTO to drive innovation, engineering and information governance in large programmes.



Lluís Sanz Marco is Director of Corporate Information in the city of Barcelona, where he has developed his experience over more than 25 years. His tasks include responsibility for official cartography, GIS systems, demography, census information and other corporate databases. We invited him specifically because of his extensive knowledge of smart cities and the mapping solutions referred to above, his experience with city councils (national and international), and his experience with EU projects.



Enrico Motta is Professor of Knowledge Technologies at the Knowledge Media Institute in the UK. His research spans a variety of aspects related to large-scale data integration and analysis to support decision-making in complex scenarios. We invited him specifically because of his experience in large-scale data integration, data analysis to support decision-making, and his current role as Director of the MK:Smart project. This project aims to address key barriers to economic growth in Milton Keynes by using innovative data-intensive solutions in the energy, transport and water management sectors.



Peter Bräutigam is partner at NOERR LLP and a proven specialist in IT Law and Digitalisation / Industry 4.0. He has also been Honorary Professor for Media and Internet Law at the University of Passau and Lecturer in IT Law. NOERR LLP is one of the top European law firms with lawyers, tax and management consultants who are recognised experts in their specialist areas. We invited Peter specifically because of his knowledge on legal challenges regarding IT security and data protection law relating to connected vehicles.



Maurice Geraets is Board Member at NXP Semiconductors Netherlands. NXP plays a leading role in providing solutions to advance urban infrastructure, vehicles and transport systems. We invited him specifically because of his experience and in-depth knowledge of technology, semiconductors, exploring new businesses relating to both the development and applications of semiconductors in the Smart Mobility domain, and ensuring safety and security of the smart car of the future.



Jacco van der Burg is Manager Innovation & Development at ENGIE infra & mobility. ENGIE (formerly GDF-SUEZ) is a worldwide energy operator, proactively responding to the constantly changing energy needs, referred to as the energy transition, while also controlling/ minimising its impact on climate. We invited Jacco specifically because of his visionary yet feasible view on smart energy solutions and smart infrastructure in the broader context of Smart Mobility.



Tijl Sietsma is Manager Business Development at Dynniq, a high-tech, innovative company offering integrated mobility and energy solutions and services internationally. We invited him specifically because of his knowledge of current and future mobility solutions, specifically in relation to intelligent infrastructure and traffic systems, future-proof parking solutions, smart grids and smart metering.



Auke Hoekstra is Senior Advisor Mobility at Eindhoven University of Technology and Strategic Advisor at the Elaad Foundation. In his research he uses agent-based modelling, surveys and focus groups to predict the future of transportation with a focus on autonomous electric vehicles and how to integrate them in the renewable smart grid. We invited Auke specifically because of his knowledge of technical innovations in relation to the overall energy transition, his in-depth knowledge of smart grids, and his visionary view on how the network of stakeholders can collaborate more effectively.



Robert Holland is Vice President Infrastructure & Area Management – IT Service Center EMEA, and Piet van Leest is Logistics Innovation Specialist. Robert and Piet both work for a leading global provider of innovative and fully integrated supply chain solutions. Their business activities are related to: sea and air freight, contract logistics & integrated logistics, and overland transportation. We invited Robert and Piet both specifically because of their in-depth knowledge of the logistic processes in relation to the management of goods and service flows, and their visionary yet realistic view of innovation in the integrated supply chain.



Maarten Neeskens is an entrepreneur in digital transformation, Smart Mobility and sustainable mobility. Maarten works nationally and internationally on breakthrough projects in the field of electric and hybrid vehicles (cars and bikes), Smart Mobility, Smart Cities and Mobility as a Service. His entrepreneurial mind, visionary view on Smart Mobility, knowledge of public-private projects are the reasons we invited Maarten. Additionally, we also invited Maarten because of his experience with Smart Mobility solutions, including digital solutions for car sharing and personal mobility planning.



Peter Krumm is Manager Strategy & Innovation at Connexion and Transdev Nederland. Transdev is an international mobility provider with operations in 19 countries around the world. We invited Peter specifically for his role in developing and monitoring the vision and strategy of Transdev. Peter is involved in overcoming key challenges in implementing demand-driven public transport, Mobility as a Service and autonomous vehicles.



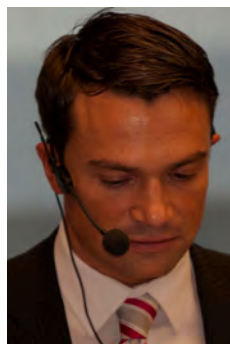
Tom van Woensel is a member of the management team of the European Supply Chain Forum, a collaborative effort with about 30 large multinational companies. He is the account manager for Bausch + Lomb, Kuehne + Nagel and Access Business Group. Tom van Woensel is also Full Professor of Freight Transport and Logistics at Eindhoven University of Technology, the Netherlands. We invited him specifically because of his practical and scientific expertise on freight transport and (city) logistics.



Jean-Charles Pandazis is Head of the Efficiency & ElectroMobility department at ERTICO – ITS Europe. ERTICO is a cooperative platform for all relevant stakeholders to develop and deploy Intelligent Transport Systems (ITS) in Europe. ERTICO is a public-private partnership with over 100 partners across eight different sectors, all working towards bringing intelligence to the mobility of people and goods in Europe. We invited Jean Charles specifically because of his knowledge of how to deploy ITS for cleaner, smarter and safer mobility in the most cost-effective way.



Ivo Cré is Deputy Director at Polis and was expert in Urban Mobility at the European Innovation Partnership on Smart Cities and Communities marketplace. Polis is a network of European cities and regions working together to develop innovative technologies and policies for local transport. Ivo leads Polis' thematic pillar on the Social and Economic Aspects of Transport. We invited Ivo because of his experience with European projects relating to (sustainable) urban transport, innovation, urban road user charging, social inclusion through transport measures, and cooperative vehicle – infrastructure systems. In addition, we invited Ivo because of his extensive experience in city networks and mobility policy.



José Maria Diez is an industrial engineer and PhD in civil and industrial engineering, and has worked on several European mobility projects. He is currently the coordinator of the CIVINET Spain and Portugal Network. We invited José Maria Diez specifically because of his project knowledge and policy experiences with European projects on mobility. The Network CIVINET Spain and Portugal brings together more than 30 Spanish and Portuguese smart cities.



Huib van Berlo is Product Planning Manager at DAF Trucks, a truck manufacturer offering solutions for a wide range of transport needs. We invited him specifically because of his experience and knowledge of the truck industry and related innovations. These can for example be related to fleet management systems, fuel efficiency, enhancing logistics efficiency, electrification, and optimising truck and driver performance.



Iles de Rooij is Manager Concept Development, and Peter Cremers is Manager Strategic Predevelopment at VDL Enabling Transport Solutions. VDL ETS focuses on research, development and testing of new possibilities, in particular for transport (E-mobility) related activities of VDL companies, specially VDL Bus & Coach. The company develops, manufactures and markets a wide range of buses, coaches and chassis modules, converts or extends mini- & midi-buses and purchases and sells used buses. Sales take place in more than 30 countries. We invited Iles and Peter because of their in-depth technology knowledge of buses and coaches, their visionary view on future concepts, and their realistic look at the trends and developments in the bus industry.



Thomas Alexander Sick Nielsen is a former member of the Department of Transport at the Technical University of Denmark. He currently works at the Danish Road Directorate, which is responsible for the state-owned roads in Denmark. We invited him specifically because of his knowledge of transport policy, road user behaviour, infrastructure and GIS-based analysis and modelling.



Alexander Schmidt heads the data mining research area in the Department of Mobility and Urban Systems Engineering at Fraunhofer IAO in Stuttgart. Fraunhofer is Europe's largest application-oriented research organisation. We invited Alexander specifically because of his knowledge on a variety of Smart Mobility-related topics, including electric vehicles, urban energy systems, innovative charging technologies for electric vehicles, business model development for Smart Mobility solutions, and seamlessly connected mobility solutions.



Joost Vantomme is Smart Mobility Director, and Petr Dolejsi is Mobility & Sustainable Transport Director, at the European Automobile Manufacturers Association (ACEA). ACEA represents Europe's car, van, truck and bus manufacturers, and works with a variety of institutional, non governmental, research and civil society partners, as well as with a number of industry associations to ensure the economic, environmental and social sustainability of the automotive industry. We invited both of them specifically because of their in-depth general and personal knowledge and insights relating to the European automotive industry.

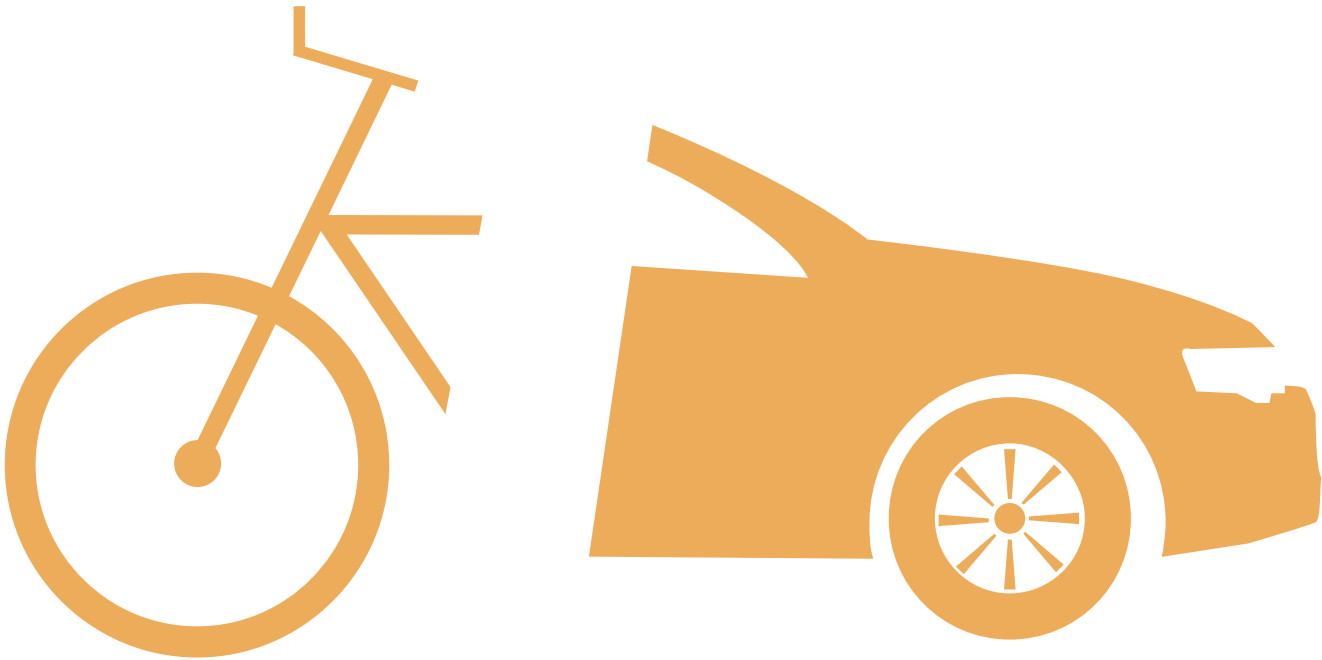


Senior Engagement Manager at a leading global strategic management consulting firm (the company's policy does not allow publication of names). This firm was founded to serve senior management on problems relating to Smart Mobility and other topics. It conducts analysis to evaluate management decisions across the public and private sectors, including the automotive sector. We invited him specifically because of his experience and in-depth knowledge of the network of all stakeholders, and his visionary yet realistic view on technological innovations emerging over time.

A series of roadmap interviews and workshops was held in the city of Eindhoven (lead partner of the R4E project) as a pilot for the roadmapping sessions in R4E. The results were also incorporated in the Roadmap Smart Mobility. The sessions involved a number of experts from the municipality and from companies and knowledge institutes:

- Wim Vossebelt — V-tron
- Bram Hendrix — DITCM Innovations
- Hans van Lint — professor of Traffic Simulation, Delft University of Technology
- Lisanne Kusters — Rijkswaterstaat (Netherlands Ministry of Infrastructure and the Environment)
- Joost Pijnappel — Rijkswaterstaat (Netherlands Ministry of Infrastructure and the Environment)
- Ineke Spapé — Professor of Integrated Sustainable Urban Mobility Planning, NHTV University of Applied Sciences, Breda
- Carlo van de Weijer — Strategic Area Smart Mobility, Eindhoven University of Technology
- Harry Timmermans — Professor of Urban Systems & Real Estate, Eindhoven University of Technology
- Geert Verbong — Professor of System Innovations & Sustainable Transitions, Eindhoven University of Technology
- Hans Jeekel — Part-time Professor of Societal Aspects of Smart Mobility, Eindhoven University of Technology and Rijkswaterstaat
- Pieter van Wesemael — Professor of Architectural Design and Urban Cultures, Eindhoven University of Technology

We would like to thank all participants for their contribution to the roadmap research.



COMMON NEEDS IN THE DESIRED FUTURE SCENARIOS

At the Joint Ambition Workshop on 19 October in Palermo, the cities shared and discussed their ambitions for Smart Mobility and identified the common aspects. The result was used for a description of the Smart Mobility focus area.

The Smart Mobility theme focuses on sustainable energy solutions for public and private transport and logistics. The ambition of the cities is to create attractive and clean public spaces and healthy, sustainable green environments that invite residents and visitors to walk or go by bike. Open data platforms, integrated systems and accurate multi-modal transport information provide personalised advice for seamless journeys, integrating sharing of sustainable vehicles and green public transport.

At the Joint Vision Workshop on 24 and 25 May 2016 in Istanbul, the cities presented their desired future scenarios for Smart Mobility to each other and held in-depth discussions to understand each other’s needs and contexts (WP2). Eight common needs were identified, as shown on the following page.



Sustainable solutions and / for lifestyles

- All systems use energy from renewable sources
- All modes of transport are sustainable (materials, zero-emission)
- Systems support users in making optimal choices (e.g. balancing costs, emissions, time and social aspects)
- Sharing of (autonomous) vehicles and rides
- Sustainable accessibility (e.g. for the elderly and disabled)



Mobility à la carte

- A wide range of (interconnected) alternative routes and modes of transport to suit different lifestyles
- Flexibility and freedom of choice
- An enjoyable and convenient travel experiences
- Demand-driven diversity (blending public and private)



Healthy lifestyles

- Comfortable, accessible, high-quality living environment that encourages outdoor activities
- Green urban areas, safe areas and clean air
- Inviting people to spend time outdoors
- Healthy lifestyles with efficient activity levels



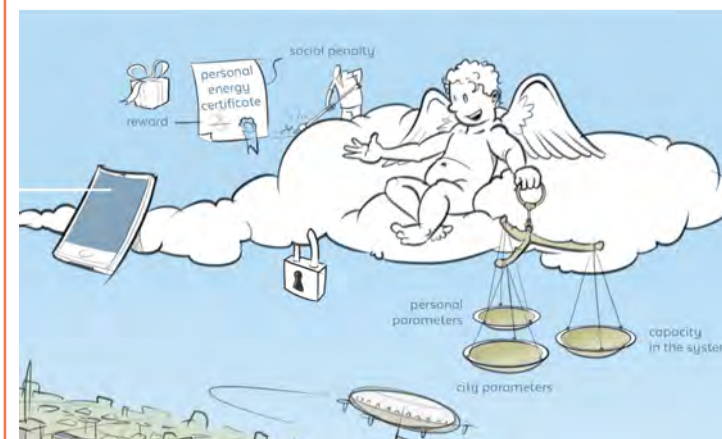
Accessible, affordable and convenient mobility

- All modes of (public) transport are safe, convenient, accessible, fast, flexible and affordable for all
- Convenient and easy-to-use ('one-click' reservation, flexible payment, pick-up/drop-off at any point)
- Easy transfer at intermodal transport hubs



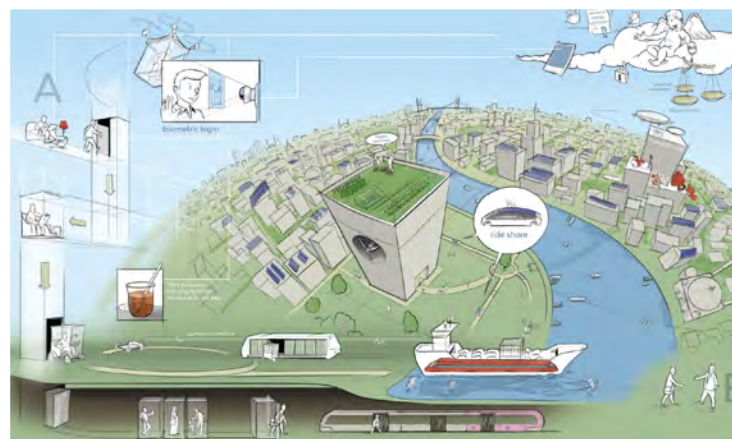
Reducing the need for travel

- Human scale urban planning: all daily needs are nearby
- Remote services (health, education, public services, working)
- Poly-centric cities with decentral service hubs
- Local production (food, 3D-printed goods)
- Smaller-scale ecological solutions (e.g. goods delivery)



Personalised advice

- Personalised travel advice based on factual, up-to-date information and personal needs at that moment
- Smart adjustments based on people's profiles & needs
- Accurate, up-to-date, real-time, cross-modal information
- Personalised advice accessible through multiple applications and devices



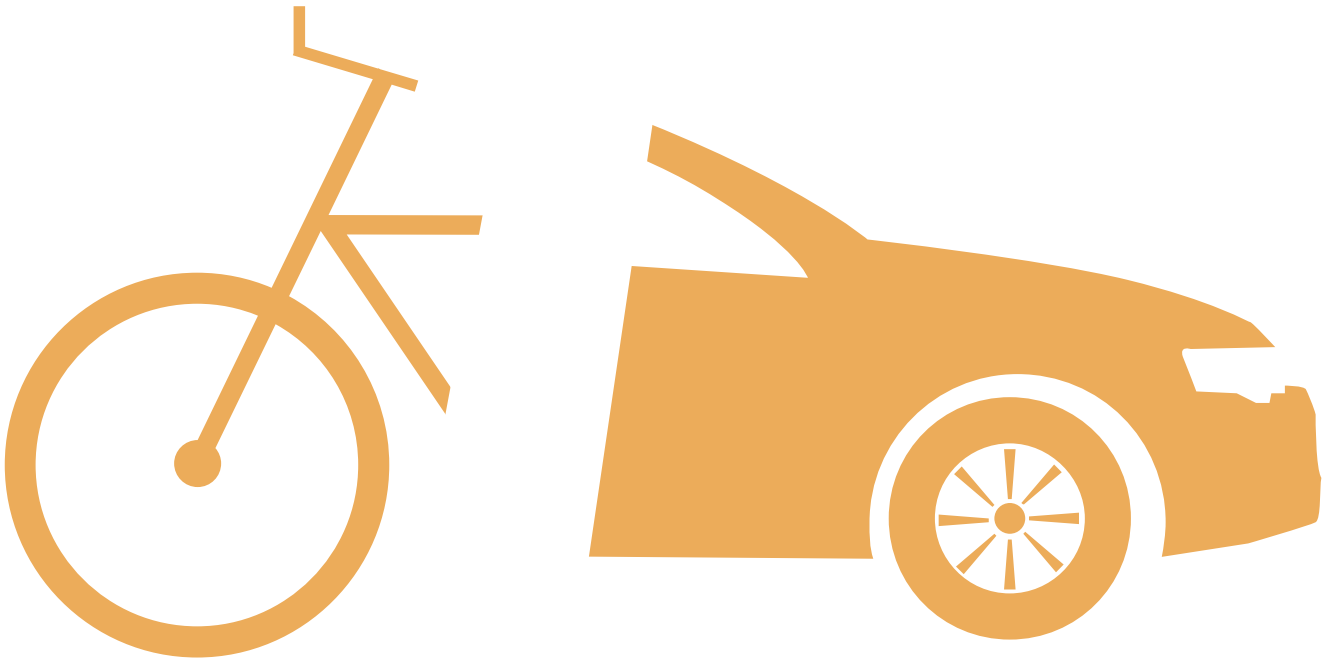
Seamlessly connected networks

- Networks for quick, easy access
- Smooth, seamless transport ('single route')
- Integrated system to provide 'door-to-door' service
- Integration of new modes of transport and innovative vehicles
- Smooth, seamless transitions between (regional) networks



Smart management

- Smart traffic management based on real-time, cross-modal information, analysis and prediction
- Automated systems for smooth (public) traffic flows
- Communication between drivers, vehicles and infrastructure
- Safe and secure, in both the physical and virtual worlds



SMART MOBILITY GENERAL ROADMAP

Roadmap topics for Smart Mobility

In the general roadmap, timelines are created for the topics that require developments to achieve the desired future scenario in 2050. The topics selected for the Roadmap Smart Mobility are described briefly.

Sustainable technologies

The first element to achieve the sustainable energy ambitions is the availability of sustainable technologies. There is already a vast amount of sustainable technologies available, and in the meantime new technologies are being developed rapidly. Unfortunately there is not always a consensus on what is the best option for the future. The technology developments included in the Roadmap Smart Mobility are:

SMART INFRASTRUCTURE

Smart Infrastructure concerns physical infrastructure and energy systems which are related to mobility. Specifically, this topic includes the engineering, (re-)design, maintenance and role of the physical infrastructure in terms of roads, city squares, urban areas, bridges and tunnels. This topic also applies to energy systems in terms of charging infrastructure and (connected) energy systems. It therefore has a close link to Smart Buildings and Smart Urban Spaces.

SMART MOBILITY MODES

The topic on Smart Mobility Modes is about the different types of (sustainable) mobility, including the development of the required technologies. More specifically, this topic applies to the development, implementation and use of sustainable and smart mobility modes such as cars, trucks, bikes or drones.

CONNECTIVITY & ROBOTISING

The subject of Connectivity & Robotising describes developments in the ICT infrastructure, communication technologies and autonomous driving. Connectivity & Robotising applies to all forms of intelligent in-vehicle solutions that allow vehicle-to-vehicle, vehicle-to-infrastructure, vehicle-to-person and vehicle-to-grid communication. This topic also includes (semi-) autonomous vehicles and developments relating to ICT such as 5G, since these contribute to a connected and automated mobility system.

DATA & TRAFFIC MANAGEMENT SYSTEMS

Data and traffic management systems include developments relating to the transport system and the increase in use of different types of data, including those relating to the shift towards Mobility as a Service. Data can and will be generated and communicated by the digital infrastructure and communication technologies as described by the connectivity and robotising topic. This data topic also applies to the management of transport systems, the developments relating to data interoperability among service providers, data protocols, and personal data and privacy issues.

PERSONALISED SERVICES

Personalised services include the availability of mobility services, developments in public transport and those relating to applications allowing for mobility a la carte and Mobility as a Service. The personalised services topic is also about the development of specific (personal) services. These (personal) services are based on different types of data such as open, personal, and real time traffic data and aimed at matching demand and supply. As such, this topic also includes the blend of public mobility services, private mobility services, and personalised travel advice.

URBAN LOGISTICS

Generally the urban logistics topic is about logistic solutions and developments that affect the logistic flows in cities. More specifically, urban logistics include aspects relating to the (integrated) transport of goods across the whole urban logistic system, integrating multiple urban logistic streams, and the development of new solutions for urban logistics.

Sustainable behaviour

One of the crucial elements of a sustainable city is the behaviour of citizens. Awareness is required to make a collective turn towards more sustainable solutions and energy-saving alternatives. In many cases, available technologies are not sufficiently attractive to gain acceptance in mass markets. The behavioural developments included in the Roadmap Smart Mobility are:

VALUES, MOTIVES & BEHAVIOURAL CHANGE

Values, motives and behavioural change is about the way that citizens can play an active role during their change in behaviour, driven by different values and reasoning over time. Small-scale initiatives, the role of the media and healthy behaviour are some of the aspects covered.

Sustainable organisation

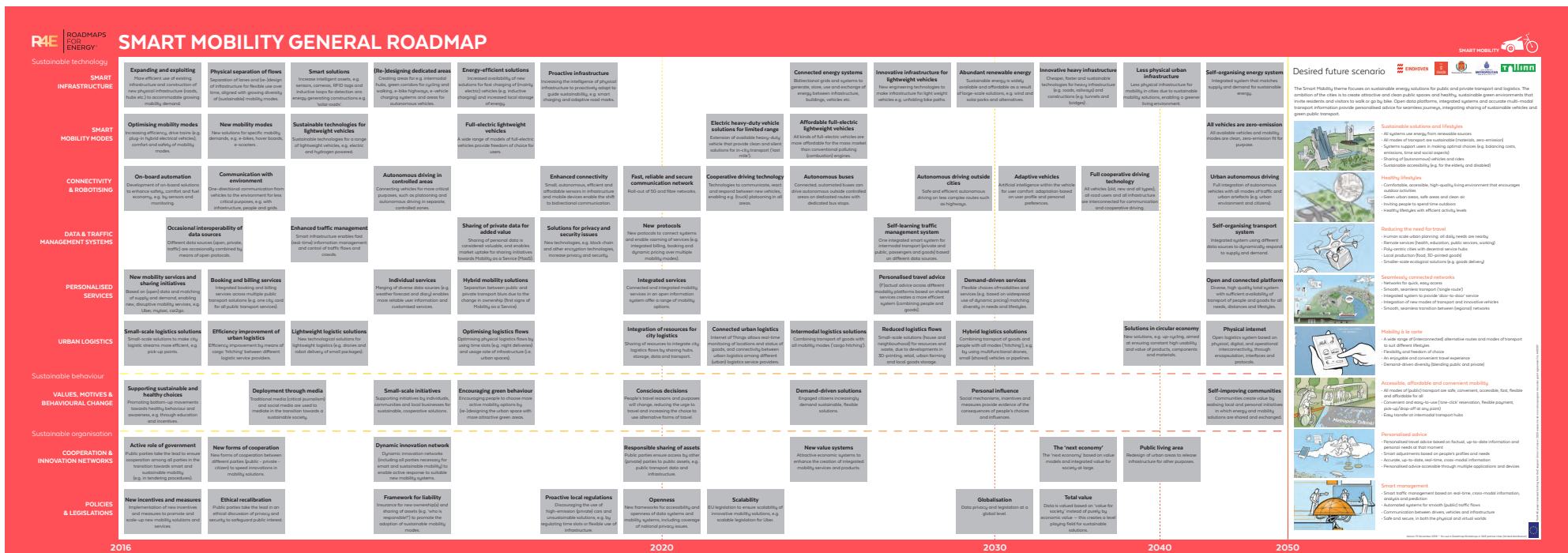
Last but not least, the element of sustainable organisation is addressed. How can we organise the collaboration between relevant parties (public, private, citizens) to achieve the desired future scenarios? Because the technology is not yet mature, new business models are needed to enable learning processes, and that can be adapted when needed. The organisational developments included in the Roadmap Smart Mobility are:

COOPERATION & INNOVATION NETWORKS

Cooperation and innovation networks describe how forms of cooperation between different types of organisations (public-private) will evolve over time to speed up innovation and mobility solutions. Among the aspects covered by this topic are an active role of multiple stakeholders, and sharing of assets.

POLICIES & LEGISLATION

Legislative changes and the right policies are important factors in the developments relating to Smart Mobility. This topic includes the developments in this field. More specifically, it is aimed at discovering the developments relating to legislative aspects, and frameworks and measures to enable the creation of a Smart Mobility system.



Smart Mobility General Roadmap showing the topics at the start of the timeline.

SMART MOBILITY GENERAL ROADMAP

Sustainable technology

SMART
INFRASTRUCTURE**Expanding and exploiting**

More efficient use of existing infrastructure and construction of new physical infrastructure (roads, hubs etc.) to accommodate growing mobility demand.

Physical separation of flows

Separation of lanes and (re-)design of infrastructure for flexible use over time, aligned with growing diversity of (sustainable) mobility modes.

Smart solutions

Increase intelligent assets, e.g. sensors, cameras, RFID tags and inductive loops for detection and energy generating constructions e.g. 'solar roads'.

(Re-)designing dedicated areas

Creating areas for e.g. intermodal hubs, green corridors for cycling and walking, e-bike highways, e-vehicle charging systems and areas for autonomous vehicles.

Energy-efficient solutions

Increased availability of new solutions for fast charging of (mainly electric) vehicles (e.g. inductive charging) and increased local storage of energy.

Proactive infrastructure

Increasing the intelligence of physical infrastructure to proactively adapt to guide sustainability, e.g. smart charging and adaptive road marks.

SMART
MOBILITY MODES**Optimising mobility modes**

Increasing efficiency, drive trains (e.g. plug-in hybrid electrical vehicles), comfort and safety of mobility modes.

New mobility modes

New solutions for specific mobility demands, e.g. e-bikes, hover boards, e-scooters.

Sustainable technologies for lightweight vehicles

Sustainable technologies for a range of lightweight vehicles, e.g. electric and hydrogen powered.

Full-electric lightweight vehicles

A wide range of models of full-electric vehicles provide freedom of choice for users.

Electric heavy-duty vehicle solutions for limited range

Extension of available heavy-duty vehicle that provide clean and silent solutions for in-city transport ('last mile').

CONNECTIVITY
& ROBOTISING**On-board automation**

Development of on-board solutions to enhance safety, comfort and fuel economy, e.g. by sensors and monitoring.

Communication with environment

One-directional communication from vehicles to the environment for less critical purposes, e.g. with infrastructure, people and grids.

Autonomous driving in controlled areas

Connecting vehicles for more critical purposes, such as platooning and autonomous driving in separate, controlled zones.

Enhanced connectivity

Small, autonomous, efficient and affordable sensors in infrastructure and mobile devices enable the shift to bidirectional communication.

Fast, reliable and secure communication network

Roll-out of 5G and fibre networks.

Cooperative driving technology

Technologies to communicate, react and respond between new vehicles, enabling e.g. (truck) platooning in all areas.

DATA & TRAFFIC
MANAGEMENT SYSTEMS**Occasional interoperability of data sources**

Different data sources (open, private, traffic) are occasionally combined by means of open protocols.

Enhanced traffic management

Smart infrastructure enables fast (real-time) information management and control of traffic flows and crowds.

Sharing of private data for added value

Sharing of personal data is considered valuable, and enables market uptake for sharing initiatives towards Mobility as a Service (MaaS).

Solutions for privacy and security issues

New technologies, e.g. block chain and other encryption technologies, increase privacy and security.

New protocols

New protocols to connect systems and enable roaming of services (e.g. integrated billing, booking and dynamic pricing over multiple mobility modes).

PERSONALISED
SERVICES**New mobility services and sharing initiatives**

Based on (open) data and matching of supply and demand, enabling new, disruptive mobility services, e.g. Uber, mytaxi, car2go.

Booking and billing services

Integrated booking and billing services across multiple public transport solutions (e.g. one city card for all public transport services).

Individual services

Merging of diverse data sources (e.g. weather forecast and diary) enables more reliable user information and customised services.

Hybrid mobility solutions

Separation between public and private transport blurs due to the change in ownership (first signs of Mobility as a Service).

Integrated services

Connected and integrated mobility services in an open information system offer a range of mobility options.

URBAN LOGISTICS

Small-scale logistics solutions

Small-scale solutions to make city logistic streams more efficient, e.g. pick-up points.

Efficiency improvement of urban logistics

Efficiency improvement by means of cargo 'hitching' between different logistic service providers.

Lightweight logistic solutions

New technological solutions for lightweight logistics (e.g. drones and robot delivery of small packages).

Optimising logistics flows

Optimising physical logistics flows by using time slots (e.g. night deliveries) and usage rate of infrastructure (i.e. urban spaces).

Integration of resources for city logistics

Sharing of resources to integrate city logistics flows by sharing hubs, storage, data and transport.

Connected urban logistics

Internet of Things allows real-time monitoring of locations and status of goods, and connectivity between urban logistics among different (urban) logistics service providers.

Sustainable behaviour

VALUES, MOTIVES &
BEHAVIOURAL CHANGE**Supporting sustainable and healthy choices**

Promoting bottom-up movements towards healthy behaviour and awareness, e.g. through education and incentives.

Deployment through media

Traditional media (critical journalism) and social media are used to mediate in the transition towards a sustainable society.

Small-scale initiatives

Supporting initiatives by individuals, communities and local businesses for sustainable, cooperative solutions.

Encouraging green behaviour

Encouraging people to choose more active mobility options by (re-)designing the urban space with more attractive green areas.

Conscious decisions

People's travel reasons and purposes will change, reducing the urge to travel and increasing the choice to use alternative forms of travel.

Sustainable organisation

COOPERATION &
INNOVATION NETWORKS**Active role of government**

Public parties take the lead to ensure cooperation among all parties in the transition towards smart and sustainable mobility (e.g. in tendering procedures).

New forms of cooperation

New forms of cooperation between different parties (public - private - citizen) to speed innovations in mobility solutions.

Dynamic innovation network

Dynamic innovation networks (including all parties necessary for smart and sustainable mobility) to enable active response to suitable new mobility systems.

Responsible sharing of assets

Public parties ensure access by other (private) parties to public assets, e.g. public transport data and infrastructure.

POLICIES
& LEGISLATIONS**New incentives and measures**

Implementation of new incentives and measures to promote and scale-up new mobility solutions and services.

Ethical recalibration

Public parties take the lead in an ethical discussion of privacy and security to safeguard public interest.

Framework for liability

Insurance for new ownership(s) and sharing of assets (e.g. 'who is responsible?') to promote the adoption of sustainable mobility modes.

Proactive local regulations

Discouraging the use of high-emission (private) cars and unsustainable solutions, e.g. by regulating time slots or flexible use of infrastructure.

Openness

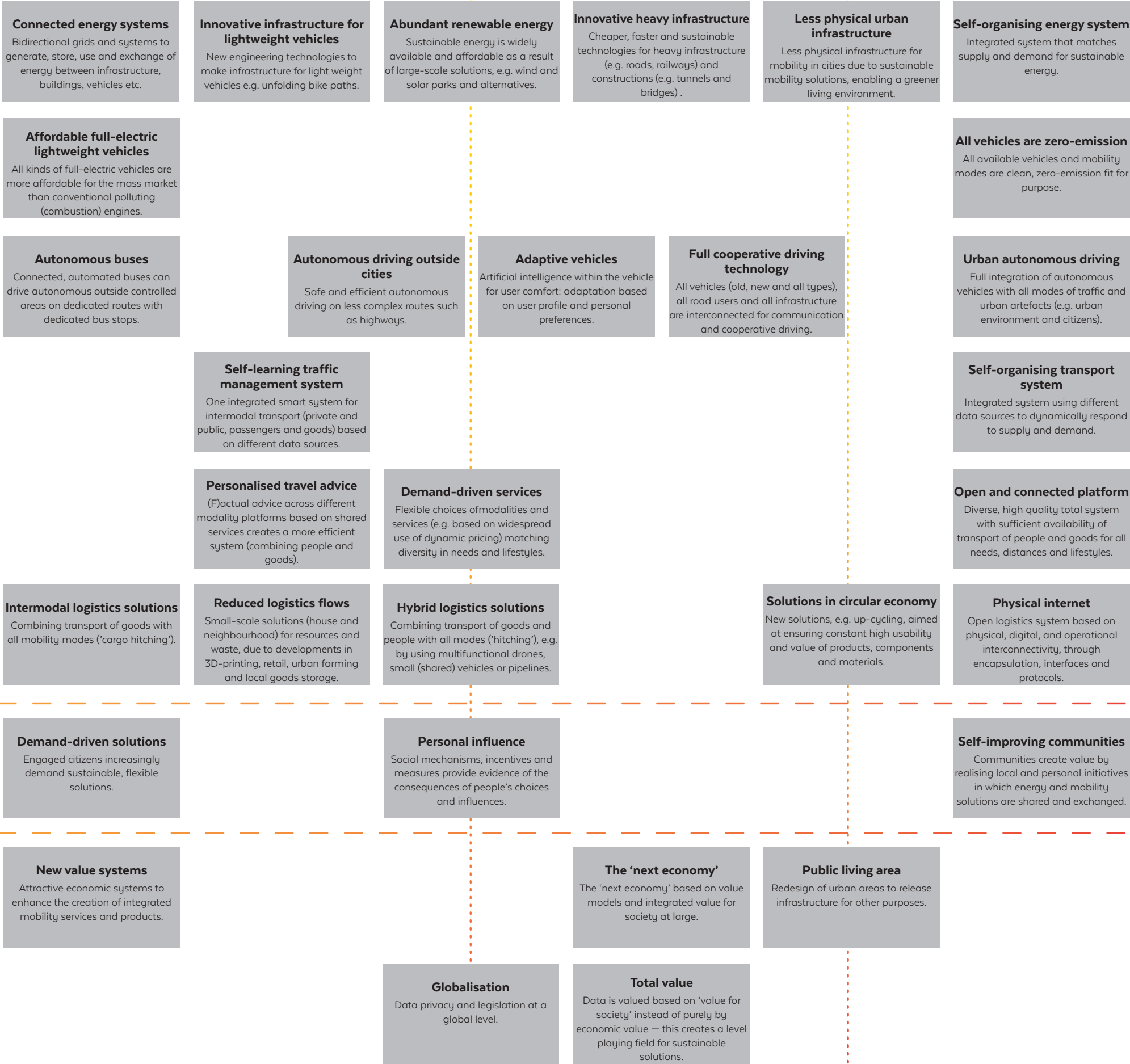
New frameworks for accessibility and openness of data systems and mobility systems, including coverage of national privacy issues.

Scalability

EU legislation to ensure scalability of innovative mobility solutions, e.g. scalable legislation for Uber.

2016

2020



Desired future scenario

The Smart Mobility theme focuses on sustainable energy solutions for public and private transport and logistics. The ambition of the cities is to create attractive and clean public spaces and healthy, sustainable green environments that invite residents and visitors to walk or go by bike. Open data platforms, integrated systems and accurate multi-modal transport information provide personalised advice for seamless journeys, integrating sharing of sustainable vehicles and green public transport.

Sustainable solutions and lifestyles

- All systems use energy from renewable sources
- All modes of transport are sustainable (materials, zero-emission)
- Systems support users in making optimal choices (e.g. balancing costs, emissions, time and social aspects)
- Sharing of (autonomous) vehicles and rides
- Sustainable accessibility (e.g. for the elderly and disabled)

Healthy lifestyles

- Comfortable, accessible, high-quality living environment that encourages outdoor activities
- Green urban areas, safe areas and clean air
- Inviting people to spend time outdoors
- Healthy lifestyles with efficient activity levels

Reducing the need for travel

- Human scale urban planning: all daily needs are nearby
- Remote services (health, education, public services, working)
- Poly-centric cities with decentral service hubs
- Local production (food, 3D-printed goods)
- Smaller-scale ecological solutions (e.g. goods delivery)

Seamlessly connected networks

- Networks for quick, easy access
- Smooth, seamless transport ('single route')
- Integrated system to provide 'door-to-door' service
- Integration of new modes of transport and innovative vehicles
- Smooth, seamless transition between (regional) networks

Mobility à la carte

- A wide range of (interconnected) alternative routes and modes of transport to suit different lifestyles
- Flexibility and freedom of choice
- An enjoyable and convenient travel experience
- Demand-driven diversity (blending public and private)

Accessible, affordable and convenient mobility

- All modes of (public) transport are safe, convenient, accessible, fast, flexible and affordable for all
- Convenient and easy-to-use ('one-click' reservation, flexible payment, pick-up/drop-off at any point)
- Easy transfer at intermodal transport hubs

Personalised advice

- Personalised travel advice based on factual, up-to-date information and personal needs at that moment
- Smart adjustments based on people's profiles and needs
- Accurate, up-to-date, real-time, cross-modal information
- Personalised advice accessible through multiple applications and devices

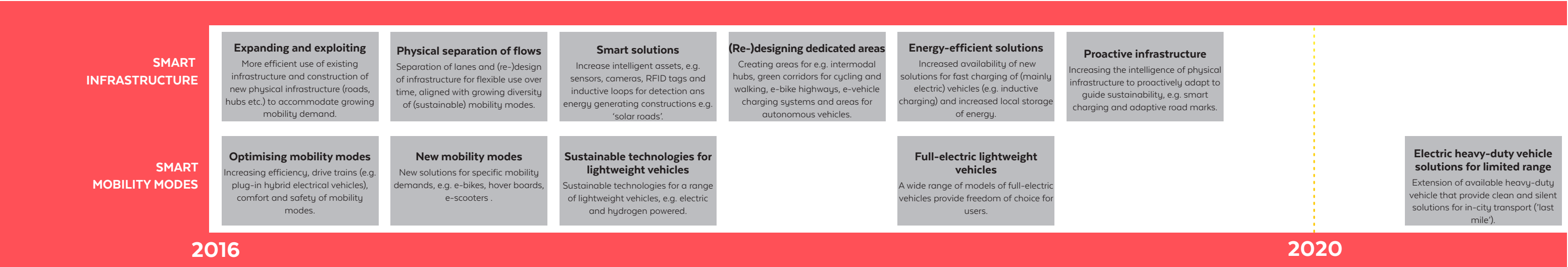
Smart management

- Smart traffic management based on real-time, cross-modal information, analysis and prediction
- Automated systems for smooth (public) traffic flows
- Communication between drivers, vehicles and infrastructure
- Safe and secure, in both the physical and virtual worlds

2030

2040

2050



Smart Infrastructure

Short-term developments

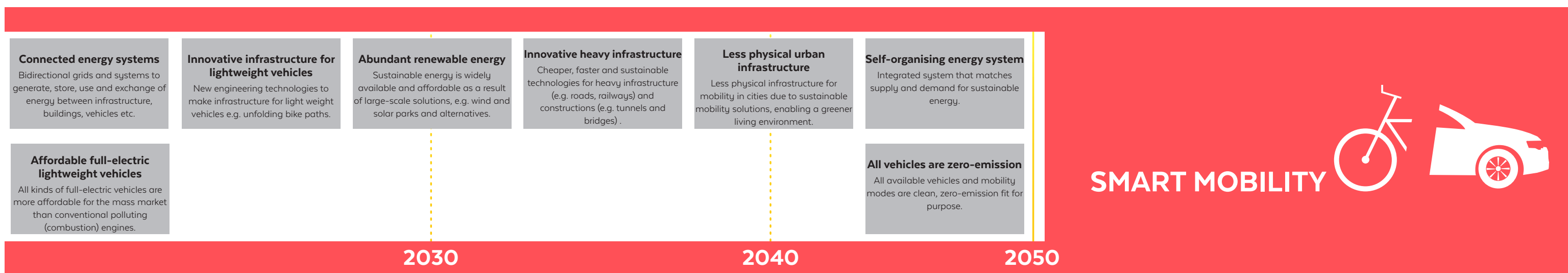
- In the short term, new infrastructure continues to be constructed (mainly outside the city centres), and current infrastructure is used more efficiently to accommodate the growing demand for mobility.
- Separation of lanes and (re-)design of infrastructure allows flexible use of infrastructure over time, aligned with growing diversity of mobility modes. In addition, the creation of new areas or the re-creation of existing areas allows for dedicated areas such as green corridors, e-bike highways and e-vehicle charging systems.
- More (fast) charging solutions and solutions for local energy storage are in place.
- The increase in intelligent assets allows for a more intelligent (proactive) infrastructure. Intelligent infrastructure could, for example, proactively drive sustainability in cities by guiding users of electric vehicles to charging stations or by automatically banning vehicles with high emission levels from city centres.

Mid-term developments

- Connected energy systems allow for the generation, storage, use and exchange of energy between infrastructure, buildings and other assets.
- New engineering technologies are in place to make lightweight infrastructure (e.g. unfoldable bike paths and footpaths).
- Sustainable energy is largely available in the medium term as a result of large-scale solutions such as wind and solar parks. The resulting abundant sustainable energy is affordable for all.

Long-term developments

- In the long term, new engineering technologies are in place to build heavy infrastructure. This results in cheaper, faster and more sustainable ways to build and maintain heavy infrastructure such as roads, railways and constructions such as tunnels and bridges.
- Finally, a wide range of sustainable mobility solutions, less physical infrastructure and an integrated energy system enable a greener living environment in which sustainable energy supply and demand can be organised efficiently.



Smart Mobility Modes

Short-term developments

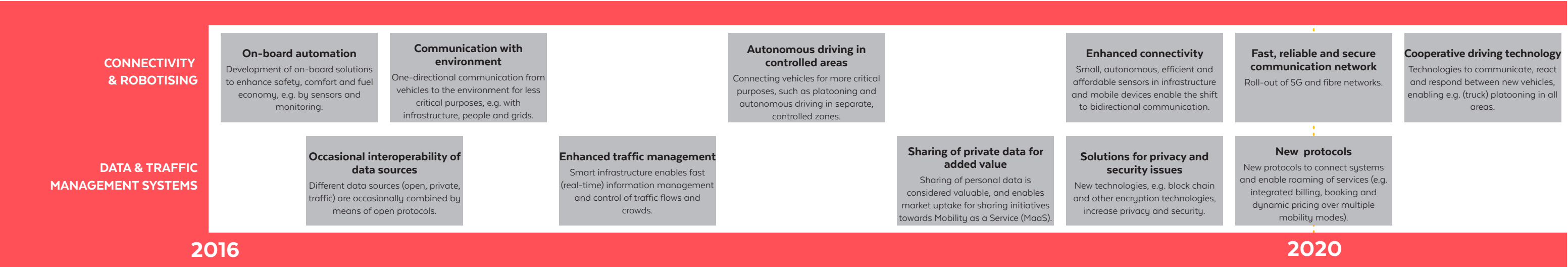
- In the short term there are incremental improvements in vehicle drivetrains, comfort and safety. As well as optimising current mobility modes, new mobility modes are also emerging as solutions for specific mobility demands, such as e-bikes, hoverboards and e scooters.
- Over time, but still in the short term, sustainable technologies enable a wide range of lightweight (electric or hydrogen-powered) vehicles. The range of lightweight vehicles is accompanied by increasing availability of full-electric vehicles, giving users freedom of choice.

Mid-term developments

- In the mid-term, a limited range of heavy-duty vehicles is available. More specifically, the available range of heavy-duty vehicles increases, providing clean and silent solutions for in-city transport.
- In addition to the developments in heavy-duty vehicles, all kinds of sustainable (mainly electric) vehicles are more affordable for the mass market than conventional, polluting vehicles. From this point on, the numbers of sustainable vehicles grow faster than the traditional, polluting vehicles.

Long-term developments

- In the long term, all available vehicles and mobility modes are clean, zero-emission and fit for their intended purposes. But it will still take a very long time before all vehicles on the road are clean and non-polluting.



Connectivity & Robotising

Short-term developments

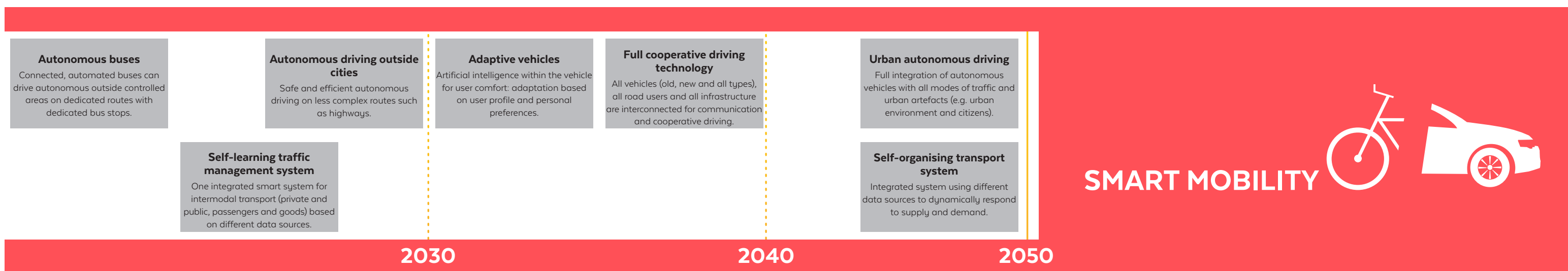
- Short-term developments in connectivity and robotising can first of all be relate mainly to in-vehicle automation and autonomous driving in controlled areas. This means that the development of in-vehicle solutions enhances safety, comfort and fuel economy, e.g. by means of sensors and monitoring. In addition, autonomous driving is possible in separate controlled zones.
- Secondly, short-term developments in connectivity and robotising are related to one-directional communication. Later in this period, enhanced connectivity enables a shift to bidirectional communication. More specifically, one-directional communication between vehicles and their environment shifts over time towards bidirectional communication. This will be enabled by efficient, affordable sensors in infrastructure and mobile devices.

Mid-term developments

- In the mid-term, the experts predict developments relating to the creation of a fast, reliable and secure communication network, enabled by the roll-out of high-speed 5G and fibre networks. In addition, cooperative driving technologies to communicate, react and respond between new vehicles enable forms of ‘platooning’ of vehicles in almost all areas. Autonomous buses and autonomous driving outside cities are expected to be possible (on a larger scale) by the end of the mid-term period.

Long-term developments

- Long-term developments in connectivity and robotising relate mainly to adaptive vehicles, full cooperative driving technology and finally autonomous urban driving. Artificial intelligence, fully interconnected and communicating vehicles (both old and new) and full integration of autonomous vehicles with other modes of traffic and urban infrastructure are some of the core aspects of these long-term developments.



Data & Traffic Management Systems

Short-term developments

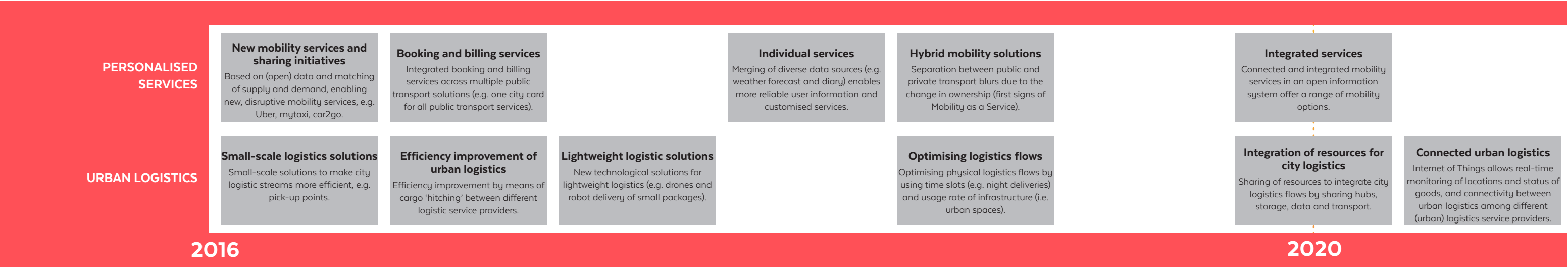
- In the short term, several main developments can be identified. The first developments relate to the interoperability of different data sources. The creation of a fully interoperable platform is perhaps the main challenge in creating complete, sophisticated data & traffic management systems. Currently open protocols allow different data sources to be combined and integrated on an occasional basis. This kind of occasional interoperability of multiple data sources continues to increase over time.
- Recognition of the value of data drives the market uptake of sharing initiatives towards Mobility as a Service. This valuing of data is already visible, but this development is likely to increase over time. In addition, the development of new protocols enables the interconnection of systems and roaming of services across multiple mobility modes. However, this requires new solutions to address privacy and security issues.
- Enhanced traffic management is already happening. The increasing amount of smart infrastructure speeds the potential of enhanced traffic management. Smart infrastructure also enables fast (real-time) information management and control of traffic flows and crowds.

Mid-term developments

- The development of new protocols is likely to increase over time, and this development also continues to intensify in the mid-term period, allowing an increase in the interconnection of systems and roaming of services across multiple mobility modes. Self-learning traffic management systems begin to emerge as a result of the enhanced traffic management system and the increase in connectivity. These integrated smart system allow the management of intermodal transport of passengers and goods, using different (secure) data sources.

Long-term developments

- The creation and use of a self-organising transport system is already possible and applicable within a (secure) small-scale environment. However, an integrated system that uses different data sources to dynamically respond to supply and demand of goods, services and passengers on a large scale is still some years away.



Personalised Services

Short-term developments

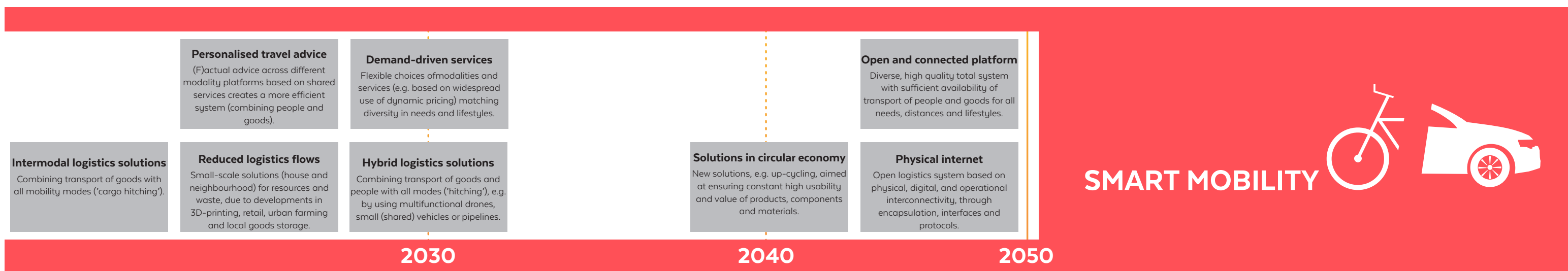
- In the short term, the number of new mobility services and sharing initiatives is likely to increase. This is mainly due to the increase in (open) data and matching of supply and demand, which enables new mobility services that could potentially disrupt the market. Integrated booking and billing services across multiple public transport solutions such as on a single city card for all public transport services, as well as individual, personalised services, enable more reliable and convenient services.
- By the end of the short term, at around the beginning of 2020, there is a shift from hybrid mobility solutions towards more integrated services. The separation of public and private also blurs over time, due to the change in ownership. In addition, connected and integrated mobility services in an open information system will offer a range of mobility options.

Mid-term developments

- New protocols to connect systems and enable roaming services allow better connected and more integrated services. Factual, up to date advice across different modalities and based on shared services creates a more efficient mobility system that combines services and the transport of goods and peoples. In the long term, this development results in demand-driven services.

Long-term developments

- In the long term, demand-drive services allow for flexible choices of modalities and services matching a wide range of needs and lifestyles. These demand-driven services are enabled by a fully open and connected platform. The result is a diverse and high-quality total system that offers sufficient capacity for all transport needs – for people and goods, for all distances and for all lifestyles. However, it will still take a couple of years and some conditions need to be met before all these services are available on a large scale.



Urban Logistics

Short-term developments

- In the short term, small-scale logistics solutions are further developed making city logistics flows more efficient, for example by using pick-up and drop-off points, and these solutions become more widely available. Efficiency improvements by means of cargo 'hitching' between logistics service providers and the development of new technological solutions for lightweight goods logistics are two developments that reach maturity and are ready for market uptake in the short term.
- Optimising physical logistics flows by exploiting time slots, for example night deliveries and higher usage of infrastructure such as urban spaces, have already been implemented on a local scale. By the end of the short term, these developments are widespread.

Mid-term developments

- The integration of resources for city logistics is a development that occurs by the end of the short term and in the beginning of the mid term period. Sharing of resources is more common and allows the integration of city logistics flows. The sharing of hubs, storage facilities, data and transport solutions is seen as a straightforward solution for urban logistics.
- In the mid-term the Internet of Things (IoT) allows extensive real-time monitoring of the locations and status of goods. In addition to real-time monitoring, IoT will allow increased connectivity of urban logistics among different service providers. The connectivity of urban logistics and the market uptake of Mobility as a Service allow intermodal logistics solutions, combining goods transport with all mobility modes (cargo 'hitching').
- Small-scale solutions (home and neighbourhood) for resources and waste resulting from developments in 3D printing, retail, urban farming and local goods storage allow logistics flows in urban areas to be reduced by the end of the mid-term period.

Long-term developments

- Hybrid logistics solutions are widely available, using all mobility modes to transport goods and people. These developments emerge in line with those already referred to in connectivity, personal services and data & traffic systems. Overall, the result is an open logistics system based on physical, digital and operational interconnectivity through embedded interfaces and protocols. These long-term developments are also known as the physical internet.
- Solutions in circular have the potential to disrupt urban logistics flows. New solutions, products, components and materials are designed to constantly maintain the highest value and efficiency.



Values, Motives & Behavioural Change

Short-term developments

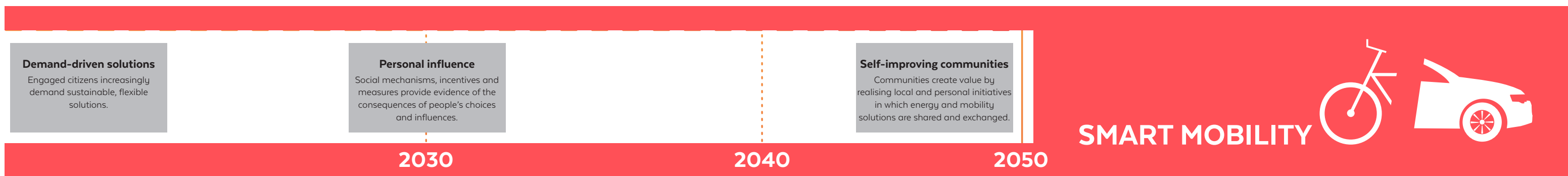
- Values, motives and behavioural change are about the way citizens can play an active role in their own behavioural change, driven by different values and reasoning over time. In the short term, this is made possible by promoting bottom-up movements towards healthy behaviour and awareness, for example with education and incentives. The role of the media is crucial for people's values, motives and behavioural change relating to the use of smart, sustainable mobility solutions. Both traditional (critical) journalism and new (social) media are used in the short term to support and facilitate the transition towards a sustainable society.
- Small-scale initiatives for sustainable and cooperative solutions by individuals, communities and local business are more widespread in the short term. This develops in line with the encouragement of green behaviour so people choose more active mobility options (e.g. bikes or walking). For this purpose, the urban space is redesigned with more green, liveable and attractive areas.

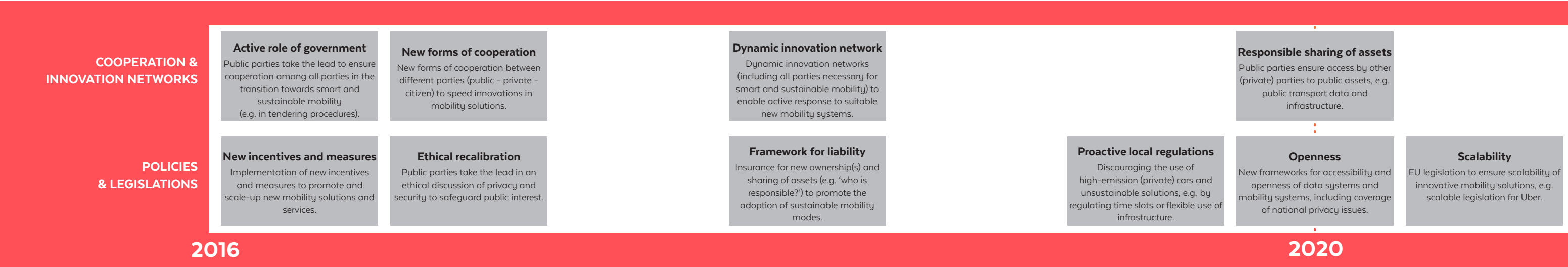
Mid-term developments

- Mid-term developments show that people's thinking and reasons for travelling will change due to technological developments and MaaS (Mobility as a Service), which reduces the urge to travel and increases the choice of alternative ways of travel. The shift in people's thinking and reasons for travelling enables demand-driven solutions, in which engaged citizens increasingly demand sustainable and flexible solutions.

Long-term developments

- Social mechanisms, incentives and measures provide help to show people the consequences of their choices by the end of the mid-term and the beginning of the long term. By the end of the long-term period self-improving communities emerge. More specifically, in the long term these communities create value through local and personal initiatives to share and exchange energy and mobility solutions.





Cooperation & Innovation Networks

Short-term developments

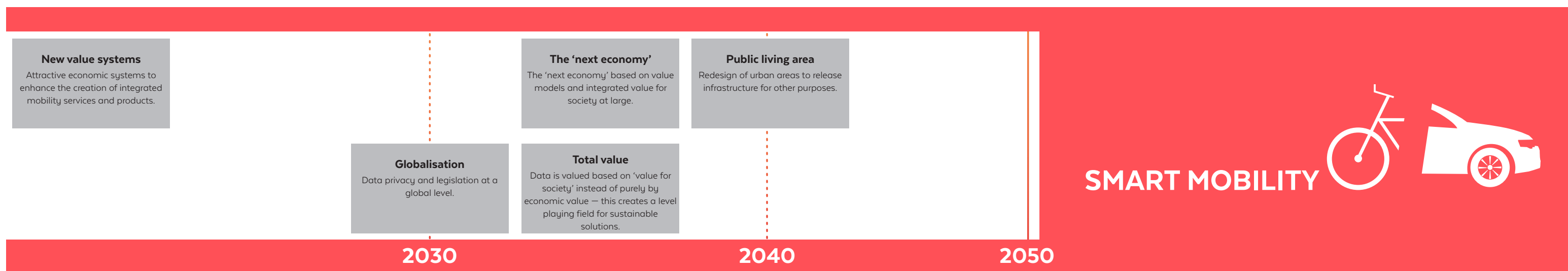
- Cooperation and innovation networks describe how new forms of cooperation between different types of organisations (public–private) evolve over time, speeding innovation and the roll-out of new mobility solutions. In the short term, public parties take active roles in ensuring cooperation between all those involved in the transition towards smart mobility; this is a trend that is already taking place. New forms of cooperation between the different parties – public, private and citizens – are established to speed innovation and the roll-out of new mobility solutions.
- Dynamic innovation networks, including all parties needed for smart mobility solutions, enable an active response to new mobility systems in the short term. Public parties play a leading role in this process by ensuring that other (private) parties have access to public asset such as data, transport data and infrastructure.

Mid-term developments

- As a result of the sharing of assets and other developments, a new value system emerges in the mid term. This is based on attractive economic systems that enhance the creation of integrated mobility services and solutions.

Long-term developments

- In the long term, expected developments relate to the ‘next economy’, based on value models and overall value for society at large. Finally in the long term, redesigned urban areas release infrastructure for other purposes.



Policies & Legislation

Short-term developments

- Legislative changes and the right policies are important factors in the developments relating to Smart Mobility. In the short term, the implementation of new incentives and measures is stimulated and new mobility solutions and services are scaled-up. In this phase, public parties play an important leadership role in the ethical discussion of privacy and security to safeguard public interest. Technological developments in data security are an important factor in allowing and enabling the discussion of ethical recalibration.
- Frameworks for liability continue to develop in the short term. The availability of insurance for new asset ownerships and sharing models drives the penetration of sustainable mobility modes and the shift towards Mobility as a Service. Proactive local regulation encourages the adoption of smart, sustainable mobility solutions. At the same time it discourages the use of polluting vehicles, for example by regulating time slots or flexible use of infrastructure.

Mid-term developments

- In the mid-term, there is more openness in terms of new frameworks for accessibility of data systems and mobility systems. The openness of these data and mobility systems takes into account national privacy issues. The way national privacy is handled, together with EU legislation, also enables the scaling-up of innovative mobility solutions, for example with scalable legislation for taxi services such as Uber.

Long-term developments

- Frameworks and long-term legislation at both national and EU level ensure global data privacy. In the long term, experts expect to see a total value system in which data is value for its societal benefits instead of purely in terms of economic value. This creates a level playing field for sustainable solutions.



This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397

SMART MOBILITY GENERAL ROADMAP

D4.2 Report — Timelines for the topics in Smart Mobility

This report (D4.2) contains the results of the Roadmapping research conducted between January 2016 and August 2017. The first Roadmapping interviews were held to identify future options for sustainable energy in the area of Smart Mobility. The interview results were analysed in an expert meeting to distil the most relevant topics and to create timelines with future options for those topics. The timeline for Smart Mobility was aligned in a cross-expert meeting, together with the timelines for Smart Buildings (D3.2) and Smart Urban Spaces (D5.2) to ensure that the links between the focus areas were also addressed. The general roadmaps were used in roadmapping sessions held in the R4E partner cities to create city-specific roadmaps (which are reported in D4.3).

The creation of the general roadmap is part of the WP4 Roadmap Smart Mobility within the R4E project. The R4E partners work together to develop a new type of energy strategy through visions and roadmaps for the eight partner cities in co-creation with local stakeholders. The project supports the development of visioning and roadmapping capacities within the municipalities to drive future development and implementation of innovative energy solutions



ROADMAPS
FOR
ENERGY®