AMBITION, VISION & ROADMAP
SMART MOBILITY TALLINN

D6.4 Final city report

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Abstract
This report (D6.4) is the final deliverable of the R4E project and contains all relevant project results for smart mobility in the city of Tallinn.

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.

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WP7. Project management

**WP1. Ambition setting**
- Ambition workshops: 3-day workshop in each city to define specific ambitions per focus area
- Future Telling: 20 interviews with experts on the future of energy in the city in general and especially w.r.t. buildings, mobility, and urban spaces, and analysis of the results to define the most important drivers for change

**WP2. Vision development**
- Scenario workshops: 3-day workshop in each city to develop specific desired future scenarios per focus area
- Scenario preparation: defining generic elements for future scenarios in preparation for the workshops with cities to develop specific desired future scenarios

**WP3, 4 & 5. Roadmapping**
- Roadmapping training session: 2-day training session for expert partners on methodology and way of working
- Desk study: analysis of the available information on the selected topics for the roadmaps and to identify relevant experts
- Roadmap interviews: collecting expert insights with 20 experts for each focus area

**WP4. Roadmap workshops**
- 2-day workshops in each city to develop specific desired future scenario’s for the realization of the desired future scenario’s

**WP5. Creation of timelines**
- Making timelines for each topic to indicate when relevant options become available on the path towards the desired future

**WP6. Project portfolio**
- Current projects: each city identifies projects it has running that will contribute to the realization of the roadmap, as well as the topics for cross-city learning
- New projects: each city identifies desired new projects to ensure the timely realization of its roadmap ambition
- Roadmap sharing & cross learning objectives: 2-day meeting in Newcastle to share the roadmaps of the different cities, as well as the current projects and to identify cross-learning objectives

**WP8. Communication & dissemination**
- Event: final event, conference in Naples
- Regular communication activities: electronic project newsletters, other newsletters and information services, project and partner websites, press releases and other media releases, social media

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 649397.
In the Roadmaps for Energy (R4E) project, the partners 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 benefit from the new strategy, such as the citizens themselves, 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 result is a shared vision, containing the desired, city-specific scenarios and the dedicated roadmaps embedded in each city’s specific context. These roadmaps take into account the diversity in the geographies, ecologies, climates, societies and cultures 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 capabilities of the individual municipalities. This includes initiating joint activities to drive the development and implementation of innovative energy solutions in cities. In this way the R4E partners learn the process and the roadmap structure. At the same time they gain the skills they need to work independently on their future roadmaps.

The ultimate result is a process that allows the partners to work together in developing the Energy Roadmap to achieve their ‘Smart Cities’ ambition. Since energy and Smart Cities are too broad to cover in a single project, R4E focuses on three key areas of sustainable energy.

The R4E project follows a 4-step approach. 1. The FIRST step sets the ambitions for the project. The ambitions of the participating cities on sustainable energy and Smart Cities in general are set, as well as the partner cities’ choice of two (out of three) focus areas within Smart Energy Savings: Smart Buildings, Smart Mobility or Smart Urban Spaces. 2. The SECOND step is to develop desired city scenarios for the selected focus areas. 3. In the THIRD step, the roadmap is created. This involves identifying existing and future technologies and other developments that will enable the desired future scenarios. The opportunities and developments are plotted on a timeline to show the route and milestones towards the favoured scenarios. The roadmaps contain common parts for all the partner cities, as well as specific parts for the individual cities. 4. In the FOURTH and final step, a project portfolio is generated with new projects and initiatives to reach the ambitions, visions and roadmaps of the cities. This portfolio provides an overview of individual and joint projects, and includes cross-city learning and financial plans.

The approach is characterised by four main elements:

- Backwards planning – the project starts with the development of a shared vision as a starting point for the creation of a well developed path to achieve it.
- Inclusive workshops in the cities – a cooperative process to engage key stakeholders (companies, citizens, public and private organisations and knowledge institutes) within the region in co-creating a clear and well designed implementation plan with a stronger commitment to the joint effort in the realisation phase.
- Expert knowledge is sourced in a practical and usable form during the vision development and roadmapping.
- A visual language is used to easily connect people and share main insights.

The ultimate result is a process that allows the partners to work together in developing the Energy Roadmap to achieve their ‘Smart Cities’ ambition. Since energy and Smart Cities are too broad to cover in a single project, R4E focuses on three key areas of sustainable energy. These are closely linked to the main responsibilities of the municipalities.

The three focus areas of R4E

**Ambition, Vision & Roadmap**

**SMART BUILDINGS**

**SMART MOBILITY**

**SMART URBAN SPACES**

The eight partner cities of R4E

EINHOVEN
- Gemeente Eindhoven, the Netherlands
- Population: 220,000
- Area: 90 km²
- Includes: Smart Buildings, Smart Mobility, Smart Urban Spaces
- Citizen participation
- Backwards planning
- Inclusive workshops

Newcastle City Council
- Newcastle City Council, United Kingdom
- Population: 282,000
- Area: 114 km²
- Includes: Smart Buildings, Smart Mobility
- Citizen participation
- Backwards planning
- Inclusive workshops

Comune di Forlì, Italy
- Population: 120,000
- Area: 228 km²
- Includes: Smart Buildings, Smart Urban Spaces
- Citizen participation
- Backwards planning
- Inclusive workshops

Comune di Palermo, Italy
- Population: 885,000
- Area: 160 km²
- Includes: Smart Buildings, Smart Mobility
- Citizen participation
- Backwards planning
- Inclusive workshops

Istanbul Metropolitan Municipality, Turkey
- Population: 14,100,000
- Area: 1.830 km²
- Includes: Smart Buildings, Smart Urban Spaces
- Citizen participation
- Backwards planning
- Inclusive workshops

Ajuntament de Sant Cugat
- Sant Cugat del Vallés, Spain
- Population: 86,000
- Area: 50 km²
- Includes: Smart Buildings, Smart Mobility
- Citizen participation
- Backwards planning
- Inclusive workshops

Ajuntamiento de Murcia, Spain
- Population: 440,000
- Area: 885 km²
- Includes: Smart Buildings, Smart Mobility, Smart Urban Spaces
- Citizen participation
- Backwards planning
- Inclusive workshops

Tallinn Keskkonnaamet, Estonia
- Population: 450,000
- Area: 160 km²
- Includes: Smart Buildings, Smart Mobility, Smart Urban Spaces
- Citizen participation
- Backwards planning
- Inclusive workshops

The four step approach of R4E

1. Ambition setting
2. Vision development
3. Roadmapping
4. Project portfolio
Ambition Setting

The aim of Step 1 is to set the ambitions for the project. An ambition expresses what a city wants to achieve in the future. For this purpose the ambitions of the participating cities on sustainable energy in general are defined and refined in a process of co-creation, using existing policy documents as a basis for workshops with the individual cities. Each city selects two focus areas for which specific city ambitions are defined.

Today’s reality

During the kick-off meeting the cities present the current status of their energy policy in general and their selected focus areas in particular. This chapter starts with a summary of this information.

Ambition Workshops

The strategic ambitions for energy-related themes in general and for the selected focus areas in particular are assessed in a series of workshops in each of the partner cities.

The Ambition Workshops consists of 3-day visits to the individual cities, during which several workshops with policy-makers and stakeholders are held to gain a deep understanding of the ambitions and specific contexts of the cities. Through the networks in the cities the local stakeholders (companies, citizens, public and private organisations and knowledge institutes) are invited to participate in the workshops. Together, the participants interactively contribute to the strategic ambitions. See also the pictures of the workshops on the previous page. The results of the Ambition Workshops are reported in similar formats for each of the cities to enable cross learning between the cities.

Joint Ambition Workshop

In a joint meeting in Palermo, the cities shared their ambitions and held in-depth discussions to understand the common and specific aspects of their ambitions. The main aim of the Joint Ambition Workshop is to enable cross-city learning. In this way the cities gain a deeper understanding of the Ambition Setting process, and can improve their own ambition with inspiration from others.

The Joint Ambition Workshop is a 1-day workshop that finalises the activities of Step 1 and prepares for Step 2.

Programme of the Ambition Workshops in the cities

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview with policy makers</td>
<td>Workshop with stakeholders focus area 1</td>
<td>Project team working session to establish scope</td>
</tr>
<tr>
<td>Workshop with strategy department</td>
<td>Workshop with stakeholders focus area 2</td>
<td>Preparing main content of concept report</td>
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Programme of the Joint Ambition Workshop

<table>
<thead>
<tr>
<th>Morning</th>
<th>Finalising Step 1</th>
</tr>
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<tbody>
<tr>
<td>Presentation of the cities ambitions</td>
<td></td>
</tr>
<tr>
<td>• Each city presents their ambition for the focus areas</td>
<td></td>
</tr>
<tr>
<td>Learning from each other’s ambitions</td>
<td></td>
</tr>
<tr>
<td>• In-depth discussion on common and specific ambitions</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Afternoon</th>
<th>Preparing for Step 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation of the Drivers for Change</td>
<td></td>
</tr>
<tr>
<td>• Sharing results of Future Telling research</td>
<td></td>
</tr>
<tr>
<td>Understanding the Drivers for Change</td>
<td></td>
</tr>
<tr>
<td>• Exploring the relevance for the focus area and selection of drivers for scenario workshops</td>
<td></td>
</tr>
</tbody>
</table>
Introduction to Tallinn

Introduction to the city
Tallinn is the capital and largest city of Estonia. Approximately 33% of Estonia's total population lives in Tallinn. Tallinn never fails to amaze visitors with its historic charm. At its heart is the Medieval Old Town, an area of cobbledstone streets, gabled houses, churches and squares that developed here from the 13th to the 15th centuries when Tallinn was a booming Hanseatic commercial hub. The Old Town has long been the main draw for visitors – in fact it is so unique that UNESCO added it to its World Heritage List in 1997. Other areas of the city reflect different ages, from the romantic, Tsarist-era Kadriorg Park to the unforgettable, early-20th-century wooden house district of Kalamaja. A modern shopping and business district in the city centre completes the city scene and blends the old and new faces of Tallinn. Tallinn is a small, relatively quiet city with 40 km² of parks and forests and a beautiful 2 km sand beach bordering its bay providing fresh air and relaxation.

Visitors can stroll along well-developed seaside pathways, explore the natural, suburban bog trails, take sailing trips to nearby islands or use a neighbouring golf course. Tallinn is widely recognised as one of the world’s most technology-oriented cities, offering a range of solutions ranging from e-government to mobile parking. Free Wi-Fi is available almost everywhere. The city also hosts a dynamic business community, in which technology plays a major part. The city is home to the world development headquarters of the Internet telephony company Skype.

Tallinn has selected two focus areas for the R4E project:

- SMART BUILDINGS
- SMART MOBILITY
Demographical aspects

- Size in km²: 159.2 km²
- Number of inhabitants: 438,569 (October 2015)

Social aspects

- Level of education of citizens: 46.4% of citizens in Tallinn (ages 15-75) have a Tertiary Education attainment. Population with secondary education level: 89.6% (2014, Statistics Estonia)
- Connectivity level: Percentage of households with a computer in Tallinn: 88.6%. Smart Phone Usage in Estonia: 60% (2014, TNS Emor)
- Unemployment rate: In Tallinn the unemployment rate is 3.5%, which is slightly lower than in Estonia (4.8% (30.04.15, Eesti Töötukassa – "Estonian Unemployment Insurance Fund")
- Share of population with energy poverty: Estonia has not introduced the concept of energy poverty in its legislation, thus there is no statistics on population living in energy poverty.
- Percentage of people that require special care/needs: In 2014 ca 7% of the population in Tallinn had a disability that prevented them from working. 4% of city residents received disability pension (2014, Statistical Yearbook of Tallinn)
- Inclusive accessibility policies / indicators (e.g. related to access to public transport): 56% of the fleet are low-floor vehicles, making them accessible for people in wheelchairs or with baby strollers.
- Satisfaction level of citizens regarding buildings, mobility, urban spaces: In Tallinn, 89% of the respondents were satisfied to be living in Tallinn. The residents’ satisfaction with their city’s infrastructure and facilities is based on eight categories: public transport (59% satisfied), health care services (53%), sports facilities (55%), cultural facilities, the state of the streets (52%), and buildings in the neighbourhood, public spaces (68%), availability of retail shops and schools and other educational facilities. In all of these categories, a positive answer was given by more than half of the surveyed residents of Tallinn. The residents of Tallinn gave a positive answer to four of five questions about the environment.

Economical aspects


Tallinn is the financial and business capital of Estonia. The city benefits from the high level of economic freedom, liberal economic policy, and has a highly diversified economy with particular strengths in information technology, tourism and logistics. Currently, over half of the Estonian GDP is created in Tallinn. 75% of residents are employed in the tertiary sector and 24% in the secondary sector (2013, Statistics Estonia). 78.9% of GDP is generated in the Services sector, 20.6% is generated in the Industry and construction sector (2012, Statistics Estonia).

In 2012 there were 21,787 buildings in Tallinn. Dwelling completions by type of building (number of buildings):
- 2009: 1,591
- 2010: 1,266
- 2011: 1,021
- 2012: 908
- 2013: 713
(2014, Statistical Yearbook of Tallinn)
Mobility modal share: see graph. Decline in the use of public transport in 2014 was due to large-scale tram network renovations, thus the share of moving by car and on foot increased.

Expenditures on public transport forms 14.6 % of the city budget.

<table>
<thead>
<tr>
<th>Area</th>
<th>Percentage (%)</th>
<th>Expenses in 2013 (million €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>37.7</td>
<td>159.17</td>
</tr>
<tr>
<td>Public Transport</td>
<td>14.6</td>
<td>61.52</td>
</tr>
<tr>
<td>Social Welfare</td>
<td>9.6</td>
<td>40.53</td>
</tr>
<tr>
<td>Administration</td>
<td>7.3</td>
<td>30.72</td>
</tr>
<tr>
<td>Roads and streets</td>
<td>6.5</td>
<td>27.48</td>
</tr>
<tr>
<td>Culture</td>
<td>5.9</td>
<td>24.9</td>
</tr>
<tr>
<td>Water supply and sewage</td>
<td>3.4</td>
<td>14.5</td>
</tr>
<tr>
<td>Housing</td>
<td>3.3</td>
<td>13.83</td>
</tr>
<tr>
<td>Open Space Maintenance</td>
<td>1.7</td>
<td>7.40</td>
</tr>
<tr>
<td>Public Safety</td>
<td>0.86</td>
<td>3.63</td>
</tr>
<tr>
<td>City Planning</td>
<td>0.7</td>
<td>2.98</td>
</tr>
<tr>
<td>Environmental protection</td>
<td>0.4</td>
<td>1.73</td>
</tr>
</tbody>
</table>

Environmental aspects

Green areas: 38 946 677 m², that is 24.4% of Tallinn area.

Estonia lies in the northern part of the temperate climate zone. The climate in Tallinn is characterized by a fairly cold winter, a cool spring with little precipitation, a moderately warm summer and a long and rainy autumn. However, some summers have weeks at a stretch of temperatures around +30°C, and a warm, sunny summer can keep autumn at bay until mid-October. Average temperature in July +16.7°C. Average temperature in February -4°C. Tallinn receives 618 millimetres (24.3 in) of precipitation annually which is evenly distributed throughout the year. March and April are the driest months, averaging about 30 millimetres (1.2 in) while July and August are the wettest months with 74 millimetres (2.9 in) of precipitation. The highest recorded temperature in Estonia was +35.6°C in 1992 and the lowest temperature -43.5°C in 1940.

In its current cooperation with the state (Ministry of Environment) flood risk maps have been completed in Estonia, including Tallinn, showing the likely rise in the water level in 10, 50, 100 and 1000 years, and describing the potential adverse effects. Flood zones shall be construed as limitations in the comprehensive plans of city districts. These maps provide the basis of the recommendations by Tallinn City Planning Department for areas located in the flood areas during the process of planning and issuing building permits. In February 2009, Tallinn joined the Covenant of Mayors. Accordingly, the city has undertaken the duty to reduce its CO2 emissions by 20% by 2020 as a result of a 20% improvement in energy efficiency and a 20% share of renewable energy sources in the energy mix. Tallinn’s present Action Plan for Energy Efficiency, which has been developed for the period 2011 to 2021, analyses energy-saving opportunities in Tallinn and sets out guidelines for the development of Tallinn’s energy economy by the year 2021.

Buildings in the medieval old town are built mostly of limestone. Several residential districts of wooden houses built in the 19th and beginning of 20th century have been preserved. There are large districts of private houses in Nõmme, Põhja, Kristiine etc. In 1960s began the extensive construction of concrete slab apartment buildings in Mustamäe, Ösmo and Lasnamäe districts which lasted until the 1980s. In 2012 7.7% of residential houses were built before 1944; the share of houses built in 1946 - 1960 was 10.3%, in 1961 - 1970 26.4%; in 1971 - 1980 21.8% and in 1981 33.8%. 88.2% of households live in apartment buildings and 11.8% in private residences. The energy efficiency in houses built before 1991 is low: poor external wall insulation, only natural ventilation without heat recovery, no indoor temperature control. The energy consumption in unrenovated residential buildings is 180 - 250 kWh/(m²*year).

Type of urban space: 9 173 378 m² / 950 km of roads in Tallinn: 28.6 km of bus lanes, 940 stops for public transport, 377 321 m² city-owned parking lots, 252.5 km of bicycle paths.
Total CO2 emission per head:

Total energy consumption in the local industry in 2011 was 1200 GWh.

The fleet of Tallinn public transport is mainly running on electricity (trams and trolleybuses) and diesel (buses). In 2015 24 new hybrid Diesel-electric buses will be procured.

Municipal buildings energy consumption:

Firewood is widely used for heating in private houses. CHP plant in Tallinn uses wood chips. In 2014 the share of wood chips used in district heating was 40%. In recent years a large number of different types of heat pumps have been introduced, to a lesser extent investments have been made in solar collectors and panels.

Annual average concentrations of air pollutants in Tallinn:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO(_2) µg/m(^3)</td>
<td>1.03</td>
<td>1.07</td>
</tr>
<tr>
<td>NO(_2) µg/m(^3)</td>
<td>16.7</td>
<td>14.7</td>
</tr>
<tr>
<td>O(_3) µg/m(^3)</td>
<td>51.7</td>
<td>47.1</td>
</tr>
<tr>
<td>PM(_{10}) µg/m(^3)</td>
<td>14.1</td>
<td>14.87</td>
</tr>
<tr>
<td>PM(_{2.5}) µg/m(^3)</td>
<td>8.2</td>
<td>8.4</td>
</tr>
<tr>
<td>CO mg/m(^3)</td>
<td>0.25</td>
<td>0.227</td>
</tr>
</tbody>
</table>

Percentage of people in Tallinn (%), who are exposed to noise over 55 dB and 65 dB:

<table>
<thead>
<tr>
<th>Noise level L(_{eq}) in dB</th>
<th>Car traffic</th>
<th>Railway</th>
<th>Industry</th>
<th>Aircraft</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 55</td>
<td>66.6</td>
<td>1.48</td>
<td>2.11</td>
<td>0</td>
<td>70.19</td>
</tr>
<tr>
<td>≥ 65</td>
<td>22.52</td>
<td>0.02</td>
<td>0.12</td>
<td>0</td>
<td>22.66</td>
</tr>
</tbody>
</table>

Water consumption:

- Water supplied in 2013 in Tallinn: 21 167 000 m\(^3\)
- Water supplied per resident: 93 l/24h

10% of consumers in Tallinn are supplied with groundwater.

The water in Tallinn is mainly supplied by Tallinn Water (90% of the supply), the largest water utility in Estonia providing drinking water and wastewater disposal services to over 400,000 people in Tallinn and in several neighbouring municipalities of Tallinn. The potable water is produced from surface water at Lake Ülemiste. The company has two treatment plants: Ülemiste Water Treatment Plant (WTP) and Paljassaare Wastewater Treatment Plant (WWTP). The public water supply system comprises almost 1,111 km of water networks, 17 water pumping stations and 64 ground water borehole pumping stations with a total of 93 boreholes throughout the entire service area.

Residual waste:

In 2012 500 kg of municipal waste (household waste and similar mixed waste from various enterprises and activities) was generated per resident. In 2012 about 230 kg of residual waste (mixed municipal waste) was generated per resident.

Tallinn Water Ltd. maintains the water supply and sewer systems. In Paljassaare Wastewater Treatment Plant mechanical treatment and biological and chemical treatment technologies are applied. Tallinn sewer system comprises of 21 sewer service areas covered by the separate sewer system and 7 areas covered by the combined sewer system. 35% of Tallinn is covered by the combined sewer system.
Historical / cultural aspects

The area of Tallinn Old Town: 110 ha (1.1km), number of buildings 579.

Tallinn is a multicultural city with people from over 100 nationalities calling it their home. The majority of the population comprises of Estonians, followed by Russians, Ukrainians, Belarusians, Finnish and others. 78% of Tallinn residents hold Estonian citizenship.

167,553 passenger cars registered (2014, Statistical Yearbook of Tallinn)

91% of residents in Tallinn are homeowners

Number of associations:
- 58 museums
- 40 galleries
- 14 theatres
- 10 cinemas
- 18 libraries
- 18 concert halls
- 13 culture centres
- 10 hobby centres for elderly
- 7 youth recreational centres
- 247 private hobby schools
- 178 cultural associations
- 610 folk culture groups
- 42 houses of worship

CO2 emissions in Tallinn transport sector:
Recent projects

- Tallinn participated in a 3-year project (2011-2014) called CASCADE of networking and mutual learning on local energy leadership. It supported cities in delivering the European Union 2020 targets for energy and climate change. Coordinated by EUROCITIES, the project involved 19 large European cities as partners, as well as thematic experts Koucky & Partners and Wuppertal Institute.

- Tallinn has also been involved in the EU project COMBAT from October 2009 until September 2011. The Covenant of Mayors in the Central Baltic Capitals (COMBAT) was an EU-funded project, spearheaded by Helsinki, Riga, Stockholm and Tallinn, with the objective of facilitating knowledge and experience-sharing on the development and implementation of Sustainable Energy Action Plans (SEAP). As part of the project, the four Baltic capitals pinpointed the key success factors and challenges encountered during the development process of their respective SEAP. In a second phase, the findings of the project were collected and outlined in a set of guidelines. These guidelines present how the four COMBAT cities prepared and developed their SEAP and identify critical factors that may be relevant to other municipalities.

- In February 2009, Tallinn signed the Covenant of Mayors. Accordingly, the city has undertaken the duty to reduce its CO2-emissions by 20% by 2020 as a result of a 20% improvement in energy efficiency and a 20% share of renewable energy sources in the energy mix. In 2011, Tallinn submitted the “Sustainable Energy Action Plan”.

- Civitas Mimosoa (2008-2013) CIVITAS MIMOSA is an innovative collaboration among the cities of Bologna (Italy), Funchal (Portugal), Gdansk (Poland), Tallinn (Estonia), and Utrecht (Netherlands). MIMOSA is short for motto of the project: “Making Innovation in MObility and Sustainable Actions”. The five MIMOSA cities joined forces to “learn how to move better, to live in better cities”, by collectively exploring new approaches to sustainable transport and demonstrating new solutions with guidance from scientific and support teams. Through the implementation and evaluation of different activities, the cities worked with their citizens towards a new and innovative concept of urban mobility. Tallinn introduced a new Contactless ticketing system (Mifare card), real-time information system for public transport service, installed red-light enforcement cameras that can catch three categories of law breaking motorists: those who run red traffic lights, exceed the speed limit, or use the bus lanes and etc.

- Project Great (begins in September 2015) aims to exchange experiences and knowledge between cities on reducing traffic jams.

- R4R INTERREG IV C project which allowed local and regional authorities to make consistent comparisons thanks to a common method and exchange of transferable good practices related to local instruments in order to improve recycling performances.

- BECOSI – INTERREG IV A project with objective to map hazardous waste contaminated land sites in partner countries. (status – ongoing at the moment)

- IUAV/M – INTERREG 3C CIP project with objective to make regional surveys and regional action plans for optimal integrated urban waste management. (duration was April 2005 – September 2007)

- SEECA- Interreg IV C

- POWER – Interreg IV C

- Tallinn is a signatory of the Baltic Sea Challenge, a network of over 200 friends of the Baltic Sea taking action for a better future of the sea. Tallinn also participated in the project Cities For a Healthier Sea in 2010-2012 aiming to increase awareness of the state of the sea and to implement water protection measures on a voluntary basis. Tallinn is a partner in the project CITYWATER (Benchmarking water protection in cities), which ends in September 2015.

In 2011, Estonia launched a project for electromobility called ELMO to support the introduction of energy-efficient and environmentally-friendly electric cars and plug-in hybrids. An electric vehicle fast-charging network, consisting of 165 fast chargers around Estonia, was built. Since establishing the programme there are 28 fast-charging stations in Tallinn. Tallinn municipality uses 29 electric cars. The first fast-charging station in Estonia was built in the city of Tallinn in 2009 at the Freedom Square underground car park. In total there are 252 electric vehicles, 185 of them belong to the public sector, 125 to legal entities and 42 to individuals.

In 2014 the city of Tallinn opened Tondiraba Ice Hall in the Lasnamäe district, which can be used for various sporting events and concerts. The heat supply system in the Ice Hall effectively uses residual heat from the operation of cold machinery producing ice for the building’s heating and hot water. If the residual heat is not enough, the system will use heat from the district heating network. The building was designed with heat recovery ventilation. The heating system in Tondiraba Ice Hall is a carefully designed solution containing various modern technology solutions with the aim of achieving high energy efficiency.
Today’s reality: Smart mobility

Tallinn is located between Lake Ülemiste and the Gulf of Finland, and the main bottleneck is in the middle of the city with width less than 2.4 km. The maximum distance from east to west is 13km. Approximately two-thirds of traffic passing through the city centre is inner transit between city districts. Urban sprawl has caused major problems as it generates additional mobility needs for people who live outside the administrative city area and commute to the city for work.

Since the beginning of the 1990s the amount of car users has grown very rapidly. This has created a lot of problems such as a lack of parking spaces, increased vehicular queuing in the city causing the average speed in rush hours to fall by 2 km/h per year. To avoid these problems, Tallinn has decided to promote public transport. The goal is to make public transport much more attractive than the use of private cars.

In Tallinn, active developing of public transport started at the beginning of 2005, when the city joined the CIVITAS SMILE project. Just a few examples of the improvements in the public transport systems are 24.2 km of bus lines, integrated ticket system in Tallinn and Harju County, creating public transport priority system, implementing real-time information system, purchasing new fleet, and offering discounts for different groups of public transport users. To promote a healthy lifestyle, 214 km of light traffic roads have been established in Tallinn.

The newly designed identity of Tallinn public transport was launched to the public in 2012, and was created to make public transport more attractive. A policy document and design standard was created to fully define any design-related decision in connection with Tallinn Transport. In 2012 the design management for Tallinn Transport won an award in the EU ‘Design Management Europe’ design competition.

In January 2013 free public transport was launched in Tallinn for registered city residents who have a contactless Mifare card (‘green card’). Since 2013 free public transport has been expanded to trains travelling within the city borders. From 2016 Tallinn will start offering free public transport to residents of all the world’s cities who join the network established on September 17, 2015 by a memorandum between Tallinn and Avesta (Sweden). Today, the first results of free public transport can be presented:

- traffic load has been reduced by 20% compared with the last months of 2012;
- the number of public transport users has increased by 6%.

Due to free public transport in Tallinn, the number of Tallinn residents has increased rapidly, which has had a positive impact to the city budget. The increased funds derived from the increase in Tallinn residents are allocated to improving the quality of public transport even further.
Ambition: Smart mobility enables an enjoyable living environment in Tallinn 2050

1 Enjoyable living environment
In 2050, citizens of Tallinn enjoy an attractive, clean and quiet living environment that encourages them to behave sustainably. More and integrated green and blue areas, with an extensive network of cycle tracks and pedestrian-only areas enables people to commute conveniently by bike or on foot.
The cityscape is dense, so all services are within easy reach or are provided in the home. More public space is allocated to living, and less for motorised transport.

2 Smooth, seamless public transport
In 2050, the citizens of Tallinn all have access to smooth, seamless public transport that connects all the city areas. Smart planning is used to respond to the (dynamic) demand for the transport of people and goods. The transport and ticketing systems around the Baltic Sea are integrated in a way that is simple, comfortable, affordable (free), clean and fast.

3 Open, collaborative decision-making
In 2050, planning and decision-making processes are based on open collaboration that includes different views and knowledge sources. Tallinn is recognised as an front-runner in openness. Citizens are aware of their roles, and actively take part in making decisions that influence their living environment.

Strategic ambitions

- In 2050 Tallinn is a liveable city where citizens get their services in walking/biking distance or at home. The city is planned for humans: user friendly facilities and more green areas invite more sustainable behaviour. People choose to walk/bike to commute.
- In 2050 the city of Tallinn has a good urban space where people are invited to move differently (more sustainable) resulting in an attractive, clean and quiet environment and liveable streets. More public space is allocated to living, and less to motorized traffic. The green and blue areas in the city are well integrated.
- In 2050 the cityscape is more dense, more functions are available within easy reach. More priority is given to pedestrians ‘above the ground’. Space is freed up for buildings and places by putting transportation underground (e.g. parking). The city is build in a way that it enables to use foot, bike and public transport.
- In 2050 the bicycle routes in the city are connected. The number of streets in the city centre that are pedestrian-only is increased. Tram and bus provide good connections to the centre. Car use is discouraged through limitations in lanes and parking fees. There is more lively boat traffic and water taxis.

Strategic ambitions

- In 2050 the connections in the city centre of Tallinn and to the neighbourhoods are very good, so all people can reach their destination fast with public transportation (in less time than cars).
- In 2050 the people of Tallinn experience smooth and seamless mobility that better connects all areas of the city by different transport modes (e.g. an extended tram network). The system responds to the demands of goods & people by smart planning to arrive at the desired destination (in the city and outside) reliably and safely.
- In 2050 the green card for free public transport is used widely, not only in Estonia, but also in Helsinki.
- In 2050 the public transportation system around the Baltic Sea is integrated in such a way that it is simple, comfortable, cheap/free, clean and fast.

Strategic ambitions

- In 2050 the planning and decision making process in Tallinn is knowledge based. Administrative organisations and departments collaborate to have an integral view. The people are aware and take their responsibility by actively taking part in decisions that influence their living environment.
Creating the visual of the desired future scenarios
VISION DEVELOPMENT

Vision development

The aim of Step 2 is to develop visions for the cities on the selected focus areas. A vision is based on a long-term perspective on the world — in this case we are focusing on 2050. Two main activities take place in this step: Future Telling research and the development of the desired future scenarios in the cities.

Future Telling

The first part of the vision development activity is to identify Drivers for Change that influence the future of Smart Cities in general, as well as of Smart Buildings, Smart Mobility and Smart Urban Spaces in particular. The Future Telling research method develops context-related possible future scenarios in a creative and imaginative way and leads to Drivers for Change for Liveable Smart Cities in 2050.

The method is briefly described on the following pages and more elaborate in the Future Telling 2050 D2.1 Report — Drivers for Change.

Developing desired future scenarios

Of the 18 Drivers for Change for Smart and Sustainable Cities, the cities chose four Drivers for Change for each focus area that relate best to their specific contexts and ambitions. Together with the ambitions of step 1, these are used to develop the desired future scenarios for the focus areas.

Scenario Workshops

The desired future scenarios for the selected focus areas of the cities are created in a series of workshops held in each of the partner cities. These Scenario Workshops consist of a 3-day programme in each city, and include sessions with policy-makers and stakeholders to develop a rich, contextual scenario for the city. Local stakeholders (companies, citizens, public and private organisations and knowledge institutes) are invited to take part in the workshops through the networks in the cities. The results of the Scenario Workshops are reported in the same format for each city to facilitate cross-learning between the cities.

Two sessions are held for each focus area. In the morning session the outline for the vision and the desired future scenario is developed. The main stakeholders work with the set ambition for the focus area and the selected Drivers for Change to understand their impact on the city in 2050. Together, the participants define the main elements of the vision. Then, in the afternoon session, a broad spectrum of stakeholders are invited to enrich the desired future scenario by making specific additions. Based on the outlined vision, they carry out a further in-depth exploration of the main elements of the vision. In all the sessions, the participants interactively build a visualisation of the desired future scenario. See also the pictures of the workshops on the previous page.

The result of the vision development step is a visualisation of the desired future scenario in an A0-format poster. The poster shows the visual together with a brief explanatory text. A common visual language is used to make sharing easier and to facilitate discussion among the cities on common and specific aspects of the visions.

Joint Vision Workshop

In a joint meeting in Istanbul the cities presented their desired future scenarios to each other, and held in-depth discussions to understand the common and specific needs in their visions. This Joint Vision Workshop served two purposes:

- To enable cross-city learning. The cities gain a deeper understanding of the vision development process, enabling them to improve their own vision with inspiration from others.
- To describe the needs as input for the roadmapping step.

The Joint Vision Workshop finalised the activities of Step 2 and prepared for Step 3.

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**Enriching the desired future scenario**

- Exploring the future of the city and the main elements of the vision
- Enriching the vision with specific additions

Programme of the scenario workshops in the cities

**Day 1: Finalising Step 2**

- Presentation of the Roadmapping process
  - Sharing of interim results of the roadmapping desk study
- Poster exhibition of the city visions
  - The cities share their desired future scenarios for the focus areas
- Learning from each other’s visions
  - In-depth discussion on common and specific needs described in the visions

**Day 2: Preparing for Step 3**

- Identifying topics and experts for the roadmap interviews
  - Selecting topics for the roadmap interviews and making a list of suggested experts using the networks of all partners

Programme of the Joint Vision Workshop
Future Telling & selection drivers for change

Future Telling research
The future is unpredictable and elusive. Recent changes in technology, ecology, economics and society have already led to significant changes. The expectation is that the complexity that people and organisations experience will only increase further in the years ahead. A number of current Drivers for Change will lead to radical changes in the future. For example, new developments in information technology will create opportunities that we cannot imagine today. These will undoubtedly change our lives significantly, including the way we shop, travel, move, communicate and work. Another example is the increasing level of social connectivity, which will drastically affect the relationships between organisations and their strategies. Even today, disruptive developments in many areas are challenging us to redesign our world.

This constant process of change has also become more complex: developments are so rapid that the future is unpredictable, based on our knowledge and models of the past and present. Predictions based on analysis appear pointless. The new complexity is characterised by simultaneous developments with far-reaching effects. We need a new way to visualise the future, with all the opportunities and challenges that it will bring – an approach that is creative, imaginative and research-oriented. Even though we can’t predict the future, we can create a range of possible context-related future scenarios. These desired scenarios will direct our decision-making, from short-term actions to long-term consequences.

In the R4E project, the Future Telling research method is used to develop possible, context-related future scenarios in a creative, imaginative way. This implies a structured method to map the expertise and ideas of the thought leaders. The process focuses on Smart Cities, in particular using analysis to gain insight into the Drivers for Change for cities in 2050.

Structured interviews
The Future Telling card set is used in the interview. The interviewees are asked to identify relevant future trends and to tell stories about how they imagine these trends could develop. The card set with a broad collection of general trends helps in the interviews with specialists by making them consider all the relevant directions (social, technological, economic, ecological, political and demographic), and at the same time to consider more distant future scenarios. The trends that are presented on the cards trigger their thinking, and inspires them to give rich descriptions of how they see the future developing in relation to energy in cities in 2050.

The interviews contain three main questions:
1. Sort the 52 trends on the cards into three categories:
   • Not relevant in the context of smart and sustainable energy in cities
   • Already relevant now
   • Relevant in the future
2. Take the selected cards in the category ‘relevant in the future’ and pick the 10 cards that in your opinion will have the greatest impact on quality of life (or lack of it) in cities in the context of smart and sustainable energy. (The interviewees can also add missing trends which they regard as important.)
3. Tell stories about how you imagine these 10 trends will develop and what the future in cities will look like.

Drivers for Change
A limited yet representative number of Drivers for Change are distilled from the large volume of expert material. In this phase, the data from the interviews is analysed by means of clustering, selecting and comparing the quotes by the thought leaders. The clustering is based on both commonalities and contradictions in the statements by the experts on the specific topics. A Driver for Change needs to address the topic of a cluster, as well as to point in the directions that the future might take. So for each cluster, a short title and a description are given to capture the richness of that cluster. The quotes by the thought leaders serve as an inspiration to paint richer stories of the possible new future scenarios.

The analysis led to 18 Drivers for Change for the future of sustainable and liveable cities in 2050. We identified Drivers for Change at the general and smart city levels, as well as more specific Drivers for Change for the future of buildings, mobility and urban spaces.

Selection of Drivers for Change
For an complete description, please refer to the complete report on Future Telling 2050 - D2.1 report Drivers for Change.

For the focus area Smart Mobility, the city of Tallinn selected four Drivers for Change:

• Better living at a human scale
• Experience, experience, experience
• Valuing public transport
• Regenerating resources in a circular economy

The following pages give brief descriptions of the chosen Drivers for Change, stating the essence of the changes. These are supported by a few quotes from the experts.
Better living at a human scale

In 2050, urban systems and spaces are designed on a human scale. Everyday activities are within walking or cycling distance. Communal spaces strengthen social cohesion, giving people the freedom to follow the activities they value most. The city offers an excellent living environment in the European tradition, merging high-quality urban space with nature, culture, the economy and social coherence. Good living means enjoying time with friends, and social life is further supported by availability of public devices in communal space. These enable new forms of communicating, blending the virtual and real worlds in these areas.

This Driver for Change represents the following clusters of quotes of the thought leaders:

- a. Respecting human scale in design of urban systems and spaces
- b. Safeguarding the European quality of cities and living
- c. Public devices

FT4.11. ... On the one hand the world is a global village, we travel all over the world. And at the same time you see that young people try to reorganise their daily life smaller and smaller, because it enables them to have a better quality of life. Spatially it is a very interesting topic of how you can accommodate that by not just focusing on the region, the nation and international networks. The only ones that matter if you talk about mobility and quality of life and the attractiveness of location when you settle, but also the quality of urban system and the human scale and the walk-ability and bike ability of it is increasingly important. And especially how the two connect to each other.

FT25.07. The life cycles will change, so a childhood will not be what it is today. Much of this also depends on public space. If public space becomes safer, maybe because of automation and so forth, our children will be more autonomous and will be able to develop skills that we think will be important in the future: like empathy, taking responsibility and taking action, and becoming leaders.

FT10.07. There are studies about luxury, and how people perceive what is luxury in different countries. ... also spending time in the most pleasant ways. And then you come to our hemispheres ... time with your friends, and having a good time. That could be related to travelling, and also to where you live and how you live. The area, or region or the surroundings is luxury. So you have pleasant and less pleasant surroundings.

FT4.02. The relaxed quality of life that lots of foreign people see in the Netherlands has a lot to do with the special quality of the place, which is that it is much more urbanised landscape, fusing all kinds of qualities, not replacing one for another. ... In its aggregation of functions, in its aggregation of social networks, of economies, it is able to compete with a metropolis, but it has a fundamentally different quality in terms of place and life. In the sense that there is much more balance between the green and the red, between the old and new, between the big scale and the small scale, etcetera.

FT23.12. There is not one solution, not one green city. It is all about looking at the context, look at the resources and think about living in a better city ...

FT20.16. The relation between the virtual and the real world. In cities people are much more physical close that in other areas. ... In my future scenario people will have emancipated themselves from their own iPhones and tablets. And I think the virtual world will be much more integrated in public spaces and in city spaces. That is not so much “bring your own device”, but it is “use the cities’ device”. ... a new way of communicating in public space. I cannot tell what it will exactly be ...

FT4.07. There are studies about luxury, and how people perceive what is luxury in different countries. ... also spending time in the most pleasant ways. And then you come to our hemispheres ... time with your friends, and having a good time. That could be related to travelling, and also to where you live and how you live. The area, or region or the surroundings is luxury. So you have pleasant and less pleasant surroundings.
Experience, experience, experience

In 2050, city residents travel because they like the experience. For short (hyper-local) distances by walking or cycling, to reach places on a daily human scale. And for longer (hyper-global) distances, the whole planet can be reached within a few hours. Even space travel could be an option! There’s a range of convenient, clean mobility options, making use of abundant renewable energy. Travel has never been easier – it provides seamless connections from where you are to where you want to go. Services focus on what people need, and not on the available systems.

This Driver for Change represents the following clusters of quotes of the thought leaders:

a. Experience, experience, experience
b. Hyper local & hyper global
c. Space for mobility

FT11.07. It will be nice to see if that will increase mobility. If we get back to that: if this is all much easier, how much more will we move? Will we be on and off everywhere in the world? Or will we stay more in one place and are connected? So far it seems that we are much more ‘out’. Even though we are connected, we still want to be somewhere else connected. I kind of think that it is human nature not to just want to sit around the house. More of us want to be somewhere else. It is about experience, experience, and experience. The virtual experience is not replacing that. We still want the real thing. People still go to concerts, although CD’s are there, even in better sound quality, but there are more concerts than ever. There is not going to be a big change in that. They are all more accessible in that sense.

FT13.21. If energy is cheap and available, that also means that you can travel far and long. So you need alternative mechanisms to reduce traffic volumes. Because the space is limited factor then...

FT13.22. How do you manage mobility? Space is an element to make people understand what traffic can and will do in the city. For instance when Groningen (in the Netherlands) started to plan its urban space, already in the 70s or begin 80s, when they started, it took them at least 25 years to become a very cycling oriented city. So 2050 is now 35 years ahead as well, if you want to accomplish something by now, you now have to start with urban space management. You can accomplish a lot, but it takes a lot of time and digital policies and modelling to support it. It is not that simple.

FT25.04. ... That is a kind of habit that we have: we accept certain travel times. Commuting will be more like buildings. Mobility is already a commodity, but will be more of a commodity, in the sense that stepping into your mode of transport will be an extension of your living room. You will not drive yourself, but basically it will be like entering another room in your home. Mobility will be a stepping-stone it will not be an activity, so as a cost on life it will disappear – other than separating us from the ones we care about.

FT3.25. For cities there is also a question in public transport. Do you just want a high speed train to bring you in two hours over a long distance to central hubs, and then just a local network to connect the centre of the city to the surrounding areas? Or do you want local networks between cities? Or will it be local sharing services, with e.g. local cars and e-bikes, but not necessarily public transportation like tram or metro. The focus on more local communities means that we need less travelling on national scale. We may have international and local transportation needs, but much less in between.
Valuing public transport

In 2050, cities offer attractive, seamless mobility options: these give everyone access to everywhere. New investment structures and revenue models ensure that the city values (such as inclusiveness) are ingrained in system design. Cities actively influence operators to ensure high levels of customer satisfaction and service quality.

FT13.30. One other thought line we are starting to explore is the impact of door to door services, the concept of collaborative or shared mobility... If you believe in this scenario to happen of the fully connected traveller, then probably the urbanite may opt out of the mass transport systems. He may no longer choose the bus or the metro. If you believe systems like Uber for instance, who promise door to door transport, and shared mobility services are more and more organised in a way that you do not have to bring back the car to where you got it and you can leave the bicycle close to your door, then you will be tempted away from mass transport. And if you look at the impact of such a scenario then that will be very big. And would you then care about spatial structure when transport becomes available at all places at all times.

FT19.05. ... the way we look at it now with each city having its own public transport corporation for trains, trams, buses, subways. But in a few years all this can be replaced by self-driving cars. There is a new technology coming up, and it is going to change the way of thinking. Suppose we stop this large scale, mass public transport or we limit it to heavy trafficked areas only, and self-driving cars are just open for use by everybody who want to use them. ... If we do that, what would be the problem? What is the kind of issue that might be coming up? These questions hook up to the question to what kind of values do we want to design our cities in the future. That is the most relevant question: what values do we have? One of the important values in Europe is inclusiveness. Public transport is now enabling people who do not have a lot of money to take part. It is these values that are important. It is the same for energy: inclusiveness is important to prevent energy poverty...

FT20.06. One thing that pops into my mind now is also in this inequality is public transport and the affordability of public transport. ... Transport needs to be affordable for people, they need to be able to travel easily from A to B. It is already now not affordable anymore, and I cannot see how that can be sustainable for the future. ... we have to rethink buses, trams, trains. Make sure people can move around in your city.

FT24.08. The hope is that in future that big cities that really want to improve quality of life that they have the right influence on the operator to ensure that they invest in customer satisfaction, and not only in earning money.
In 2050, the circular economy ensures self-sufficiency of cities. Renewable energy is abundant, and this ensures a secure supply of vital resources for life (energy, water, food and clean air), although other resources may still be scarce. Cities have implemented circular systems to regenerate all the resources needed by their populations. These mechanisms are based on small-scale, local solutions, enabled by changed decision-making levels.
Creating the visual of the desired future scenarios
In 2050, citizens in Tallinn enjoy an attractive, clean and quiet living environment that encourages sustainable behaviour. The cityscape is dense, so all services are within easy reach or are provided in the home. More public space is allocated to living, and less to motorised transport. Smooth, seamless public transport connects all the city areas. Smart planning is used to respond dynamically to the changing demand for the transport of people and goods. The transport and ticketing systems around the Baltic Sea are integrated in a way that is simple, comfortable, affordable (free), clean and fast.

Planning and decision-making processes are based on open collaboration that includes different views and knowledge sources. Tallinn is recognised as a front-runner in openness. Citizens are aware of their roles, and actively take part in making decisions that influence their living environment.

**Human scale squares**
The city’s streets and squares are designed around people. The urban environment is safe, attractive and suitable for a wide range of social interactions. The design of the spaces, with an extensive network of cycle tracks and pedestrian-only areas, gives clear priority to walking, cycling and new modes of personal mobility like self-driving bikes and wheelchairs. This ensures easy accessibility for all citizens.

**Vehicles on renewable energy**
All vehicles, bikes and cars are shared, self-driving and adaptive to the available infrastructure. A shared electrical vehicle system provides the city with renewable energy storage by allowing access to the vehicle batteries. The smart infrastructure collects information from the vehicles for the central system, through which users receive relevant information such as traffic signs, traffic information and navigation suggestions.

**Innovative public transport**
Different energy-efficient mobility modes include more flexible infrastructure, like trams with magnetic tracks for midrange distances between the neighbourhoods. The non-disruptive infrastructure allows shared use by all vehicles. For longer distances, an integrated public transport system covers Estonia, Scandinavia and the Baltic States, based on superfast and energy-efficient solutions.

**Metropole Talsinki**
Tallinn and Helsinki together form one big metropolis, with the advantages of economy of scale. This also provides advantages for direct goods logistics connections to Helsinki and beyond. Tallinn is a key hub between mainland Europe and Helsinki. The airport in Tallinn and a high-speed transportation system provide fast, comfortable and reliable links for people and goods, and have a positive impact on the labour market and economics.

**Data system**
The ‘Smart Department’ of Tallinn collects and analyses real-time information for use in smart algorithms that optimise the system based on people’s needs. The system is used for decision-making and planning purposes, such as parking & charging of e-vehicles and use of public transport lines. All kinds of applications use the resulting information to provide users with valuable services.
Roadmapping

The aim of Step 3 is to develop specific roadmaps for the cities in the selected focus areas. A roadmap shows all existing and future technologies and other relevant developments that enable the achievement of the desired future scenarios by 2050. Two main activities take place in this step. Firstly, the roadmapping research to define the general roadmaps. Secondly, the definition of milestones for the years 2020 and 2030, and local solutions and research projects to create city-specific roadmaps.

General roadmaps

Desk studies and expert interviews are conducted to collect input for the roadmaps. The roadmaps explore the options to achieve the cities’ desired future scenarios. The resulting General Roadmaps for Smart Buildings, Smart Mobility, and Smart Urban Spaces provide input for the city-specific roadmaps.

Roadmap Workshops

The city-specific roadmaps are created in a series of workshops held in each of the partner cities. These Roadmap Workshops consist of programmes with three sessions in each city.

In the first session, the policy-makers and city representatives select the topics from the general roadmaps as focus for the city-specific roadmap. This choice is based on their specific ambitions and context. They also define intermediate milestones for 2020 and 2030 on the path to their desired future scenarios.

Then, for each of the focus areas, local stakeholders (companies, citizens, public and private organisations and knowledge institutes) are invited to take part in the roadmapping sessions. With all the available knowledge of potential developments and the given focus of the city, the local stakeholders generate project proposals for (local) solutions and research proposals, as a first step towards the project portfolio. See also the pictures of the workshops on the previous page.

The results of the Roadmap Workshops are reported in the same format for each of the cities, facilitating cross-learning between the cities.

Joint Roadmap Workshop

In a joint meeting in Newcastle, the cities presented their city-specific roadmap enriched with current projects and proposals for new projects, and held in-depth discussions to understand the common and specific learning objectives and opportunities for joint projects. The Joint Roadmap Workshop served two purposes:

- To enable cross-city learning. The cities gain a deeper understanding of the roadmapping process, and can improve their own roadmaps with inspiration from others.
- To describe the common learning ambitions as input for the Project Portfolio step.

The Joint Roadmap Workshop finalised the activities of Step 3 and prepared for Step 4, in which the project portfolio will be further developed.

Programme of the roadmapping workshops in the cities

Making choices for the focus and intermediate milestones in the city specific roadmap to realise the Desired Future Scenarios for the two focus areas.

Programme of the Joint Roadmap Workshop

Identifying cross-city learning objectives
- Selecting common ambitions
- Formulating cross-city learning objectives as input for the Project Portfolio step

Day 1

Finalising Step 3
- Presentation of current projects and proposals for new projects
- Gaining understanding of the current strengths and challenges of the R4E partner cities

Day 2

Preparing for Step 4
- Identifying project synergies and opportunities for joint projects
- Identifying project synergies and opportunities for joint projects

Learning from each other
- Selecting common ambitions
- Formulating cross-city learning objectives as input for the Project Portfolio step
How to read the general roadmap

The resulting General Roadmap contains four important elements:

- The timeline from now (2016) to the vision 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 the focus area 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 short or longer term for each of the topics.

Each topic has a timeline showing the developments that are relevant to that topic. The image shows the elements of the General Roadmap.
In the general roadmap, timelines are created for the topics that require developments to achieve the desired future scenarios in 2050. The topics selected for the Roadmap Smart Mobility are described briefly here.

**Sustainable technologies**

The first element needed to achieve the sustainable energy ambitions is the availability of sustainable technologies. A wide range of sustainable technologies is already available, and new technologies are constantly being developed. But unfortunately, there is not always a consensus on the best option for the future. The Roadmap Smart Mobility includes the following technology developments:

**SMART INFRASTRUCTURE**

Smart Infrastructure is about the physical infrastructure and energy systems relating 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. The topic also applies to energy systems in terms of charging infrastructure and (connected) energy systems. It therefore has close links to Smart Buildings and Smart Urban Spaces.

**SMART MOBILITY MODES**

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 and drones.

**CONNECTIVITY & ROBOTISING**

Connectivity & Robotising describes developments in 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. The topic also includes (semi-)autonomous vehicles and ICT-related developments such as 5G, since these contribute to a connected and automated mobility system.

**DATA & TRAFFIC MANAGEMENT SYSTEMS**

Data and Traffic Management Systems includes developments relating to transport systems and the increasing 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 between 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 à la carte and Mobility as a Service. The Personalised Services topic is also about the development of specific (personalised) services. These are based on different types of data such as open, personal and real-time traffic data, and are aimed at matching supply and demand. As such, this topic also includes the blend of public and private mobility services and personalised travel advice.

**URBAN LOGISTICS**

In general, Urban Logistics is about logistics solutions and developments that affect the logistics flows in cities. More specifically, it includes aspects relating to the (integrated) transport of goods across the whole urban logistics system, integrating multiple urban logistics flows, 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. Making a collective shift to more sustainable solutions and energy-saving alternatives requires awareness. In many cases, the available technologies are not sufficiently attractive to gain acceptance in mass markets. The Roadmap Smart Mobility includes the following behavioural developments:

**VALUES, MOTIVES & BEHAVIOURAL CHANGE**

Values, Motives and Behavioural Change includes the way citizens can play an active role in behavioural change, 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 these can be modified and updated as necessary. The Roadmap Smart Mobility includes the following organisational developments:

**COOPERATION & INNOVATION NETWORKS**

Cooperation and Innovation Networks describes how forms of cooperation between different types of organisations (public and private) will evolve over time to speed innovation and new mobility solutions. Among the aspects covered are active roles 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 applies to developments relating to legislative aspects, and frameworks and measures to enable the creation of Smart Mobility systems.

**The city specific roadmap**

The general roadmap describes the developments on a timeline, indicating when experts estimate that those development will be broadly available. For the cities to create their specific roadmaps, they were asked to focus on the topics that are most relevant for them to reach their own desired future scenarios. The cities create milestones for 2020 and 2030, describing what they will look like when their own developments and city projects have evolved. In this way each city can indicate the focus and pace that it will need to achieve. Projects can then be proposed on this basis to define (local) solutions or research leading to further realisation of the roadmap.
### Smart Mobility General Roadmap 2030

**Sustainable Technology**

- **Expanding and exploiting 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 redesign of infrastructure for flexible use over time, aligned with growing diversity of sustainable mobility modes.
- **Smart solutions**
  - Increase intelligent assets, e.g. sensors, cameras, RTID 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 (many) 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 tools.

**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-vehicles.
- **Sustainable technologies for lightweight vehicles**
  - Sustainable technologies for a range of lightweight vehicles, e.g. electric and hydrogen powered.
- **Autonomous driving in controlled areas**
  - Connecting vehicles for more critical purposes, such as platooning and autonomous driving in separate, controlled zones.
- **Enhanced traffic management**
  - Smart infrastructure enables fast real-time information management and control of traffic flows and clouds.
- **Individual services**
  - Planning of diverse data sources (e.g. weather forecast and diary) enables more reliable user information and customised sensors.
- **Hybrid mobility solutions**
  - Separation between public and private transport blues due to the change in ownership (first sign of Mobility as a Service).
- **Optimising logistics flows**
  - Optimising logistics flows by using time slots (e.g. night deliveries) and usage role of infrastructure (e.g. urban spaces).
- **Dynamic innovation network**
  - Dynamic innovation networks (including all parties necessary for smart and sustainable mobility) to enable active response to suitable new mobility systems.
- **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.

**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 goods.
- **Enhanced traffic management**
  - Smart infrastructure enables fast real-time information management and control of traffic flows and clouds.
- **Autonomous driving in controlled areas**
  - Connecting vehicles for more critical purposes, such as platooning and autonomous driving in separate, controlled zones.
- **Demand-driven services**
  - Offering of diverse data sources (e.g. weather forecast and diary) enables more reliable user information and customised sensors.
- **Hybrid mobility solutions**
  - Separation between public and private transport blues due to the change in ownership (first sign of Mobility as a Service).
- **Optimising logistics flows**
  - Optimising logistics flows by using time slots (e.g. night deliveries) and usage role of infrastructure (e.g. urban spaces).
- **Integrated services**
  - Providing of diverse data sources (e.g. weather forecast and diary) enables more reliable user information and customised sensors.
- **Optimising logistics flows**
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  - Discouraging the use of high-emission (private) cars and unsustainable solutions, e.g. by regulating time slots or flexible use of infrastructure.

**Data & Traffic Management Systems**

- **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).
- **Lightweight logistic solutions**
  - Lightweight logistic solutions (e.g. drone and robot delivery of small packages).
- **Small-scale initiatives**
  - Supporting initiatives by individuals, communities and local frictions for more 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.
- **Responsible sharing of assets**
  - Public parties ensure access by other (private) parties to public assets, e.g. public transport data and 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.

**Personalised Services**

- **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**
  - lightweight logistic solutions (e.g. drone and robot delivery of small packages).
- **Optimising logistics flows**
  - Optimising logistics flows by using time slots (e.g. night deliveries) and usage role of infrastructure (e.g. urban spaces).
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**Urban Logistics**

- **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 frictions for more 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**
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- **Scalability**
  - EU legislation to ensure scalability of innovative mobility solutions, e.g. scalable legislation for Uber.

**Sustainable Organisation**

- **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 - citizens) 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.
- **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.

**Values, Motives & Behavioural Change**

- **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.
- **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 - citizens) 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.
- **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.

**Politics & Legislations**

- **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.
- **Responsible sharing of assets**
  - Public parties ensure access by other (private) parties to public assets, e.g. public transport data and 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.

**R4E project received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 649397.**
The Smart Mobility theme focuses on sustainable energy solutions for public and private transport and logistics. The ambition of the city 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 personalized advice for seamless journeys, integrating sharing of sustainable vehicles and green public transport.

### Sustainable solutions and lifestyles
- All transport 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 trips
- 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 decentralized service hubs
- Local production (food, 3D-printed goods)
- Smaller-scale ecological solutions (e.g. goods delivery)

### Seamlessly connected logistics
- Networks for park, ride and transport
- Smooth, seamless transport (single route)
- Integrated system to provide ‘so-to-do’ service
- Integration of new modes of transport and innovative vehicles
- Smooth, seamless transition between (regional) networks

### Mobility à la corte
- 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 diversification (blending public and private)

### Accessible, affordable and convenient mobility
- All modes of public transport are safe, convenient, accessible, fast, flexible and affordable for all
- Accessible and easy-to-use ‘zero-click’ reservation, flexible payment, pick-up/drop-off at any point
- Exchangeable at intermodal transport hubs

### Personalised advice
- Personalised travel advice based on factual, up-to-date information and personal needs/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, analyses 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 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.

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).

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

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 goods.

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

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).

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.

2016

2020
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 systems 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

- **New mobility services and sharing initiatives** Based on (open) data and matching of supply and demand, enabling new, disruptive mobility services, e.g. Uber, 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 parking) enables more reliable user information and customised services.
- **Hybrid mobility solutions** Separation between public and private transport (e.g. bike sharing).
- **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 flows 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 (e.g. 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.

### 2016

- **2016**

### 2020

- **2020**

### 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 an 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-driven 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 still takes 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 interconnectedness 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 MoAS (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.
The Smart Mobility theme focuses on sustainable energy solutions for public and private transport and logistics. The R4E project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397.
### 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 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. 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.

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<th>2016</th>
<th>2020</th>
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<tr>
<td><strong>Active role of government</strong></td>
<td><strong>Responsible sharing of assets</strong></td>
</tr>
<tr>
<td>Public parties take the lead to ensure cooperation among all parties in the transition towards smart and sustainable mobility (e.g. in tendering procedures)</td>
<td>Public parties ensure access by other (private) parties to public assets, e.g. public transport data and infrastructure</td>
</tr>
<tr>
<td><strong>New forms of cooperation</strong></td>
<td><strong>Dynamic innovation network</strong></td>
</tr>
<tr>
<td>New forms of cooperation between different parties (public - private - citizen) for a smooth transition towards smart and sustainable mobility</td>
<td>Dynamic innovation networks (including all parties necessary for smart and sustainable mobility) enable an active response to suitable new mobility systems</td>
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<tr>
<td><strong>New incentives and measures</strong></td>
<td><strong>Framework for liability</strong></td>
</tr>
<tr>
<td>Implementation of new incentives and measures to promote and scale-up new mobility solutions and services</td>
<td>Insurance of new ownership(s) and sharing of assets (e.g. who is responsible?) to promote the adoption of sustainable mobility modes</td>
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<tr>
<td><strong>Ethical recalibration</strong></td>
<td><strong>Proactive local regulations</strong></td>
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<tr>
<td>Public parties take the lead in an ethical discussion of privacy and security to safeguard public interest</td>
<td>Discouraging the use of high-emission (private) cars and unsustainable solutions, e.g. by regulating time slots or flexible use of infrastructure</td>
</tr>
<tr>
<td><strong>Dimensional innovation networks</strong></td>
<td><strong>Openness</strong></td>
</tr>
<tr>
<td>Dynamic innovation networks (including all parties necessary for smart and sustainable mobility) enable an active response to suitable new mobility systems</td>
<td>New frameworks for accountability and openness of data systems and mobility systems, including coverage of national privacy issues</td>
</tr>
</tbody>
</table>

**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.

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*The R4E project received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 649397.*
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.
Expanding and exploiting
More effective use of existing infrastructure and construction of new physical infrastructure (bridges, hubs, etc.) to accommodate growing mobility demand.

Physical separation of flows
Separation of lanes and (de)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 industrial loops for detection or energy-generating constructions e.g. solar towers.

(Re-)designing dedicated areas
Creating areas for e.g. intermodal hubs, green corridors for cycling and walking, e-bike highways, e-véhicle charging systems and areas for autonomous vehicles.

Energy-efficient solutions
Increasing availability of new solutions for fast charging of (mainly electric) vehicles (e.g. industrial charging) and increased local storage of energy.

Proactive infrastructure
Increasing the intelligence of physical infrastructure to proactively adapt to changes and needs of the user, e.g. smart charging and adaptive road marks.

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-rovers.

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.

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 processes.

New forms of cooperation
New forms of cooperation between different parties (public, private - citizens) 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.

Framework for liability
Insurance for new concepts and sharing of assets (e.g. ‘who is responsible?’) to promote the adoption of sustainable mobility modes.

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

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

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 (print, journalism) are used to mediate in the transition towards a sustainable society.

Smart landscape
Increasing smartness of existing infrastructure such as traffic signs, traffic information and navigation suggestions.

Solutions for privacy and security issues
New technologies, e.g. biometrics, blockchain and other encryption technologies, to increase privacy and security.

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.

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

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

SMART MOBILITY ROADMAP TALLINN

2016

2020

MILESTONE 2020
People make more use of free public transport because it offers better connectivity and accessibility. The system integrates different modes, with reliable, real-time data - e.g. buses on demand and first miles of autonomously driven full-electric buses. Smart traffic lights guide traffic, mobile parties can use zero-emission, and separate lanes give priority to cyclists and ugylits.

Electric heavy-duty vehicle solutions for limited range
Extension of available heavy-duty vehicle that provide clean and silent solutions for in-city transport (test runs).

Cooperative driving technology
Technologies to communicate, react and respond between new vehicles, enabling e.g. truck platooning in all areas.

Sustainable technology
SMART INFRASTRUCTURE

SMART MOBILITY MODES

CONNECTIVITY & ROBOTICS

DATA & TRAFFIC MANAGEMENT SYSTEMS

PERSONALISED SERVICES

SMALL SCALE LOGISTICS

URBAN LOGISTICS

Sustainable behaviour
VALUES, MOTIVES & BEHAVIOURAL CHANGE

Sustainable organisation

COOPERATION & INNOVATION NETWORKS

POLICIES & LEGISLATIONS

2016

2020

SMART MOBILITY ROADMAP TALLINN

Selin Tekin Kaygan, Head of Department of Mobility, City of Tallinn

The R4E project received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 649397.
Connected energy systems
Biobased and smart grids and systems to generate, store, use and exchange of energy between infrastructure, buildings, vehicles etc.

Affordable full-electric lightweight vehicles
All kinds of full-electric vehicles are more affordable for the mass market than conventional polluting (combustion) engines.

Innovative infrastructure for lightweight vehicles
New engineering technologies to make infrastructure for lightweight vehicles e.g. unfurling bike paths.

Innovative heavy infrastructure
Cheaper, faster and sustainable technologies for heavy infrastructure (e.g. roads, railways) and constructions (e.g. tunnels and bridges).

Self-organising energy system
Integrated system that matches supply and demand for sustainable energy.

Total value
Data is valorised based on value for society, instead of purely by economic value – this creates a level playing field for sustainable solutions.

Linked physical and urban infrastructure
Less physical infrastructure for mobility in cities due to sustainable mobility solutions, enabling a greener living environment.

Public living area
Redesign of urban areas to release infrastructure for other purposes.

The ‘next economy’
The ‘next economy’ based on value models and integrated value for society at large.

Personalisation
Social mechanisms, incentives and measures provide evidence of the consequences of people’s choices and influences.

New values systems
Attractive economic systems to enhance the creation of integrated mobility services and products.

Autonomous buses
Connected, automated buses can drive autonomous outside controlled areas on dedicated routes with dedicated bus stops.

Self-learning traffic management systems
One integrated smart system for intermodal transport (private and public, passengers and goods) based on different data sources.

MILESTONE 2030

Responsible sharing of assets
Sharing of resources to integrate city logistics.

Intelligent logistics solutions
Combining transport of goods with all mobility modes (‘cargo hitching’).

Incentives for usage of (sustainable) mobility modes
Merging of diverse data sources (e.g. urban logistics, urban mobility) to (including all parties necessary for) enable roaming of services (e.g. public transport data and connected vehicles e.g. unfolding bike paths).

Demand-driven services
Flexible choices for affording and services (e.g. based on widespread use of dynamic pricing) matching diversity in needs and lifestyles.

Physical internet
Protocols.

Full cooperative driving technology
All vehicles (local, national and international) and all road users and all infrastructure are interconnected for communication and cooperative driving.

Open and connected platform
Flexible choices for affording and services (e.g. based on widespread use of dynamic pricing) matching diversity in needs and lifestyles.

High-quality logistics systems
Combining transport of goods and people with all mobility modes (‘cargo hitching’), e.g. by using multifunctional drones, shared vehicles or pipelines.

Personalisation
Social mechanisms, incentives and measures provide evidence of the consequences of people’s choices and influences.

Total value
Data is valorised based on value for society, instead of purely by economic value – this creates a level playing field for sustainable solutions.

Globalisation
Data privacy and legislation at a global level.

Autonomous driving outside cities
Safe and efficient autonomous driving on less complex routes such as highways.

Smart solutions
Sustainable technologies for a range of sectors, including all road users and all infrastructure.

Adaptive vehicles
Artificial intelligence within the vehicle for user comfort, adaptation based on user profile and personal preferences.

Solutions in circular economy
New solutions, e.g. up-cycling, shared use by all vehicles. For longer distances, an integrated public transport system with renewable energy storage by allowing access to the vehicle batteries.

Personalised travel advice
Flexible choices for affording and services (e.g. based on widespread use of dynamic pricing) matching diversity in needs and lifestyles.

Physical internet
Protocols.

Smart mobility system
Sustainable and resilient mobility solutions for mobility in cities due to sustainable mobility solutions, enabling a greener living environment.

Desired future scenario

In 2050, citizens in Tallinn enjoy an attractive, clean and quiet living environment that encourages sustainable behaviour. The city is dense, so all services are within easy reach or are provided in the home. More public space is allocated to living, and less to motorised transport.

A smooth, seamless public transport connects all the city areas. Smart planning is used to respond dynamically to the changing demand for the transport and goods and services. The transport and logistics systems around the Baltic Sea are designed in a way that is simple, comfortable, affordable and clean.

Planning and decision-making processes are based on open collaboration that includes different views and knowledge sources. Tallinn is recognised as a frontrunner in openness. Citizens are aware of their roles, and actively take part in making decisions that influence their living environment.

Elements of the desired future scenario are:

- **Human scale squares**
  - The city’s streets and squares are designed around people. The urban environment is safe, attractive and suitable for a wide range of social interactions. The design of the spaces, with an extensive network of cycle tracks and pedestrian areas, gives clean priority to cycling, running and new modes of personal mobility like self-driving bikes and wheelchairs. This ensures easy accessibility for all citizens.

- **Vehicles on renewable energy**
  - All vehicles, bikes and cars are shared, self-driving and adaptive to the available infrastructure. A shared electronic vehicle system provides the city with renewable energy storage by allowing access to the vehicle batteries. The smart infrastructure collects information from the vehicles for the central system, through which users access relevant information such as traffic signs, traffic information and navigation suggestions.

- **Innovative public transport**
  - Different energy-efficient mobility modes include more flexible infrastructure, like rails with magnetic tracks for interchange distances between the neighbourhoods. The non-disruptive infrastructure allows shared use by all vehicles. For longer distances, an integrated public transport system covers Estonia, Sweden and the Baltics States, based on superfast and energy-efficient solutions.

- **Metropole Tolkini**
  - Tallinn and Helsinki together form one big metropolis, with the advantages of economy of scale. This also provides advantages for direct goods logistics connections to Helsinki and beyond. Tallinn is a key hub between mainland Europe and Ineke. The airport in Tallinn and a high-speed transportation system provide fast, comfortable and reliable links for people and goods, and have a positive impact on the labour market and economies.

- **Data system**
  - The Smart Department of Tallinn collects and analyses real-time information for use in smart algorithms that optimise the system based on people’s needs. The system is used for decision-making and planning purposes, such as parking and charging of vehicles and use of public transport lines. All kinds of applications use this information to provide users with valuable services.

2030

2040

2050

**SMART MOBILITY ENABLES AN ENJOYABLE LIVING ENVIRONMENT IN TALLINN 2050**

- **The next economy**
  - The ‘next economy’ based on value models and integrated value for society at large.

- **Public living area**
  - Redesign of urban areas to release infrastructure for other purposes.

- **Total value**
  - Data is valorised based on value for society, instead of purely by economic value – this creates a level playing field for sustainable solutions.

- **Self-improving communities**
  - Communities create value by seeking local and personal initiatives in which energy and mobility solutions are shared and exchanged.

- **Open and connected platform**
  - Flexible choices for affording and services (e.g. based on widespread use of dynamic pricing) matching diversity in needs and lifestyles.

- **Physical internet**
  - Protocols.

- **Self-organising transport system**
  - Integrated system using different data sources to dynamically respond to supply and demand.

- **Solutions in circular economy**
  - New solutions, e.g. up-cycling, shared use by all vehicles. For longer distances, an integrated public transport system with renewable energy storage by allowing access to the vehicle batteries.

- **Sustainable energy**
  - Cheaper, faster and sustainable technologies for heavy infrastructure (e.g. roads, railways) and constructions (e.g. tunnels and bridges).

- **Self-organising energy system**
  - Integrated system that matches supply and demand for sustainable energy.

- **Affordable full-electric lightweight vehicles**
  - People use more personalised services, e.g. provided by electric and shared vehicles. They have adapted healthier lifestyles using locally produced food. The impact of online shopping and home deliveries is visible in the city through lower urban logistics costs. The city is greener, and has more parks. The connection with Helsinki is improved by a tunnel, and a hyperloop system is in under construction.

- **Personalised travel advice**
  - Flexible advice across different modality platforms based on shared services creates a more efficient system (combining people and goods).

- **Hybrid logistics solutions**
  - Combining transport of goods and people with all mobility modes (‘cargo hitching’), e.g. by using multifunctional drones, small (shared) vehicles or pipelines.

- **Reduced logistics flows**
  - Small-scale solutions (house and neighbourhood) for resources and waste, due to developments in 3D-printing, retail, urban farming and sharing economies.

- **Deeply driven services**
  - Flexible choices for affording and services (e.g. based on widespread use of dynamic pricing) matching diversity in needs and lifestyles.

- **Demand-driven services**
  - Engaged citizens increasingly demand sustainable, flexible solutions.

- **Intermodal logistics solutions**
  - Combining transport of goods with all mobility modes (‘cargo hitching’).

- **Sustainable total energy system**
  - Cheaper, faster and sustainable technologies for heavy infrastructure (e.g. roads, railways) and constructions (e.g. tunnels and bridges).

- **Innovative infrastructure for lightweight vehicles**
  - New engineering technologies to make infrastructure for lightweight vehicles e.g. unfurling bike paths.

- **Effective total energy system**
  - Less physical infrastructure for mobility in cities due to sustainable mobility solutions, enabling a greener living environment.

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The cities plotted the presented current and future projects on a matrix, indicating when the result of the project would be visible in the city (horizontally) and the expected impact on the city, in terms of energy or emission (vertically).
PROJECT PORTFOLIO

Project portfolio

The aim of Step 4 is to develop a portfolio of projects that the cities can work on—individually or jointly—and that help them to reach their desired future scenarios. The cities created an overview of running projects, and in a joint meeting they selected common ambitions that they all want to pursue. The new projects have to explore many new ways forward. This means that new project proposals are worked out in specific project plans, all relating to the learning opportunities between cities. The financial opportunities are also explored in this step.

Joint workshop

In a joint meeting in Newcastle the cities presented current projects and proposals for new projects based on their city-specific roadmaps. They held in-depth discussions to understand their shared and specific learning objectives and opportunities for joint projects. First, the cities presented their projects and plotted them on a poster to show when the results will be visible in the city and how they will impact energy and emissions in the city. The picture at the left on the previous page shows the result of this first part of the workshop.

Secondly, a marketplace was held in which city representatives could put forward themes for further development into project portfolios. A theme is a challenge to become a smart city with the ability to grow into a project programme. The themes build on the running and new projects presented by the cities.

In the marketplace, each city took on the role of ‘seller’ of a theme and proposed it to ‘buyers’. The buyers supported the themes, and were able to enrich them by ‘negotiation’ to include objectives which they considered important. If three cities ‘bought’ a theme, it was accepted. The marketplace resulted in 14 themes. Together it was decided to merge some of these themes. This left 10 themes for further elaboration in groups.

Thirdly, the cities worked in groups to elaborate the themes by describing their objectives, relevant projects and innovation opportunities. The resulting rich discussion combined the insights of all the experts, and built on the visions and roadmaps.

The groups then presented their proposals in a plenary session, after which all the cities described their learning objectives related to the themes.

Towards a project portfolio

The themes defined in the joint workshop will be further developed into project portfolios that contain local projects in the cities, but also joint projects, all forming part of the project portfolio. The project portfolios are not included in this report as they will not be made public.
Running Projects Smart Mobility Tallinn

1. URBACT III Freight TAILS
   - The Freight TAILS Action Planning Network will address the challenges posed by rapidly increasing freight movements, within the context of all urban logistics. This Freight TAILS project will develop tailored freight management policies using the URBACT Integrated Action Planning methodology to pro-actively support the functioning of different growing cities, whilst reducing the carbon emissions.

2. NSB CORE (North Sea Baltic Connector of Regions)
   - NSB CoRe improves the sustainable accessibility of the Eastern BSR (EBSR) in freight and passenger transport. The project produces a joint transnational vision of regional development with recommendations for policymakers in passenger and freight transport.

3. FinEstSmartMobility (Improving old city harbour)
   - FinEst Smart Mobility is a project that seeks to improve transport flows between Tallinn’s Old City Harbor and Jatkasaari harbor of Helsinki as well as to improve passengers’ customer experience. The project includes various smart mobility experiments such as smart ‘park and ride’ and control of heavy traffic. It is also planned to improve connections from the harbors to the airport in Helsinki and to the ring road in Tallinn.

4. FinEst Link (Finnish Estonian Transport Link)
   - The project will create comprehensive assessment of FinEst Transport Link and a plan for the future fixed link (tunnel) between Helsinki and Tallinn. The project focuses in wider Finnish-Estonian perspective, European TEN-T perspective, transport technology development, environmental aspects and in changing socio-economic context of the emerging twin-city region.
New Project Ambitions Smart Mobility Tallinn

1. **ONE TICKETING SYSTEM IN TALLINN AND HELSINKI**

   We want to have in two cities has the one ticketing system. So Tallinn and Helsinki citizens can use one ticket in different kind of Cities.

2. **TALLINN-BERLIN HYPERLOOP**

   Maybe in the future the cargo will sent through hyperloop.
### CONTRIBUTIONS

The results in this project are co-created with many stakeholders in the cities. We would like to thank all participants for their valuable contributions.

#### Participants of the ambition workshops:

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<td>Tallinn Energy Agency</td>
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<tr>
<td>Õla Kask</td>
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<td>Liivar Luts</td>
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<tr>
<td>Viljar Meester</td>
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<tr>
<td>Väino Olev</td>
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<td>Andrus Väärmõõ</td>
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<td>Lembit Vali</td>
<td>Harju Public Transport Centre</td>
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#### Participants of roadmap workshops:

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<thead>
<tr>
<th>Participant</th>
<th>Organization/Department</th>
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<tbody>
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<td>Tallinn Linnakantselj</td>
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<tr>
<td>Pille Aijakas</td>
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<td>Tarmo A. Elvisto</td>
<td>SRIK MTU</td>
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<td>Andres Herkel</td>
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<td>Stockholmkommunkansliktallinn keskus</td>
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<td>Kristjan Kalameets</td>
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<td>Keskutute Nõukogu</td>
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<td>Arvo Paabo</td>
<td>Sõpruste 202 KU</td>
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<td>Evar Kukk</td>
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<tr>
<td>Ragnar Kuusk</td>
<td>MTÜ Easakoda</td>
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<tr>
<td>Madis Laaniste</td>
<td>Majandus- ja Kommunikatsooministerium</td>
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<td>Jaak Loek</td>
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<td>Jaak-Adam Looveer</td>
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<tr>
<td>Mikk Maivel</td>
<td>Rigi Kinnisvara AS</td>
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<td>RikKe Maandi</td>
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<td>Marek Muiste</td>
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<tr>
<td>Priidu Nõmm</td>
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<tr>
<td>Raimond Nõgast</td>
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<td>Arbo Reino</td>
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<td>Linnavaaranet</td>
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<td>Karl Sovali</td>
<td>SFP Group OU/Easakoda</td>
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<td>Andres Tukkar</td>
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This report contains the results of the ambition setting, vision development and roadmapping activities for smart mobility in the city of Tallinn. Workshops were conducted with policy makers, strategy departments, integral project managers, department managers and external stakeholders and strategic partners to define a shared ambition, create a desired future scenario, develop a city specific roadmap and identify initial (local) solutions and research projects to achieve the desired future in the specific context of the city. The participants will continue working on the project portfolio.

This report is the final public deliverable of the Roadmaps for Energy (R4E) project. The R4E partners work together to develop a new type of energy strategy through visions and roadmaps for the 8 partners cities, in co-creation with local stakeholders. The project supports the development of visioning and roadmapping capacities within the municipalities to spur future development and implementation of innovative energy solutions.