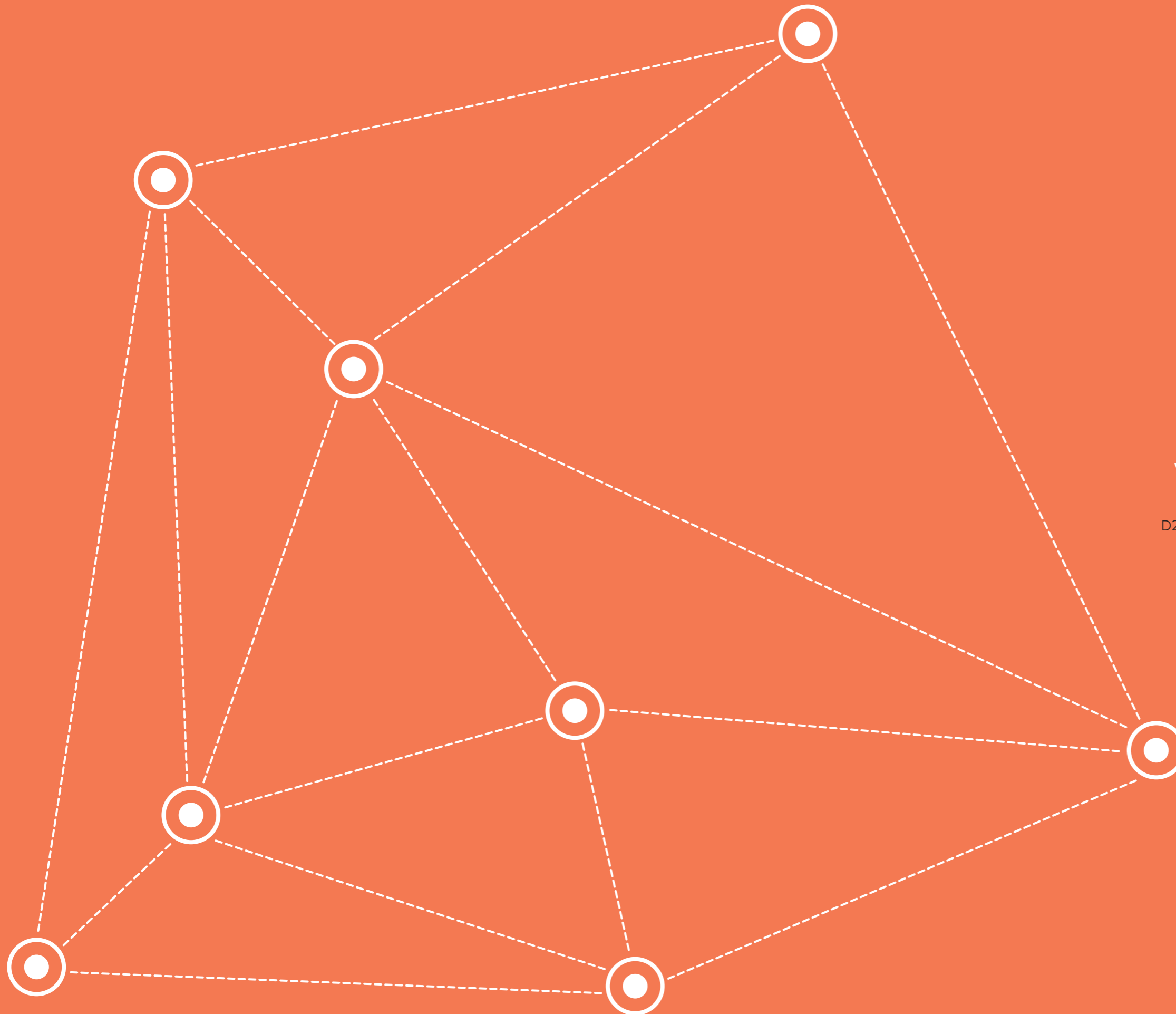




This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



# VISION DEVELOPMENT

D2.2 Report – Desired future scenarios of the R4E partner cities

#### Contributions by:

Jan-Willem HOMMES & Luuk POSTMES, Gemeente Eindhoven  
Francesca RAVAIOLI & Stefano BAZZOCCHI, Comune di Forlì  
Esmâ DILEK & Ugur KIZILOK, Istanbul Metropolitan Municipality (IMM)  
Jaime RUIZ HUESCAR & María Cruz FERREIRA COSTA, Ayuntamiento de Murcia  
Adrian MCLOUGHLIN & Simon JOHNSON, Newcastle City Council (NCC)  
Antonio MAZZON & Nunzio SALFI, Comune di Palermo  
Victor MARTINEZ & Gerard RIBA, Ajuntament de Sant Cugat del Vallès  
Villu PELLA & Jaagup AINSALU, Tallinna Keskkonnaamet

# VISION DEVELOPMENT

## D2.2 Report - Desired future scenarios of the R4E partner cities

Work Package title: WP2, Vision Development

Task: 2.2, Scenario Development

WP coordinator: TU/e LightHouse

Submission due date: August 2016

Actual submission date: 15 June 2016

### Abstract

This report (D2.2) contains the results of the Vision Development (WP2) activities from October 2015 to May 2016. These results are based on scenario workshops held with the local stakeholder network in each partner city to co-create visualisations of the Desired Future Scenarios for 2050 (Task 2.2). In addition, a Joint Vision Workshop was held in Istanbul to share the visions and cross-city learnings, and to prepare for the next step: Roadmapping (Task 2.3).

Visuals by Splinter, Jan-Jaap Rietjens

English corrections by Wordware, Nigel Morrisson



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

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

### Versions of this report:

31 May 2016	Concept for internal check by R4E partners (limited distribution)
15 June 2016	Final version for public distribution

# Contents

<b>R4E - ROADMAPS FOR ENERGY.....</b>	<b>5</b>
Approach in WP2 - Vision Development.....	7
<b>DESIRED FUTURE SCENARIOS FOR SMART BUILDINGS.....</b>	<b>9</b>
History made smart in Forlì 2050.....	10
Smart, interconnected green buildings maximise user comfort in Murcia 2050.....	11
Energy smart buildings and infrastructures enabling a high quality of living and thriving economy in Newcastle 2050.....	12
Cultural and social harbour Palermo 2050.....	14
Smart citizens enjoy smart buildings in Sant Cugat 2050.....	16
Smart buildings and smart people in energy-neutral Tallinn 2050.....	17
Common needs in the desired future scenarios for Smart Buildings.....	19
<b>DESIRED FUTURE SCENARIOS FOR SMART MOBILITY.....</b>	<b>25</b>
Smart, sustainable mobility in Eindhoven 2050.....	26
Fully integrated, accessible & sustainable mobility in Istanbul 2050.....	27
Personalised, smooth, safe traffic in Istanbul 2050.....	28
Safe, clean and affordable mobility in Murcia 2050.....	29
Cultural and social harbour Palermo 2050.....	30
Smart mobility enables an enjoyable living environment in Tallinn 2050.....	32
Common needs in the desired future scenarios for Smart Mobility.....	35
<b>DESIRED FUTURE SCENARIOS SMART URBAN SPACES.....</b>	<b>41</b>
Safe and pleasant living in Eindhoven 2050.....	42
Renewed, thriving city live in Forlì 2050.....	43
High-quality environment for well-being in Sant Cugat 2050.....	44
Common needs in the desired future scenarios for Smart Urban Spaces.....	47
<b>CONTRIBUTIONS.....</b>	<b>53</b>
<b>APPENDICES.....</b>	<b>57</b>
A - Ambitions of Eindhoven	
B - Ambitions of Forlì	
C - Ambitions of Istanbul	
D - Ambitions of Murcia	
E - Ambitions of Newcastle	
F - Ambitions of Palermo	
G - Ambitions of Sant Cugat	
H - Ambitions of Tallinn	



# WP7. Project management

Project coordination  
quality management, project coordination, financial & administrative activities

SC  
Sant Cugat

SC  
Palermo

SC  
Istanbul

SC  
Tallinn

SC  
Newcastle

SC  
Forli

SC  
Murcia

Joint project kick-off & SC  
2-day workshop in Eindhoven with all partners to sort project (WP7) and to prepare for ambition workshops and future telling interviews (WP1)

## WP1. Ambition setting

**Ambition workshops**  
3-day workshop in each city to define specific ambitions per focus area

Icons for cities: Eindhoven, Istanbul Metropolitan Municipality (public transport, traffic mgt), Murcia, Newcastle City Council (domestic, non-domestic), Ajuntament de Sant Cugat, Tallinn, and another Murcia.

**Ambition sharing & selecting drivers for change**  
1-day meeting in Palermo to share the results of the ambition workshops and future telling and to select the drivers for change for WP2

## WP2. Vision development

**Scenario workshops**  
3-day workshop in each city to develop specific desired future scenario's per focus area

Icons for cities: Eindhoven, Murcia, Newcastle City Council (domestic, non-domestic), Ajuntament de Sant Cugat, Tallinn, and Istanbul Metropolitan Municipality (public transport, traffic mgt).

**Scenario sharing & selecting topics for roadmaps**  
2-day meeting in Istanbul to share the desired future scenario's of all cities with all partners and to select the topics for the roadmaps (covering sustainable technologies, behaviour and organisation)

## 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

**SMART BUILDINGS**  
- Sustainable technologies  
- Sustainable behaviour  
- Sustainable organisation

**SMART MOBILITY**  
- Sustainable technologies  
- Sustainable behaviour  
- Sustainable organisation

**SMART URBAN SPACES**  
- Sustainable technologies  
- Sustainable behaviour  
- Sustainable organisation

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

**Expert meeting**  
cross team expert meetings to share and align timelines for the focus areas and prepare roadmap workshops with cities

**Roadmap workshops**  
2-day workshops in each city to develop specific timelines for the realisation of the desired future scenario's

Icons for cities: Eindhoven, Tallinn, Murcia, Newcastle City Council (domestic, non-domestic), Ajuntament de Sant Cugat, and Istanbul Metropolitan Municipality (public transport, traffic mgt).

## WP6. Project portfolio

**Current projects**  
each city identifies projects it has running that will contribute to the realisation of the roadmap, as well as the topics for cross-city learning

**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

**New projects**  
each city identifies the desired new projects to ensure the timely realisation of its roadmap ambition

Icons for cities: Eindhoven, Murcia, Newcastle City Council (domestic, non-domestic), Ajuntament de Sant Cugat, Tallinn, and Istanbul Metropolitan Municipality (public transport, traffic mgt).

**Joint portfolio meeting**  
3-day meeting in Forli to share the portfolios of the different cities, as well as to prepare for joint projects that support the achievement of common ambitions

**Financing opportunities**  
identifying different opportunities for financing of the city specific and the joint projects

**Organising for learning**  
organising for continued cross city learning

**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

**Scenario preparation**  
defining generic elements for future scenario's as preparation for the workshops with cities to develop specific desired future scenario's

**Strategy & visuals**  
developing a communication & dissemination strategy, logo's and graphic charter

**Event**  
Palermo

**Regular communication activities**  
electronic project newsletters, other newsletters and information services, project and partner websites, press releases and other media releases, social media

**Event**  
Tallinn

**Regular communication activities**

**Final event**  
conference in Murcia

# WP8. Communication & dissemination



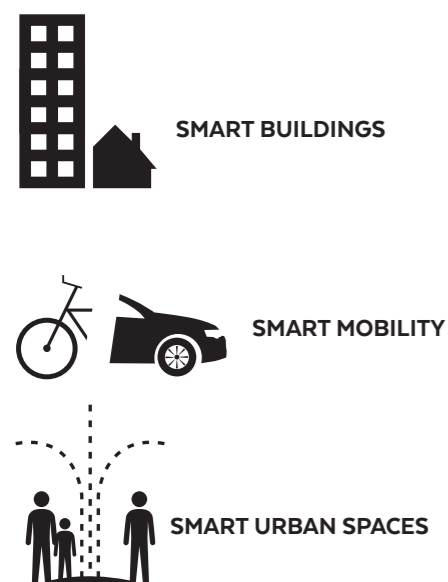
# R4E - ROADMAPS FOR ENERGY

## Introduction

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, better developed involvement of local stakeholders. These include not only those who will 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 aim is to create a shared vision containing the desired, city-specific scenarios and the dedicated roadmaps to be embedded in the context of each city. The visions and roadmaps will address the diversity in the geography, ecology, climate, society and culture of the eight partner cities in the project: Eindhoven, Forlì, Istanbul, Newcastle, Murcia, Palermo, Sant Cugat and Tallinn.

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

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



## Approach

The R4E project follows a four step approach:

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

## Step Two: Vision Development

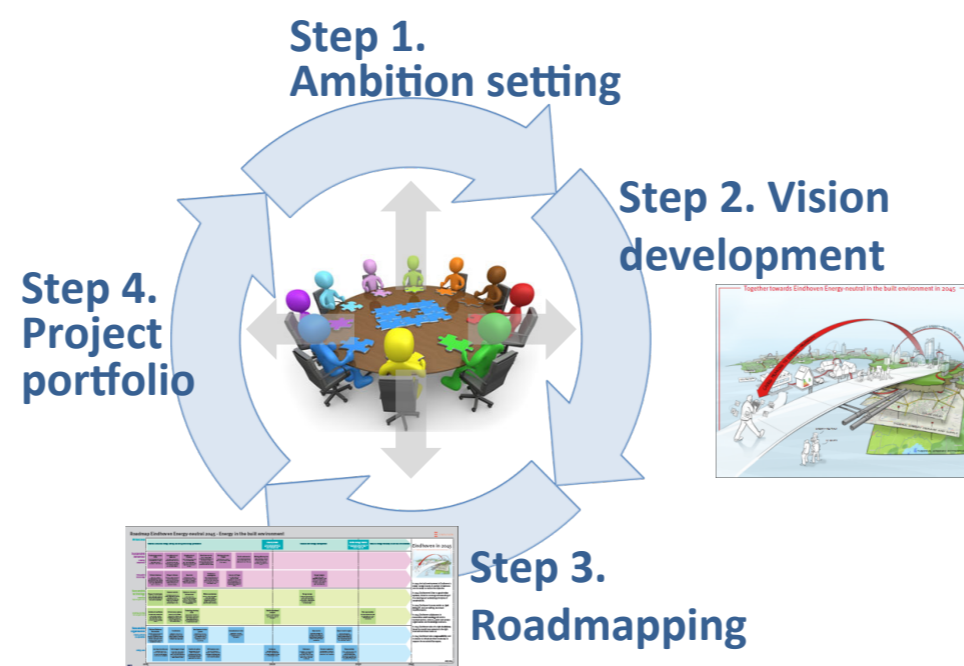
This report is part of Step 2 of the R4E project, and describes the second part of Work Package 2 (WP2). The aim of WP2 is to develop desired future scenarios for the cities in the selected focus areas. First of all, Future Telling interviews were held on sustainable energy in general, and on the themes of Smart Buildings, Smart Mobility and Smart Urban Spaces in particular. The Future Telling results are Drivers for Change (see D2.1 Report – Drivers for Change). The cities then use these Drivers for Change to develop their desired future scenarios for the selected focus areas. During the Joint Vision Workshop they identified the common needs in the desired future scenarios, and described them as input for the roadmap development steps in WP3, WP4 and WP5.

## How to read this report

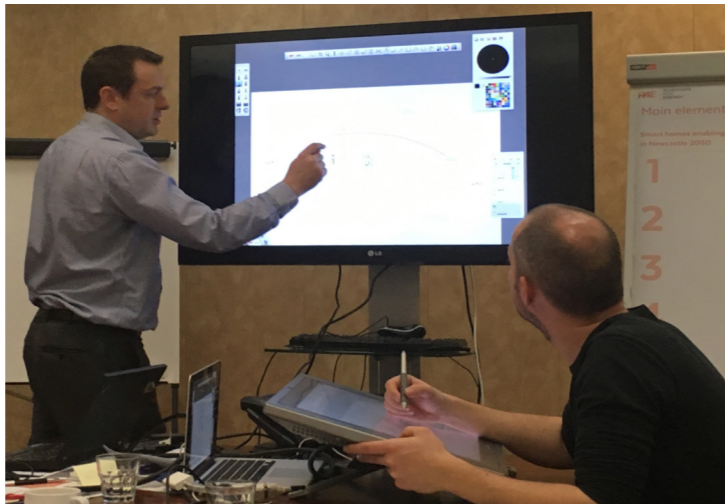
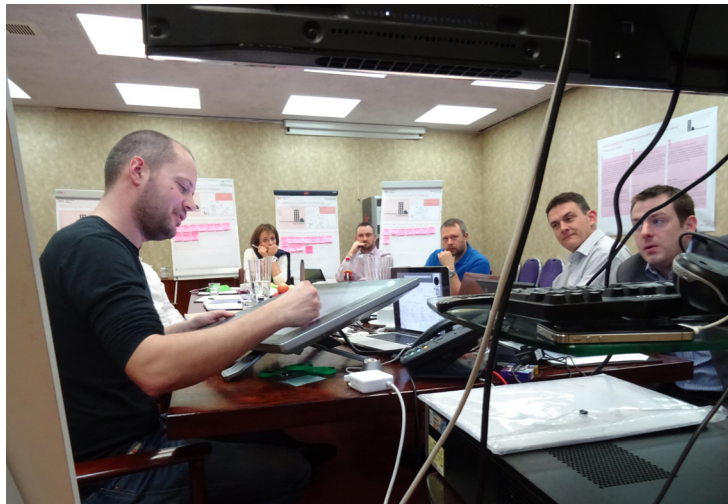
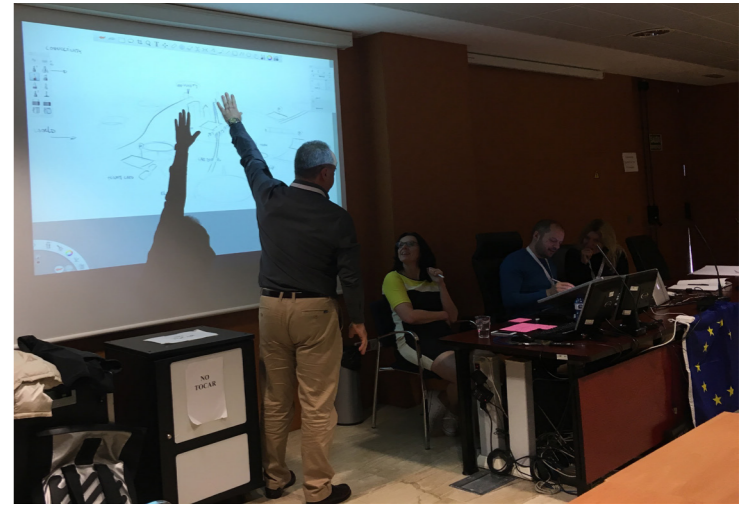
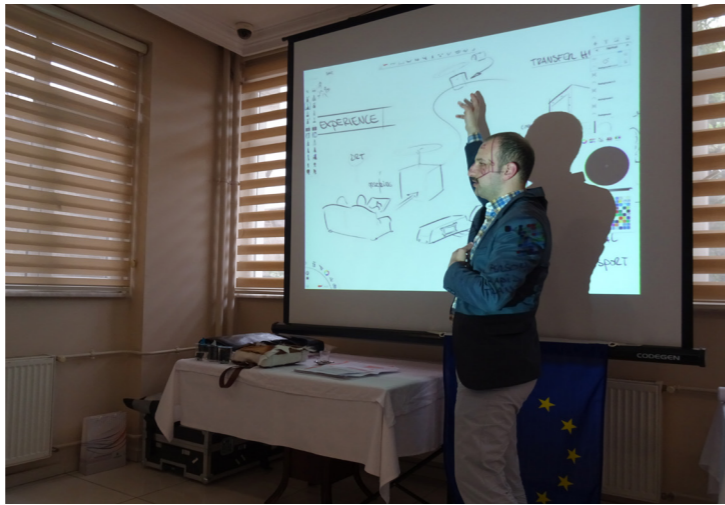
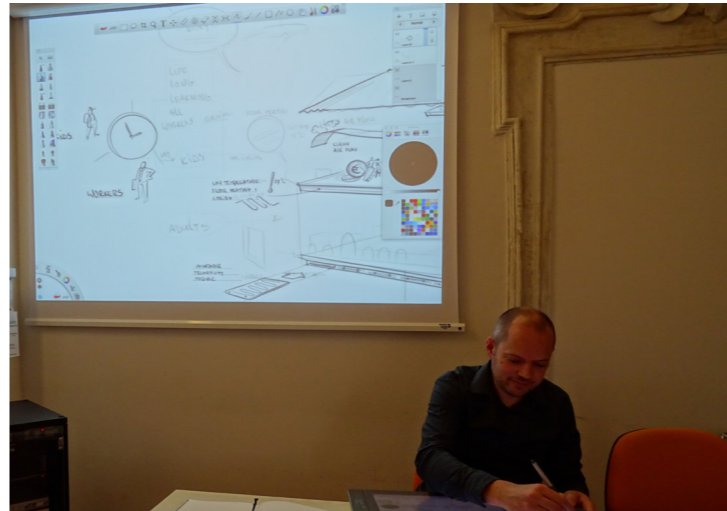
This report contains the results of the development of the desired future scenarios of the R4E partner cities. It starts with a brief description of the approach to co-create the desired future scenarios and the working method in the scenario workshops held in each city.

This is followed by three separate sections: one for each of the three focus areas. Each section contains the posters with the desired future scenarios (visualisation and accompanying text). The results of the Joint Vision Workshop are presented at the end of each section, including a brief description of the identified common needs in the future visions for the focus areas.

The complete results of the scenario development workshops in the cities can be found in the appendices (added as separate reports to this main report).



Four step approach of R4E



# Approach in WP2 - Vision Development

## Vision development

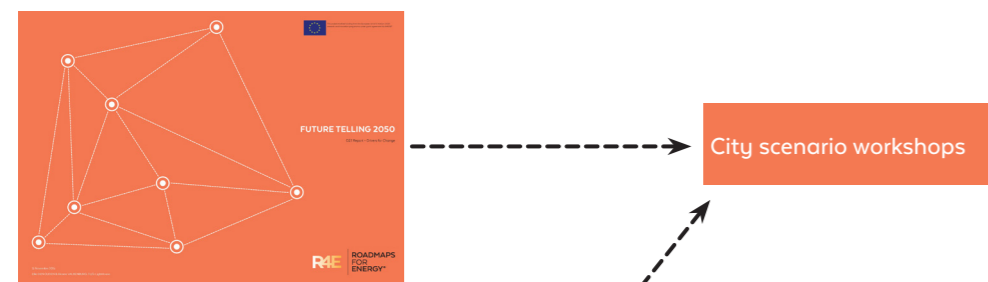
The aim of Step 2 is to develop visions for the cities in the selected focus areas. A vision is based on a long-term perspective on the world – in this case we are focusing on 2050. Two main activities are taking place in this step: Future Telling research and the development of desired future scenarios.

### 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 Smart Buildings, Smart Mobility and Smart Urban Spaces in particular. The Future Telling research method is an approach to create context-related possible future scenarios in a creative, imaginative way. Future Telling research consist of a structured method to map expertise and ideas of thought leaders from the Smart Cities domain. Through interviews and analysis leading to the Drivers for Change for liveable and smart cities in 2050. This research and the 18 Drivers for Change are described in the report Future Telling 2050 D2.1 Report – Drivers for Change.

### Developing desired future scenario's

Out of the 18 Drivers for Change for smart and sustainable cities, the cities have chosen the most important Drivers for Change to be included in their further vision development. Together with the Ambitions, which the cities set in Step 1, the desired future scenarios for the focus areas will be developed in city scenario workshops. The ambitions are described in the Ambition Setting D1.1 Report – Specific ambitions of the R4E partner cities.



Future Telling 2050 - D2.1 report - Drivers for Change



Ambition Setting - D1.1 report - Specific ambitions of the R4E partner cities

## Scenario Workshops

The desired future scenarios for the selected focus areas in the cities are created in a series of workshops held in each of the partner cities (Task 2.2). 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 of the city, facilitating 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 with specific additions. Based on the outlined vision they carry out a further in-depth exploration of the main elements of the vision in-depth.

In all the sessions, the participants will interactively build a visualisation of the desired future scenario. See also the pictures of the workshops on the previous page.

Day 1 - Focus area 1	Day 2 - Focus area 2	Day 3 - Reporting
<b>Outlining the vision</b> <ul style="list-style-type: none"> <li>Exploring the drivers for change in relation to the future of the city</li> <li>Selecting the main elements of the vision</li> </ul>	<b>Outlining the vision</b> <ul style="list-style-type: none"> <li>Exploring the drivers for change in relation to the future of the city</li> <li>Selecting the main elements of the vision</li> </ul>	Project team working session to prepare the report of the Scenario Workshop
<b>Enriching the desired future scenario</b> <ul style="list-style-type: none"> <li>Exploring the future the city and the main elements of the vision</li> <li>Enriching the vision with specific additions</li> </ul>	<b>Enriching the desired future scenario</b> <ul style="list-style-type: none"> <li>Exploring the future of the city and the main elements of the vision</li> <li>Enriching the vision with specific additions</li> </ul>	

Program of the ambition workshops

The result of the Vision Development step is a visualisation of the desired future scenario on 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

The last step in WP2 was a joint meeting in Istanbul (Task 2.3), in which 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. The Joint Vision Workshop served two purposes:

- To enable cross-city learning. The cities will gain a deeper understanding of the Vision Development process, and can 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 WP2, and prepared for WP3, 4 and 5.

Day 1	<b>Poster exhibition of the city visions</b> <ul style="list-style-type: none"> <li>The cities share their desired future scenarios for the focus areas</li> </ul>
Finalising WP2	<b>Learning from each other's visions</b> <ul style="list-style-type: none"> <li>In-depth discussion on common and specific needs described in the visions</li> </ul>
Day 2	<b>Presentation of the Roadmapping process</b> <ul style="list-style-type: none"> <li>Sharing of interim results of the roadmapping desk study</li> </ul>
Preparing for WP3, 4 and 5	<b>Identifying topics and experts for the roadmap interviews</b> <ul style="list-style-type: none"> <li>Selecting topics for the roadmapping interviews and making a list of suggested experts using the networks of all partners</li> </ul>

Programme of the Joint Vision Workshop

This report includes the results of the sessions held on the first day. The results of the second day's sessions will be included in D3.2 - Generic Roadmaps for Smart Buildings, D4.2 - Generic Roadmaps for Smart Mobility, and D5.2 - Generic Roadmaps for Smart Urban Spaces.





# DESIRED FUTURE SCENARIOS FOR SMART BUILDINGS

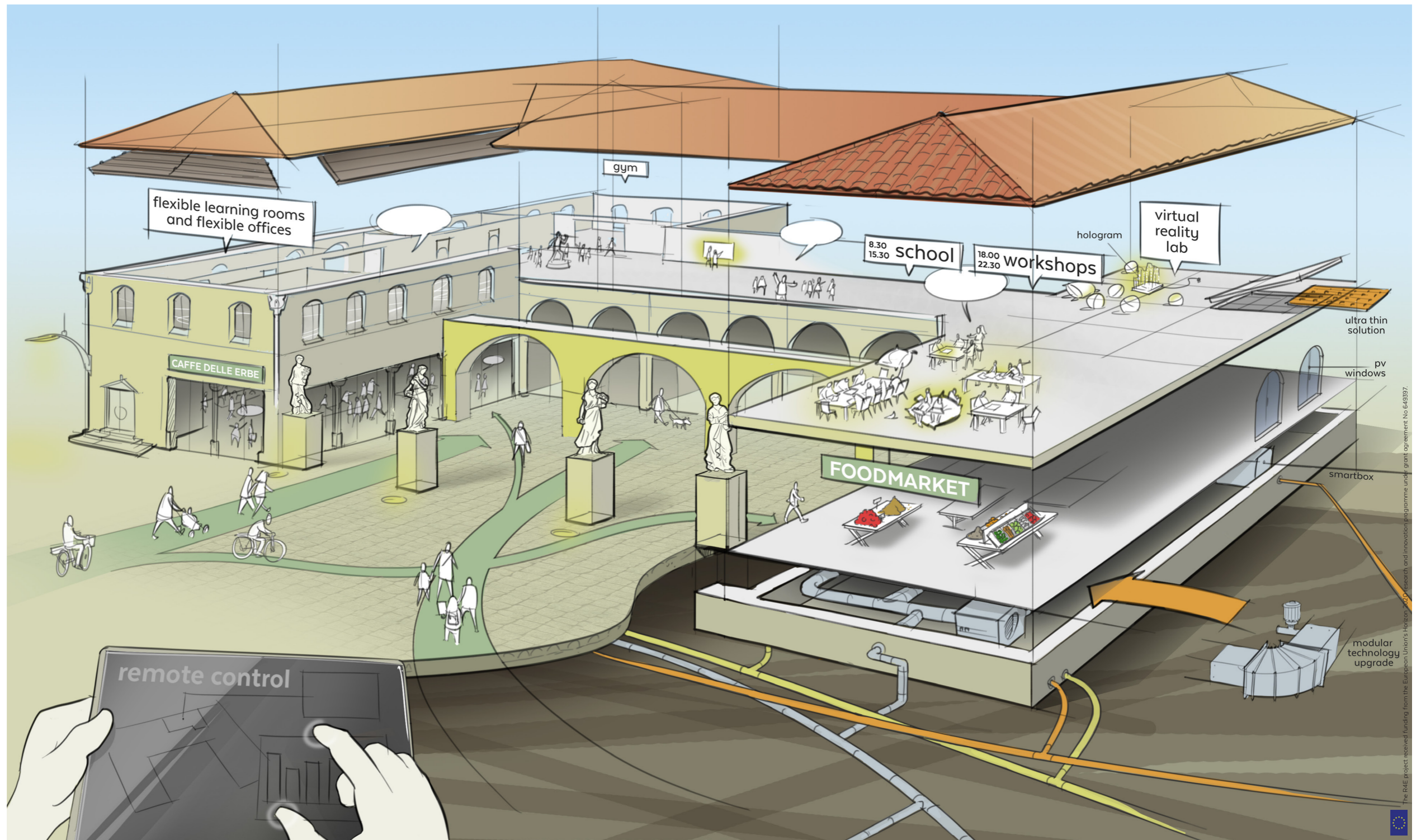


## HISTORY MADE SMART IN FORLÌ 2050

In 2050, people in Forlì value their historical heritage. Historical buildings are renovated with respect for their heritage, and have new uses that serve the community. Forlì boldly implement modern energy-efficient building technologies, both in top-quality new buildings and in the less valuable elements of existing buildings. All buildings are designed or renovated for safety and resilience to both normal climatic conditions and exceptional natural events.

The social environment of Forlì is supported by the technological infrastructure. People – both citizens and entrepreneurs – value high-quality connectivity and technical infrastructure. They interact with the urban space, and have real-time information inviting them to engage in social activities. The top-level infrastructure of Forlì attracts companies (both established and start-up) to set up their activities and contribute to the local economy.

The smart people of Forlì value energy-efficient buildings. Schools and hospitals are leading examples of 'people smart' services that encourage learning and healing. Starting as young children, people are aware of the basic principles of sustainable living that has spread across the whole city. New technologies are used to achieve zero-emission, self-sufficient buildings.



Elements of the desired future scenario are:

### Historical memory

Historical buildings are renovated with respect for their heritage. There are no standard rules: each building has a different social and cultural background that is revived while it is transformed to the needs of 2050. Both the building itself and its historical value are preserved, although with an up-to-date meaning of its function. For example, the church may become a museum or a theatre, thereby maintaining the function of connecting citizens.

### High-tech blended with history

Superb buildings maximise comfort for the users and facilitate building management because they use the latest technology for building automation, air quality control, renewable materials and efficient installations. Less invasive systems (e.g. pipeless, very thin or upgradeable modular solutions) are used for historical buildings to preserve valuable elements such as frescos. IT systems monitor the use of spaces, and manage energy at a district scale.

### Economic development

The economy is flourishing with new businesses that create community value. Entrepreneurs develop new sharing services for citizens, thereby reducing the use of land and environmental resources. Citizens have a different mindset and reduce their footprint actively by choosing sustainable energy, locally produced food and shared services. Districts are designed and buildings are renovated to create more efficient spaces for sharing and growing food.

### Shared & versatile spaces

Buildings and spaces are versatile, so they can be used by the community for different purposes on a 24/7 basis. For example the building adapts to a new concept of open schooling for children. Spaces are also better integrated to facilitate lifelong learning for people of all ages, with different programmes at different times of the day and the year. The design of the buildings enables extra functionality and versatility for different purposes, users and contexts.

### Communicating examples

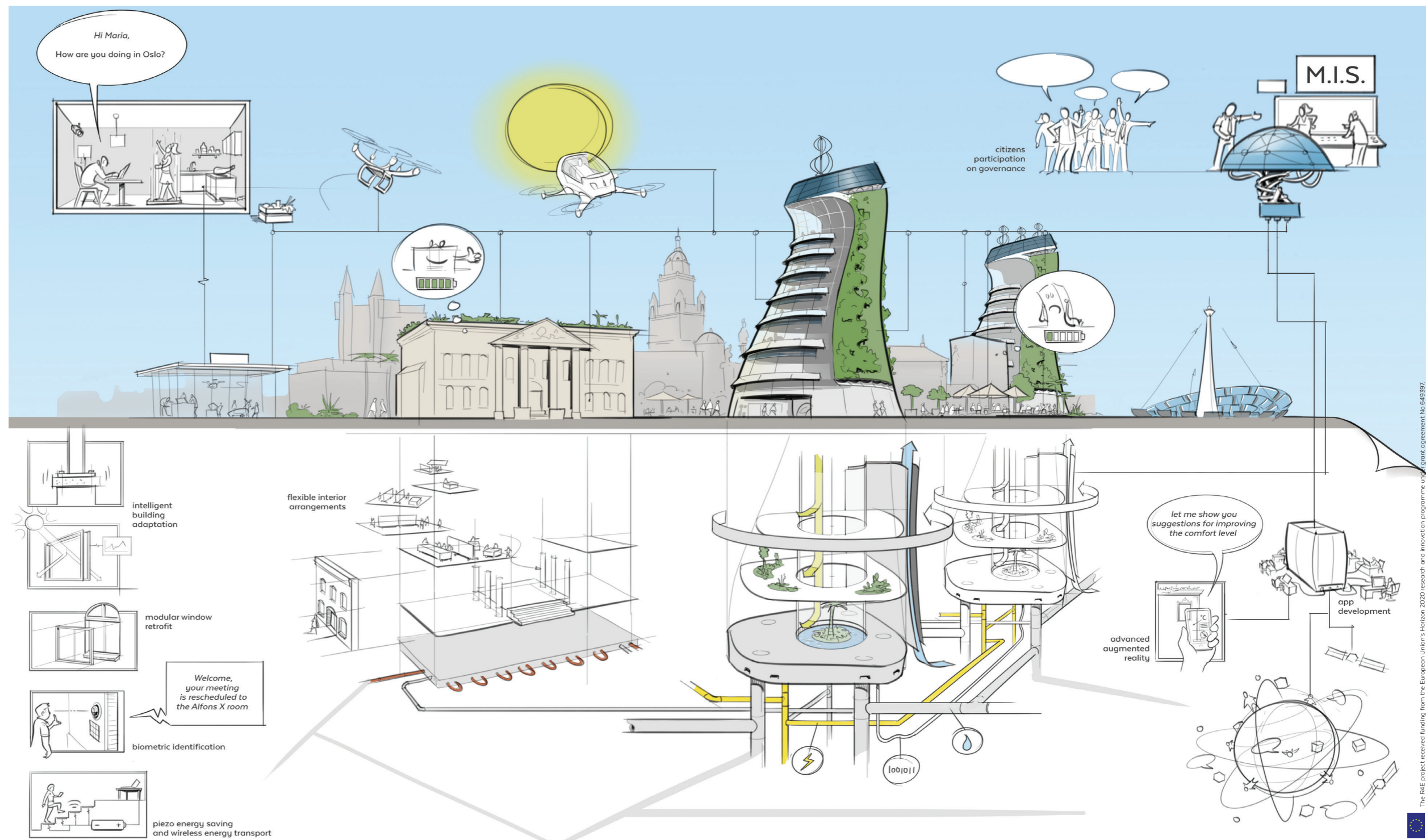
Good practices and leading examples are shared in the community and transformed into solutions for common use in other buildings. Public buildings (e.g. schools and hospitals) demonstrate the basic principles of sustainable construction and provide open platforms for citizens to engage in discussions about sustainable living. Children learn about environmental systems, which inspires conscious and sustainable lifestyles as adults.

## SMART, INTERCONNECTED GREEN BUILDINGS MAXIMISE USER COMFORT IN MURCIA 2050

In 2050, the people of Murcia enjoy buildings that proactively adjust to their changing needs. Through profiles based on the expected use (presence and activities) and external factors (weather, season etc.), buildings actively choose the optimum energy settings to maximise comfort for users.

The buildings are interconnected by a telemanagement system that enables sharing of energy and resources. This makes a big contribution to users' comfort and convenience, both inside and outside the buildings.

Murcia achieved a position among Europe's top 'clean & green' cities by green urban planning that values CO<sub>2</sub>-neutral energy-producing buildings. The buildings use renewable energy sources and have a low impact on nature, both during construction and in everyday use.



Elements of the desired future scenario are:

### Flexible use of buildings

The buildings in Murcia facilitate highly flexible use, for different users, different activities and in different seasons. Walls, installations and furniture can be rearranged easily – for example using flexible partitioners, changeable windows or 'floating' desks. Standardised protocols enable roaming profiles for user settings in the virtual space. Smart management systems support effective and efficient use of the workspaces.

### Enhancing working & family life

The buildings recognise people and can adapt to their personal preferences and habits by providing the desired atmosphere and climate settings. Homes cater for teleworking and remote healthcare through good connectivity and smart appliances. Use of the latest technologies facilitates a whole range of other activities – for example using augmented reality for easy enjoyable shopping, navigation and other everyday tasks.

### 'Green' buildings technologies

The latest technologies are used in the buildings for easy energy saving, generation and storage. Examples are the use of energy-absorbing materials, and light tubes to bring daylight into the heart of the building. The buildings are climate-proof, so they can absorb heavy rain showers. And they are resistant to earth-quakes through the use of innovative solutions like flexible materials and active bumpers. Wireless networks are used to charge energy-efficient appliances.

### Learning buildings

The buildings are interconnected: not only do they learn during use, but they can also share their learnings. The use of all utilities (energy, water, waste and other resources) is monitored. Patterns of use are recognised so upcoming activities can be anticipated, providing maximum comfort for users. This active data sharing allows the buildings to learn from each other, providing maximum user comfort at the lowest energy consumption.

### Master Intelligent System

Murcia's Master Intelligent System uses open data and standard protocols all over the city, providing new services on an open platform. People can easily access and connect to the platform, wherever they are. Energy supply and demand are matched – and legally embedded – in the central system. The focus is on the users' needs, with priority for emergency services when necessary. Energy can be exchanged freely between users, appliances, vehicles and buildings.

## ENERGY SMART BUILDINGS AND INFRASTRUCTURES ENABLING A HIGH QUALITY OF LIFE AND THRIVING ECONOMY IN NEWCASTLE 2050

In 2050, people in Newcastle enjoy energy-efficient buildings with a high level of comfort. All homes and non-domestic buildings are connected to an effective energy system, to achieve net-zero energy consumption and net-zero emission.

Newcastle has adopted a collective approach to decisions in the infrastructure that enables joint decision-making with stakeholders in the city. Urban planning takes a broad wide-area view to take full advantages of the opportunities extending beyond site or estate boundaries and city limits. Through the open data centre the City Council and its partners are able to implement evidence-based policies and decision-making. Residents are empowered and have the means and the wish to make responsible choices on their own energy usage and investments.

### Sustainable buildings

Homes and non-domestic buildings provide high levels of comfort with sustainable energy solutions. They support their users with personalised advice to save energy in line with their lifestyles. Retrofit solutions as well as new innovative buildings ensure that all buildings are sustainable. Buildings are exemplary in their use of innovative and sustainable technologies. High visibility of the solutions supports their adoption as well as a thriving building sector that 'exports' design and consulting services. In this way the standard of the buildings is raised, adding value to existing business models in the local community.

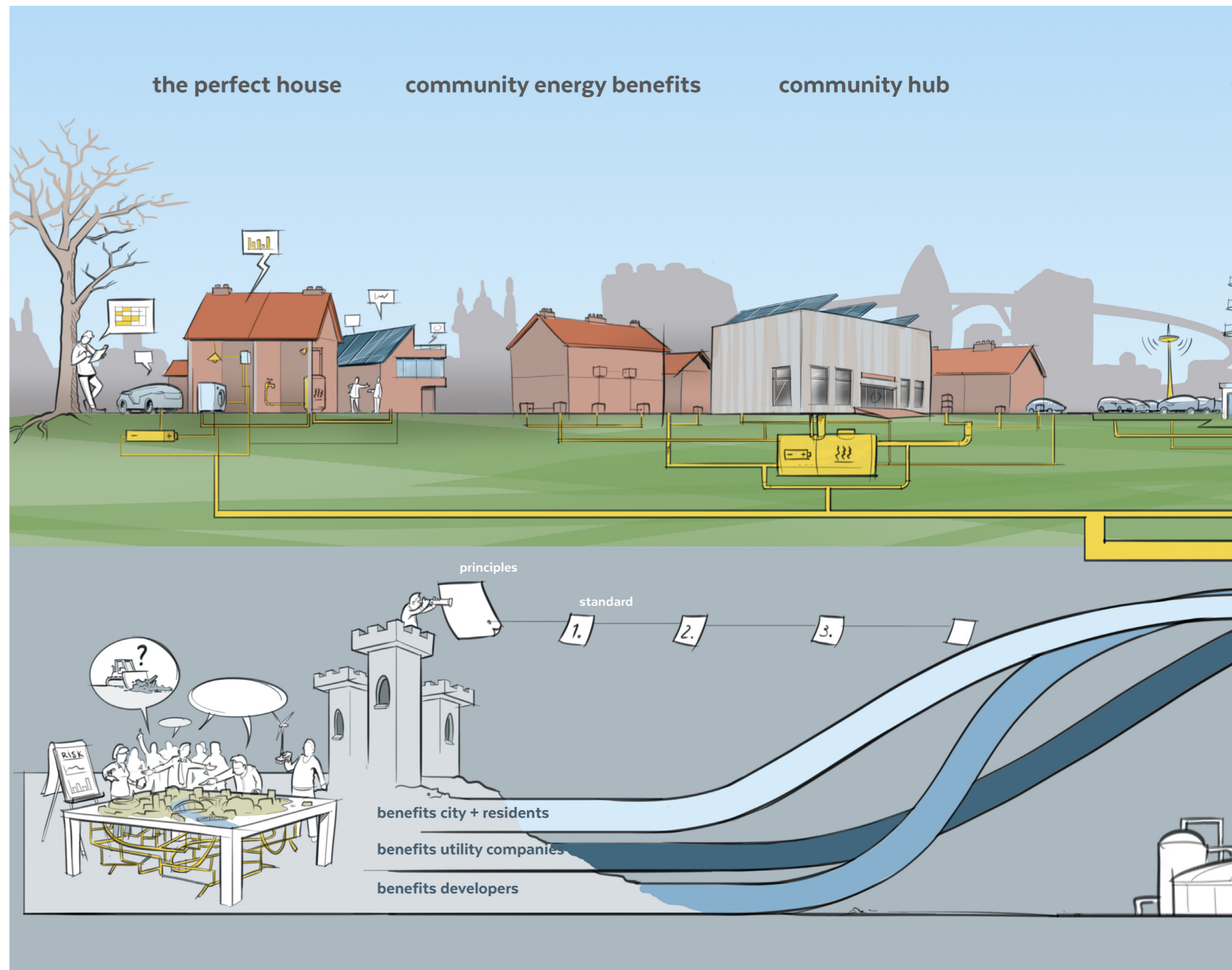
### Smart infrastructures

Infrastructure interconnects local grids for different energy sources, such as electricity, temperature control (heating and cooling), water and data, and connect the local grids to regional and national levels. Local grids enable communities to invest in and share sustainable solutions with peers, and support optimal use of renewable energy and the specific features and qualities of separate buildings. All buildings are connected to the grid, receiving and transmitting information to peers or to a wider network with respect for the privacy of the users.

The top layer of the visual represents different type of buildings and sharing options, with an increasing complexity of the solutions. This builds up from a (perfect) house, connected within the neighbourhood, through a community hub around a (public) building, shared use and modular buildings, right up to the future living environment.

At the bottom left the new policy and planning process are shown as a way to manage future-proofing. Elements of the desired future scenario here are the flow of benefits between stakeholders, and city-wide planning (around the table) to align information and decision-making.

At the right of the visual are the underlying infrastructure and personal schemes, which are needed to enable all the other solutions.



### Flow of benefits

An integrated planning and development process optimises the flow of benefits for different stakeholders. The value of 'community gain' is considered (not just financial gain) is considered through local integration. A long-term perspective allows business models and decision making to consider state-of-the-art solutions and to avoid the need for renovation. Democratic decision-making enables future retrofitting with participation by residents.

### City-wide planning

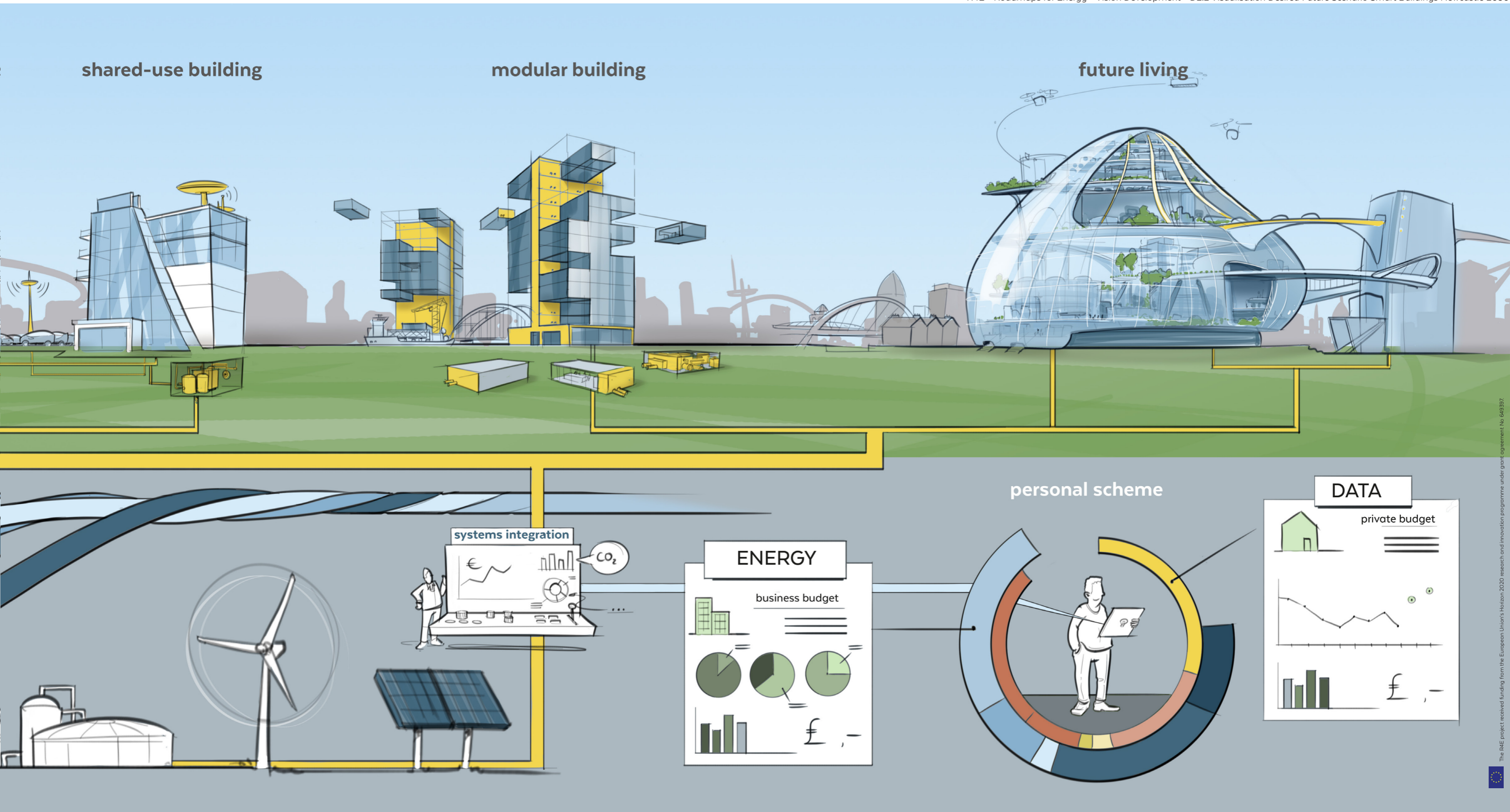
Policy-making and planning in Newcastle are based on a city-wide plan. This fully integrates all assets and their interactions, so the total impact on the surrounding can be considered. A collaborative approach together with all stakeholders drives alignment of information and leads to better decisions. Through regional cooperation, one set of principles provides developers with progressive standards to achieve sustainable projects.

### The perfect house

Houses are designed for people. Connectivity with the energy and data net provides valuable services for comfortable living (e.g. tele-care). People can make responsible choices, even from options they did not think of themselves. The smart house manages itself according to set parameters. Simplicity and accessibility are the norm: people have freedom of choice, with full control of their homes and their lives.

### Community energy benefits

People living in Newcastle's estates jointly benefit from shared sustainable resources provided through local grid solutions. Residents share energy solutions tailored to their homes (e.g. PV panels on south-facing roofs, or turbines in 'windy gardens', with basement for batteries). The grid provides local interconnectivity promoting community-building and cultural change.



**Community hubs**

Residents, businesses and public organisations share energy through a two-way interactive local grid. This increases resilience, benefitting from the strengths of the features and investments in other buildings. The benefits of energy investments and production are retained within the community. A smart (virtual) infrastructure allows matching of fluctuations in energy supply and demand of energy.

**Shared-use buildings**

Smart (wireless) systems enable flexible use of buildings with variable occupancy patterns and users' needs. Office buildings, shopping centres, community buildings and schools can meet varying demands for space by providing the required energy, lighting and heating according to specific user and activity profiles. The building minimises energy consumption by recognising recurring patterns of use.

**Modular buildings**

Modular buildings offer smart systems, increasing flexibility for reconfiguration of spaces and energy systems (biomass boilers, heat pumps, PV modules). Smart building controls enable internal restructuring. Flexibility de-risks the business case for investors to make the building structures future-proof. Newcastle can exploit its heritage of building large ships and offshore structures to develop core structures that can be clad with modules.

**Future living**

Citizens' daily living patterns have changed significantly. Buildings suit the activities of future citizens, with flexibility between working, living and leisure activities. Future buildings offer a range of facilities and technologies to encourage social interaction.

**Personal energy schemes**

Individual energy schemes with personal roaming profiles allow the use of (wireless) energy and data where and when they are needed. These provide access to new services such as telecare or energy donations. The scheme enables localised trading, sharing and lending of resources through peer-to-peer networks. The scheme addresses different lifestyles and provides individual budgets and advice for behaviour based on planned and predicted usage.

**Energy infrastructure**

The energy infrastructure enables gradual replacement of non-sustainable energy sources by renewable energy in buildings as well as regionally (e.g. wind parks and solar farms). Optimisations are done at the appropriate levels, linking local, regional and national grids. Shared data and knowledge from all stakeholders feed into the city-wide plan and support future-proof decision-making. In 2050, Newcastle is a net-zero emissions city.





## CULTURAL AND SOCIAL HARBOUR PALERMO 2050

In 2050, the city of Palermo values smart, ecological buildings, spaces and mobility. Palermo values being a social harbour, open and friendly to all, as well as a cultural harbour, enriching people's lives and helping to make good citizenship and sustainable behaviour second nature for everyone.

Innovation and new technologies are embraced to become energy-neutral. Circular systems are implemented to enable sustainable behaviour and businesses. There is an integrated, connected, wireless data and energy network and a green mobility network connects the city and its various centres.

The core of city life is the people of Palermo, with their social interactions and their enjoyment of the city's buildings, spaces and cultural features. Technological solutions are demand-driven and can be personally adjusted. Cultural exchanges enrich people's lives in the city.

Elements of the desired future scenario are:

### A social harbour

Palermo is an open and friendly city, welcoming to all, while retaining its unique characters. A city for the people, that is lighter, in the sense of fewer cars, less pollution and lower noise. With buildings and spaces that are comfortable for people and that exploit Palermo's beauty, with its attractive views and sound scape.

### A cultural harbour

Palermo cherishes its historical city centre and cultural heritage. These are enriched by new technologies and innovation to create comfortable, energy-efficient housing and neighbourhoods. Innovative solutions are used to maintain historical buildings and to make them energy efficient. (Re-)location of public service buildings and re-purposing of old buildings supports sustainable living.

### Circularity

Palermo greatly values new technologies as a means to become an energy-efficient and circular city. Especially in the outlying areas, new technologies are used for energy generation, storage and charging of 'sweet mobility' solutions. Circular systems are used, for example for food: from urban farming, markets, joint cooking and enjoying local food, as well as organic waste recycling. Or for the business of natural materials: from green roofs, natural materials for isolation, local entrepreneurship in printing isolation materials from waste of local food production. School buildings serve as demonstrators of new solutions and behavioural change.

### An integrated, connected, wireless data and energy network

The city of Palermo is connected and accessible through a network of infrastructure for energy systems and open data. An energy network connecting the whole city based on renewable energy sources ensures energy-neutrality at city level. Energy production (PV, buildings), storage (cars and batteries) and usage (where needed) are balanced through the network.

Open data is the norm, and enables new entrepreneurship based on services for people. The connected data is valued by citizens because of the improved affordable and reliable information on mobility and public transport. Citizens support this principle of data sharing by providing access to their own data. The connected data is valued by information management experts for the interconnection of mobility modes and the integration with other functionalities, such as measuring air quality, pollution or congestion.

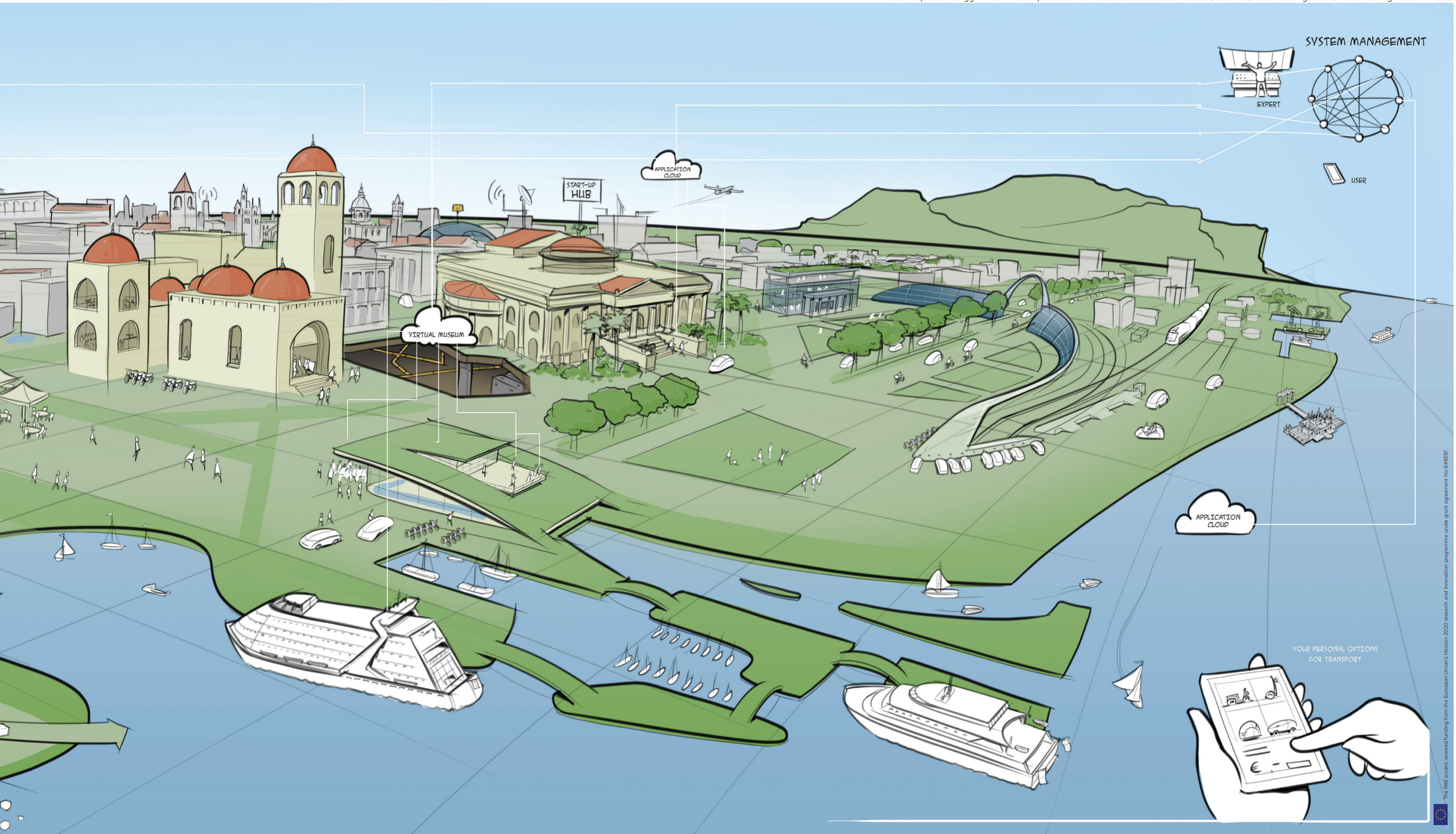


### City for the people of Palermo

The heart of the city of Palermo are its people, enjoying social interactions and the city's buildings and spaces. These spaces have been given back to the people, so they can enjoy them in comfort and safety. Children can play outdoors, and can walk to school. The urban space is used by citizens, developing cultural activities and by local entrepreneurs to create awareness and change. Tourists also value the city's cultural history, which they can experience both physically and virtually.

### A green mobility network

The city of Palermo has been (re-)designed with a green mobility network, connecting the city and its various centres, adding value to the poly-centric city and integrating the qualities of the different areas into a harmonious whole. The Golden Valley 2.0 connects green roofs and walking areas to make walking and biking into obvious choices for people. All areas are easily accessible and safe, with a closely-knit transport network throughout the city.



### 'Sweet and green' mobility

A range of mobility solutions provide a dense network of mobility modes. This demand-driven diversity includes walking, bike, scooter, and car sharing, as well as tram and metro connections to the outlying areas. Individual solutions are accessible and affordable for all, supported by local entrepreneurs, new business models and both public and private investments.

### Sea motorway and central distribution centre

Palermo is a capital city and an important sea port which serves as a logistics and transport hub, connecting the hinterland with other Italian cities. The sea will be further exploited as a mobility option to reduce traffic volumes on the roads, with a logistics platform based on new technologies. Good transport management also allows smaller-scale ecological solutions, such as smart individual delivery of (personal) goods in the city.

Version 15 June 2016

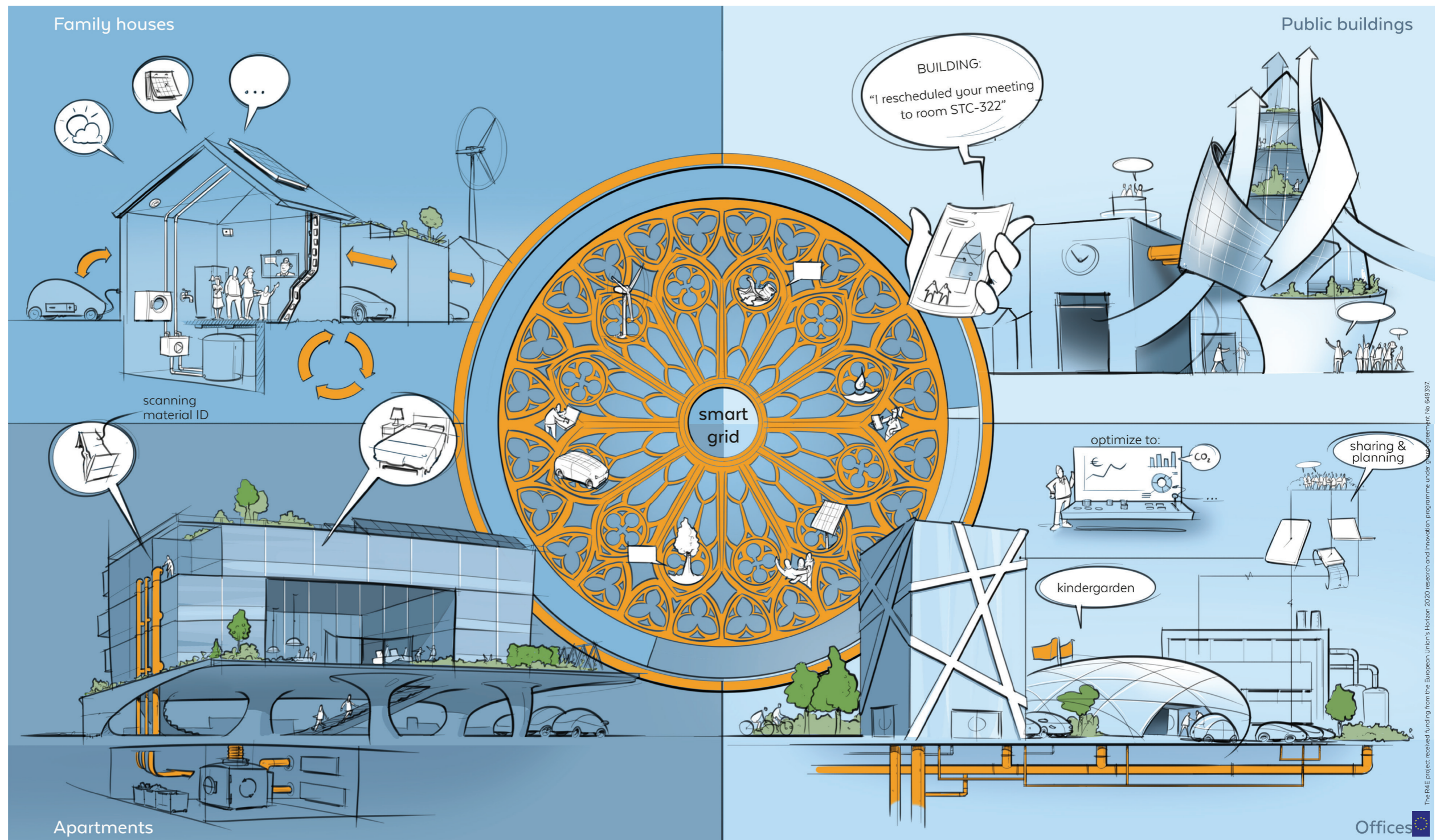
## SMART CITIZENS ENJOY SMART BUILDINGS IN SANT CUGAT 2050

In 2050, all the stakeholders in Sant Cugat value collaboration and shared responsibility to manage their energy pro-actively. Both owners and occupiers of buildings value the opportunity to save energy and water.

They do this by using the latest energy-saving technologies and energy-efficient system designs. These concepts add up to significant energy savings. But people don't have to make any compromises on the comfort of their (living) environment. The latest technologies are also applied in the materials used in buildings and in the urban space. For example with materials that can clean the air, and take advantage of the kinetic energy of cars, bikes and pedestrians, transforming this energy into other forms that are useful for citizens.

Renewable resources are valued because they create a self-sufficient smart energy grid connecting all the individual buildings and neighbourhoods.

The desired future scenario makes a distinction between the different type of buildings – family houses, apartments, public buildings and offices – addressing specific opportunities and solutions. Those solutions can also be applied in other areas and categories when the need arises.



Elements of the desired future scenario are:

### Smart communities

In 2050, owners of family houses are aware of the need for sustainable energy, water and waste services. They invest in systems and share them with their neighbours, so together they can afford a range of solutions for energy (generation and storage), water, food and waste. Together, they form a self-sufficient community. Smart homes provide a high level of comfort, with easy access to services like healthcare, so people can continue to live independently in their own homes.

### Saving through sharing

Apartments in 2050 provide both shared and private areas and services. Next to gyms, gardens and swimming pools, sharing also extends to kitchen, dining areas, office spaces for teleworking, and many other facilities. Green roofs provide shared gardens and urban farming spaces. These are interconnected to provide green walking routes. Basements offer common parking spaces for bikes and charging points for shared vehicles.

### Empowerment by example

Public buildings in 2050 are like a service rather than just a space. They make efficient use of space by adapting to the needs of the users – e.g. smart services to optimise behaviour. Nature and natural resources are used, like plants and green, to reduce the impact of the building. Public buildings are showcases for the highest possible energy efficiency and teach and empower citizens towards sustainable behaviour.

### Campuses as incubator

In 2050, offices and campuses are small villages in themselves, providing local facilities and services. They open up to citizens and connect to the community. The controlled environment of campuses and the predictable patterns of use, make them ideal incubators to test new solutions for energy exchange, self-driving mobility and other shared services. All systems use and provide open data, supporting start-ups in developing new business.

### Open smart grid

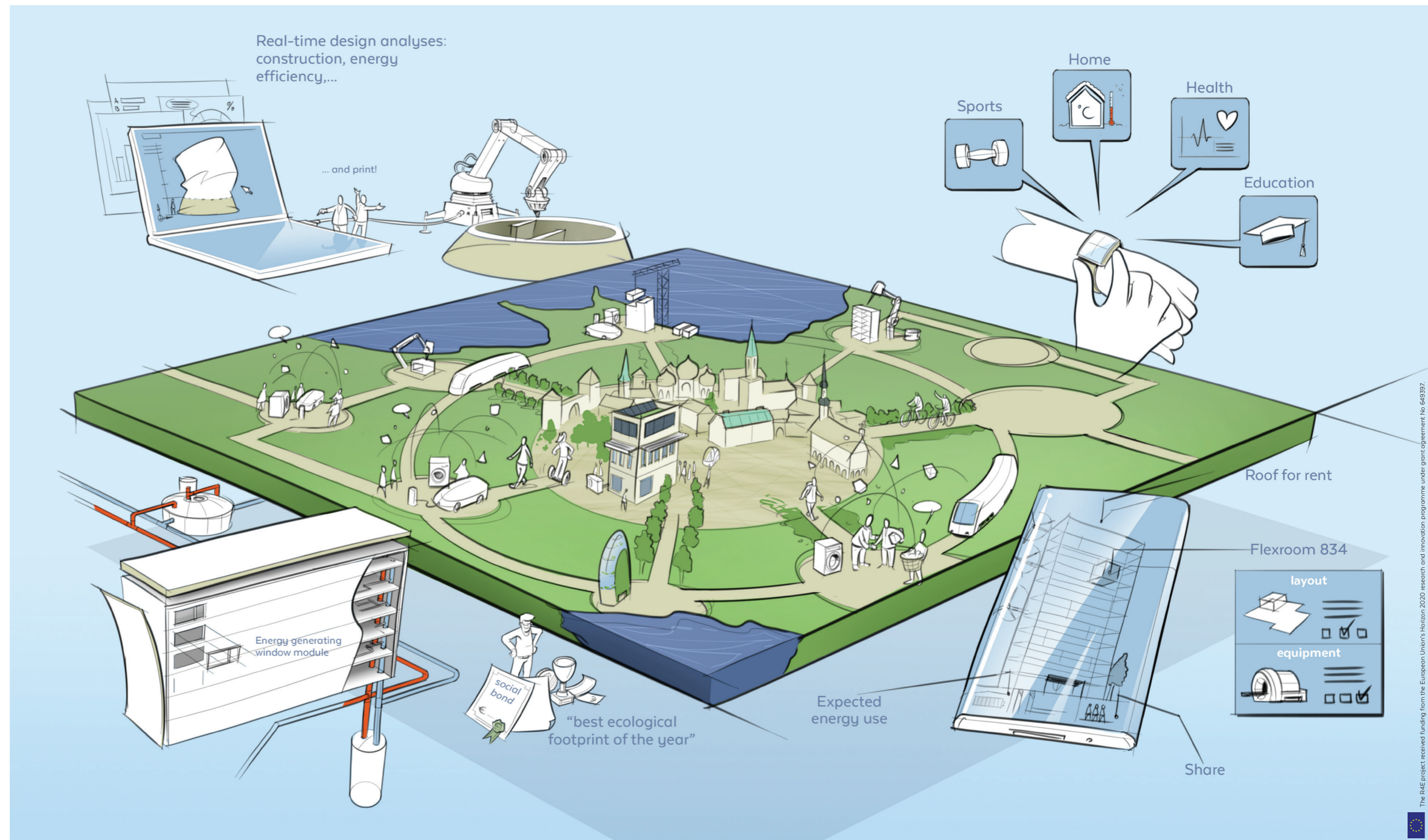
In 2050, a smart grid connects all buildings and public services. The system is accessible by all users and providers of energy, water and other resources (waste disposal). It allows users to choose from a range of available options. It brings together supply and demand, anticipating weather and other conditions and use patterns. The system enables self-sufficiency at city level. It uses open data, although citizens are in charge of their own data and of the system.

## SMART BUILDINGS AND SMART PEOPLE IN ENERGY-NEUTRAL TALLINN 2050

In 2050, people in Tallinn value sustainable behaviour and renewable energy. They take individual responsibility for energy saving, and the remaining energy demand is affordable for all. Renewable energy sources such as heat pumps, biofuels and energy from the sea enable a CO<sub>2</sub>-neutral city.

All existing buildings have had a far-reaching renovation and modernisation, with respect for their historical heritage. All the energy systems are automated and connected. Smart materials and equipments contribute to an energy-neutral city.

Integrated and flexible city planning values an energy-efficient smart city. Planners have the knowledge and awareness to work at an integrated system level. Their work takes into account all relevant issues, and provides the flexibility to adapt to changing situations. These policies are implemented through specific, integrated district plans.



Elements of the desired future scenario are:

### Distributed services

Services in Tallinn are distributed in decentral hubs around the city, with logical clusters of services according to the needs of the people in the area. The hubs are connected by free (self-driving) public transport and light traffic highways for safe and comfortable commuting by (e-)bike. Households enjoy sharing facilities for sauna, laundry and mobility. The newest technologies for generating electricity and charging devices are widely available.

### Prefab building modules

Buildings are constructed and renovated with prefab building blocks using state-of-the-art, sustainable and energy-efficient materials. Smart technical systems are integrated in the modules, so technical rooms are small. The blocks allow flexible additions to buildings to add extra space or change functionalities (e.g. accommodating changes in schools). New technologies such as 3D printing allow high flexibility and custom design for architectural freedom.

### Smart public services

Public services (home care, medical care, sports training, education etc.) are remotely accessible. Smart solutions enable service delivery at home (e.g. measuring blood pressure). An integrated system (like a web portal) offers access to services from all companies, and makes it easy to search for and find the right ones. The use of artificial intelligence allows tuning to individual needs, and providing useful services and incentives (e.g. comparing ecological footprints).

### Flexible use of public buildings

Public buildings (schools, churches, theatres) in Tallinn are used intensively. People can book rooms, buildings and equipment for different purposes through an online portal, e.g. using schools in the evening for computer training for adults, yoga classes in a gym or office rooms for short-term rental by start-ups. The buildings are showcases of energy efficiency and provide energy for the community (e.g. as carriers of PV panels for shared use) and energy education.

### Sophisticated renovation

All buildings are deeply renovated with the newest technologies for energy efficiency, and are connected to CO<sub>2</sub>-neutral district solutions for heating and electricity generation. Flexible funding schemes and incentives (e.g. tax breaks or prizes) drive people to achieve the highest saving with the best indoor climate through renovation and behavioural change. Local government demonstrates and encourages good practice, and provides temporary housing during renovation.





# Common needs in the desired future scenarios for Smart Buildings

During the Joint Vision Workshop on 24 and 25 May 2016 in Istanbul the cities presented their desired future scenarios for Smart Buildings to each other and held in-depth discussions to understand each other's needs and contexts.

## Common needs

One of the objectives of the discussions was to identify the aspects of the future scenarios that are common for all cities, and those that are specific for one or more cities only. For this purpose a clustering was prepared of the needs expressed in the desired future scenarios, including relevant input from the scenarios for Smart Mobility and Smart Urban Spaces. The city representatives explored the descriptions to gain insight into the scope of the needs and differences in understanding of the relevant themes. First they decided on a maximum of eight main clusters to reflect the priorities of their needs. Then they created a short description in the form of bullet points to describe the full scope of needs cluster, taking into account the different needs of the partner cities. They also defined a short title reflecting the focus of the common need. Finally, they selected (part of) a visual that provided the best illustration of the need.

The result of this discussion is a list of seven common needs for Smart Buildings that will be used as input for the description of a joint desired scenario for the roadmapping step of the R4E project (WP3).

## Common needs Smart Buildings

- Energy-efficiency and sustainability
- Renovation to secure cultural heritage
- Versatile, flexible and proactive
- Future smart grid
- Community sharing
- High quality, easily accessible systems
- Sustainable behaviour

The results of the Joint Vision Workshop are presented on the following pages. For each common need the corresponding cluster of needs from the desired future scenarios is given, as well as the short description and selected visual that will be used in the Generic Roadmap Smart Buildings.

## Overlap with Smart Urban Spaces

A number of needs in the Smart Buildings focus area overlap with other needs covered by Smart Urban Spaces. These needs will be addressed in the Generic Roadmap Smart Urban Spaces:

- they interact with the urban space, and have real-time information inviting them to engage in social activities (F)
- the economy is flourishing with new businesses that create community value: entrepreneurs develop new sharing services for citizens, thereby reducing the use of land and environmental resources (F)
- offices and campuses are small villages in themselves, providing local facilities and services: they open up to citizens and connect to the community; the controlled environment of campuses and the predictable patterns of use, make them ideal incubators to test new solutions for energy exchange, self-driving mobility and other shared services (S)
- circular systems are implemented to enable sustainable behaviour and businesses (P)
- circular systems are used, for example for food: from urban farming, markets, joint cooking and enjoying local food, as well as organic waste recycling (P)

## Energy-efficiency and sustainability

### Energy saving, generation and storage solutions for new & existing buildings

- boldly implement modern energy-efficient building technologies, both in top-quality new buildings and in the less valuable elements of existing buildings (F)
- the latest technologies are used in the buildings for easy energy saving, generation and storage: examples are the use of energy-absorbing materials, and light tubes to bring daylight into the heart of the building (M)
- wireless networks are used to charge energy-efficient appliances (M)
- retrofit solutions as well as new innovative buildings ensure that all buildings are sustainable (N)
- Innovation and new technologies are embraced to become energy-neutral (P)
- new technologies as a means to become an energy-efficient city: especially in the outlying areas, new technologies are used for energy generation, storage and charging of 'sweet mobility' solutions (P)
- the latest technologies are also applied in the materials used in buildings: for example with materials that can clean the air, and take advantage of the kinetic energy of cars, bikes and pedestrians, transforming this energy into other forms that are useful for citizens (S)
- the newest technologies for generating electricity and charging devices are widely available (T)
- all buildings are deeply renovated with the newest technologies for energy efficiency (T)

### Zero-emission and self-sufficient buildings

- new technologies are used to achieve zero-emission, self-sufficient buildings (F)
- CO2-neutral energy-producing buildings (M)
- all homes and non-domestic buildings are connected to an effective energy system, to achieve net-zero energy consumption and net-zero emission (N)
- a net-zero emission city (N)
- renewable resources are valued (S)

### Focus on people and comfort

- superb buildings maximise comfort for the users and facilitate building management because they use the latest technology for building automation, air quality control, renewable materials and efficient installations (F)
- energy-efficient buildings with a high level of comfort (N)
- homes and non-domestic buildings provide high levels of comfort with sustainable energy solutions; they support their users with personalised advice to save energy in line with their lifestyles (N)
- buildings and spaces that are comfortable for people (P)
- using the latest energy-saving technologies and energy-efficient system designs: these concepts add up to significant energy savings, but people don't have to make any compromises on the comfort of their (living) environment (S)

### Renewable energy and low impact on nature during construction and in everyday use

- the buildings use renewable energy sources and have a low impact on nature, both during construction and in everyday use (M)
- smart, ecological buildings (P)
- the business of natural materials: from green roofs, natural materials for isolation, local entrepreneurship in printing isolation materials from waste of local food production (P)
- nature and natural resources are used, like plants and green, to reduce the impact of the building (S)
- renewable energy sources such as heat pumps, biofuels and energy from the sea enable a CO2-neutral city (T)
- smart materials and equipments contribute to energy-neutral city (T)

### Progressive standards and continuous innovation

- through regional cooperation, one set of principles provides developers with progressive standards to achieve sustainable projects (N)
- new technologies such as 3D printing allow high flexibility and custom design for architectural freedom (T)

#### Relevant input from scenarios of the other focus areas:

- new buildings offer modern city facilities: they produce and store (renewable) energy (F)
- emission-free and ecological buildings with green roofs and waste recycling (I)

## Energy-efficiency and sustainability

- Zero-emission and self-sufficient buildings through energy-saving, generation and storage solutions
- Buildings focus on peoples needs and comfort
- Low-environmental-impact buildings
- Continuous improvement strategies for buildings

## Renovation to secure cultural heritage

### Historical heritage

- people value their historical heritage: historical buildings are renovated with respect for their heritage, and have new uses that serve the community (F)
- each building has a different social and cultural background that is revived while it is transformed it to the needs of 2050: both the building itself and its historical value are preserved, although with an up-to-date meaning of its function; for example, the church may become a museum or a theatre, thereby maintaining the function of connecting citizens (F)
- cherish historical city centre and cultural heritage: these are enriched by new technologies and innovation to create comfortable, energy-efficient housing and neighbourhoods (P)
- all existing buildings have had a far-reaching renovation and modernisation, with respect for their historical heritage (T)

### Non-invasive systems for renovation of historical buildings

- less invasive systems (e.g. pipeless, very thin or upgradeable modular solutions) are used for historical buildings to preserve valuable elements such as frescos (F)
- innovative solutions are used to maintain historical buildings and to make them energy efficient (P)

### Climate proof solutions

- all buildings are designed or renovated for safety and resilience to both normal climatic conditions and exceptional natural events (F)
- buildings are climate-proof, so they can absorb heavy rain showers; and they are resistant to earth-quakes through the use of innovative solutions like flexible materials and active bumpers (M)

#### Relevant input from scenarios of the other focus areas:

- the spatial planning of the city and the region cherishes history and at the same time facilitates new dynamics (E)
- the urban fabric features taller and more efficient buildings, while preserving and enhancing unique historical assets (F)
- new buildings provide vertical vegetable gardens, and green surfaces that reduce heat stress and recover rainwater (F)



## Renovation to secure cultural heritage

- Deep energy renovation of historical building
- Non-invasive technologies
- Smart grid integration



## Versatile, flexible and proactive

### Versatile buildings and spaces

- buildings and spaces are versatile, so they can be used by the community for different purposes on a 24/7 basis: for example the building adapts to a new concept of open schooling for children; spaces are also better integrated to facilitate lifelong learning for people of all ages, with different programmes at different times of the day and the year (F)
- the design of the buildings enables extra functionality and versatility for different purposes, users and contexts (F)
- the buildings facilitate highly flexible use, for different users, different activities and in different seasons: walls, installations and furniture can be rearranged easily — for example using flexible partitioners, changeable windows or ‘floating’ desks (M)
- smart building controls enable internal restructuring: flexibility de-risks the business case for investors to make the building structures future-proof (N)
- a long-term perspective allows business models and decision making to consider state-of-the-art solutions and to avoid the need for renovation (N)
- smart (wireless) systems enable flexible use of buildings with variable occupancy patterns and users’ needs (N)
- (re-)location of public service buildings and re-purposing of old buildings supports sustainable living (P)
- flexible use of public buildings: public buildings (schools, churches, theatres) are used intensively; people can book rooms, buildings and equipment for different purposes through an online portal, e.g. using schools in the evening for computer training for adults, yoga classes in a gym or office rooms for short-term rental by start-ups (T)

### Proactive adjustment to specific users and changing needs

- buildings that proactively adjust to their changing needs (M)
- standardised protocols enable roaming profiles for user settings in the virtual space: smart management systems support effective and efficient use of the workspaces (M)
- office buildings, shopping centres, community buildings and schools can meet varying demands for space by providing the required energy, lighting and heating according to specific user and activity profiles (N)
- citizens’ daily living patterns have changed significantly: buildings suit the activities of future citizens, with flexibility between working, living and leisure activities (N)
- future buildings offer a range of facilities and technologies to encourage social interaction (N)
- technological solutions are demand-driven and can be personally adjusted (P)
- public buildings make efficient use of space by adapting to the needs of the users - e.g. smart services to optimise behaviour (S)
- a smart grid anticipating weather and other conditions and use patterns (S)
- the use of artificial intelligence allows tuning to individual needs, and providing useful services (T)

## Future smart grid

### Top-level technical infrastructures

- the social environment is supported by the technological infrastructure: people — both citizens and entrepreneurs — value high-quality connectivity and technical infrastructure (F)
- the top-level infrastructure attracts companies (both established and start-up) to set up their activities and contribute to the local economy (F)

### Integrated, connected, wireless data and energy network

- the buildings are interconnected by a telemanagement system that enables sharing of energy and resources; this makes a big contribution to users’ comfort and convenience, both inside and outside the buildings (M)
- there is an integrated, connected, wireless data and energy network (P)
- connected and accessible through a network of infrastructure for energy systems and open data: an energy network connecting the whole city based on renewable energy sources ensures energy-neutrality at city level (P)
- energy production (PV, buildings), storage (cars and batteries) and usage (where needed) are balanced through the network (P)

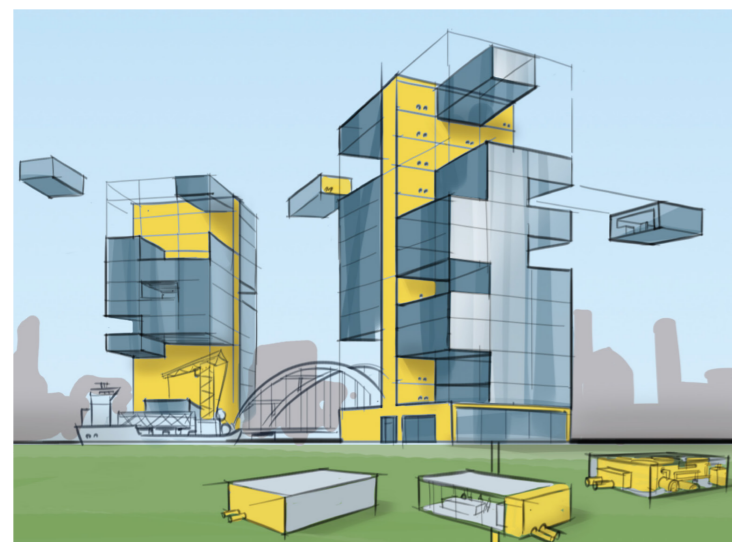
### Enabling new (remote) services

- homes cater for teleworking and remote healthcare through good connectivity and smart appliances; use of the latest technologies facilitates a whole range of other activities — for example using augmented reality for easy enjoyable shopping, navigation and other everyday tasks (M)
- houses are designed for people: connectivity with the energy and data net provides valuable services for comfortable living (e.g. tele-care) (N)
- smart homes provide a high level of comfort, with easy access to services like healthcare, so people can continue to live independently in their own homes (S)
- all systems use and provide open data, supporting start-ups in developing new business (S)

- public services (home care, medical care, sports training, education etc.) are remotely accessible: smart solutions enable service delivery at home (e.g. measuring blood pressure); an integrated system (like a web portal) offers access to services from all companies, and makes it easy to search for and find the right ones (T)

### Relevant input from scenarios of the other focus areas:

- high-quality services are available remotely: for example remote health monitoring and preventive health services (I)



## Versatile, flexible and proactive

- Versatile buildings and spaces
- Proactive adjustment to specific users and changing needs
- Buildings are prepared for future smart grid integration
- Designed for flexibility



## Future smart grid

- Intelligent master system managing building performances across the city
- Community-owned grid

## Community sharing

### District scale solutions

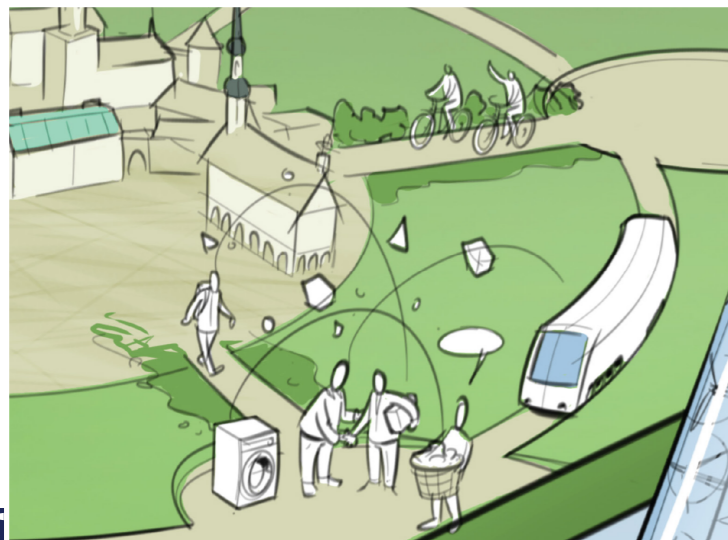
- IT systems monitor the use of spaces, and manage energy at a district scale (F)
- infrastructure interconnects local grids for different energy sources, such as electricity, temperature control (heating and cooling), water and data, and connect the local grids to regional and national levels (N)
- a self-sufficient smart energy grid connecting all the individual buildings and neighbourhoods (S)
- a smart grid brings together supply and demand, anticipating weather and other conditions and use patterns; the system enables self-sufficiency at city level (S)
- all buildings are connected to CO<sub>2</sub>-neutral district solutions for heating and electricity generation (T)

### Community sharing

- residents, businesses and public organisations share energy through a two-way interactive local grid, this increases resilience, benefiting from the strengths of the features and investments in other buildings: the benefits of energy investments and production are retained within the community (N)
- people living in estates jointly benefit from shared sustainable resources provided through local grid solutions: residents share energy solutions tailored to their homes (e.g. PV panels on south-facing roofs, or turbines in 'windy gardens', with basement for batteries) (N)
- saving through sharing: apartments provide both shared and private areas and services; next to gyms, gardens and swimming pools, sharing also extends to kitchen, dining areas, office spaces for teleworking, and many other facilities; green roofs provide shared gardens and urban farming spaces; basements offer common parking spaces for bikes and charging points for shared vehicles (S)
- owners of family houses are aware of the need for sustainable energy, water and waste services: they invest in systems and share them with their neighbours, so together they can afford a range of solutions for energy (generation and storage), water, food and waste; together, they form a self-sufficient community (S)

### District scale policy-making

- districts are designed and buildings are renovated to create more efficient spaces for sharing and growing food (F)
- a collective approach to decisions in the infrastructure that enables joint decision-making with stakeholders in the city; urban planning takes a broad wide-area view to take full advantages of the opportunities extending beyond site or estate boundaries and city limits (N)
- policy-making and planning are based on a city-wide plan; this fully integrates all assets and their interactions, so the total impact on the surrounding can be considered (N)
- democratic decision-making enables future retrofitting with participation by residents (N)
- an integrated planning and development process optimises the flow of benefits for different stakeholders (N)
- the value of 'community gain' is considered (not just financial gain) is considered through local integration (N)
- a collaborative approach together with all stakeholders drives alignment of information and leads to better decisions (N)
- integrated and flexible city planning values an energy-efficient smart city: planners have the knowledge and awareness to work at an integrated system level; their work takes into account all relevant issues, and provides the flexibility to adapt to changing situations; these policies are implemented through specific, integrated district plans (T)
- services in Tallinn are distributed in decentral hubs around the city, with logical clusters of services according to the needs of the people in the area. The hubs are connected by free (self-driving) public transport and light traffic highways for safe and comfortable commuting by (e-)bike. Households enjoy sharing facilities for sauna, laundry and mobility (T)



## Community sharing

- Smart grid integration at district level
- Saving through sharing
- Collective approach to infrastructure decision-making

## High quality, easy and accessible systems

### Roaming profiles for energy access and community sharing

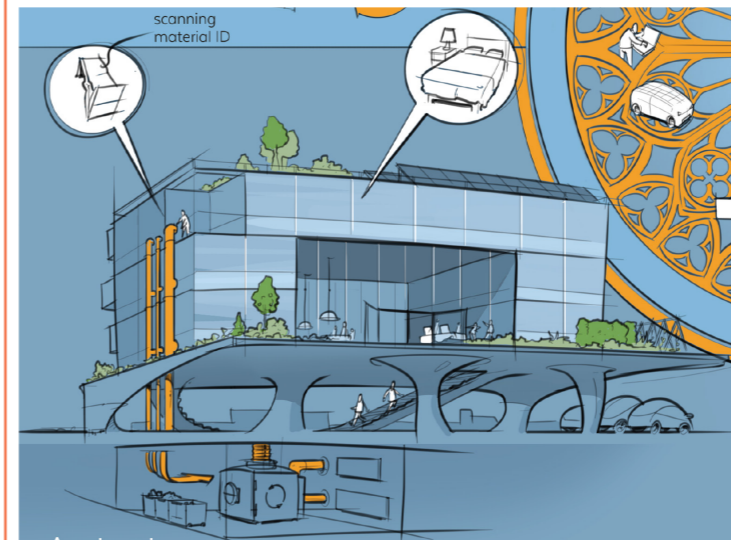
- individual energy schemes with personal roaming profiles allow the use of (wireless) energy and data where and when they are needed (N)
- Individual energy schemes with personal roaming profiles provide access to new services such as telecare or energy donations; the scheme enables localised trading, sharing and lending of resources through peer-to-peer networks (N)

### Monitoring and learning

- buildings are interconnected: not only do they learn during use, but they can also share their learnings: the use of all utilities (energy, water, waste and other resources) is monitored; patterns of use are recognised so upcoming activities can be anticipated, providing maximum comfort for users: this active data sharing allows the buildings to learn from each other, providing maximum user comfort at the lowest energy consumption (M)
- all buildings are connected to the grid, receiving and transmitting information to peers or to a wider network with respect for the privacy of the users (N)

### Easy accessible open platforms

- Master Intelligent System uses open data and standard protocols all over the city, providing new services on an open platform: people can easily access and connect to the platform, wherever they are (M)
- energy supply and demand are matched — and legally embedded — in the central system; the focus is on the users' needs, with priority for emergency services when necessary; energy can be exchanged freely between users, appliances, vehicles and buildings (M)
- local grids enable communities to invest in and share sustainable solutions with peers, and support optimal use of renewable energy and the specific features and qualities of separate buildings (N)
- simplicity and accessibility are the norm: people have freedom of choice, with full control of their homes and their lives (N)
- a smart (virtual) infrastructure allows matching of fluctuations in energy supply and demand of energy (N)



- the grid provides local interconnectivity promoting community-building and cultural change (N)
- open data is the norm, and enables new entrepreneurship based on services for people (P)
- all systems use and provide open data (S)
- a smart grid connects all buildings and public services: the system is accessible by all users and providers of energy, water and other resources (waste disposal); it allows users to choose from a range of available options (S)
- the system uses open data, although citizens are in charge of their own data and of the system (S)

### Enabling transition to sustainable energy

- the energy infrastructure enables gradual replacement of non-sustainable energy sources by renewable energy in buildings as well as regionally (e.g. wind parks and solar farms): optimisations are done at the appropriate levels, linking local, regional and national grids (N)

### Evidence-based, future-proof decision-making

- through the open data centre the City Council and its partners are able to implement evidence-based policies and decision-making (N)
- shared data and knowledge from all stakeholders feed into the city-wide plan and support future-proof decision-making (N)

### Automation for optimum energy consumption and maximum user comfort

- through profiles based on the expected use (presence and activities) and external factors (weather, season etc.), buildings actively choose the optimum energy settings to maximise comfort for users (M)
- buildings recognise people and can adapt to their personal preferences and habits by providing the desired atmosphere and climate settings (M)
- the smart house manages itself according to set parameters (N)
- the building minimises energy consumption by recognising recurring patterns of use (N)
- all the energy systems are automated and connected (T)

## High quality, easily accessible systems

- Roaming profiles for energy access and community sharing
- Monitoring and learning
- Easily accessible open platforms
- Enabling the transition to sustainable energy
- Evidence-based, future-proof decision-making



## Sustainable behaviour

### Responsible people with sustainable behaviour

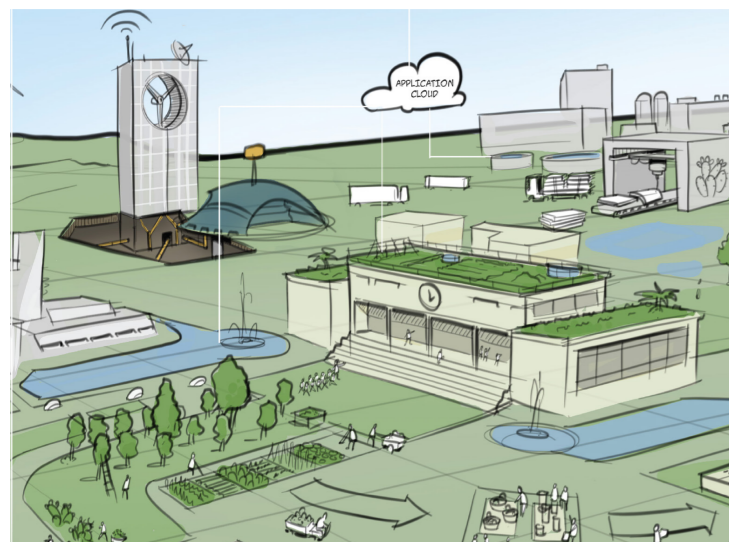
- smart people value energy-efficient buildings (F)
- citizens have a different mindset and reduce their footprint actively by choosing sustainable energy, locally produced food and shared services (F)
- residents are empowered and have the means and the wish to make responsible choices on their own energy usage and investments (N)
- people can make responsible choices, even from options they did not think of themselves (N)
- all the stakeholders in Sant Cugat value collaboration and shared responsibility to manage their energy pro-actively: both owners and occupiers of buildings value the opportunity to save energy and water (S)
- people value sustainable behaviour and renewable energy: they take individual responsibility for energy saving, and the remaining energy demand is affordable for all (T)

#### Incentives for sustainable behaviour

- personal energy schemes address different lifestyles and provides individual budgets and advice for behaviour based on planned and predicted usage (N)
- flexible funding schemes and incentives (e.g. tax breaks or prizes) drive people to achieve the highest saving with the best indoor climate through renovation and behavioural change (T)
- the use of artificial intelligence allows tuning to individual needs, and providing incentives (e.g. comparing ecological footprints) (T)

### (Public buildings as) leading examples

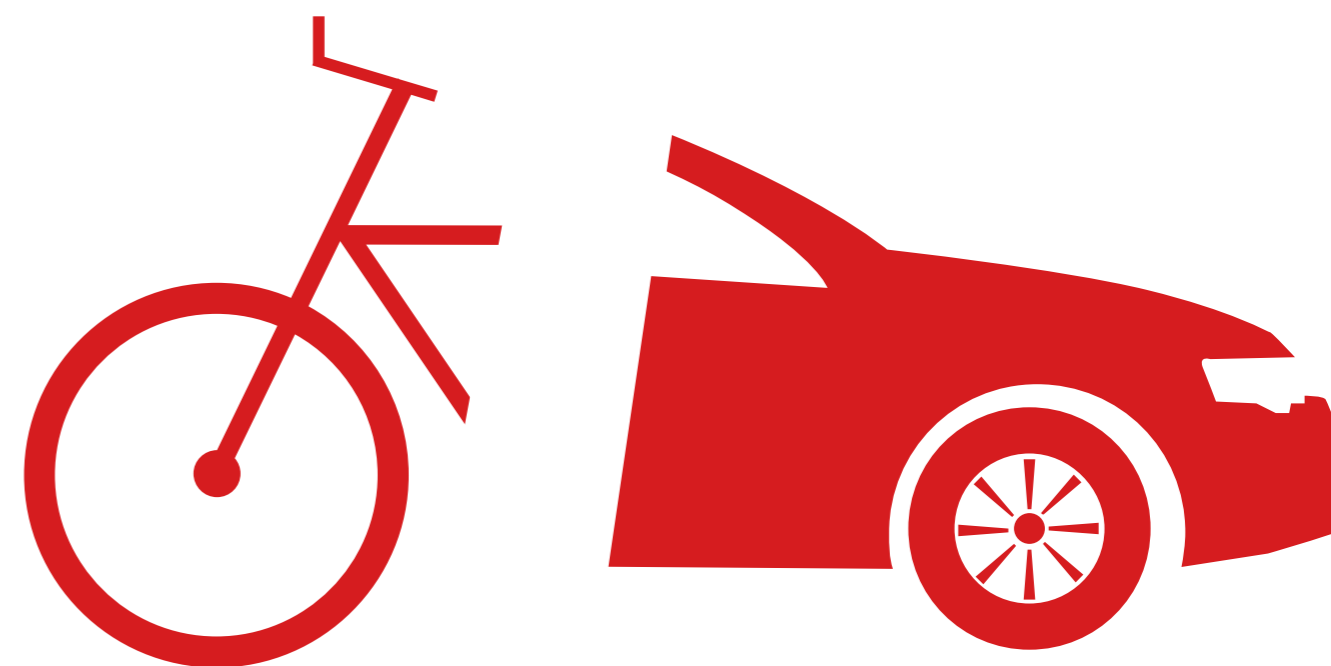
- schools and hospitals are leading examples of 'people smart' services that encourage learning and healing: good practices and leading examples are shared in the community and transformed into solutions for common use in other buildings (F)
- public buildings (e.g. schools and hospitals) demonstrate the basic principles of sustainable construction and provide open platforms for citizens to engage in discussions about sustainable living (F)
- starting as young children, people are aware of the basic principles of sustainable living that has spread across the whole city (F)
- children learn about environmental systems, which inspires conscious and sustainable lifestyles as adults (F)
- buildings are exemplary in their use of innovative and sustainable technologies: high visibility of the solutions supports their adoption as well as a thriving building sector that 'exports' design and consulting services; in this way the standard of the buildings is raised, adding value to existing business models in the local community (N)
- school buildings serve as demonstrators of new solutions and behavioural change (P)
- public buildings are like a service rather than just a space (S)
- public buildings are showcases for the highest possible energy efficiency and teach and empower citizens towards sustainable behaviour (S)
- public buildings are showcases of energy efficiency and provide energy for the community (e.g. as carriers of PV panels for shared use) and energy education (T)
- local government demonstrates and encourages good practice, and provides temporary housing during renovation (T)



## Sustainable behaviour

- Collaboration and shared responsibility of citizens
- Incentives for sustainable behaviour
- Technology leading to sustainable behaviour



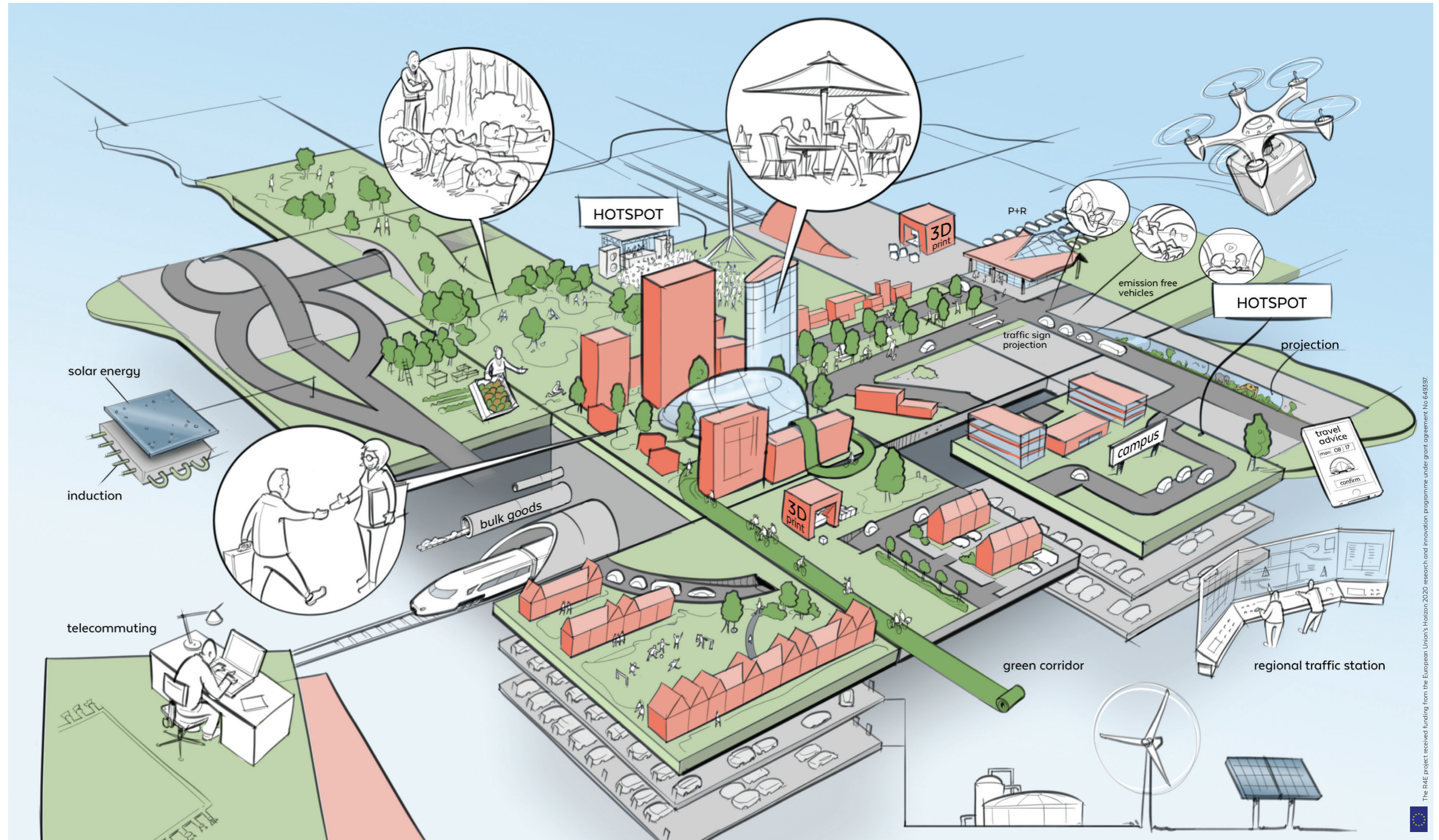


# DESIRED FUTURE SCENARIOS FOR SMART MOBILITY



## SMART, SUSTAINABLE MOBILITY IN EINDHOVEN 2050

In 2050, people in the Eindhoven region enjoy a clean and safe city with energy-neutral mobility solutions. Their personal mobility needs are met by seamless services provided as and when they are needed, at that specific moment and in line with their personal lifestyles. A wide range of sustainable options 'nudge' them towards more sustainable lifestyles, but always with full freedom of choices. The spatial planning of the city and the region cherishes history and at the same time facilitates new dynamics. Solutions are chosen because of their flexibility to adapt to changing conditions and users' needs. The region offers an attractive climate for business. It functions as a 'living lab' in which innovative solutions are developed and proven in practice. People can experience these innovations in their own living environment, and can adopt them if and when they wish to do so. The region is an economic hotspot for smart and sustainable mobility.



The R4E project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 648937.



Elements of the desired future scenario are:

### Attractive and clean city

The city of Eindhoven and its surroundings are clean and attractive. Widespread greenery in public spaces creates a healthy living environment and encourages people to choose healthy transport options such as walking and biking. Extensive and attractive walking and cycling routes throughout the region connect areas for living, working and leisure. Quality of the living environment is high, with air quality, low emissions and road safety are better than average.

### Sustainable transportation

Mobility in the region is energy-neutral, using of entirely renewable resources and sustainable materials. The city centre is free of private cars. The region is well connected with sustainable mobility solutions that enable convenient access to all destinations in different ways. Smart traffic management provides efficient guidance based on real-time analysis and predictions of traffic flows, demand and transport availability.

### A range of options

People can choose from a range of mobility options. Individual choices are facilitated by (f)actual information and seamless mobility products and services that meet their personal needs at that moment. People experience autonomy and freedom in their choices, although they understand that service availability and prices can be influenced by scarcity of resources at specific times. Smart apps help them to choose the best solution at that moment.

### Local facilities

Facilities for people's daily living are within walking/cycling distance in all neighbourhoods. Shops and other facilities provide social meeting opportunities for citizens in their direct living environment. Local produce (food, but also innovative solutions like 3D printing) is available in the local convenience stores. Green squares, school yards, recreational grounds and public spaces facilitate healthy lifestyles and social activities.

### Diversity in experience

People enjoy a variety of environments in the region. They can choose from different areas in the city or surrounding villages that provide different experiences, and offer a range of options for different needs and lifestyles. People are free to explore new things and try them for themselves (for example faster or more attractive routes, or innovative sustainable vehicles). This makes it easier for them to choose and adopt sustainable solutions.

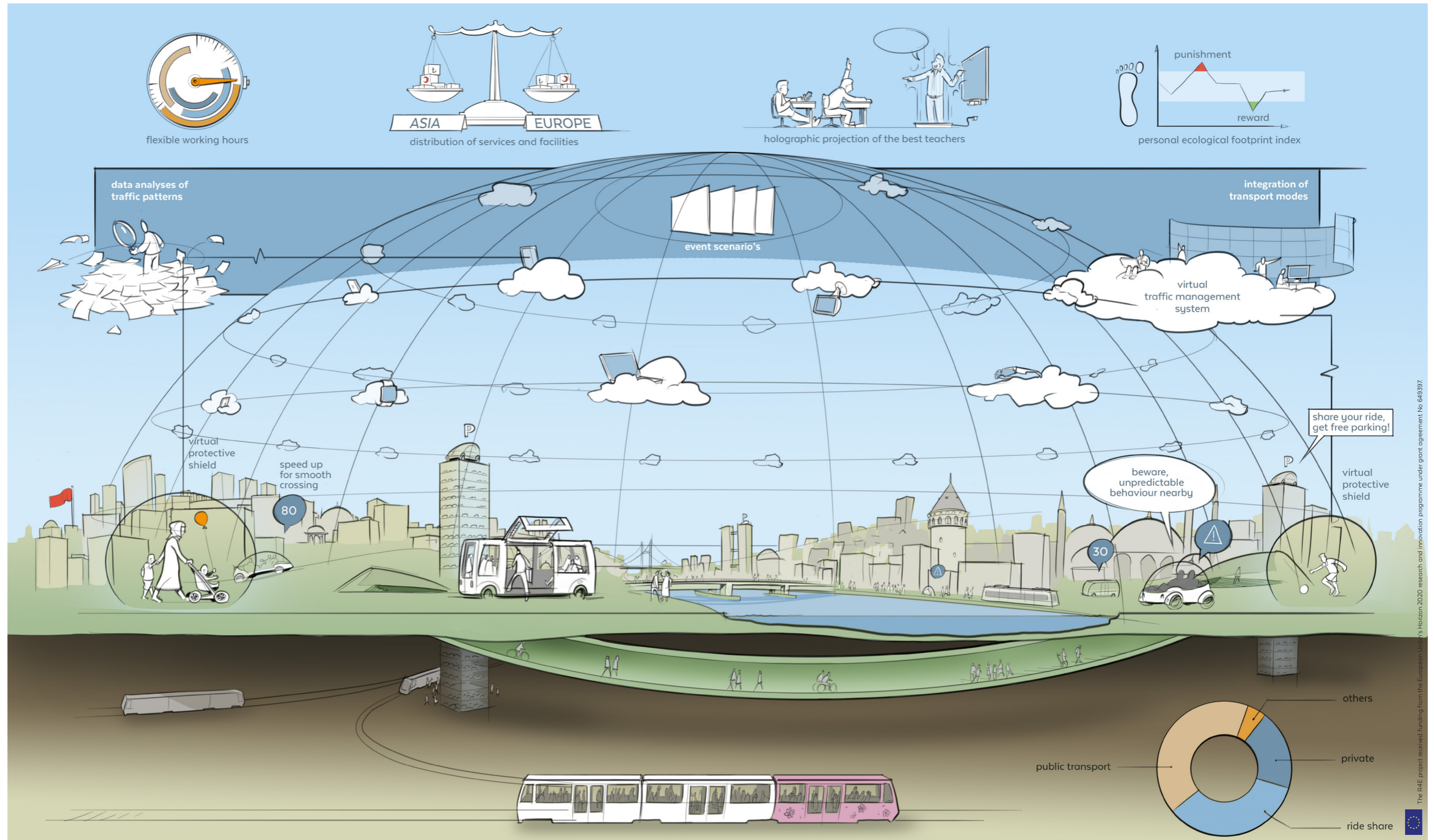


# PERSONALISED, SMOOTH, SAFE TRAFFIC IN ISTANBUL 2050

In 2050, individual travellers in Istanbul are valued and facilitated by personalised travel advise. Smart technologies and apps enable personalised route planning. Communication between vehicles, drivers and infrastructure allows smart signalling. Green behaviour is encouraged by a range of personalised, sustainable options.

People value fast, smoothly flowing traffic, free from congestion. Automated systems support smooth traffic flows through the city. Mass transport solutions are attractive thanks to flexible charging and working hours. Alternative routes and transport modes are conveniently available. People value better air quality and choose healthier options such as walking and cycling.

Traffic is safe. Smart safety measures help to avoid accidents and traffic violations. Vehicles are equipped with smart solutions and options to communicate, both with other road users and with the infrastructure.



Elements of the desired future scenario are:

## Smart traffic management system

All traffic in Istanbul is managed through a single, safe, reliable and efficient system. The system connects all public and private vehicles, devices and road users and is accessible from anywhere. Data is collected to analyse the traffic movements and provide real-time (event-driven) smart traffic management.

## Compact smart e-vehicles:

People make use of personalised services based on compact smart vehicles. Vehicles are sustainable (using recycled materials and with zero-emissions) and are charged at widely available charging stations using renewable energy sources. The service allows easy reservation, flexible payment and pick-up/drop-off at any point. Personal profiles (e.g. including a network of friends) and connection to the smart system provide routes and options to share rides with friends.

## Strategic demand management

People travel less because high-quality services are available remotely. Remote health monitoring and preventive health services reduce the need to visit distant hospitals. High-quality training and education are available in all districts, for example through holograms of excellent teachers. Flexible school and working hours and relocation of offices spread the demand for travel. Ride-sharing and air-cargo drones reduce road traffic. Ride-sharing is safe and efficient thanks to easy reservation and accessibility (e.g. special, cheaper parking for shared cars).

## Sustainable, healthy behaviour

Citizens have adopted healthy lifestyles. Activity levels are measured by wearable devices, and more walking is rewarded by privileged services. The use of private cars has been reduced. The new generation of people care about sustainability and use the system to make optimal choices (balancing costs, emissions, time, social aspects etc.).

## SAFE, CLEAN AND AFFORDABLE MOBILITY IN MURCIA 2050

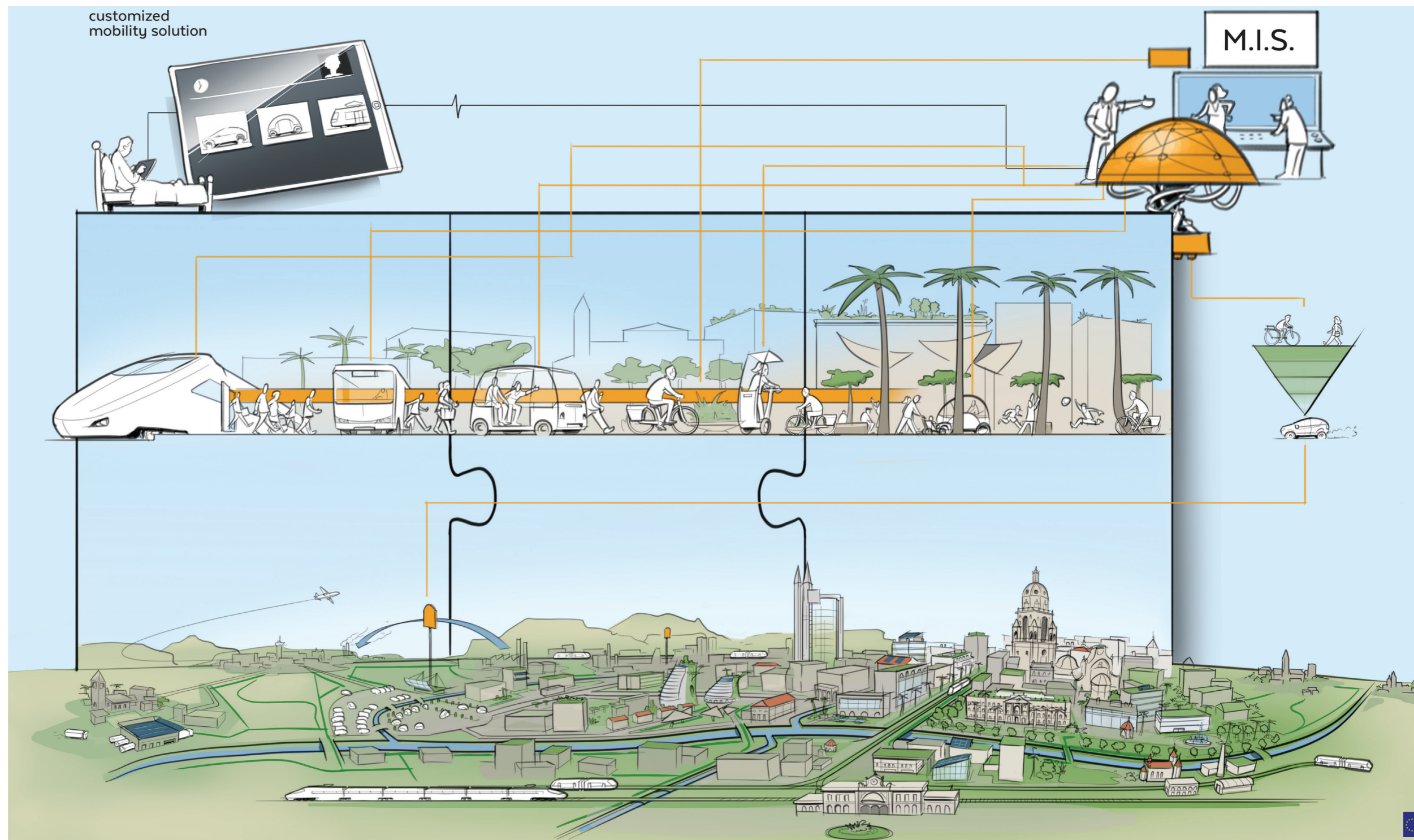
In 2050, people in the Murcia region enjoy a safe and clean city, with green and healthy areas and safe and clean mobility solutions.

Personal mobility needs are met and healthy mobility, such as walking and cycling, co-exists in harmony with other safe, clean forms of (shared) mobility.

The public transport system is clean and effective throughout the city region, with 'one-click' accessibility enabled by a master intelligent system.

The design of public space and services and the availability of a wide range of mobility options 'nudges' people towards more sustainable and healthy lifestyles. The flexibility of personal choices is met by a system of different, interconnecting mobility modes, reflecting the differences in needs and possible solutions throughout the city and region.

Urban spaces are designed with a focus on people. Those from the outlying areas and visitors are provided with clean, fast accessibility to the city centre. It is easy for people to move around near the centre with services to meet their daily needs. The down-town area is a safe and pleasant place for pedestrians.



Elements of the desired future scenario are:

### All people's avenue

The down-town area is a safe and pleasant place for pedestrians. Public spaces are designed for them and traffic is restricted to emergencies, residents and public services. Urban spaces such as an 'all people's avenue' are pleasant, comfortable, quiet, green, shady and accessible for all. These spaces are shared with bikes and one-person e-cars.

### Urban liveability

The 'urban zone' is a place where people can easily move around, with good access to the city as well as the outlying areas. Industrial estates and warehouses are moved from the urban areas to the outskirts, freeing space for sustainable transport, such as trams, electric buses, clean private cars and a public car-sharing system. De-centralised services are provided to meet daily needs, and there are green lanes for long-distance walking and cycling.

### Connecting people

The 'pedanías' zone provides accessibility for people from the outlying areas and visitors. (Mass) public transport is provided by train, tram and bus, and is clean, fast and accessible. Free parking for private (unsustainable) cars is available at inter-modal transport hubs. These make it easy for people and goods to switch between different mobility means, encouraging sustainable choices. Easy access to the countryside revalues country lifestyle and products.

### Smart citizens

Citizens naturally choose sustainable and healthy solutions. Mentality and behaviour embrace healthy living. People value a clean and safe city, and are willing to contribute to achieving this. Education from an early age and co-creative workshops with citizens and companies, increase awareness and involvement, and challenge people to participate actively in new 'mobility plans'.

### Master Intelligent System

An intelligent global system integrates mobility modes and allows users to enjoy 'mobility à la carte'. A 'one-click' system pro-actively adjusts to people's profiles and needs, based on up-to-date information and forecasts. The system is easily accessible with one profile for reservations, payments and information. Controlling incentives avoid misuse and keep the system free of undesired side-effects.



## CULTURAL AND SOCIAL HARBOUR PALERMO 2050

In 2050, the city of Palermo values smart, ecological buildings, spaces and mobility.

Palermo values being a social harbour, open and friendly to all, as well as a cultural harbour, enriching people's lives and helping to make good citizenship and sustainable behaviour second nature for everyone.

Innovation and new technologies are embraced to become energy-neutral. Circular systems are implemented to enable sustainable behaviour and businesses. There is an integrated, connected, wireless data and energy network and a green mobility network connects the city and its various centres.

The core of city life is the people of Palermo, with their social interactions and their enjoyment of the city's buildings, spaces and cultural features. Technological solutions are demand-driven and can be personally adjusted. Cultural exchanges enrich people's lives in the city.

Elements of the desired future scenario are:

### A social harbour

Palermo is an open and friendly city, welcoming to all, while retaining its unique characters. A city for the people, that is lighter, in the sense of fewer cars, less pollution and lower noise. With buildings and spaces that are comfortable for people and that exploit Palermo's beauty, with its attractive views and sound scape.

### A cultural harbour

Palermo cherishes its historical city centre and cultural heritage. These are enriched by new technologies and innovation to create comfortable, energy-efficient housing and neighbourhoods. Innovative solutions are used to maintain historical buildings and to make them energy efficient. (Re-)location of public service buildings and re-purposing of old buildings supports sustainable living.

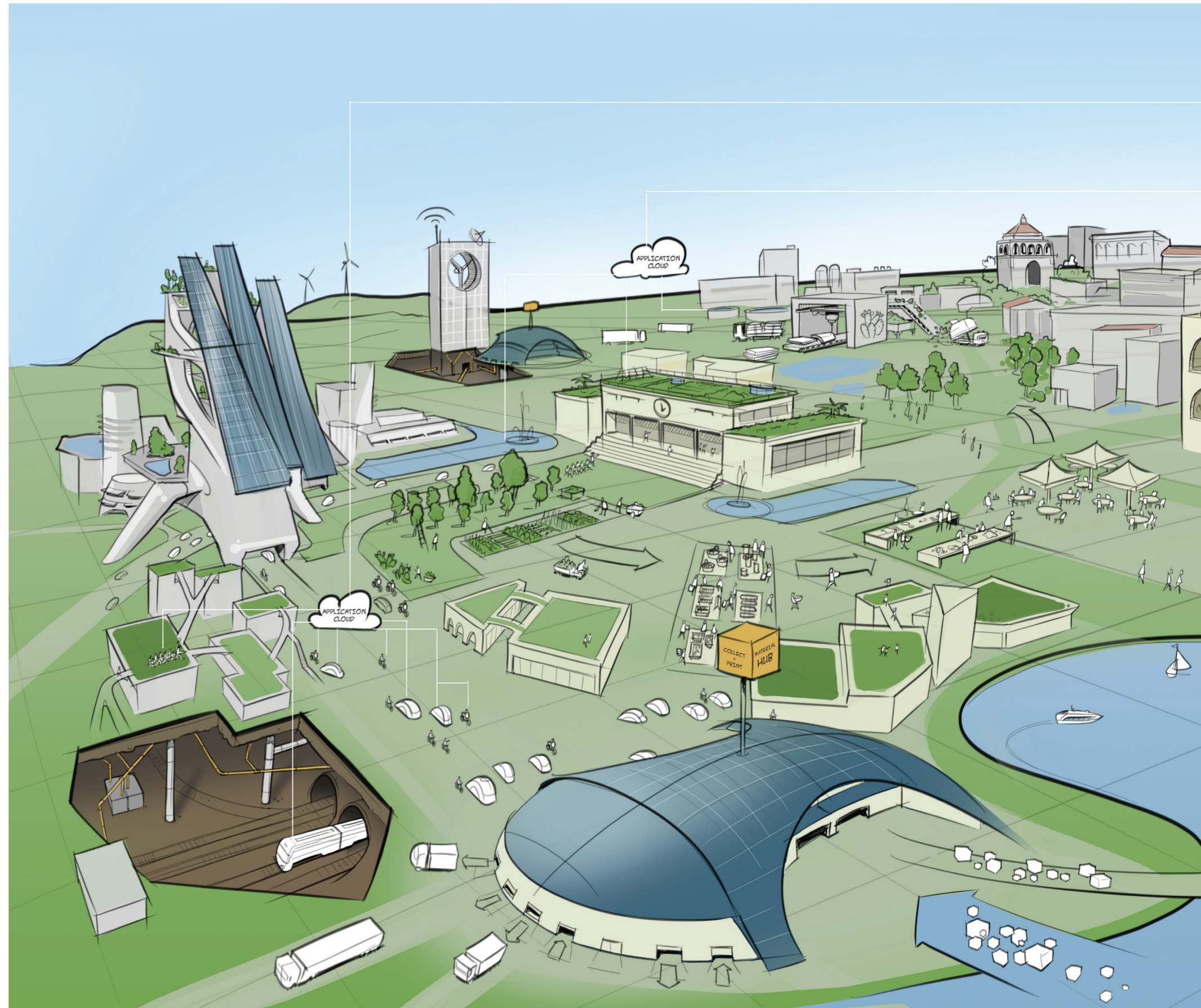
### Circularity

Palermo greatly values new technologies as a means to become an energy-efficient and circular city. Especially in the outlying areas, new technologies are used for energy generation, storage and charging of 'sweet mobility' solutions. Circular systems are used, for example for food: from urban farming, markets, joint cooking and enjoying local food, as well as organic waste recycling. Or for the business of natural materials: from green roofs, natural materials for isolation, local entrepreneurship in printing isolation materials from waste of local food production. School buildings serve as demonstrators of new solutions and behavioural change.

### An integrated, connected, wireless data and energy network

The city of Palermo is connected and accessible through a network of infrastructure for energy systems and open data. An energy network connecting the whole city based on renewable energy sources ensures energy-neutrality at city level. Energy production (PV, buildings), storage (cars and batteries) and usage (where needed) are balanced through the network.

Open data is the norm, and enables new entrepreneurship based on services for people. The connected data is valued by citizens because of the improved affordable and reliable information on mobility and public transport. Citizens support this principle of data sharing by providing access to their own data. The connected data is valued by information management experts for the interconnection of mobility modes and the integration with other functionalities, such as measuring air quality, pollution or congestion.

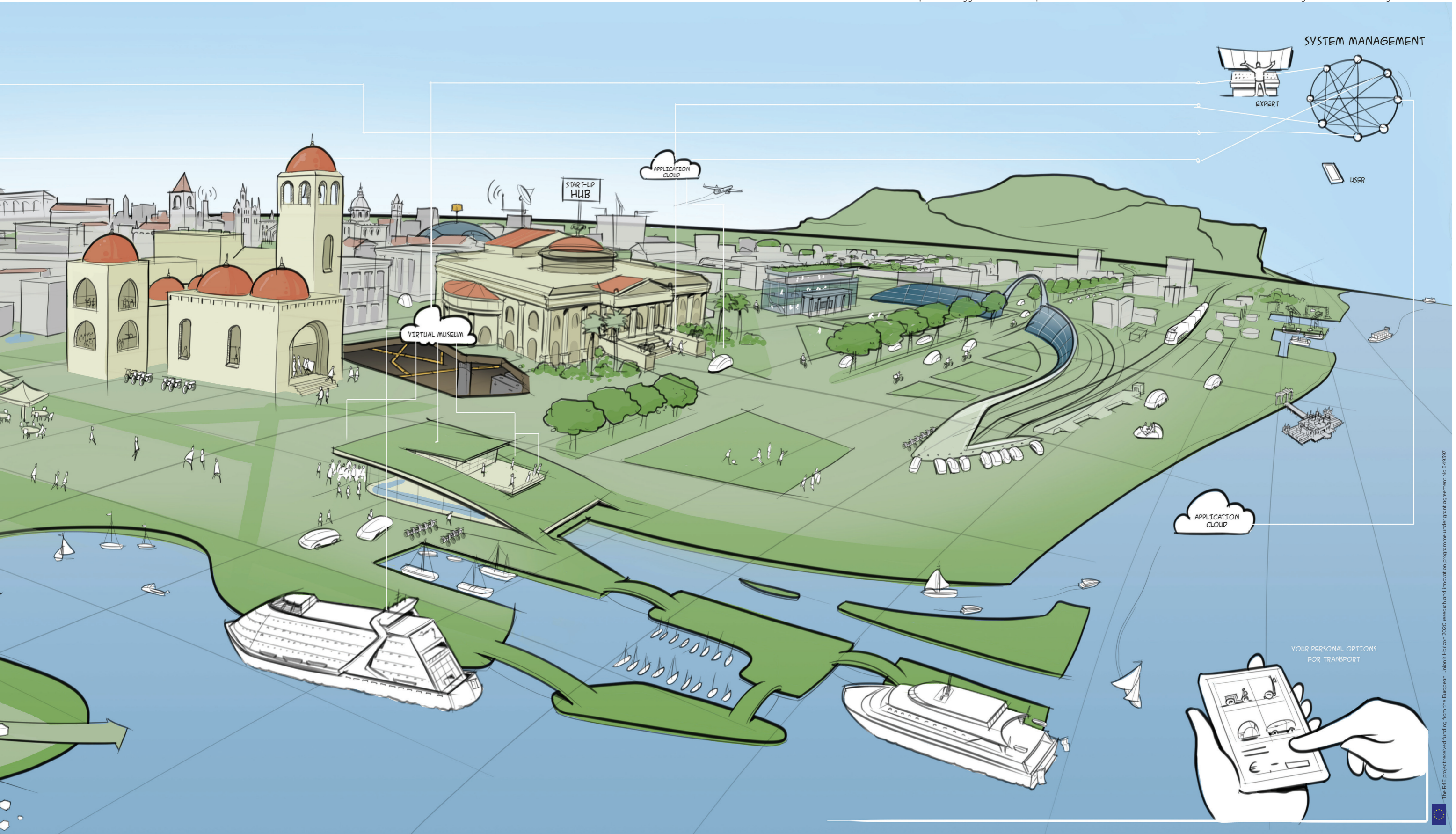


### City for the people of Palermo

The heart of the city of Palermo are its people, enjoying social interactions and the city's buildings and spaces. These spaces have been given back to the people, so they can enjoy them in comfort and safety. Children can play outdoors, and can walk to school. The urban space is used by citizens, developing cultural activities and by local entrepreneurs to create awareness and change. Tourists also value the city's cultural history, which they can experience both physically and virtually.

### A green mobility network

The city of Palermo has been (re-)designed with a green mobility network, connecting the city and its various centres, adding value to the poly-centric city and integrating the qualities of the different areas into a harmonious whole. The Golden Valley 2.0 connects green roofs and walking areas to make walking and biking into obvious choices for people. All areas are easily accessible and safe, with a closely-knit transport network throughout the city.



### 'Sweet and green' mobility

A range of mobility solutions provide a dense network of mobility modes. This demand-driven diversity includes walking, bike, scooter, and car sharing, as well as tram and metro connections to the outlying areas. Individual solutions are accessible and affordable for all, supported by local entrepreneurs, new business models and both public and private investments.

### Sea motorway and central distribution centre

Palermo is a capital city and an important sea port which serves as a logistics and transport hub, connecting the hinterland with other Italian cities. The sea will be further exploited as a mobility option to reduce traffic volumes on the roads, with a logistics platform based on new technologies. Good transport management also allows smaller-scale ecological solutions, such as smart individual delivery of (personal) goods in the city.

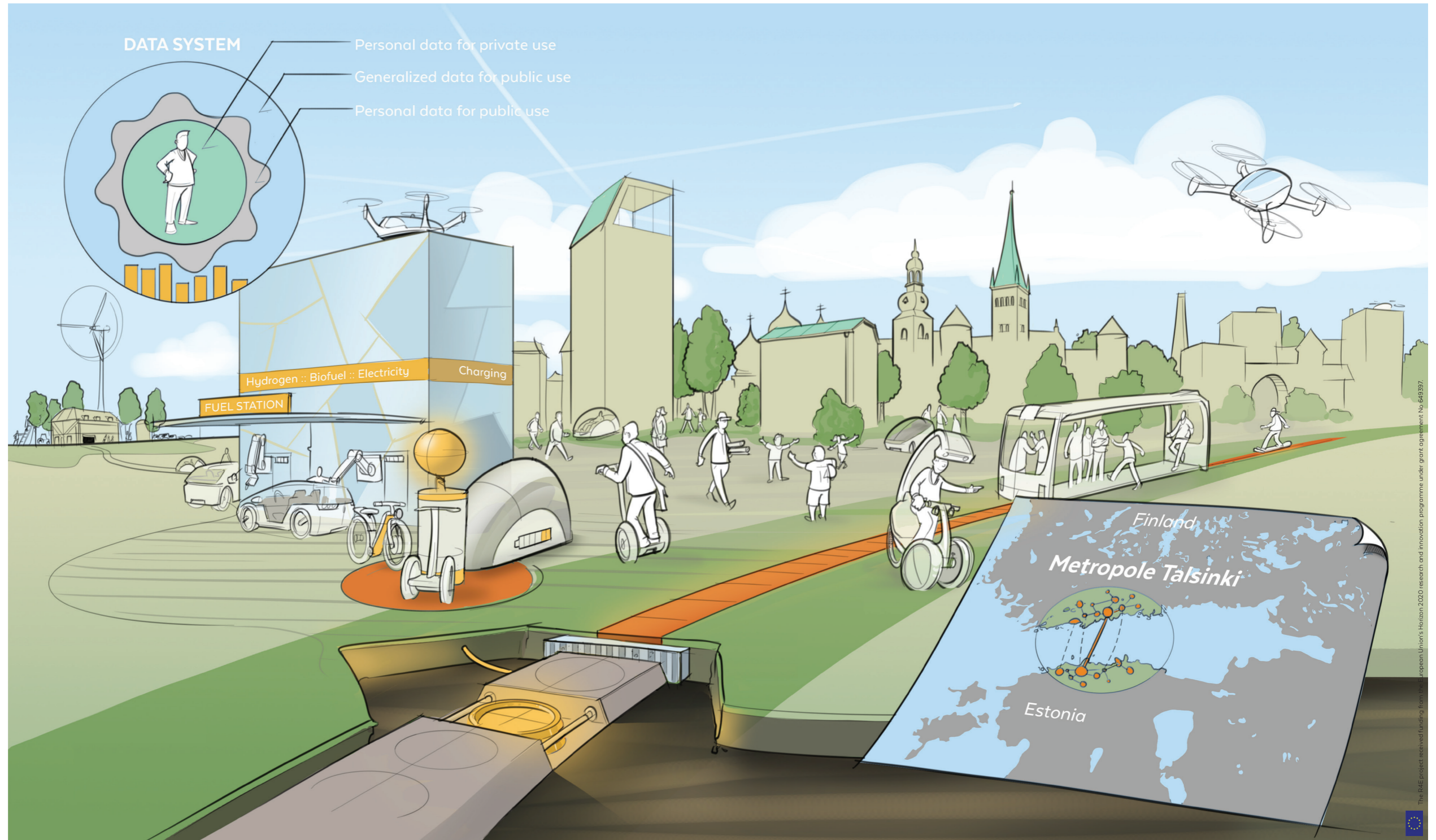
Version 15 June 2016

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

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.



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-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.

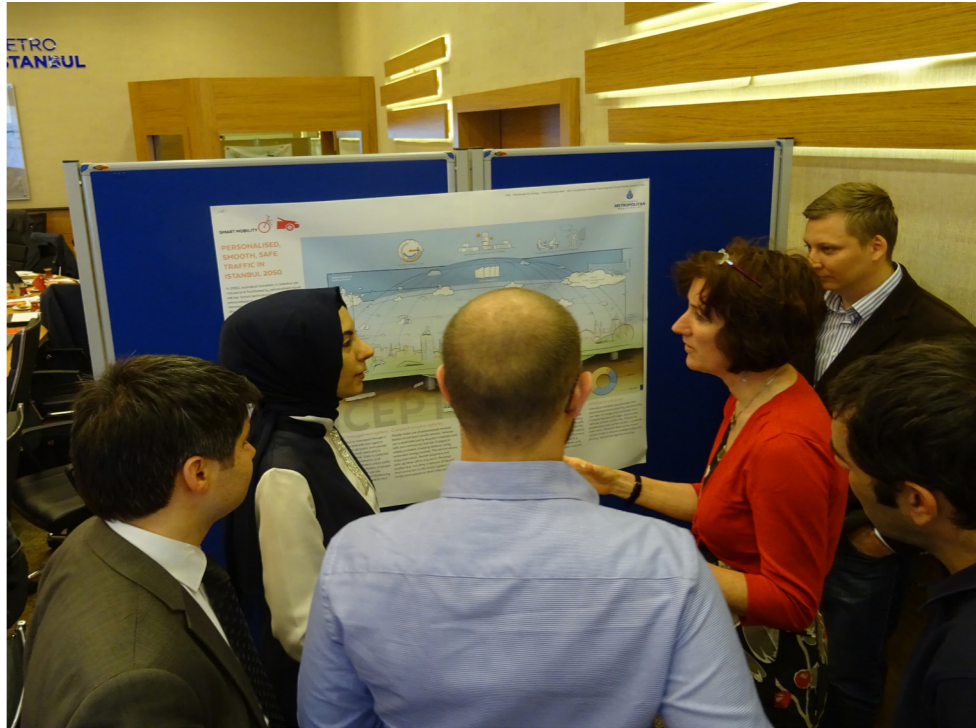
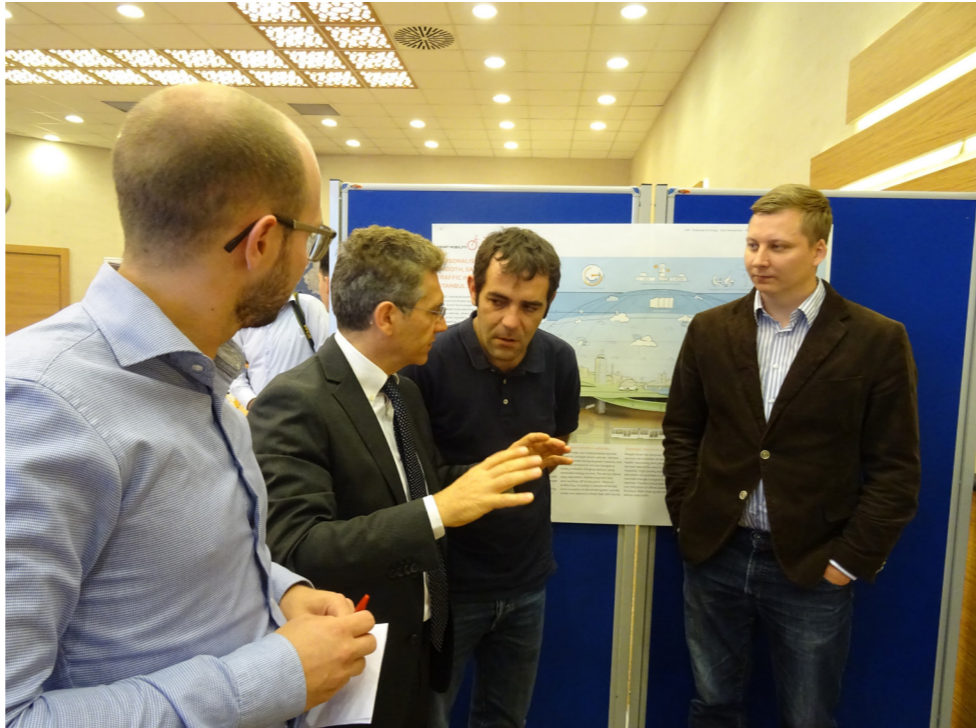
### Metropole Talsinki

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.







# Common needs in the desired future scenarios for Smart Mobility

During the Joint Vision Workshop on 24 and 25 May 2016 in Istanbul the cities presented their desired future scenarios for Smart Mobility to each other and had in-depth discussions to understand each others needs and context.

## Common needs

One of the objectives of the discussions was to identify the aspects of the future scenarios that are common for all cities, and those that are specific for one or more cities only. For this purpose a clustering was prepared of the needs expressed in the desired future scenarios, including relevant input from the scenarios for Smart Buildings and Smart Urban Spaces. The city representatives explored the descriptions to gain insight into the scope of the needs and differences in understanding of the relevant themes. First they decided on a maximum of eight main clusters to reflect the priorities of their needs. Then they created a short description in the form of bullet points to describe the full scope of needs cluster, taking into account the different needs of the partner cities. They also defined a short title reflecting the focus of the common need. Finally, they selected (part of) a visual that provided the best illustration of the need.

The result of this discussion is a list of eight common needs for Smart Mobility that will be used as input for the description of a joint desired scenario for the roadmapping step of the R4E project (WP4).

## Specific needs

A number of needs in the focus area Smart Mobility are only expressed by one city. These will not be addressed specifically in the Generic Roadmap Smart Mobility, but they will be covered in the specific city roadmap.

- the region functions as a 'living lab' in which innovative solutions are developed and proven in practice: people can experience these innovations in their own living environment, and can adopt them if and when they wish to do so (E)
- people are free to explore new things and try them for themselves (for example faster or more attractive routes, or innovative sustainable vehicles): this makes it easier for them to choose and adopt sustainable solutions (E)
- the region is an economic hotspot for smart and sustainable mobility (E)

## Overlap with Smart Urban Spaces

A number of needs in the Smart Mobility focus area are only expressed by one city. These will not be addressed specifically in the Generic Roadmap Smart Mobility, but they will be covered in the specific city roadmap:

- people enjoy a variety of environments in the region: they can choose from different areas in the city or surrounding villages that provide different experiences, and offer a range of options for different needs and lifestyles (E)
- the region offers an attractive climate for business (E)
- the city and its surroundings are clean and attractive (E)
- spatial planning of the city and the region cherishes history and at the same time facilitates new dynamics (E)
- education from an early age and co-creative workshops with citizens and companies, increase awareness and involvement, and challenge people to participate actively in new 'mobility plans' (M)
- cultural exchanges enrich people's lives in the city (P)
- planning and decision-making processes are based on open collaboration that includes different views and knowledge sources, the city 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 (T)

## Common needs Smart Mobility

- Sustainable solutions and / for lifestyles
- Healthy lifestyles
- Reducing the need for travel
- Seamlessly connected networks
- Mobility à la carte
- Accessible, affordable and convenient mobility
- Personalised advice
- Smart management

The results of the Joint Vision Workshop are presented on the following pages. For each common need the corresponding cluster of needs from the desired future scenarios is given, as well as the short description and selected visual that will be used in the Generic Roadmap Smart Mobility.

## Sustainable solutions and / for lifestyles

### Renewable energy and sustainable vehicles

- public transport systems use renewable energy resources
- vehicles are sustainable (using recycled materials and with zero-emissions) and are charged at widely available charging stations using renewable energy sources (I)
- 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 international connections, based on superfast and energy-efficient solutions (T)
- industrial estates and warehouses are moved from the urban areas to the outskirts, freeing space for sustainable transport, such as trams, electric buses, clean private cars and a public car-sharing system (M)
- citizens enjoy an attractive, clean and quiet living environment that encourages sustainable behaviour (T)
- the city of Palermo values smart, ecological mobility (P)
- circular systems are implemented to enable sustainable behaviour and businesses (P)
- new technologies are used for energy generation, storage and charging of 'sweet mobility' solutions (P)
- 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 (T)
- people make use of personalised services based on compact smart vehicles (I)

### Sustainable lifestyles

- a wide range of sustainable options 'nudge' them towards more sustainable lifestyles (E)
- travellers choose sustainable and healthy options (I)
- the design of public space and services and the availability of a wide range of mobility options 'nudges' people towards more sustainable and healthy lifestyles (M)
- a social harbour, open and friendly to all, as well as a cultural

- harbour, enriching people's lives and helping to make good citizenship and sustainable behaviour second nature for everyone (P)
- the new generation of people care about sustainability and use the system to make optimal choices (balancing costs, emissions, time, social aspects etc.) (I)

### Energy-neutral mobility solutions

- energy-neutral mobility solutions (E)
- mobility in the region is energy-neutral, using of entirely renewable resources and sustainable materials (E)
- energy efficiency and sustainability are monitored for continuous improvement (I)
- Innovation and new technologies are embraced to become energy-neutral (P)

### Reduced car use and car-free zones

- the city centre is free of private cars (E)
- the use of private cars has been reduced (I)

### Sharing

- ride-sharing and air-cargo drones reduce road traffic (I)

#### Relevant input from scenarios of the other focus areas:

- citizens have a different mindset and reduce their footprint actively by choosing sustainable energy, locally produced food and shared services (F)
- the latest technologies are also applied in the materials used in buildings and in the urban space: for example with materials that can clean the air, and take advantage of the kinetic energy of cars, bikes and pedestrians, transforming this energy into other forms that are useful for citizens (S)
- green roofs on buildings provide shared gardens and urban farming spaces: these are interconnected to provide green walking routes; basements offer common parking spaces for bikes and charging points for shared vehicles (S)

## Sustainable solutions and / for lifestyles

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

## Healthy lifestyles

### High quality living environment

- urban spaces are designed with a focus on people: urban spaces such as an 'all people's avenue' are pleasant, comfortable, quiet, green, shady and accessible for all: these spaces are shared with bikes and one-person e-cars (M)
- a clean and safe city (E)
- a clean, green and healthy environment is valued by the citizens (I)
- a clean and green city (I)
- a safe and clean city, with green and healthy areas and safe and clean mobility solutions (M)
- a city for the people, that is lighter, in the sense of fewer cars, less pollution and lower noise (P)
- citizens are energy-aware; a tree is planted for each child's birthday (I)
- quality of the living environment is high, with air quality, low emissions and road safety are better than average (E)
- more public space is allocated to living, and less to motorised transport (T)

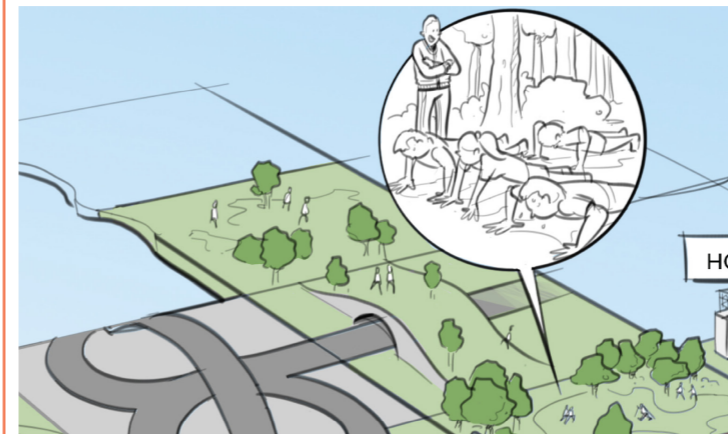
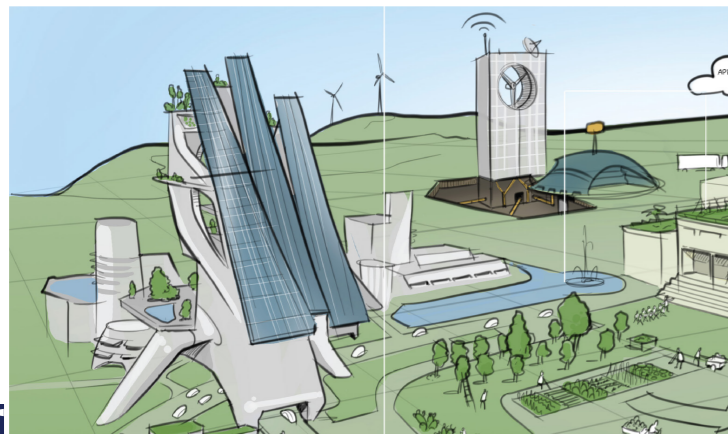
### Healthy lifestyles (walking, cycling)

- widespread greenery in public spaces creates a healthy living environment and encourages people to choose healthy transport options such as walking and biking (E)
- personal mobility needs are met and healthy mobility, such as walking and cycling, co-exists in harmony with other safe, clean forms of (shared) mobility (M)
- in green areas all over the city residents enjoy walking, cycling and (hobby and urban) gardening. Pedestrian tunnels and floating gardens connect the areas (I)
- citizens have adopted healthy lifestyles: activity levels are measured by wearable devices, and more walking is rewarded by privileged services (I)
- citizens naturally choose sustainable and healthy solutions: mentality and behaviour embrace healthy living. People value a clean and safe city, and are willing to contribute to achieving this (M)
- extensive and attractive walking and cycling routes throughout the region connect areas for living, working and leisure (E)

- green squares, school yards, recreational grounds and public spaces facilitate healthy lifestyles and social activities (E)
- people value better air quality and choose healthier options such as walking and cycling (I)
- green roofs and walking areas are connected to make walking and biking into obvious choices for people (P)

#### Relevant input from scenarios of the other focus areas:

- a high-quality living environment supports healthy lifestyles: an ecological system connects the green areas and enables multifunctional use of urban spaces; the result is an increase in social activities, and in walking and cycling (S)
- citizens enjoy 'slow mobility' (walking, cycling and automated vehicles), allowing more attractively designed streets (F)



## Healthy lifestyles

- Comfortable, accessible, high-quality living environment that encourages outdoor life
- 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 with local and/or remote services

- facilities for people's daily living are within walking/cycling distance in all neighbourhoods (E)
- it is easy for people to move around near the centre with services to meet their daily needs (M)
- people travel less because high-quality services are available remotely: remote health monitoring and preventive health services reduce the need to visit distant hospitals; high-quality training and education are available in all districts, for example through holograms of excellent teachers; flexible school and working hours and relocation of offices spread the demand for travel (I)
- de-centralised services are provided to meet daily needs, and there are green lanes for long-distance walking and cycling (M)
- the cityscape is dense, so all services are within easy reach or are provided in the home (T)
- shops and other facilities provide social meeting opportunities for citizens in their direct living environment (E)
- the city's streets and squares are designed around people (human scale): the urban environment is safe, attractive and suitable for a wide range of social interactions (T)
- the city has been (re-)designed with a green mobility network, connecting the city and its various centres, adding value to the poly-centric city and integrating the qualities of the different areas into a harmonious whole (P)
- good transport management also allows smaller-scale ecological solutions, such as smart individual delivery of (personal) goods in the city (P)

### Local produce

- local produce (food, but also innovative solutions like 3D printing) is available in the local convenience stores (E)
- easy access to the countryside revalues country lifestyle and products (M)



### Relevant input from scenarios of the other focus areas:

- offices and campuses are small villages in themselves, providing local facilities and services (S)
- services in Tallinn are distributed in decentral hubs around the city, with logical clusters of services according to the needs of the people in the area: the hubs are connected by free (self-driving) public transport and light traffic highways for safe and comfortable commuting by (e-)bike (T)
- public services (home care, medical care, sports training, education etc.) are remotely accessible: smart solutions enable service delivery at home (e.g. measuring blood pressure); an integrated system (like a web portal) offers access to services from all companies, and makes it easy to search for and find the right ones.; the use of artificial intelligence allows tuning to individual needs, and providing useful services and incentives (e.g. comparing ecological footprints) (T)

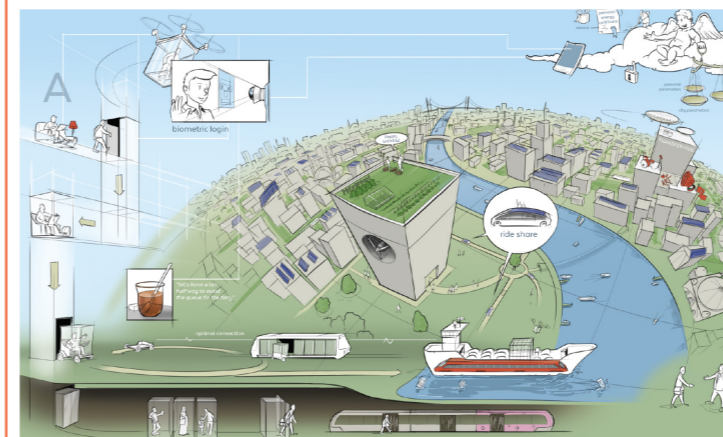
## Reducing the need for travel

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

## Seamless connections within networks

### Regional, seamless, closely-knit network

- the region is well connected with sustainable mobility solutions that enable convenient access to all destinations in different ways (E)
- people from the outlying areas and visitors are provided with clean, fast accessibility to the city centre (M)
- all modes of transport are seamlessly integrated, providing a closely-knit network that reaches every part of the city while respecting its historical heritage (I)
- the 'urban zone' is a place where people can easily move around, with good access to the city as well as the outlying areas (M)
- public transport provides a single route to people's destinations, without disruptions caused by changes between modes (I)
- smooth, seamless public transport connects all the city areas (T)
- an integrated transport system that provides door-to-door service: buses, trams, automated vehicles, taxis, shared cars and bikes are all integrated into one, easily accessible service (I)
- integration of smaller units (personal or larger) into larger ones (ferries or trains) avoids transfers (I)
- the public transport system is clean and effective throughout the city region, with 'one-click' accessibility enabled by a master intelligent system (M)
- all areas are easily accessible and safe, with a closely-knit transport network throughout the city (P)
- an integrated, connected, wireless data and energy network and a green mobility network connects the city and its various centres (P)
- the sea port serves as a logistics and transport hub, connecting the hinterland with other Italian cities: the sea will be further exploited as a mobility option to reduce traffic volumes on the roads, with a logistics platform based on new technologies (P)
- 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 to the Asia-Pacific region); Tallinn is a key hub between mainland Europe and Helsinki (T)



### Integrating new modes of transport & innovative vehicles

- new modes of transport and innovative vehicles are also integrated, like autonomous vehicles in the air and on water (I)
- the controlled environment of campuses and the predictable patterns of use, make them ideal incubators to test new solutions for energy exchange, self-driving mobility and other shared services (S)
- a 'hyperloop' provide fast, comfortable and reliable links for people and goods, and have a positive impact on the labour market and economics (T)

### Relevant input from scenarios of the other focus areas:

- a well-designed network of routes, exploring nature, culture, sports and local wine, food and handicrafts: the routes respond to the demand for a quality lifestyle supported by smart technologies; better and faster links allow full connectivity to seaside resorts and nearby cities; central role in services (e.g. hospital, airport) reaches its full potential with efficient and sustainable transport (F)

## Seamlessly connected networks

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

## A range of options

### Mobility options and alternatives suited to personal lifestyles

- personal mobility needs are met by seamless services provided as and when they are needed, at that specific moment and in line with their personal lifestyles (E)
- alternative routes and transport modes are conveniently available (I)
- the flexibility of personal choices is met by a system of different, interconnecting mobility modes, reflecting the differences in needs and possible solutions throughout the city and region (M)
- by balancing capacity in the system, important city parameters (energy, air quality, etc.) and personal health parameters, the 'guardian angels' provide travel options, optimised to meet personal needs and lifestyles: this supports sustainable behaviour (I)
- travellers appreciate the wide range of alternative routes and forms of transport (I)
- a range of mobility solutions provide a dense network of mobility modes; this demand-driven diversity includes walking, bike, scooter, and car sharing, as well as tram and metro connections to the outlying areas (P)

### Freedom of choice

- people can choose from a range of mobility options (E)
- people experience autonomy and freedom in their choices, although they understand that service availability and prices can be influenced by scarcity of resources at specific times (E)
- green behaviour is encouraged by a range of personalised, sustainable options (I)
- an intelligent global system integrates mobility modes and allows users to enjoy 'mobility à la carte' (M)

### Pleasurable travel experience

- 'public' transport provides a pleasurable and comfortable travel experience: the PRT (personal rapid transit) system allows people to travel in their own units, which are transformed into DRTs (demand response transit) with VIP services (I)
- transfer hubs are real experience centres, with shopping, cinemas, and theatres (I)
- mass transport solutions are attractive thanks to flexible charging and working hours (I)

## Accessible, affordable and convenient mobility

### Accessible and affordable for all

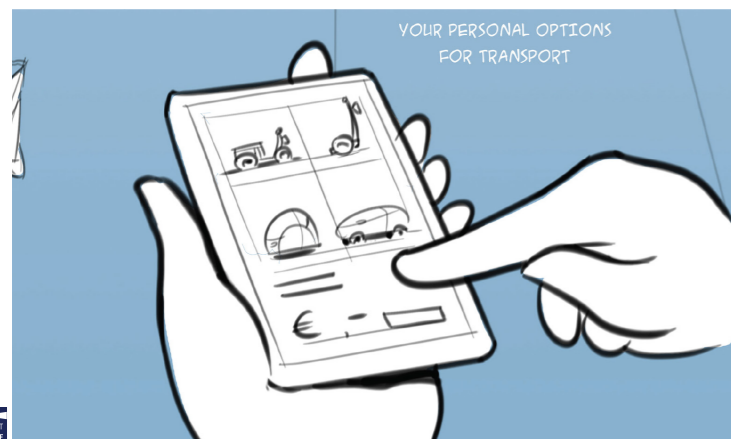
- public transport benefits everyone by providing good accessibility to all modes of transport (I)
- individual solutions are accessible and affordable for all, supported by local entrepreneurs, new business models and both public and private investments (P)
- safe, clean and affordable transport (M)
- people can easily transfer between all vehicles at hubs (I)
- accessibility for people from the outlying areas and visitors (M)
- 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 (T)
- the transport and ticketing systems around the Baltic Sea are integrated in a way that is simple, comfortable, affordable (free), clean and fast (T)

### Convenient and easy to use

- the service allows easy reservation, flexible payment and pick-up/drop-off at any point: personal profiles (e.g. including a network of friends) and connection to the smart system provide routes and options to share rides with friends (I)
- (mass) public transport is provided by train, tram and bus, and is clean, fast and accessible: free parking for private (unsustainable) cars is available at inter-modal transport hubs (M)
- the system is easily accessible with one profile for reservations, payments and information (M)
- inter-modal transport hubs make it easy for people and goods to switch between different mobility means, encouraging sustainable choices (M)
- ride-sharing is safe and efficient thanks to easy reservation and accessibility (e.g. special, cheaper parking for shared cars) (I)

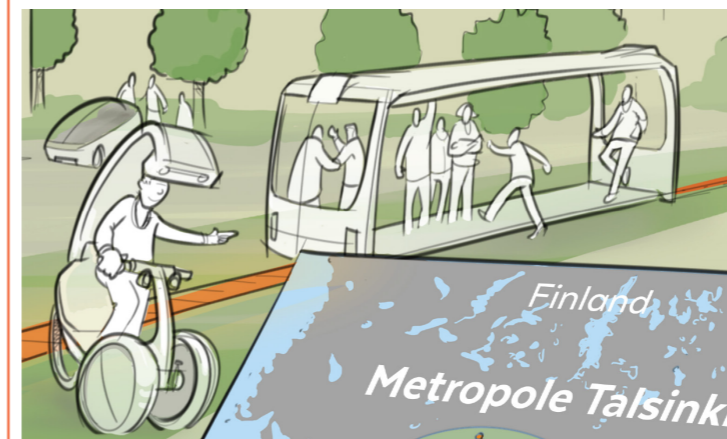
### Safe

- public transport is safe and comfortable, also for children and the elderly (for example with dedicated cabins) (I)
- the transport systems are also perceived as secure: for example, the biometric information used to identify people at entry points is also used to identify suspicious persons and activities (I)
- the down-town area is a safe and pleasant place for pedestrians: public spaces are designed for them and traffic is restricted to emergencies, residents and public services (M)
- automated vehicles ensure a safer city: shields for pedestrians and cyclists protect vulnerable road users (I)



### Mobility à la carte

- A wide range of (interconnected) alternatives in routes and forms of transport to suit different lifestyles
- Flexibility and freedom of choice
- Enjoyable and convenient travel experiences
- Demand-driven diversity (blending public and private)



### Accessible, affordable and convenient mobility

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



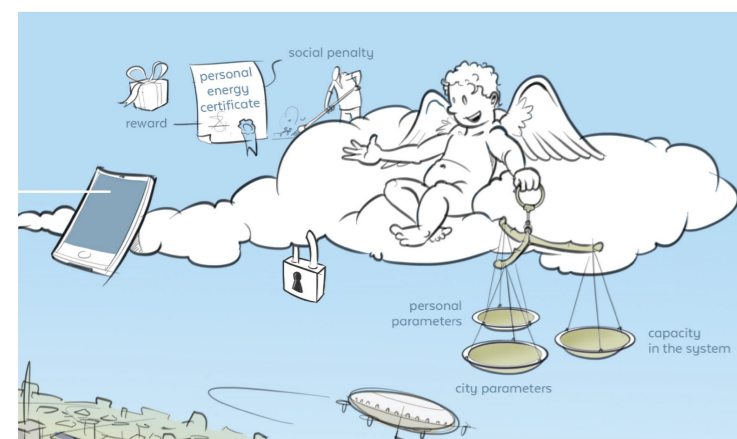
## Personalised advice

### Personalised travel advice and route planning

- individual choices are facilitated by (f)actual information and seamless mobility products and services that meet personal needs at that moment (E)
- a ‘one-click’ system pro-actively adjusts to people’s profiles and needs, based on up-to-date information and forecasts (M)
- everyone has a virtual ‘guardian angel’ for personal travel advice: all the ‘angels’ are connected to the cloud for accurate, up-to-date, cross-modal information (I)
- individual travellers are valued and facilitated by personalised travel advice: smart technologies and apps enable personalised route planning (I)
- technological solutions are demand-driven and can be personally adjusted (P)
- the ‘angels’ give warnings of storms or snowfall, help to cancel or postpone trips when needed, help in case of emergencies or prevent accidents by warnings (I)

### Accessibility via multiple devices

- individual travellers are provided with personalised travel planning wherever they are, free of charge and accessible from multiple devices and apps (I)
- smart apps help people to choose the best solution at that moment: they can choose from a range of mobility options (E)
- 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 (T)
- all kinds of applications use the resulting information of the ‘smart department’ to provide users with valuable services (T)



## Personalised advice

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

## Connectivity for smart management

### Real-time, cross-modal information and analysis

- smart traffic management provides efficient guidance based on real-time analysis and predictions of traffic flows, demand and transport availability (E)
- travellers value the availability of accurate, up-to-date and cross-modal information: this enables them to choose the best options as and when they need them, taking into account changing situations and transport availability (I)
- data is collected to analyse the traffic movements and provide real-time (event-driven) smart traffic management (I)
- open data is the norm, and enables new entrepreneurship based on services for people; the connected data is valued by citizens because of the improved affordable and reliable information on mobility and public transport (P)
- citizens support the principle of data sharing by providing access to their own data; the connected data is valued by information management experts for the interconnection of mobility modes and the integration with other functionalities, such as measuring air quality, pollution or congestion (P)
- the ‘Smart Department’ 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 (T)

### Automated systems for smooth flows

- people value fast, smoothly flowing traffic, free from congestion: automated systems support smooth traffic flows through the city (I)
- smart planning is used to respond dynamically to the changing demand for the transport of people and goods (T)
- management is by an autonomous system (I)
- the city is connected and accessible through a network of infrastructure for energy systems and open data: an energy network connecting the whole city based on renewable energy sources ensures energy-neutrality at city level; energy production (PV, buildings), storage (cars and batteries) and usage (where needed) are balanced through the network (P)



### Connected vehicles

- all traffic is managed through a single, safe, reliable and efficient system: the system connects all public and private vehicles, devices and road users and is accessible from anywhere (I)
- communication between vehicles, drivers and infrastructure allows smart signalling (I)

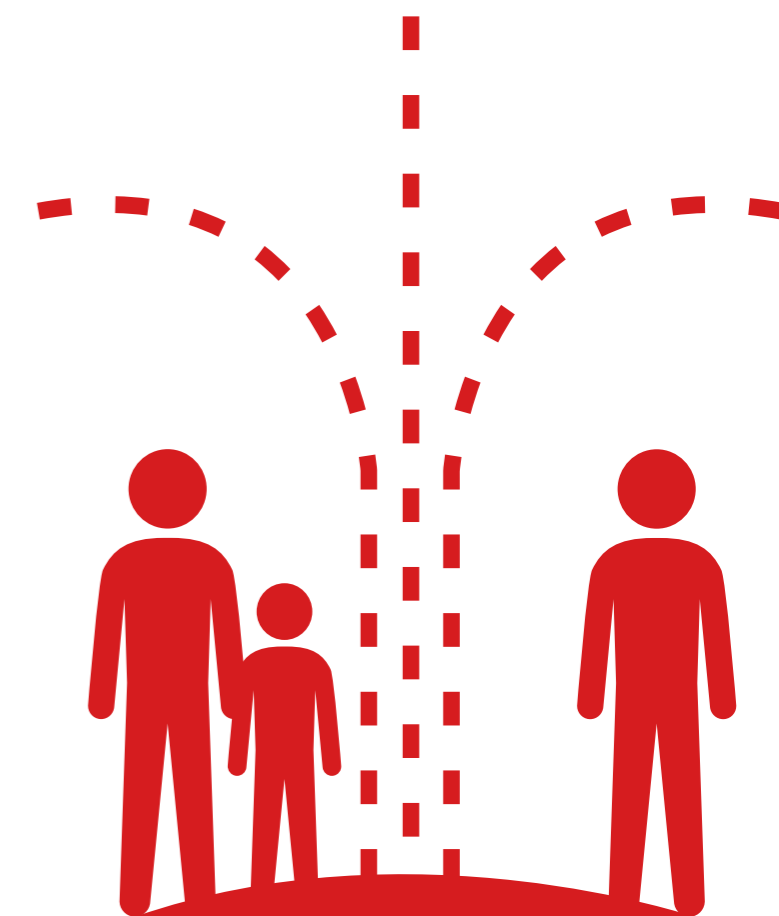
### Safe and secure systems

- traffic is safe: smart safety measures help to avoid accidents and traffic violations: vehicles are equipped with smart solutions and options to communicate, both with other road users and with the infrastructure (I)
- controlling incentives avoid misuse and keep the system free of undesired side-effects (M)
- people feel comfortable and safe, because only the ‘angels’ have access to personal data (I)
- personal data banks have a virtual shield to ensure confidentiality and privacy, and guard against hacking (I)

## Smart management

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





# DESIRED FUTURE SCENARIOS

## SMART URBAN SPACES

## SAFE AND PLEASANT LIVING IN EINDHOVEN 2050

In 2050, the city's 'green and blue' spaces provide a safe and pleasant living environment for the citizens of the Eindhoven region.

A high quality of life is achieved by integrated physical planning to create a resilient region by strengthening the interdependencies between 'blue' (water), 'green' (flora), 'grey' (pavement) and 'red' (buildings).

Citizens, public and private parties jointly take care of private and public spaces to create a safe, pleasant and healthy living environment. People are aware of the value of the interplay between the built environment and nature. They adopt healthy lifestyles and behaviour, through which they also contribute to their surroundings.

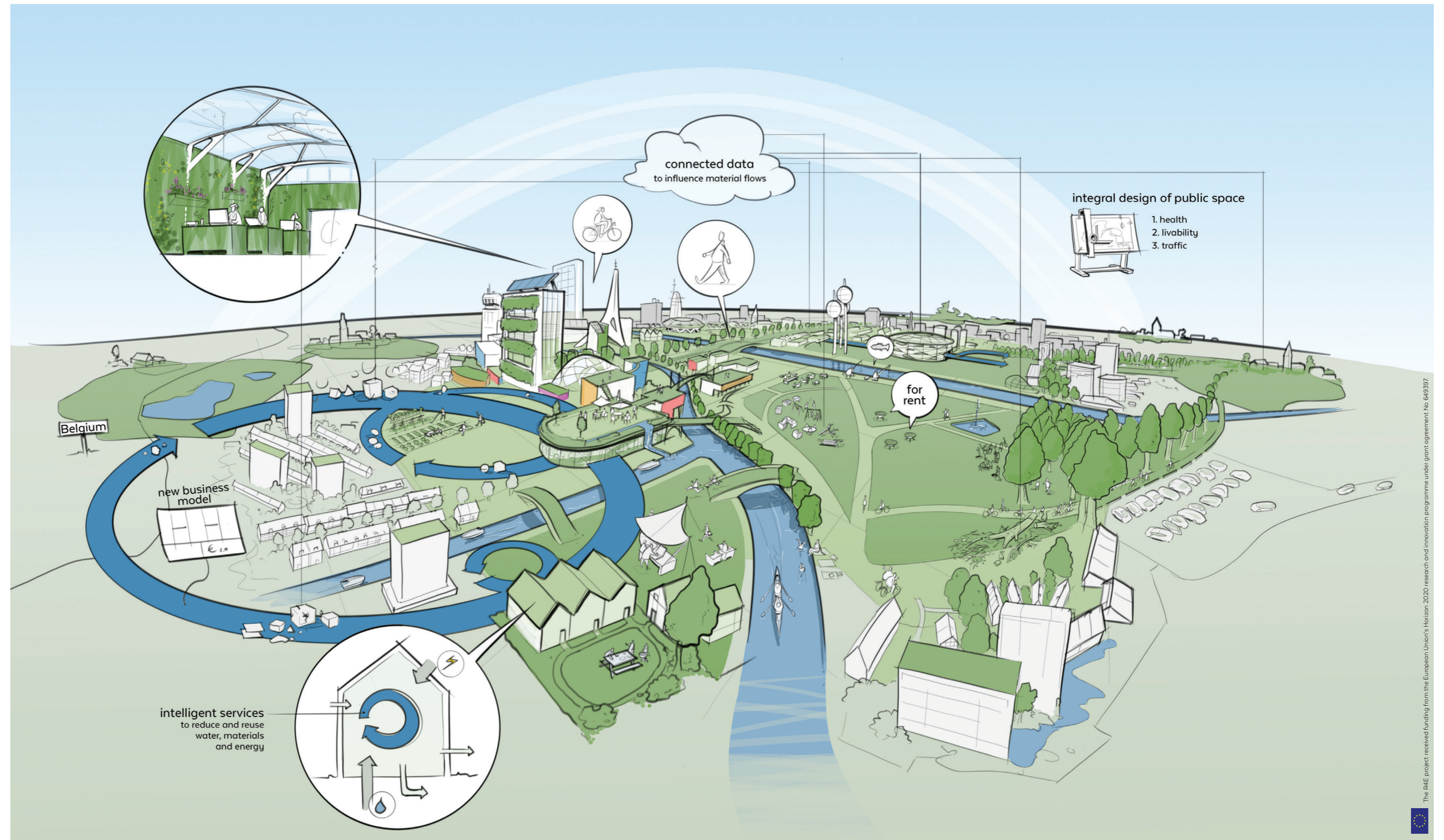
The region enjoys clean and safe water and green spaces that can be used actively for recreation (e.g. swimming, fishing) as well as to supply food (urban farming).

All meaningful resources are reused, thanks to circular systems on different scales.

The region values:

- a **safe living environment** that is resilient to the changing climate through the smart use of solutions on the appropriate scale;
- a **healthy living environment** with extensive 'green and blue' areas that support social activities and healthy lifestyles;
- a **circular water system** that provides sustainable re-use of water, materials and energy.

Elements of the desired future scenario are:



### Active use of 'green and blue' spaces

People use public spaces actively for social interaction, working and leisure activities. Spaces are attractive in all seasons, and are accessible for all. The diversity of the spaces in the city and surrounding villages, and the flexibility in their use cater for different and changing needs and wishes. Smart use of spaces serves many different goals, with plenty of room for flora and fauna. Synergy between urban and rural areas is strong.

### Human-scale design to promote sustainable living

People find everything they need for their daily living in their direct surroundings. The region is designed to encourage social interactions and sustainable lifestyles. People value the effects on their health and well-being, and spread the adoption of good lifestyles through social activities. The city and region provide an ideal environment for companies and start-ups with sustainable and healthy core-businesses.

### Connected, integrated 'green and blue'

The region values well connected 'green and blue' spaces to strengthen climate resilience. The boundaries between public and private green areas are blurred, and people actively add green to roofs, gardens, squares and parks and make them accessible. Interconnected water systems reduce the risks of flooding and heat stress. Citizens' initiatives are valued, and are facilitated and encouraged by regulations.

### Circular solutions on the right scale

The region uses circular systems at different levels to maximise re-use of water, materials and energy. Intelligent systems at the levels of homes, neighbourhoods, city and region are interconnected to balance demand and supply. Citizens use applications and sensors to monitor the quality of their water, food and environment, and contribute to its improvement. New technologies are used to make the systems intelligent.

### New business and investment models

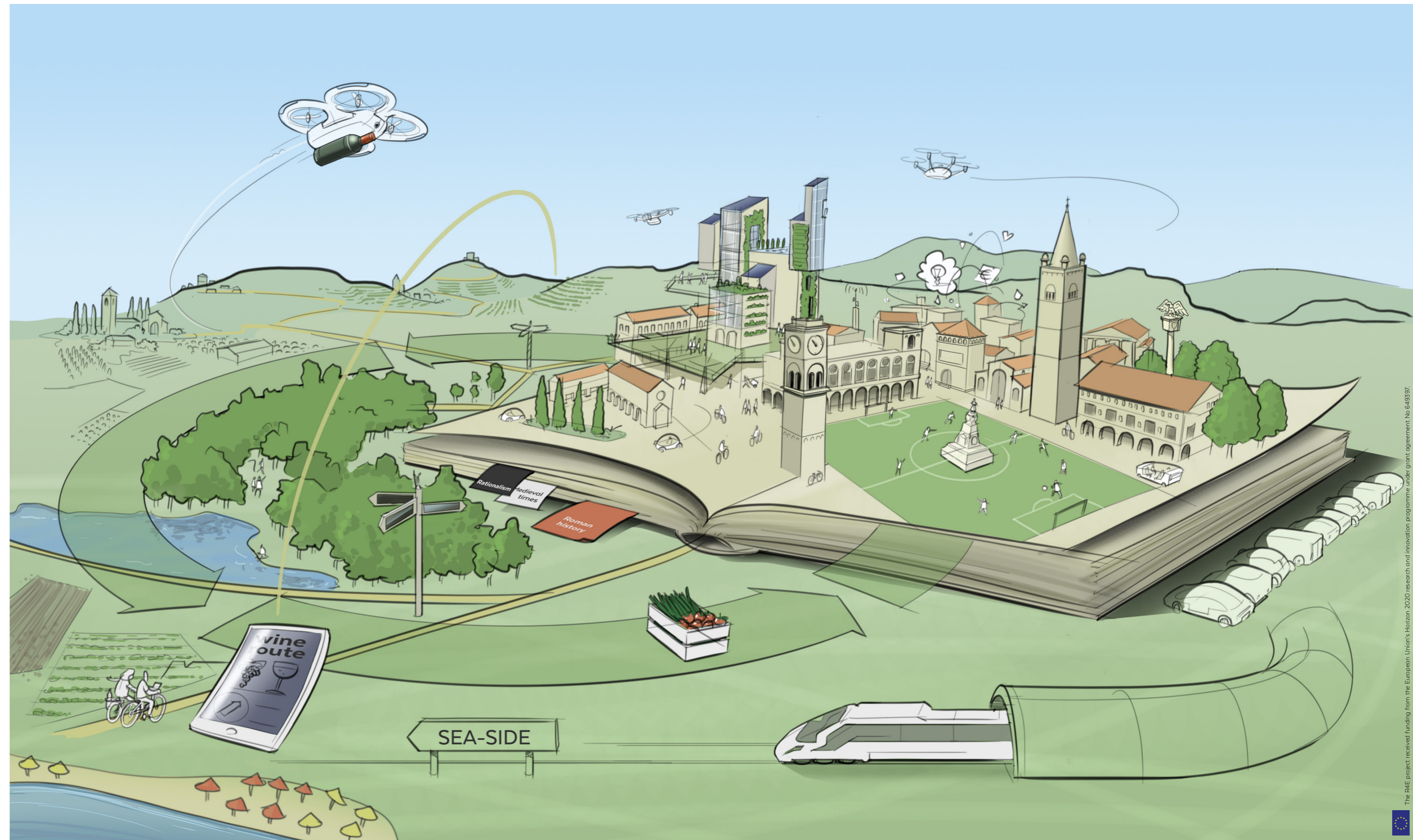
Public spaces are always freely accessible, and new business models are explored to provide added-value services. Decisions are based on an integrated view of value (economic, social, cultural and other) in both the short and long term. This 'Euro 2.0' approach enables new business with services in the public domain that create value for society at large as well as for individual citizens and enables investments in infrastructure.

## RENEWED, THRIVING CITY LIFE IN FORLÌ 2050

In 2050, the people in Forlì enjoy a compact, well-planned city with a lively centre. The city offers many well-connected, well-equipped green spaces that enhance social life.

The city has regained its primary role as a social, business and residential hub. History and culture are respected, contributing to the attractiveness of the city and its central role in the territory.

The people of Forlì benefit from the results of open territorial cooperation that encourages innovation and contributes to the city's economic development. At the same time the soil is protected for agricultural use and leisure activities.



Elements of the desired future scenario are:

### Enhancing social interaction

The cities planning focuses on providing spaces for social engagement. The functionality of urban space has been redefined in line with people's needs in 2050, such as sports and playing facilities on the city squares, outdoor social games (interactive graffiti wall) and vegetable gardens. Citizens are encouraged to initiate and participate in social events through open platforms. The university campus has become an open meeting place for students and citizens.

### A lively city centre

Shops in the centre offer modern handicrafts and other products with local production facilities. There are also other commercial activities offering dedicated services, such as smart home delivery (roof-to-roof delivery). Residents and entrepreneurs participate in identifying and creating new solutions to improve city life. This also encourages and enables young start-ups to set up new businesses offering and using technology services.

### Historical value in a new way

Citizens enjoy 'slow mobility' (walking, cycling and automated vehicles), allowing more attractively designed streets. The heritage is valued as a common responsibility. Citizens, the administration and other stakeholders participate in planning and designing for new purposes. Sustainable and responsible development starts by considering all the pages ('black' and 'white') of Forlì's history.

### A compact city

The urban fabric features taller and more efficient buildings, while preserving and enhancing unique historical assets. The new buildings offer modern city facilities: they produce and store (renewable) energy, provide vertical vegetable gardens, and green surfaces that reduce heat stress and recover rainwater. In this way the city footprint is reduced and the agricultural function of the countryside is restored.

### Territorial connectivity

Forlì provides a well-designed network of routes, exploring nature, culture, sports and local wine, food and handicrafts. The routes respond to the demand for a quality lifestyle supported by smart technologies. Better and faster links allow full connectivity to seaside resorts and nearby cities. Forlì's central role in services (e.g. hospital, airport) reaches its full potential with efficient and sustainable transport.



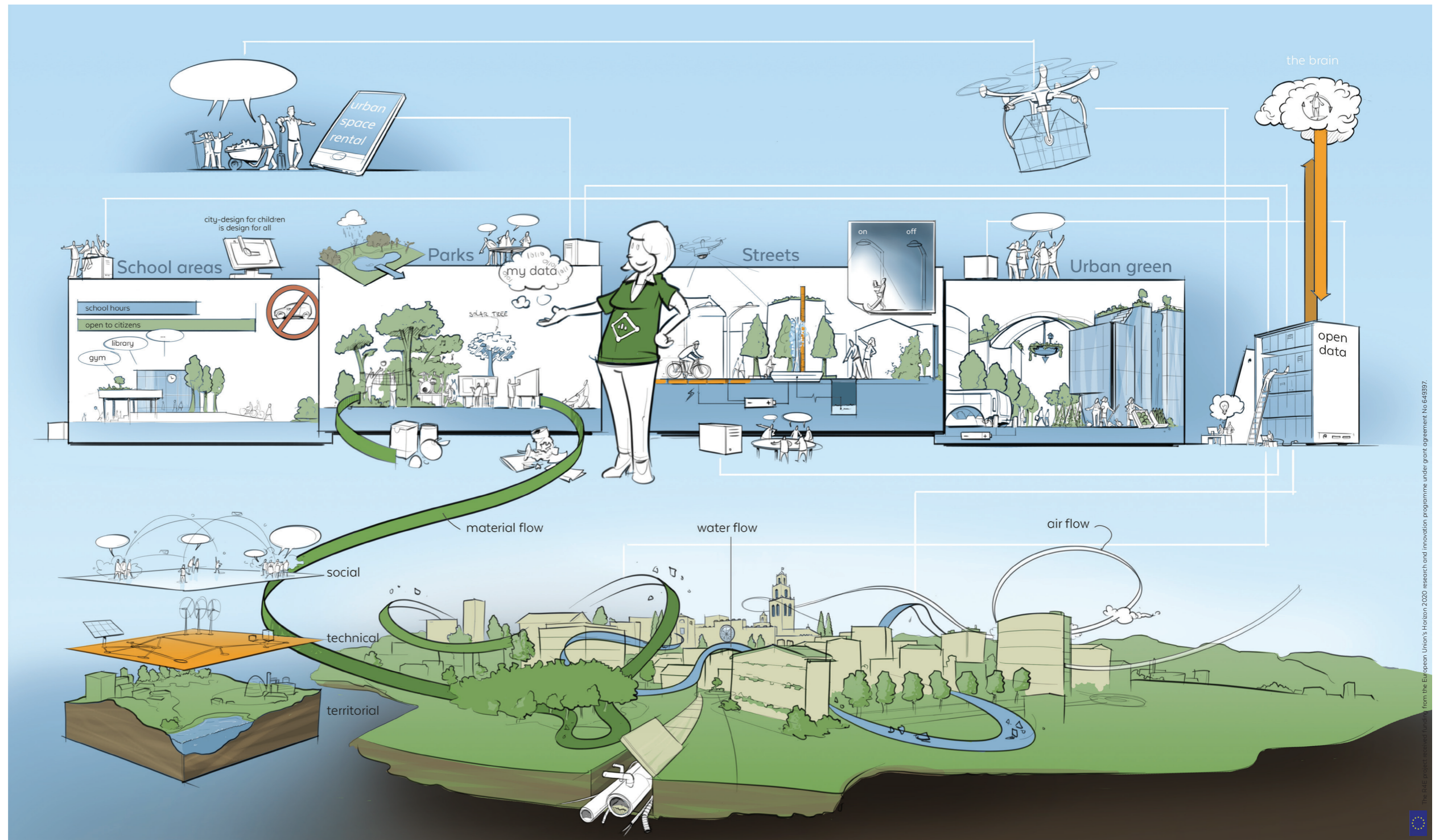
# HIGH-QUALITY ENVIRONMENT FOR WELL-BEING IN SANT CUGAT 2050

In 2050, the citizens of Sant Cugat enjoy a high-quality environment for well-being. People feel responsible for sustainability and engage in collaborative urban planning, use and maintenance.

A high-quality living environment supports healthy lifestyles. An ecological system connects the green areas and enables multifunctional use of urban spaces. The result is an increase in social activities, and in walking and cycling.

The newest technologies are applied in the materials used in buildings and urban spaces. For example, materials that can clean the air and take advantage of the kinetic energy of cars, bikes, and pedestrians transforming this energy into other forms that are useful for citizens. Circular systems for water, food, waste and energy are managed efficiently for maximum re-use of resources.

The environment is designed around people as users of different urban spaces, such as school areas, parks, streets and urban green (visualised in the top layer of the desired future scenario). The spaces are supported by smart systems to allow for a variety of services. All subsystems are balanced by the city 'brain' (top right) This is all brought together in the city landscape as a holistic city ecosystem, in which all materials, water and air flows are of high quality.



Elements of the desired future scenario are:

## Empowered people

People are proud to live and/or work in Sant Cugat. They drive initiatives, supported by the administration. Social discussion groups (with good representation of the community) co-create their living environment. A database with the latest data and historical knowledge supports living with lower use of resources. Visibility of the (now invisible) infrastructure and resources enables responsible management and anticipation by citizens themselves.

## Multi-use of urban space

The urban spaces all over the city are used more flexible and cater for different activities. Spaces can be rented for short-term use (e.g. playing football) or for longer-term use (e.g. urban gardening) through an app. Facilities can also be booked, and will be tuned to the activity (business meetings, sports and games, picnics etc.). Citizens engage in social activities with respect for the environment and for other people. The elderly, children and the disabled can use the spaces safely.

## Resilience of the city

The resources available in the different areas are shared at city level in a circular system. This is done territorially – to understand and monitor the (natural) resources; socially – to enable the awareness and interests of people; technologically – a system and grid to make the resources accessible and to respond to changes and emergencies; and economically – to allow continuous improvement. In a 'system-of-systems', everything is connected and maintained as a single infrastructure.

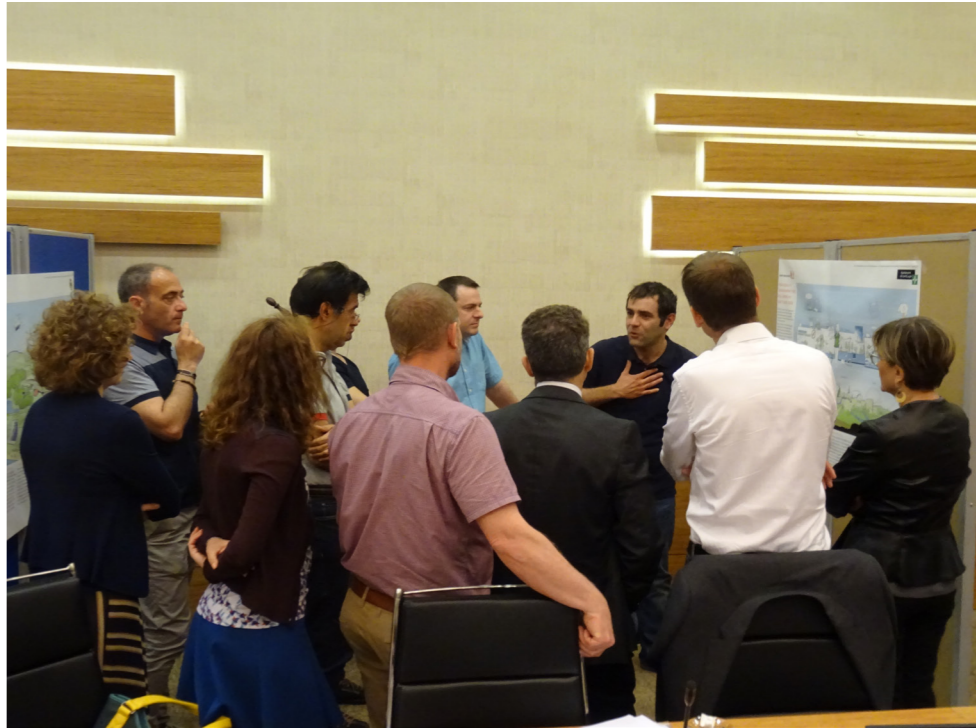
## Open data & smart grid

The system includes a centralised data base containing different types of data from different stakeholders on all services and assets in the city. The 'brain' of the system anticipates the expected use and conditions, suggests actions suited to users' needs and optimises the use of the infrastructure and resources. It enables people to make choices in complex situations. The data is accessible for the development of new apps and services by entrepreneurs.

## Financing model

New solutions and systems are needed, and these require new financing models and cooperation by the stakeholders. The administration and social conscious citizens jointly invest in the living environment. Public spaces, resources and data are used for valuable new services (e.g. food delivery for picnics in the park or the use of spaces as terraces) to generate revenue enabling sustainable business and further investments.







# Common needs in the desired future scenarios for Smart Urban Spaces

During the Joint Vision Workshop on 24 and 25 May 2016 in Istanbul the cities presented their desired future scenarios for Smart Urban Spaces to each other and had in-depth discussions to understand each others needs and context.

## Common needs

One of the objectives of the discussions was to identify the aspects of the future scenarios that are common for all cities, and those that are specific for one or more cities only. For this purpose a clustering was prepared of the needs expressed in the desired future scenarios, including relevant input from the scenarios for Smart Buildings and Smart Mobility. The city representatives explored the descriptions to gain insight into the scope of the needs and differences in understanding of the relevant themes. First they decided on a maximum of eight main clusters to reflect the priorities of their needs. Then they created a short description in the form of bullet points to describe the full scope of needs cluster, taking into account the different needs of the partner cities. They also defined a short title reflecting the focus of the common need. Finally, they selected (part of) a visual that provided the best illustration of the need.

The result of this discussion is a list of seven common needs for Smart Urban Spaces that will be used as input for the description of a joint desired scenario for the roadmapping step of the R4E project (WP5).

## Common needs Smart Urban Spaces

- Flexible and attractive living environment
- Social interaction and healthy behaviour
- Climate resilience
- Synergy between urban and rural areas
- Smart systems
- New business and financing models
- Citizen taking the lead in co-creation

The results of the Joint Vision Workshop are presented on the following pages. For each common need the corresponding cluster of needs from the desired future scenarios is given, as well as the short description and selected visual that will be used in the Generic Roadmap Smart Urban Spaces.

## Flexible and attractive living environment

### Flexibility for diverse activities

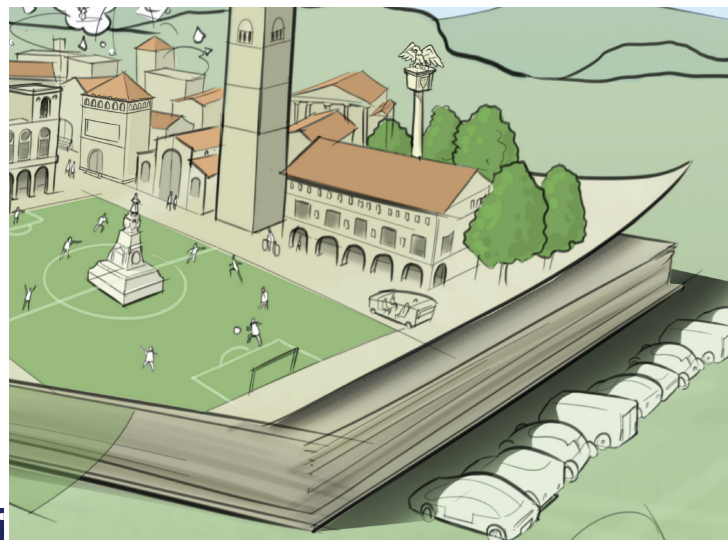
- the diversity of the spaces in the city and surrounding villages, and the flexibility in their use cater for different and changing needs and wishes: smart use of spaces serves many different goals, with plenty of room for flora and fauna (E)
- human-scale design to promote sustainable living (E)
- residents and entrepreneurs participate in identifying and creating new solutions to improve city life: this also encourages and enables young start-ups to set up new businesses offering and using technology services (F)
- the heritage is valued as a common responsibility: citizens, the administration and other stakeholders participate in planning and designing for new purposes; sustainable and responsible development starts by considering all the pages ('black' and 'white') of history (F)
- an ecological system connects the green areas and enables multifunctional use of urban spaces (S)
- the environment is designed around people as users of different urban spaces, such as school areas, parks, streets and urban green (S)
- the urban spaces all over the city are used more flexible and cater for different activities: spaces can be rented for short-term use (e.g. playing football) or for longer-term use (e.g. urban gardening) through an app; facilities can also be booked, and will be tuned to the activity (business meetings, sports and games, picnics etc.) (S)

### Attractive living environment (green, culture and history)

- the city's 'green and blue' spaces provide a safe and pleasant living environment for the citizens (E)
- people are aware of the value of the interplay between the built environment and nature (E)
- history and culture are respected, contributing to the attractiveness of the city and its central role in the territory (F)
- people enjoy a compact, well-planned city with a lively centre (F)
- shops in the centre offer modern handicrafts and other products with local production facilities (F)

### Relevant input from scenarios of the other focus areas:

- people enjoy a variety of environments in the region. They can choose from different areas in the city or surrounding villages that provide different experiences, and offer a range of options for different needs and lifestyles (E)
- the spatial planning of the city and the region cherishes history and at the same time facilitates new dynamics (E)
- the region offers an attractive climate for business: it functions as a 'living lab' in which innovative solutions are developed and proven in practice; people can experience these innovations in their own living environment, and can adopt them if and when they wish to do so. The region is an economic hotspot for smart and sustainable mobility (E)
- quality of the living environment is high, with air quality, low emissions [...] better than average (E)
- a clean, green and healthy environment is valued by the citizens (I)
- people in the region enjoy a safe and clean city, with green and healthy areas and safe and clean mobility solutions (M)
- urban spaces such as an 'all people's avenue' are pleasant, comfortable, quiet, green, shady and accessible for all (M)
- a city for the people, that is lighter, in the sense of fewer cars, less pollution and lower noise: with spaces that are comfortable for people and that exploit the city's beauty, with its attractive views and sound scape (P)
- the city cherishes its historical city centre and cultural heritage: these are enriched by new technologies and innovation to create comfortable, energy-efficient neighbourhoods (P)
- tourists also value the city's cultural history, which they can experience both physically and virtually (P)
- enjoy an attractive, clean and quiet living environment that encourages sustainable behaviour (T)
- being a social harbour, open and friendly to all, as well as a cultural harbour, enriching people's lives and helping to make good citizenship and sustainable behaviour second nature for everyone (P)



## Flexible and attractive living environment

- Pleasant living environment for everyone
- Changing and updating, while preserving the identity of the city (history, culture)
- Ecological system connecting the 'green' and 'blue' areas
- Urban space is for people, not for private use (like parking cars)

## Social interaction and healthy behaviour

### Inviting spaces to engage in social interaction

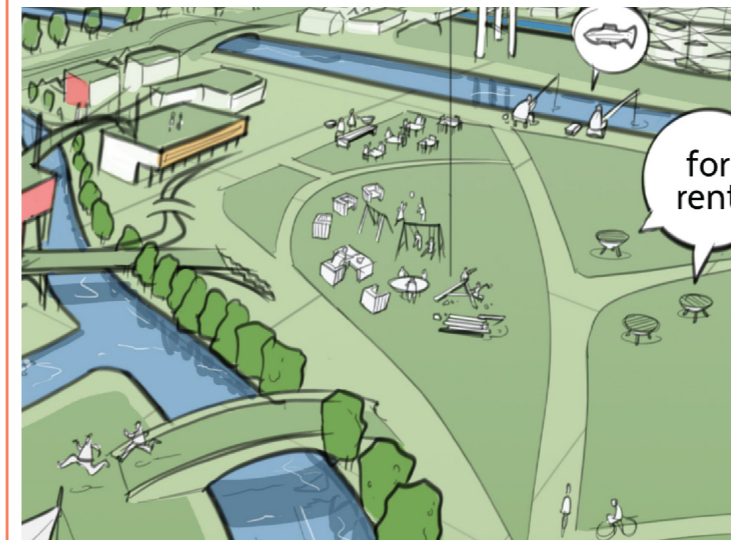
- people use public spaces actively for social interaction, working and leisure activities: spaces are attractive in all seasons, and are accessible for all (E)
- the region is designed to encourage social interactions and sustainable lifestyles (E)
- the city offers many well-connected, well-equipped green spaces that enhance social life (F)
- citizens engage in social activities with respect for the environment and for other people: the elderly, children and the disabled can use the spaces safely (S)
- the city has regained its primary role as a social, business and residential hub (F)
- enhancing social interaction (F)
- citizens are encouraged to initiate and participate in social events through open platforms (F)
- the cities planning focuses on providing spaces for social engagement: the functionality of urban space has been redefined in line with people's needs in 2050, such as sports and playing facilities on the city squares, outdoor social games (interactive graffiti wall) and vegetable gardens (F)

### Active use of spaces for healthy lifestyles

- active use of 'green and blue' spaces (E)
- people value the effects on their health and well-being, and spread the adoption of good lifestyles through social activities (E)
- the university campus has become an open meeting place for students and citizens (F)
- a high-quality environment for well-being (S)
- the region enjoys clean and safe water and green spaces that can be used actively for recreation (e.g. swimming, fishing) as well as to supply food (urban farming) (E)
- a high-quality living environment supports healthy lifestyles (S)
- a healthy living environment with extensive 'green and blue' areas that support social activities and healthy lifestyles (E)
- an increase in social activities, and in walking and cycling (S)

### Relevant input from scenarios of the other focus areas:

- 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 (T)
- green squares, school yards, recreational grounds and public spaces facilitate healthy lifestyles and social activities (E)
- the heart of the city are its people, enjoying social interactions and the city's buildings and spaces (P)
- in green areas all over the city residents enjoy walking, cycling and (hobby and urban) gardening (I)
- people value better air quality and choose healthier options such as walking and cycling (I)



## Social interaction and healthy behaviour

- Active use of public spaces for sustainable lifestyles
- Well-connected and equipped green spaces enhance social life
- Healthy living environment with extensive 'green' and 'blue' areas to support social activities
- Open platforms to encourage citizens to initiate and participate in social events



## Climate resilience

### Climate resilience (flooding, draught, heat, earth quakes)

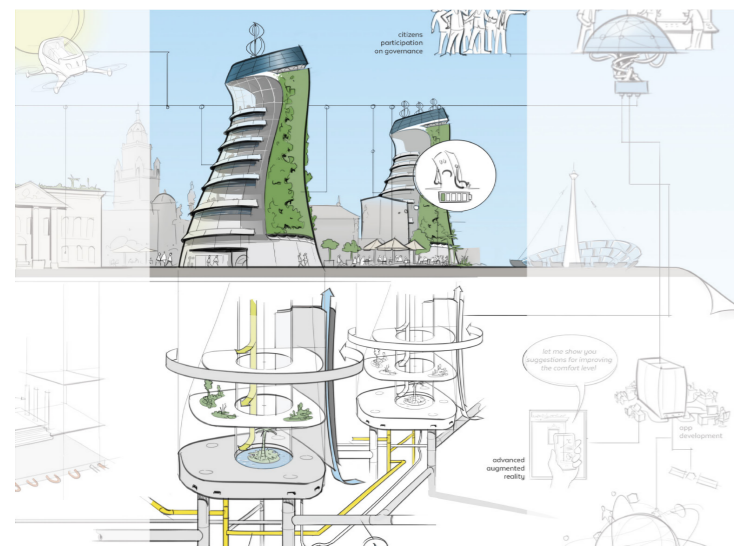
- integrated physical planning to create a resilient region by strengthening the interdependencies between 'blue' (water), 'green' (flora), 'grey' (pavement) and 'red' (buildings) (E)
- a safe living environment that is resilient to the changing climate through the smart use of solutions on the appropriate scale (E)
- the region values well connected 'green and blue' spaces to strengthen climate resilience (E)
- interconnected water systems reduce the risks of flooding and heat stress (E)
- the new buildings offer modern city facilities: they produce and store (renewable) energy, provide vertical vegetable gardens, and green surfaces that reduce heat stress and recover rainwater (F)
- resilience of the city (S)

### Visibility of infrastructure and resources

- visibility of the (now invisible) infrastructure and resources enables responsible management and anticipation by citizens themselves (S)

#### Relevant input from scenarios of the other focus areas:

- resilience to both normal climatic conditions and exceptional natural events (F)



## Climate resilience

- Integrated physical planning to strengthen interdependencies between water, flora, pavement and buildings
- Green areas to help produce and store (renewable) energy, reduce heat stress and recover rainwater
- Private property should be climate resilient as well

## Synergy between urban and rural areas

### Territorial network of 'green' routes

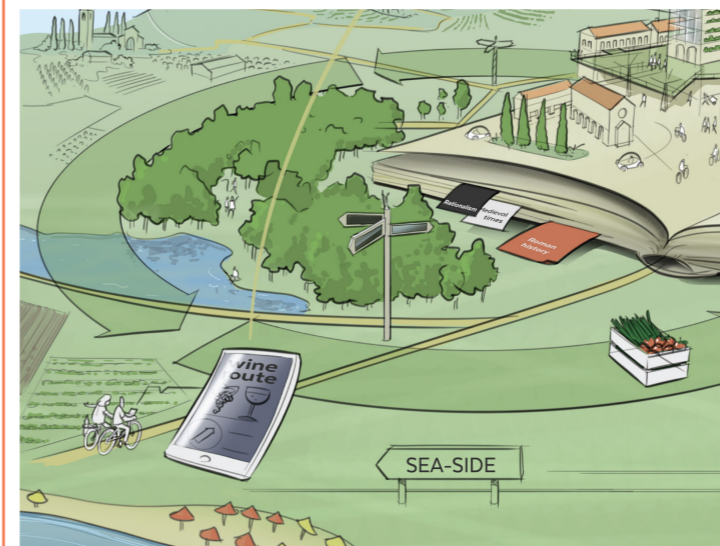
- synergy between urban and rural areas is strong (E)
- connected, integrated 'green and blue' (E)
- people benefit from the results of open territorial cooperation that encourages innovation and contributes to the city's economic development: at the same time the soil is protected for agricultural use and leisure activities (F)
- the city footprint is reduced and the agricultural function of the countryside is restored (F)
- territorial connectivity (F)
- a well-designed network of routes, exploring nature, culture, sports and local wine, food and handicrafts. The routes respond to the demand for a quality lifestyle supported by smart technologies (F)

### Circular systems for water, energy, materials and food on different scales

- all meaningful resources are reused, thanks to circular systems on different scales (E)
- a circular water system that provides sustainable re-use of water, materials and energy (E)
- the region uses circular systems at different levels to maximise re-use of water, materials and energy (E)
- people find everything they need for their daily living in their direct surroundings (E)
- recover rainwater (F)
- circular systems for water, food, waste and energy are managed efficiently for maximum re-use of resources (S)
- the city landscape as a holistic city ecosystem, in which all materials, water and air flows are of high quality (S)

### Balancing supply and demand

- the resources available in the different areas are shared at city level in a circular system: this is done territorially – to understand and monitor the (natural) resources; socially – to enable the awareness and interests of people; technologically – a system and grid to make the resources accessible and to respond to changes and emergencies; and economically – to allow continuous improvement (S)



- intelligent systems at the levels of homes, neighbourhoods, city and region are interconnected to balance demand and supply (E)

#### Relevant input from scenarios of the other focus areas:

- widespread greenery in public spaces creates a healthy living environment and encourages people to choose healthy transport options such as walking and biking: extensive and attractive walking and cycling routes throughout the region connect areas for living, working and leisure (E)
- create more efficient spaces for sharing and growing food (F)
- pedestrian tunnels and floating gardens connect the areas: citizens are energy-aware; a tree is planted for each child's birthday (I)
- people can easily move around, with good access to the city as well as the outlying areas; there are green lanes for long-distance walking and cycling (M)
- easy access to the countryside revalues country lifestyle and products (M)
- green roofs provide shared gardens and urban farming spaces; these are interconnected to provide green walking routes (M)
- a green mobility network connects the city and its various centres (P)
- the city has been (re-)designed with a green mobility network, connecting the city and its various centres, adding value to the poly-centric city and integrating the qualities of the different areas into a harmonious whole: connects green roofs and walking areas to make walking and biking into obvious choices for people (P)
- connecting the hinterland with other cities (P)
- new city concept has been created around emission-free and ecological buildings with green roofs and waste recycling (I)
- people invest in systems and share them with their neighbours, so together they can afford a range of solutions for energy (generation and storage), water, food and waste: together, they form a self-sufficient community (M)
- nature and natural resources are used, like plants and green, to reduce the impact of buildings (M)
- circular systems are implemented to enable sustainable behaviour and businesses (P)
- values new technologies as a means to become an energy-efficient and circular city (P)
- circular systems are used, for example for food: from urban farming, markets, joint cooking and enjoying local food, as well as organic waste recycling; or for the business of natural materials: from green roofs, natural materials for isolation, local entrepreneurship in printing isolation materials from waste of local food production (P)

## Synergy between urban and rural areas

- Open territorial cooperation that encourages innovation and contributes to local economic development
- Reducing footprint by using circular systems
- Well-designed route network connecting urban and rural areas, responding to quality lifestyles and supported by smart technologies

## Smart systems

### Intelligent systems with real time information

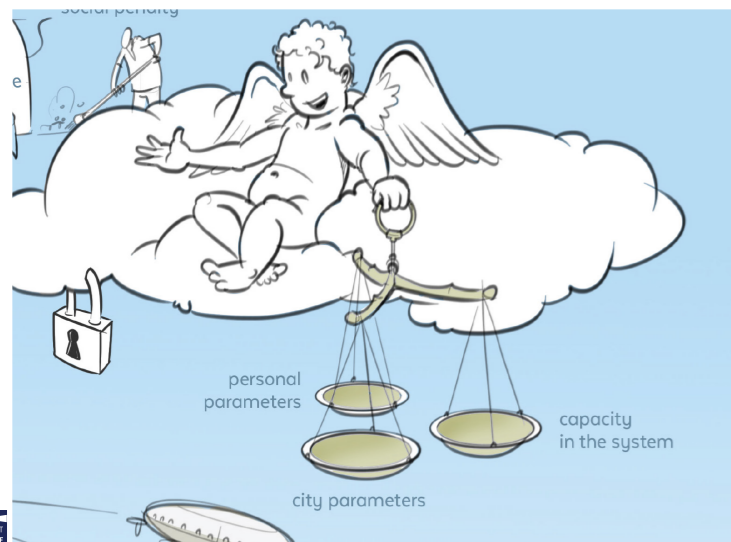
- new technologies are used to make the systems intelligent (E)
- people interact with the urban space, and have real-time information inviting them to engage in social activities (F)
- the spaces are supported by smart systems to allow for a variety of services: all subsystems are balanced by the city 'brain' (S)
- a database with the latest data and historical knowledge supports living with lower use of resources (S)
- in a 'system-of-systems', everything is connected and maintained as a single infrastructure (S)
- open data & smart grid (S)
- the system includes a centralised data base containing different types of data from different stakeholders on all services and assets in the city. The 'brain' of the system anticipates the expected use and conditions, suggests actions suited to users' needs and optimises the use of the infrastructure and resources (S)
- the system enables people to make choices in complex situations (S)

### New sustainable materials and solutions

- the newest technologies are applied in the materials used in buildings and urban spaces: for example, materials that can clean the air and take advantage of the kinetic energy of cars, bikes, and pedestrians transforming this energy into other forms that are useful for citizens (S)

#### Relevant input from scenarios of the other focus areas:

- a smart grid connects all buildings and public services: the system is accessible by all users and providers of energy, water and other resources (waste disposal); it allows users to choose from a range of available options; it brings together supply and demand, anticipating weather and other conditions and use patterns; it enables self-sufficiency at city level; it uses open data, although citizens are in charge of their own data and of the system (M)



## Smart systems

- Real-time information to engage people in social activities
- Smart grid to connect public spaces and services
- Centralised 'brain' to enable information-sharing
- Secure system ensures privacy by understanding the boundary between public and private information
- Resilient system (optimising resources in line with conditions)

## New business and financing models

### New added-value services in public space

- public spaces are always freely accessible, and new business models are explored to provide added-value services (E)
- public spaces, resources and data are used for valuable new services (e.g. food delivery for picnics in the park or the use of spaces as terraces) to generate revenue enabling sustainable business and further investments (S)
- there are also other commercial activities offering dedicated services, such as smart home delivery (roof-to-roof delivery) (F)
- the city and region provide an ideal environment for companies and start-ups with sustainable and healthy core-businesses (E)
- data is accessible for the development of new apps and services by entrepreneurs (S)

### Integral decision-making

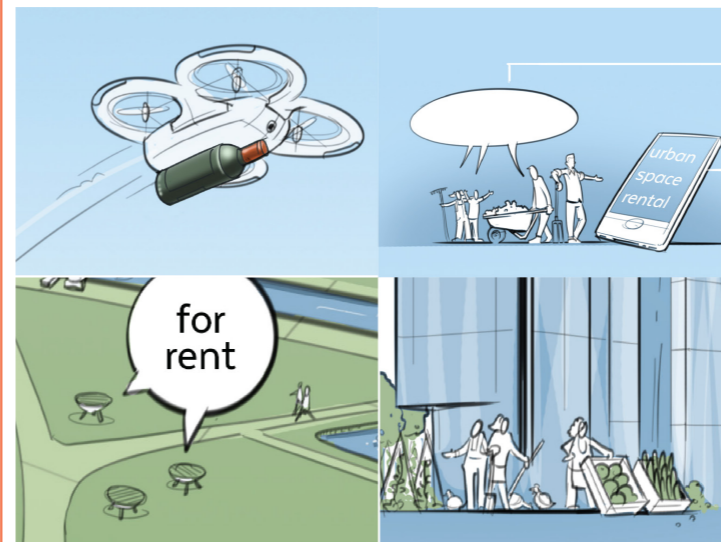
- decisions are based on an integrated view of value (economic, social, cultural and other) in both the short and long term: this 'Euro 2.0' approach enables new business with services in the public domain that create value for society at large as well as for individual citizens and enables investments in infrastructure (E)

### New financing models

- new solutions and systems are needed, and these require new financing models and cooperation by the stakeholders (S)
- new business and investment models (E)
- the administration and social conscious citizens jointly invest in the living environment (S)

#### Relevant input from scenarios of the other focus areas:

- entrepreneurs develop new sharing services for citizens, thereby reducing the use of land and environmental resources (F)



## New business and financing models

- Providing an ideal environment for (local) entrepreneurs with sustainable and healthy services
- Accessible data to develop new apps and services
- Citizens and administration jointly invest in the living environment
- Public spaces are always freely accessible, but charges may be made for added-value services



## Citizens taking the lead and co-creation

### Citizens' initiatives

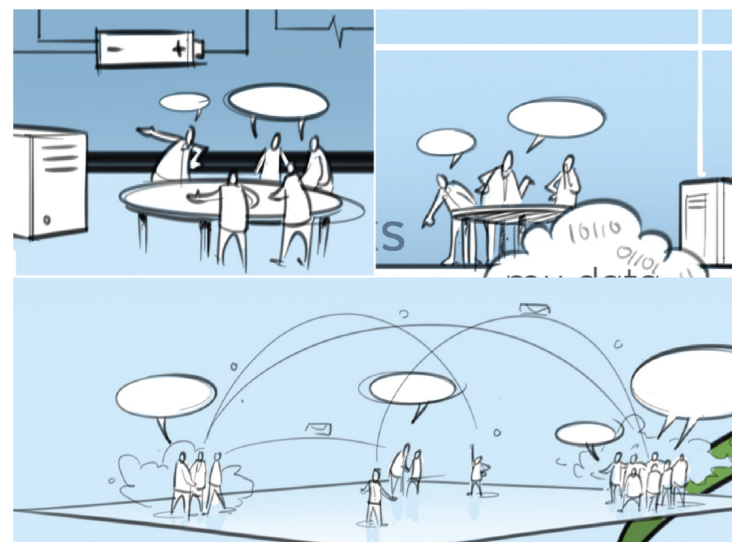
- the boundaries between public and private green areas are blurred, and people actively add green to roofs, gardens, squares and parks and make them accessible (E)
- people feel responsible for sustainability and engage in collaborative urban planning, use and maintenance (S)
- citizens use applications and sensors to monitor the quality of their water, food and environment, and contribute to its improvement (E)
- people are proud to live and/or work in the city; they drive initiatives, supported by the administration; social discussion groups (with good representation of the community) co-create their living environment (S)

### Open and collaborative approaches to city planning

- citizens, public and private parties jointly take care of private and public spaces to create a safe, pleasant and healthy living environment: they adopt healthy lifestyles and behaviour, through which they also contribute to their surroundings (E)
- citizens' initiatives are valued, and are facilitated and encouraged by regulations (E)

### Relevant input from scenarios of the other focus areas:

- spaces have been given back to the people, so they can enjoy them in comfort and safety: the urban space is used by citizens, developing cultural activities and by local entrepreneurs to create awareness and change (P)
- planning and decision-making processes are based on open collaboration that includes different views and knowledge sources (T)
- 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 (T)



### Citizen taking the lead in co-creation

- People feel responsible for sustainability and are engaged in urban planning use and maintenance
- People create and take initiatives, supported by the administration
- Citizens use smart systems to monitor the quality of the environment and contribute to its improvement
- Citizens actively take part in decision-making to influence their living environment



# CONTRIBUTIONS

The desired future scenarios 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 Eindhoven scenario workshops:

• Ronald Aben	Provincie Noord Brabant
• Hanne Baudoin	Waterschap de Dommel
• Dick Boland	Waterschap de Dommel
• Inge van den Broek	GGD
• Jean-Paul Close	Stad van morgen
• Roel den Dikken	Gemeente Eindhoven
• Lot van de Giessen	Gemeente Eindhoven
• Antoinette Grips	Gemeente Eindhoven
• Has van Helvoort	Omgevingsdienst ZO Brabant
• Eric Hendrickx	Waterschap de Dommel
• Magna Hofman	Trefpunt Groen Eindhoven
• Jan-Willem Hommes	Gemeente Eindhoven
• Lex Huijbers	Waterschap de Dommel
• Berry de Jong	Metropoolregio Eindhoven
• Jarno de Jonge	Waterschap de Dommel
• Herman Kerkdijk	Gemeente Eindhoven
• Nelleke Knipscheer	Gemeente Gemert-Bakel
• Erik Kronenburg	Waterschap de Dommel
• Delia Mitcan	Gemeente Eindhoven
• Robbert de Mug	Gemeente Eindhoven
• Ruud van Nieuwenhuijze	Brabant Water
• Luuk Postmes	Gemeente Eindhoven
• Ger Renkens	Gemeente Eindhoven
• Jan Rots	Bosgroepen
• Mary-Ann Schreurs	Gemeente Eindhoven
• Vanessa Silvertand	Gemeente Eindhoven
• Robbert Snep	Wageningen Universiteit/Alterra
• Sandra van der Sterren	Gemeente Eindhoven
• Frans van Strijp	Cure
• Robert Teunissen	Gemeente Eindhoven
• Nanette van der Ven	Waterschap de Dommel
• Hans Verhoeven	Gemeente Eindhoven
• Ron Wetzter	Provincie Noord Brabant
• Jean van Zeeland	Gemeente Eindhoven

## Participants of the Forlì scenario workshops:

• Camillo Acerbi	Union of Municipalities of "Romagna Forlivese"
• Cristina Ambrosini	Municipality of Forlì
• Roberto Angelini	Architect
• Francesca Argnani	Engineer
• Gianfranco Argnani	Municipality of Forlì
• Francesca Bacchiocchi	Municipality of Forlì
• Maurizio Baietta	Municipality of Forlì
• Berardo Bandini	HERA

• Luca Bartoletti	CISE ( Center for the Innovation and Economic Development)
• Andrea Bassi	President of the Association of Engineers of the Province of Forlì-Cesena
• Stefano Bazzocchi	Municipality of Forlì
• Chiara Bernabini	Municipality of Forlì
• Giovanni Bertozzi	Confcooperative Forlì-Cesena
• Gabriele Di Bonaventura	CNA Forlì-Cesena
• Gianpiero Borghesi	Municipality of Forlì
• Raffaele Borgini	Smart Domotics S.r.l.
• Barbara Casadei	Scholastic supervisor – Junior high school
• Giorgio Casadei WWF	T.A.A.F
• Enzo Cortesi	Fondazione Cassa dei Risparmi di Forlì (Bank Foundation)
• Maurizio Fiori	Municipality of Forlì
• Bacchiocchi Francesca	Municipality of Forlì
• Francesca Frazzoli	Municipality of Forlì
• Francesca Gardini	Municipality of Forlì – Councillor
• Raffaella Lombardi	Municipality of Forlì
• Elena Lotti	Municipality of Forlì
• Gina Luca Laghi	Municipality of Forlì
• Roberto Malvezzi	CertiMaC soc.cons. a r.l.
• Zakaria Meskine	Municipality of Forlì – Intern
• Lubiano Montaguti	Municipality of Forlì – Councillor
• Marco Molinelli	Scholastic supervisor – "Ruffilli" Professional Institute (High School)
• Michela Nanni	Municipality of Forlì
• Serena Nesti	Municipality of Forlì
• Pamela Panzavolta	CertiMaC soc.cons. a r.l.
• Dario Pinzarrone	Municipality of Forlì
• Antonio Randazzo	Municipality of Forlì
• Francesca Ravaioli	Municipality of Forlì
• Pasquale Ricciato	Municipality of Forlì
• Mara Rubino	Municipality of Forlì
• Tiziana Sabetta	Municipality of Forlì
• Gioia Sambenedetto	Municipality of Forlì
• Andrea Savorelli	Municipality of Forlì
• Stefano Spazzoli	Forlì Mobilità Integrata
• Michele Tassinari	Board of Surveyors of Forlì-Cesena
• Stefano Torelli	RInnova – Romagna Innovazione Soc. Cons. a R.L.
• Chiara Ugolini	CertiMaC soc.cons. a r.l.
• Massimo Visani	Municipality of Forlì
• Nevio Zaccarelli	Municipality of Forlì – Councillor

## Participants of the Istanbul scenario workshops:

• İlsmail Adıyıl	Metro Istanbul Corp. – Energy Manager
• Kevser AKÇALI	ISBAK Corp. – Engineer

• Aliye AKÇIL	ISBAK Corp. – Chief
• Gizem AKIN	IETT – Engineer
• Verda ALPAN	Translation Services – Translator
• Muhammet ALYÜRÜK	ISBAK Corp. – General Manager
• İlhan ASLANTÜRK	ISBAK Corp. – Manager
• Prof.Dr. Ali Osman ATAHAN	Istanbul Technical University – Professor
• Hamza AYDIN	IETT
• Yunus Emre AYÖZEN	IMM – Traffic Manager
• Ali BAYINDIR	R4E Communication and Finance Manager – IMM EU Relations Project Chief
• Kübra BAYRAKTAR SISMAN	IMM – EU Relations Department Manager
• Zeyd BÖHÜRLER	IMM
• Serap ÇETINKAYA	IMM – City Planner
• Ugur CORA	IETT – Engineer
• Esmâ DILEK	R4E Project Manager – IMM Assistant Traffic Manager
• Mustafa Onur ERDEM	IMM – Engineer
• Onur ERDEM	Bilge Adam IT Group
• Dilek ERDOGAN	ISBAK Corp. – GIS Engineer
• Ercan EROL	ISBAK Corp. – Chief
• Mahmut ERSAHIN	ISBAK Corp. – Engineer
• Mehmet ERSAHIN	ISBAK Corp. – Engineer
• Mustafa ERUYAR	ISBAK Corp. – Manager
• Hilmi GENÇ	ISBAK Corp. – Engineer
• Süleyman GÜLER	IMM – Assistant Traffic Manager
• Dr. Fatih GÜNDOGAN	ISBAK Corp. – Deputy General Manager
• Ali GÜNES	IETT – Engineer
• Enes ISMAİLOGLU	Metro Istanbul Corp. – Engineer
• Seyma ISTENGIR	ISBAK Corp. – R4E Intelligent Traffic Management – Mobility Expert
• Nesim KARACA	IMM – Administrative Assistant of Head of Transportation
• Yakup KÖMÜR	Dijital Medya Corp. – Presenter
• Özgür ÖZALP	HITACHI – Business Development Manager
• Önder ÖZCAN	IIMM – Engineer
• Mustafa ÖZÇELİK	IETT – Engineer
• Sinem ÖZTÜRK	ISBAK Corp. – Engineer
• Ersoy PEHLIVAN	ISBAK Corp. – Chief
• Hamit POLAT	IMM – Assistant Traffic Manager
• İsa SAGLAM	IETT – Planning Manager
• Kürsad SENSOY	IMM – Supervisor of Traffic Control Centre
• Cemil TEKİN	ISBAK Corp. – Graphics Designer
• Elif TEKTAS	ISBAK Corp. – Traffic Control Centre Operator
• Eser TözÜM	TözÜM Interpretation Services
• Ali ÜNAL	IMM – Engineer
• Hayati UYSAL	Metro Istanbul Corp. – Energy Manager
• Yavuz YALÇIN	IETT – Energy Management Manager

- Yrd.Doç Dr.Mustafa Sinan YARDIM Yıldız Technical University - Assistant Professor
- Muhammed YAVUZ IETT - ITS Systems Manager
- Yıldray YEDIKARDES Metro Istanbul Corp. - Seyrantepe Operations Manager
- Hasan YILDIZ IMM - Assistant Traffic Manager
- Hüseyin Gazi YILMAZ Bilge Adam IT Group - Bilge Adam
- Murat YILMAZ HITACHI
- R. Çağrı YÜZBASIOGLU ISSD - Systems Engineer

#### Participants of the Murcia scenario workshops:

- Elena Alday Colegio Arquitectos
- Carmen Aleman Murcia municipality
- Gines Ángel García CONERY
- Francisco Arce Siemens
- Carmen Blanco Murcia municipality
- Andrés Brugarolas LATBUS
- Antonio Caballero Murcia municipality
- Sergio Caravaca Murcia Sobre Rudas
- Agustín Cayela Murcia en Bici
- Antonio Contreras UMU
- Juan Pedro Collado Murcia municipality
- Alvaro Cozar IDEA ENERGY LAB
- Maria Cruz Ferreira Costa ALEM- Local Energy Agency of Murcia
- David de Diego KIO Networks España
- Jara Feliu Regenera Levante
- Isabel Fernández Murcia municipality
- Francisco Fernández Murcia municipality
- Ramón Gonzalez Vodafone
- Antonio Luis González Ede-Energy
- Juan Gonzalez Renault Murcia
- Mateo Gomez Universidad de Murcia
- José Granero Colegio Ingenieros técnicos Indus.
- Ginés Heredia Salzillo energía
- Esther Jimenez INFO
- Roberto José Liñán UCAM
- Tomás López El Corte Inglés informática
- Silvia López Telefónica
- Sofia Lorents Fonfria ALEM- Local Energy Agency of Murcia
- Jose Carlos Madrid Select Asterisco
- Antonio Martinez IDEA ENERGY LAB
- Sebastian Martinez Murcia municipality
- Jose Miguel CETENMA
- Santiago Molina Onate TRANVIA MURCIA
- Jose Maria Muñoz MURTRAFIC
- Antonio Ochoa Emurtel
- Roque Ortiz Murcia municipality
- Pepe Osorio Murcia municipality
- Luis Pan Colegio Ingenieros Industriales

- Jose Enrique Pérez TRANSPORTE DE MURCIA
- Alberto Requena Universidad de Murcia
- Juan David Reverte Colegio de Ing. Telecomunicaciones
- Juan Antonio Romera Murcia municipality
- Antonio Romera Electromur
- Jaime Ruiz Huescar ALEM- Local Energy Agency of Murcia
- David Sanchez IRSA
- Lola Sánchez Murcia municipality
- Antonio Skarmeta Universidad de Murcia
- Antonio Valdevira Murcia municipality
- Concepción Velasco CISCO
- Juan Villa VIAJEST
- Patricia Zambudio Emisiones 00

#### Participants of the Newcastle scenario workshops:

- Graeme Armstrong Newcastle City Council
- Paul Armstrong Newcastle City Council
- Kate Coulthard Newcastle City Council
- Kit England Newcastle City Council
- Chris Goodhand Northern Powergrid
- Kelly Graham Newcastle City Council
- Chris Hogg Northern Gas Networks
- Simon Johnson Newcastle City Council
- Allen Jones Newcastle City Council
- James Lowden Newcastle City Council
- Pdraig Lyons Newcastle University
- Adrian McLoughlin Newcastle City Council
- Sam Neill Newcastle University
- Claire Prospert Newcastle City Council
- Steve Smith Newcastle City Council
- Colin White Newcastle City Council

#### Participants of the Palermo scenario workshops:

- Vincenza Conigliaro Comune di Palermo
- Mario Ferrante Universita' Di Palermo
- Patrizia Ferrante Universita' Di Palermo -Dipartimento Energia
- Maria Stella Mangiarotti C/Mare Golfo
- Antonio Mazzon Comune di Palermo
- Ernesta Morabito Italia Nostra
- Antonino Picone Paradox
- Giulio Pirrotta Arsnova - Italia Nostra - Comitato Ballaro' Significa Palermo
- Nunzio Salfi Comune di Palermo

#### Participants of the Sant Cugat scenario workshops:

- Jordi Abadal BCN Ecologia
- Elena Albareda UPC

- Angel Andreu Veolia
- Santiago Andrés Connatura
- Adriana Anguera Everis
- Kim Arcas Ciclica
- Alejandro Asensi Citelum
- Blanca Avellano UPC
- Joana Barbany Ajuntament Sant Cugat del Vallès
- Jordi Barot Interlands
- Araceli Belmonte Ajuntament Sant Cugat del Vallès
- Eduard Benasques Everis
- Dani Bennasar Citelum
- Ignasi Bonet Ajuntament Sant Cugat del Vallès
- Mikel Borrás IDP
- Eloi Burriel l'Origen
- Eduard Calderon Inergybcn
- Ignacio Campo Villa Valoriza
- Ruben Cánovas Everis
- Jessica Carballo Clece
- Marc Castella Eurecat
- Santi Coca Ajuntament Sant Cugat del Vallès
- Fran Comino Wattia
- Gonçal Costa La Salle
- Albert Daví Moba
- Pau Drago Citelum
- Pau Duran Duran Arquitectes
- Marg Egea Optimene
- Andres El-Fakdi UdG
- Eva Español Edenway
- Albert Estival SOREA
- Francesc Estrada Veolia
- Carme Ferrer Ajuntament Sant Cugat del Vallès
- Joan Gil El Cedre
- Almudena Gonzalez Ajuntament Sant Cugat del Vallès
- Cesar González El Cedre
- Mario Heredero Eurecat
- David Hernández Ajuntament Sant Cugat del Vallès
- Konstantinos Kampouropoulos Eurecat
- Josep Lopez Gaja Valoriza
- Victor Martínez Ajuntament Sant Cugat del Vallès
- Francesc Massana Effilogics
- Torsten Masseck UPC
- Moises Morató BCN Ecologia
- Albert Muratet Ajuntament Sant Cugat del Vallès
- Joan Naval Ajuntament Sant Cugat del Vallès
- Marta Oliver Ajuntament Sant Cugat del Vallès
- Cristina Paraira Ajuntament Sant Cugat del Vallès
- Joan Pons Citelum
- Joan Puigdomenech Ajuntament Sant Cugat del Vallès


• Josep Antoni Ramon	UdG
• Gerard Riba	Ajuntament Sant Cugat del Vallès
• Víctor Romera	Citelum
• Carlos Rubio	Valoriza
• Pau Soler	Opticits
• Jordi Torrijos	Ajuntament Sant Cugat del Vallès
• Jelle Bart Van Breest	IDP
• Isa Vega	UPC
• Albert Vidal	Effilogics
• Alberto Vilardell	Citelum
• Climent Vilatersana	Moba

#### Participants of the Tallinn scenario workshops:

• Jaagup Ainsalu	Tallinn Transport Department
• Dago Antov	Tallinn University of Technology
• Pille Arjakas	Tallinn Energy Agency
• Rasmus Armas	Elektrilevi Ltd
• Andres Jaadla	Estonian Union of Co-operative Housing Associations
• Mari Jüssi	Stockholm Environment Institute
• Targo Kalamees	Tallinn University of Technology
• Anu Kalda	Tallinn Transport Department
• Tõnu Karu	Tallinn Energy Agency
• Ülo Kask	Tallinn University of Technology
• Janno Kauts	Tallinn City Office
• Kristel Kibus	Tallinn City Office
• Kerli Kirsimaa	Stockholm Environment Institute Tallinn Centre
• Tiit Laiksoo	Tallinn Transport Department
• Hannu Lamp	Environmental Investment Centre
• Liivar Luts	Tallinn Transport Department
• Andres Meesak	Estonian Solar Energy Association
• Viljar Meister	Tallinn City Office
• Väino Olev	Tallinn City Office
• Kaarel Põldemaa	Tallinn Transport Department
• Triin Sakermäe	Tallinn Environment Department
• Marit Sarapuu	Tallinn Transport Department
• Kaur Sarv	Ministry of Economic Affairs and Communications
• Martin Siimer	Tallinn City Property Department
• Jaanus Uiga	Civitta Ltd
• Andrus Väärtnõu	Ministry of Economic Affairs and Communications
• Lembit Vali	Estonian Development Fund
• Terje Villemi	Harju Public Transport Centre

#### The participants of the R4E Joint Vision workshop:

• Jaagup Ainsalu	Tallinn Energy Agency
• Ali Bayındır	Istanbul Metropolitan Municipality
• Stefano Bazzocchi	Municipality of Forlì
• Bernadette Bergsma	City of Eindhoven
• Fatih Canitez	Istanbul Metropolitan Municipality-IETT
• Vincenza Conigliaro	City of Palermo
• Maria Cruz Ferreira	Ayuntamiento de Murcia
• Esmâ Dilek	Istanbul Metropolitan Municipality
• Wouter van Galen	TU/e
• Anja Hannema	City of Eindhoven
• Seyma Istengir	Istanbul Metropolitan Municipality
• Ugur Kızılok	Istanbul Metropolitan Municipality
• Victor Martinez	City of Sant Cugat
• Torsten Maseck	UPC
• Antonio Mazzan	City of Palermo
• Adrian McLoughlin	Newcastle City Council
• Delia Mitcan	City of Eindhoven
• Villu Pella	Tallinn Energy Agency
• Luuk Postmes	City of Eindhoven
• Francesca Ravaioli	Municipality of Forlì
• Gerard Riba	City of Sant Cugat
• Jaime Ruiz Huescar	Ayuntamiento de Murcia
• Yavuz Yalçın	Istanbul Metropolitan Municipality-IETT



**FUTURE SCENARIO EINDHOVEN 2050**  
Appendix A to D2.2 Report - Desired Future Scenarios

15 June 2018  
Lid van de GIESSEN & Lusk POSTHUIS, Diermaats Eindhoven  
Ewa DEN OUDEN & Jan-Joep RETZENS & Sjoera VALKENBURG, TU/e LightHouse

**R4E** ROADMAPS FOR ENERGY



**FUTURE SCENARIO FORLÌ 2050**  
Appendix B to D2.2 Report - Desired Future Scenarios

15 June 2018  
Francesco DRACOLI & Stefano RAZZICCHI, Comune di Forlì  
Ewa DEN OUDEN & Jan-Joep RETZENS & Sjoera VALKENBURG, TU/e LightHouse


**R4E** ROADMAPS FOR ENERGY



**FUTURE SCENARIO ISTANBUL 2050**  
Appendix C to D2.2 Report - Desired Future Scenarios

15 June 2018  
Ezra DÜZÜN & Uğur KIZILDIR, Istanbul Metropolitan Municipality (IMM)  
Ewa DEN OUDEN & Jan-Joep RETZENS & Sjoera VALKENBURG, TU/e LightHouse

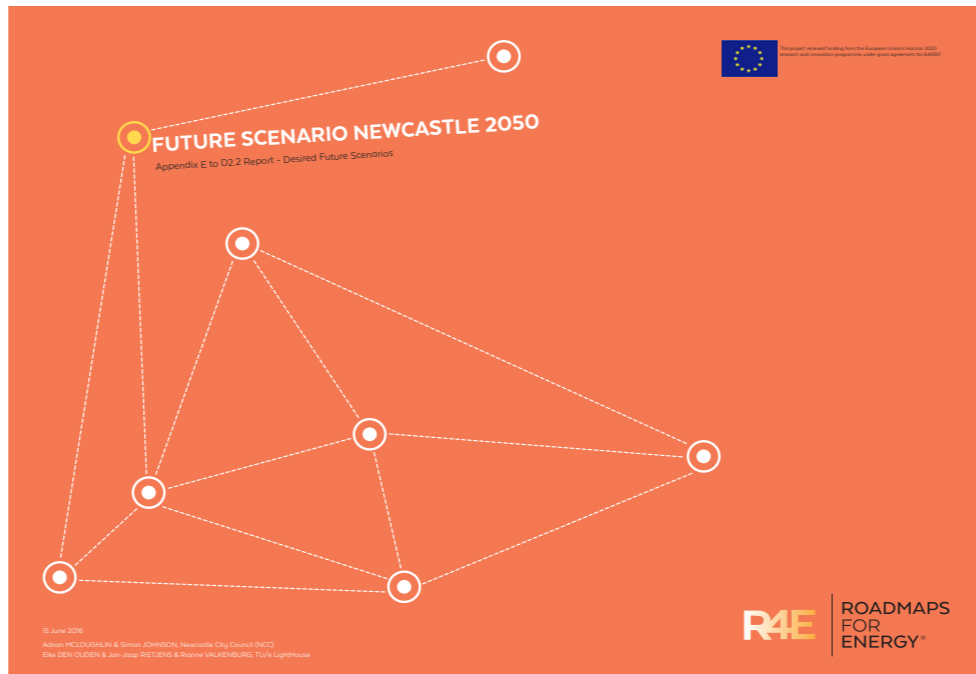
**R4E** ROADMAPS FOR ENERGY



**FUTURE SCENARIO MURCIA 2050**  
Appendix D to D2.2 Report - Desired Future Scenarios

15 June 2018  
Jaime DUZ HUESCAR & María Cruz FERRERA COSTA, Ayuntamiento de Murcia  
Ewa DEN OUDEN & Jan-Joep RETZENS & Sjoera VALKENBURG, TU/e LightHouse


**R4E** ROADMAPS FOR ENERGY



**FUTURE SCENARIO NEWCASTLE 2050**  
Appendix E to D2.2 Report - Desired Future Scenarios

15 June 2018  
Aidan MCLOUGHLIN & Simon JOHNSON, Newcastle City Council (NCC)  
Ewa DEN OUDEN & Jan-Joep RETZENS & Sjoera VALKENBURG, TU/e LightHouse

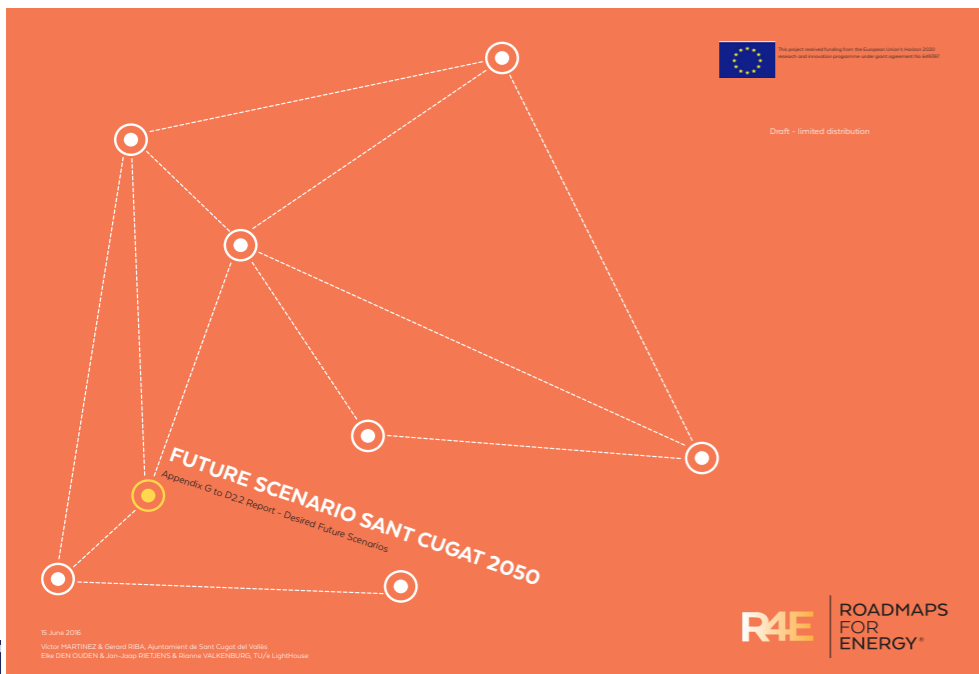
**R4E** ROADMAPS FOR ENERGY



**FUTURE SCENARIO PALERMO 2050**  
Appendix F to D2.2 Report - Desired Future Scenarios

15 June 2018  
Antonio MAZZON & Nunzio SAUPE, Comune di Palermo  
Ewa DEN OUDEN & Jan-Joep RETZENS & Sjoera VALKENBURG, TU/e LightHouse

**R4E** ROADMAPS FOR ENERGY



**FUTURE SCENARIO SANT CUGAT 2050**  
Appendix G to D2.2 Report - Desired Future Scenarios

15 June 2018  
Victor MARTINEZ & David DBA, Ajuntament de Sant Cugat del Valles  
Ewa DEN OUDEN & Jan-Joep RETZENS & Sjoera VALKENBURG, TU/e LightHouse

**R4E** ROADMAPS FOR ENERGY



**FUTURE SCENARIO TALLINN 2050**  
Appendix H to D2.2 Report - Desired Future Scenarios

15 June 2018  
Urvi PELLA & Jaagup ANSALU, Tallinn Raikonnimeeskond  
Ewa DEN OUDEN & Jan-Joep RETZENS & Sjoera VALKENBURG, TU/e LightHouse

**R4E** ROADMAPS FOR ENERGY

# APPENDICES

Appendices are published as separate reports.

- A - Future Scenario Eindhoven 2050
- B - Future Scenario Forlì 2050
- C - Future Scenario Istanbul 2050
- D - Future Scenario Murcia 2050
- E - Future Scenario Newcastle 2050
- F - Future Scenario Palermo 2050
- G - Future Scenario Sant Cugat 2050
- H - Future Scenario Tallinn 2050



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

# VISION DEVELOPMENT

## D2.2 Report – Desired future scenarios of the R4E partner cities

This report contains the results of the Vision Development (WP1) activities, for which scenario workshops have been held in each partner city. The goal of these workshops is to define the desired future scenarios for energy-related themes in general, and for the selected focus areas Smart Buildings, Smart Mobility and Smart Urban Spaces in particular. Workshops were conducted with policy-makers, strategy departments, overall project managers, department managers, external stakeholders and strategic partners to gain an in depth understanding of the desired future scenarios in the specific context of each city. In addition, a Joint Vision Workshop was held in Istanbul to share the visions and enable cross city learning. The R4E partners jointly defined the common needs in the desired future scenarios as input for the Roadmapping step.

This report is a deliverable of WP2 of the Roadmaps for Energy (R4E) project. The R4E partners work together to develop a new kind of energy strategy through visions and roadmaps for the eight partner cities in co-creation with local stakeholders. The project supports the development of visioning and roadmapping capacities within the municipalities to drive future development and implementation of innovative energy solutions.



ROADMAPS  
FOR  
ENERGY®