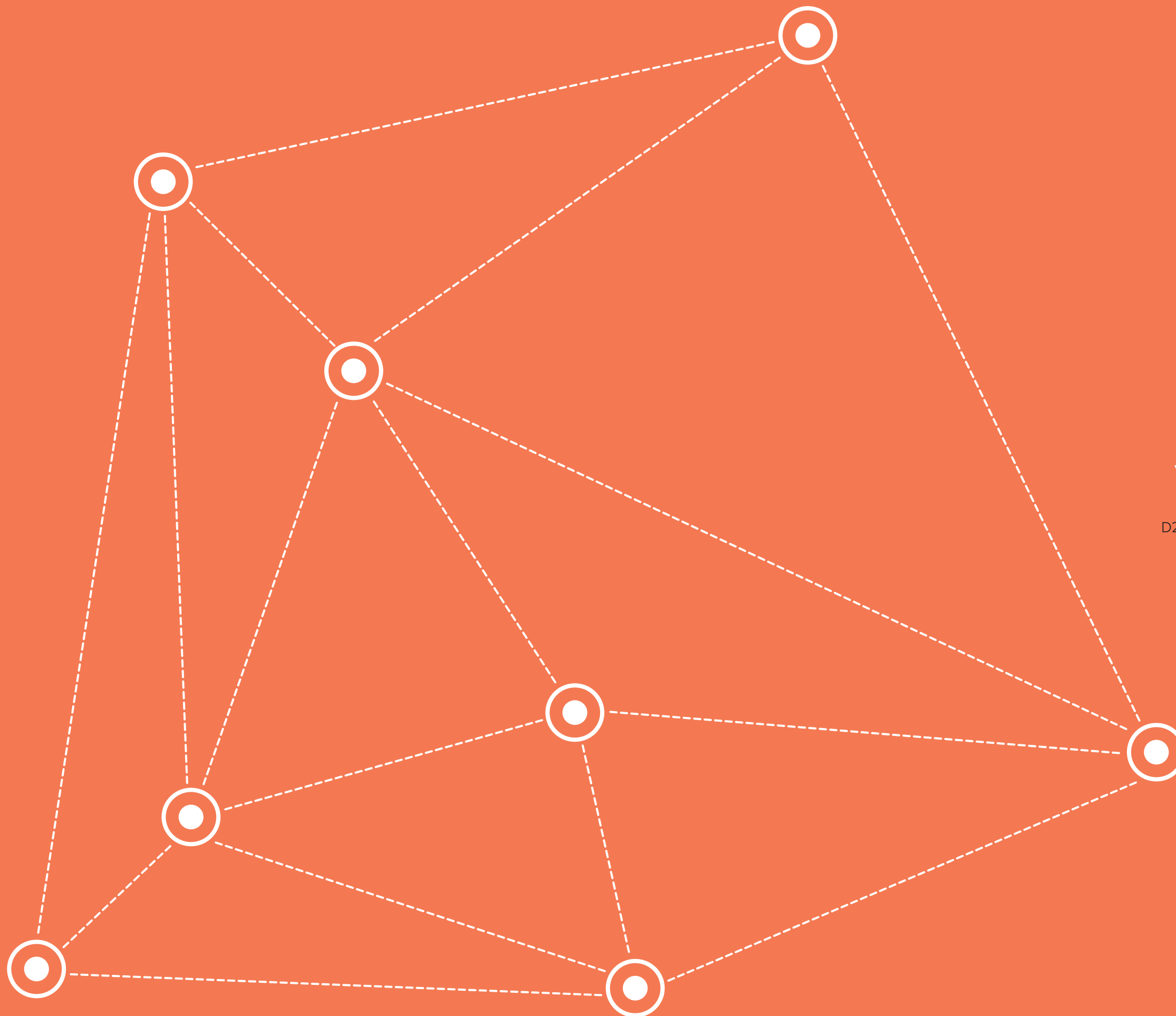




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VISION DEVELOPMENT

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

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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

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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).

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

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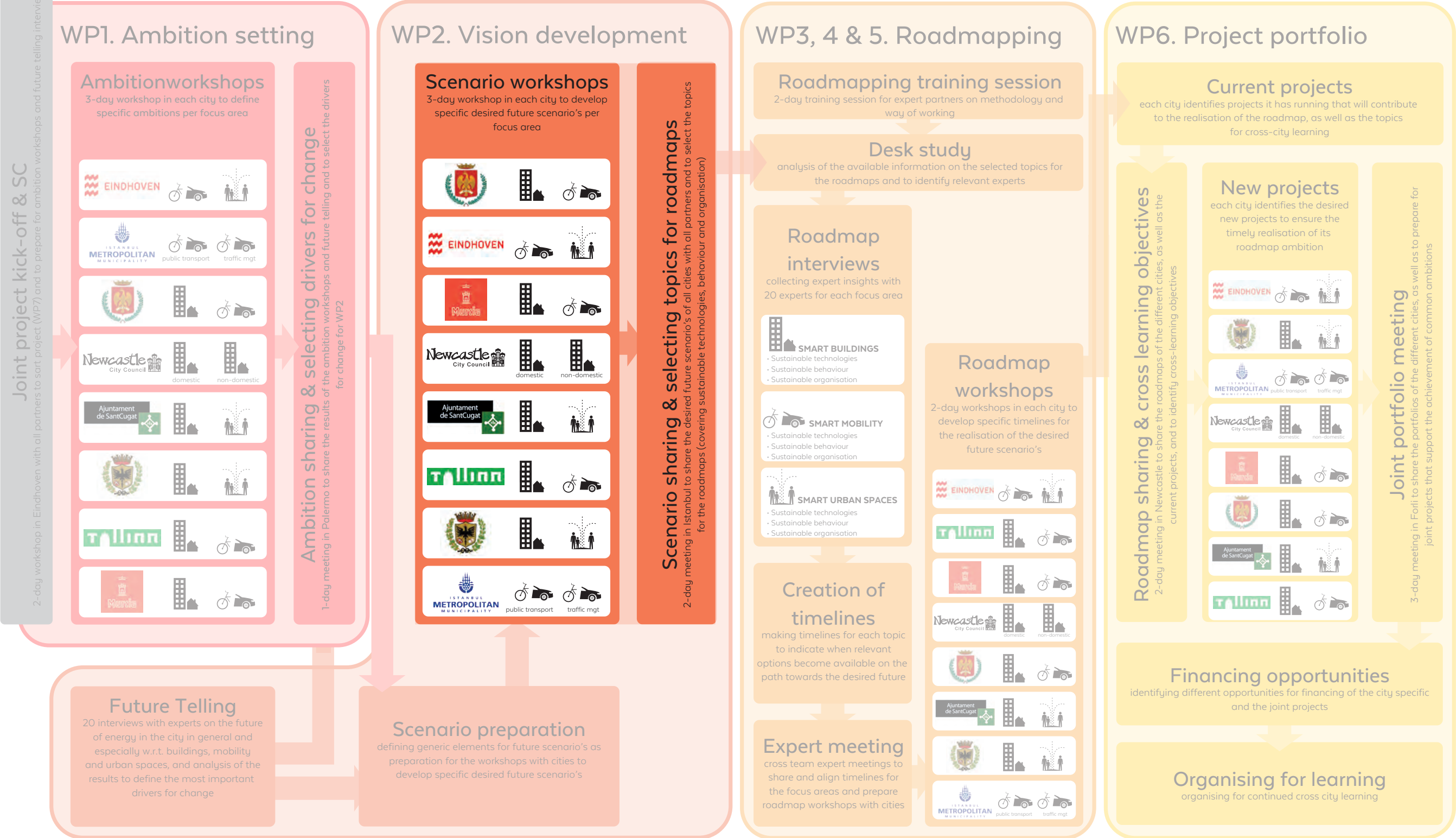
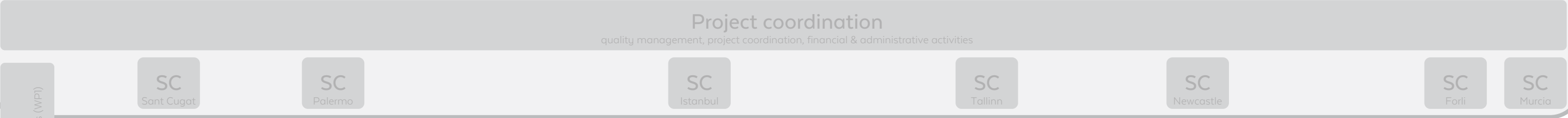
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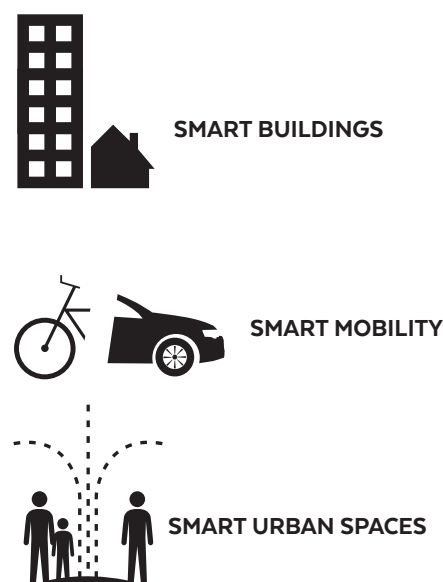
R4E - ROADMAPS FOR ENERGY

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.

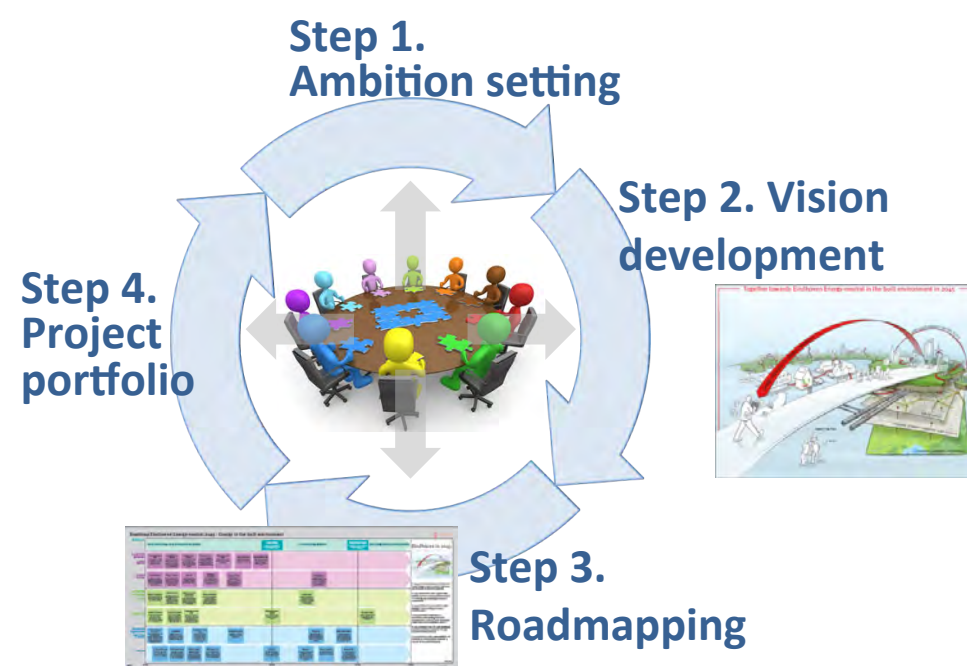
The ultimate aim is to create a process that will allow the partners to work together in developing the Energy Roadmap to achieve their 'Smart Cities' ambition. But energy and Smart Cities are too broad to cover in one project, so R4E focuses on three key areas of sustainable energy. These are closely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



Four step approach of R4E

Step Two: Vision Development

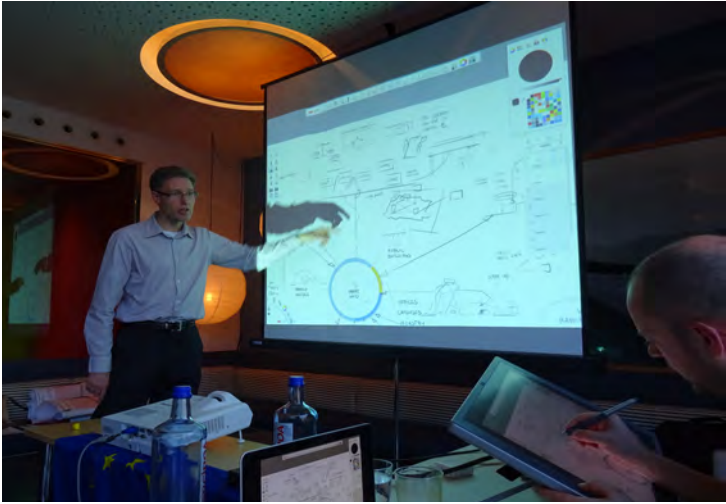
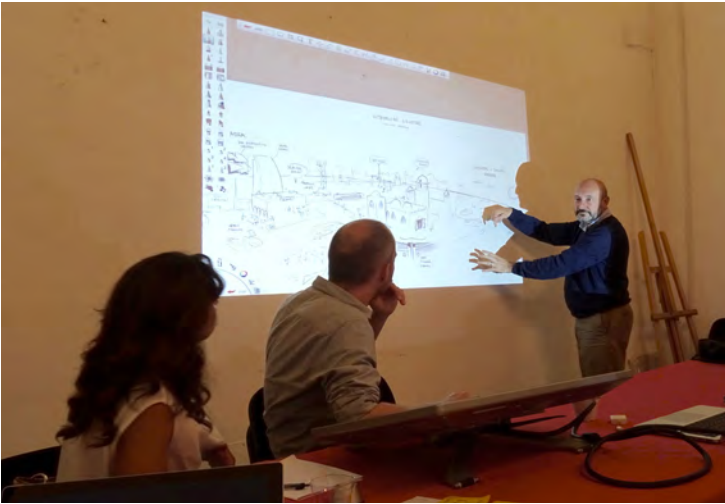
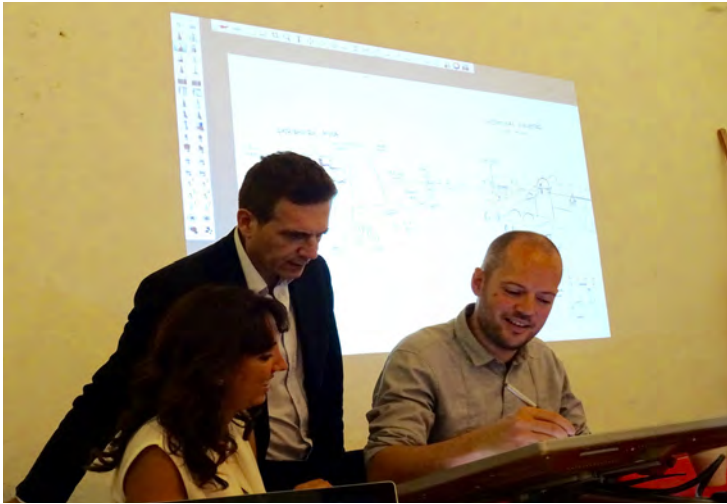
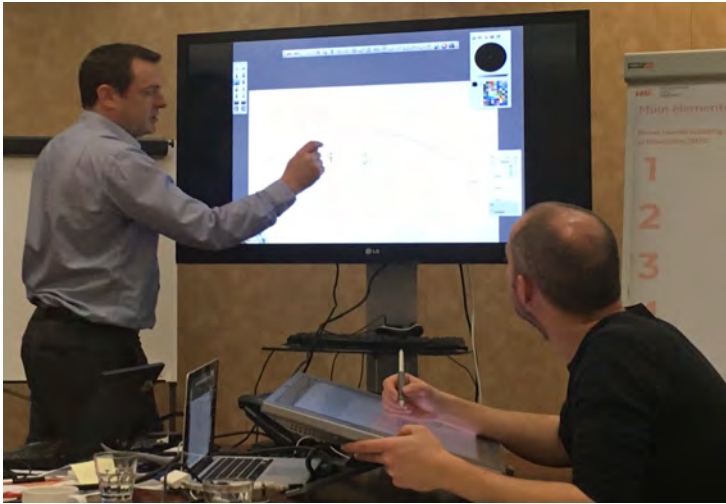
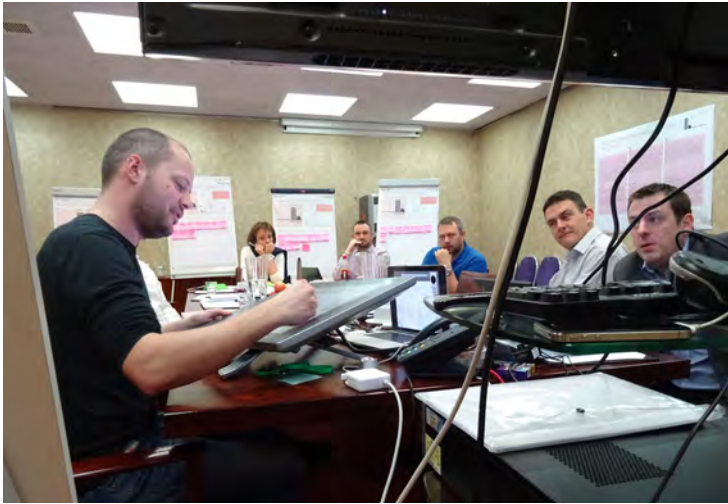
This report is part of Step 2 of the R4E project, and describes the second part of Work Package 2 (WP2). The aim of WP2 is to develop desired future scenarios for the cities in the selected focus areas. First of all, Future Telling interviews were held on sustainable energy in general, and on the themes 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).





DESIRED FUTURE SCENARIOS FOR SMART BUILDINGS

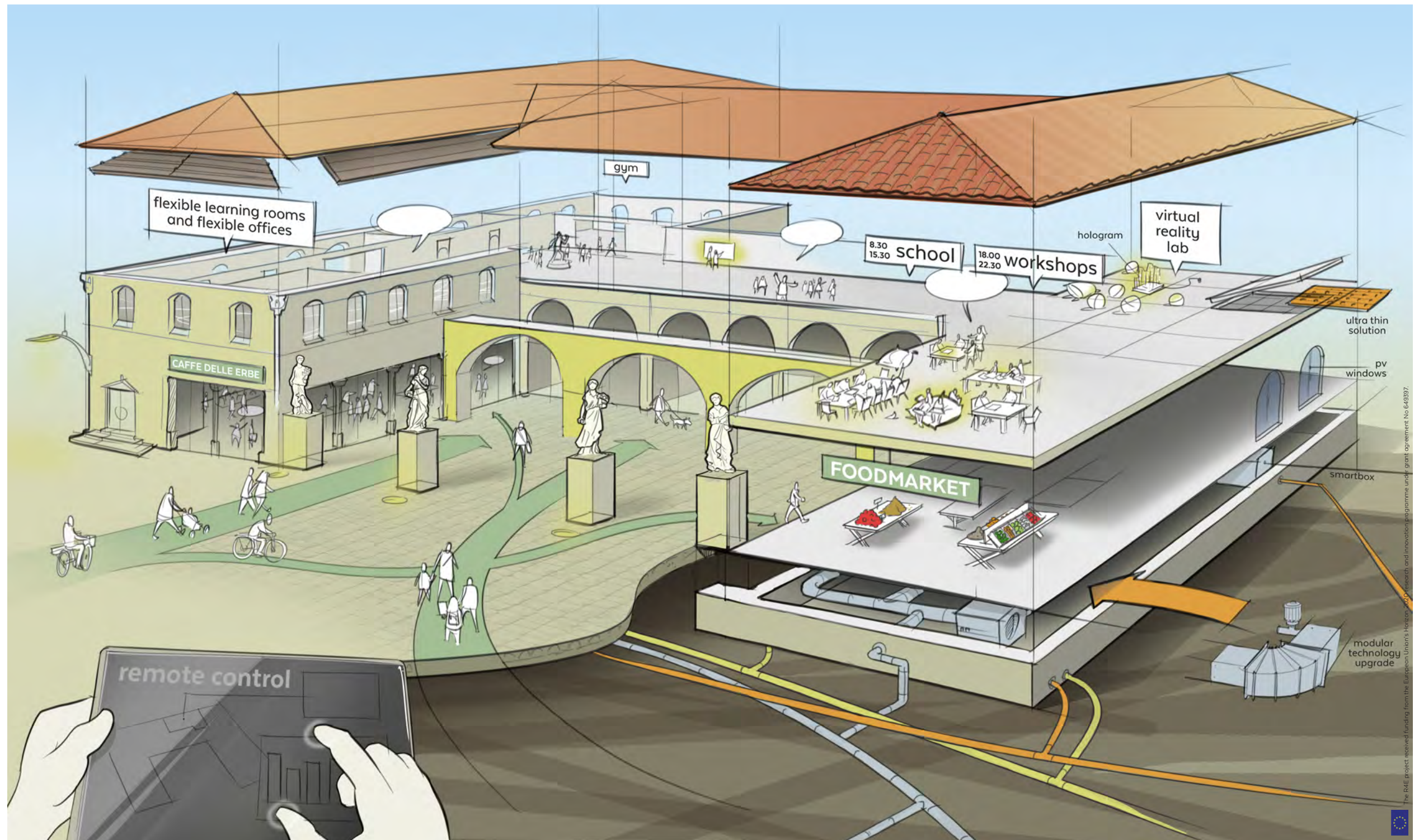


HISTORY MADE SMART IN FORLÌ 2050

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

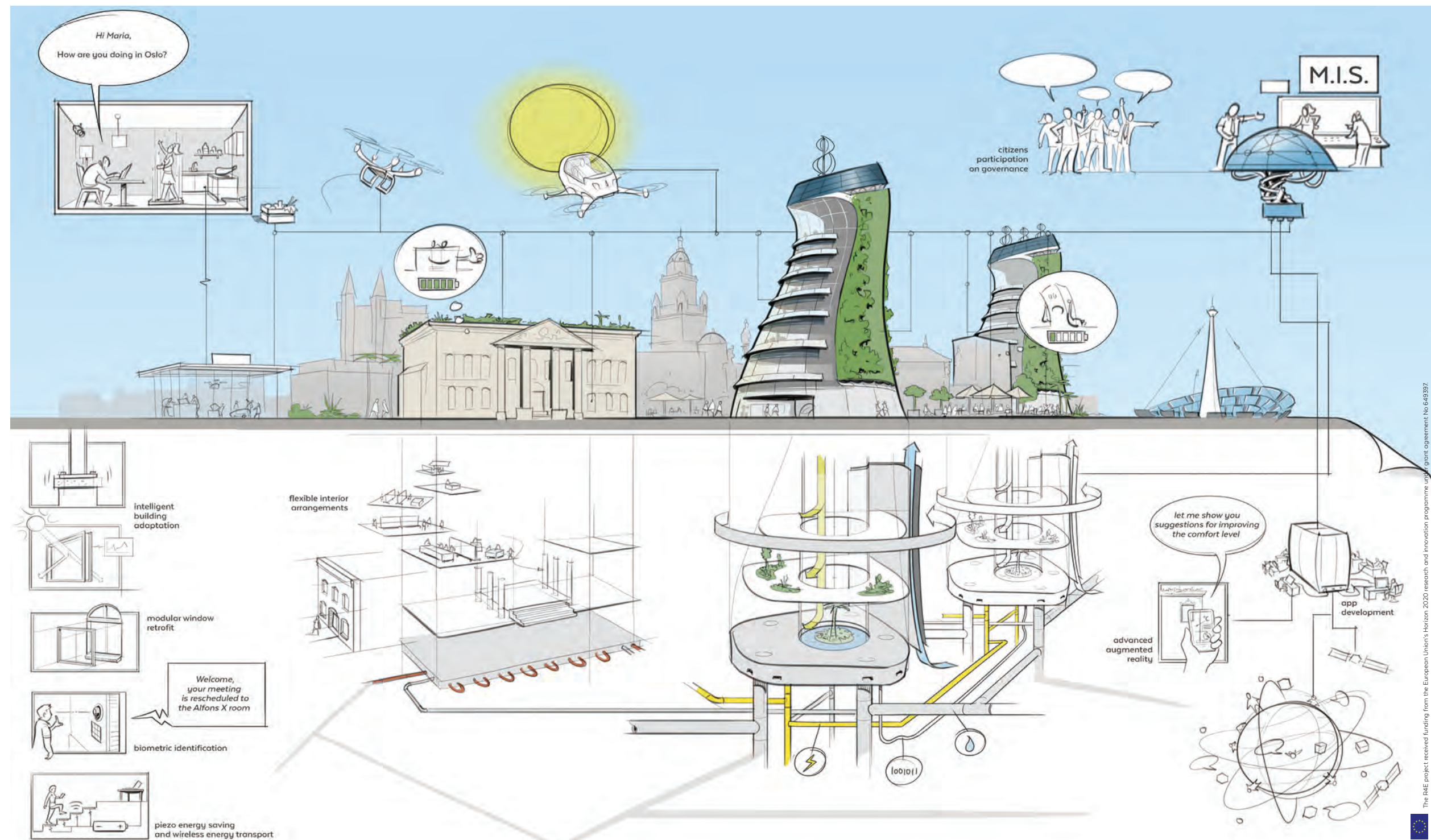
Good practices and leading examples are shared in the community and transformed into solutions for common use in other buildings. Public buildings (e.g. schools and hospitals) demonstrate the basic principles of sustainable construction and provide open platforms for citizens to engage in discussions 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 CO₂-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

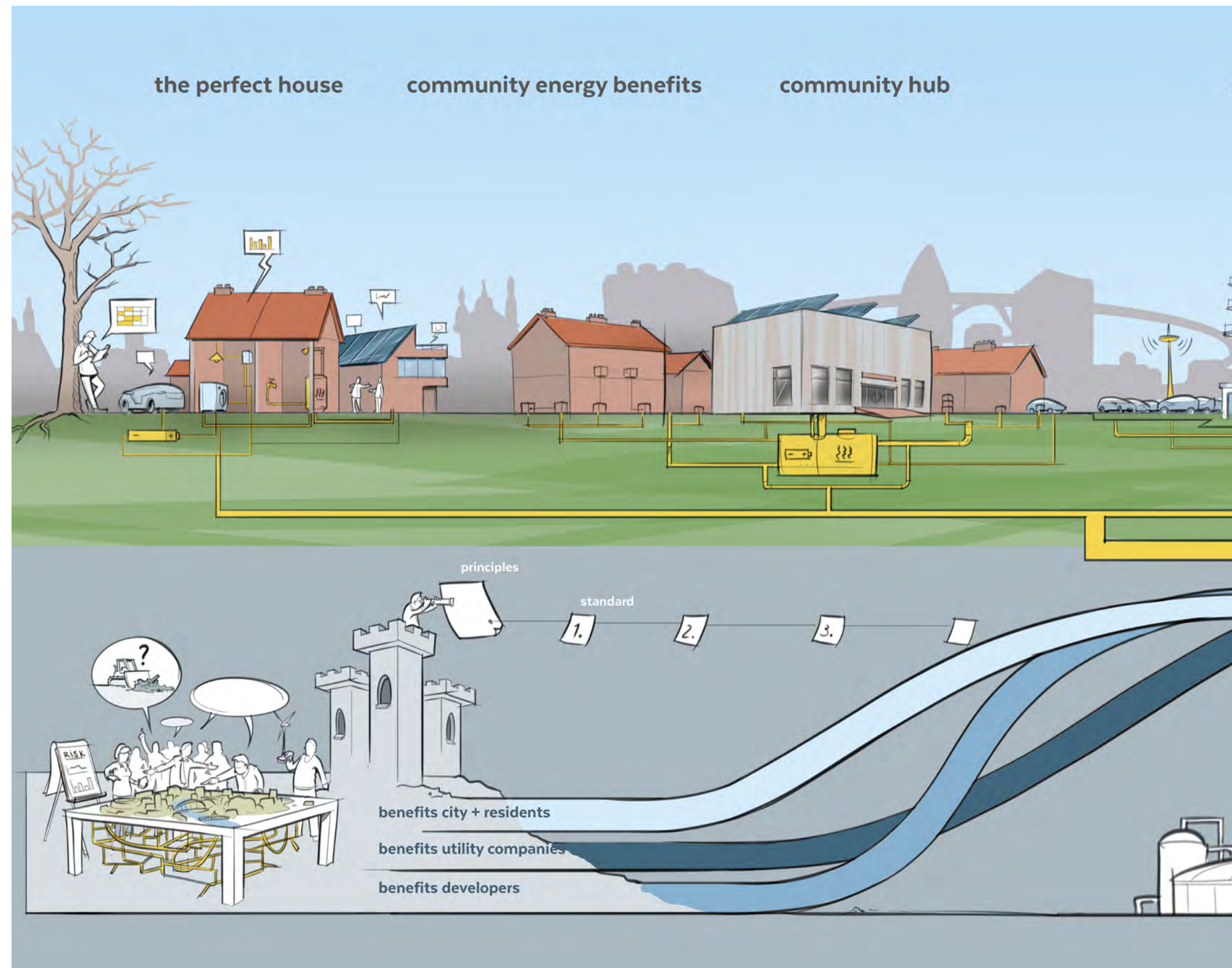
Infrastructure interconnects local grids for different energy sources, such as electricity, temperature control (heating and cooling), water and data, and connect the local grids to regional and national levels. Local grids enable communities to invest in and share sustainable solutions with peers, and 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.

Version 15 June 2016



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

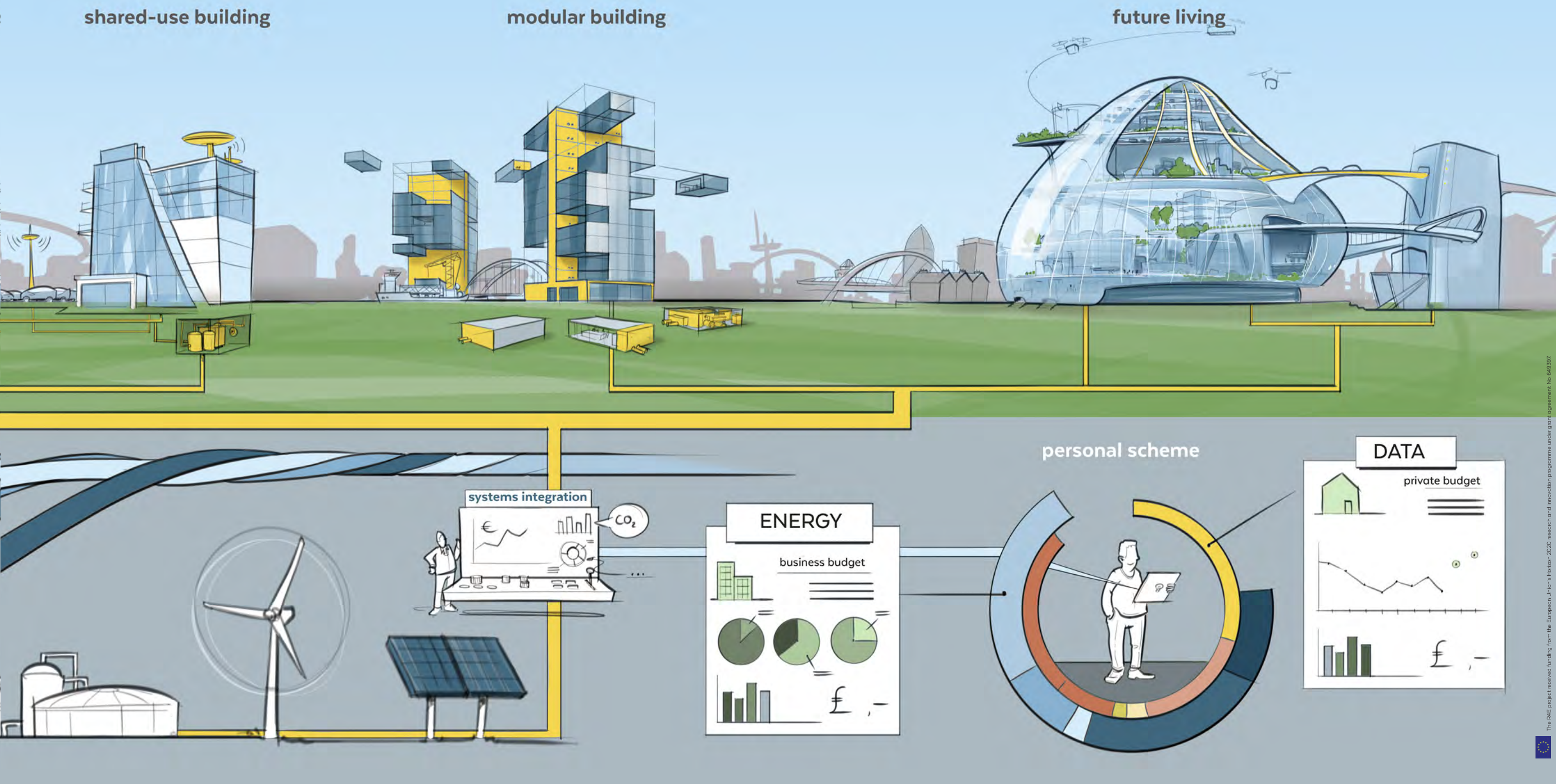
Policy-making and planning in Newcastle are based on a city-wide plan. This fully integrates all assets and their interactions, so the total impact on the surrounding can be considered. A collaborative approach together with all stakeholders drives alignment of information and leads to better decisions. 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.

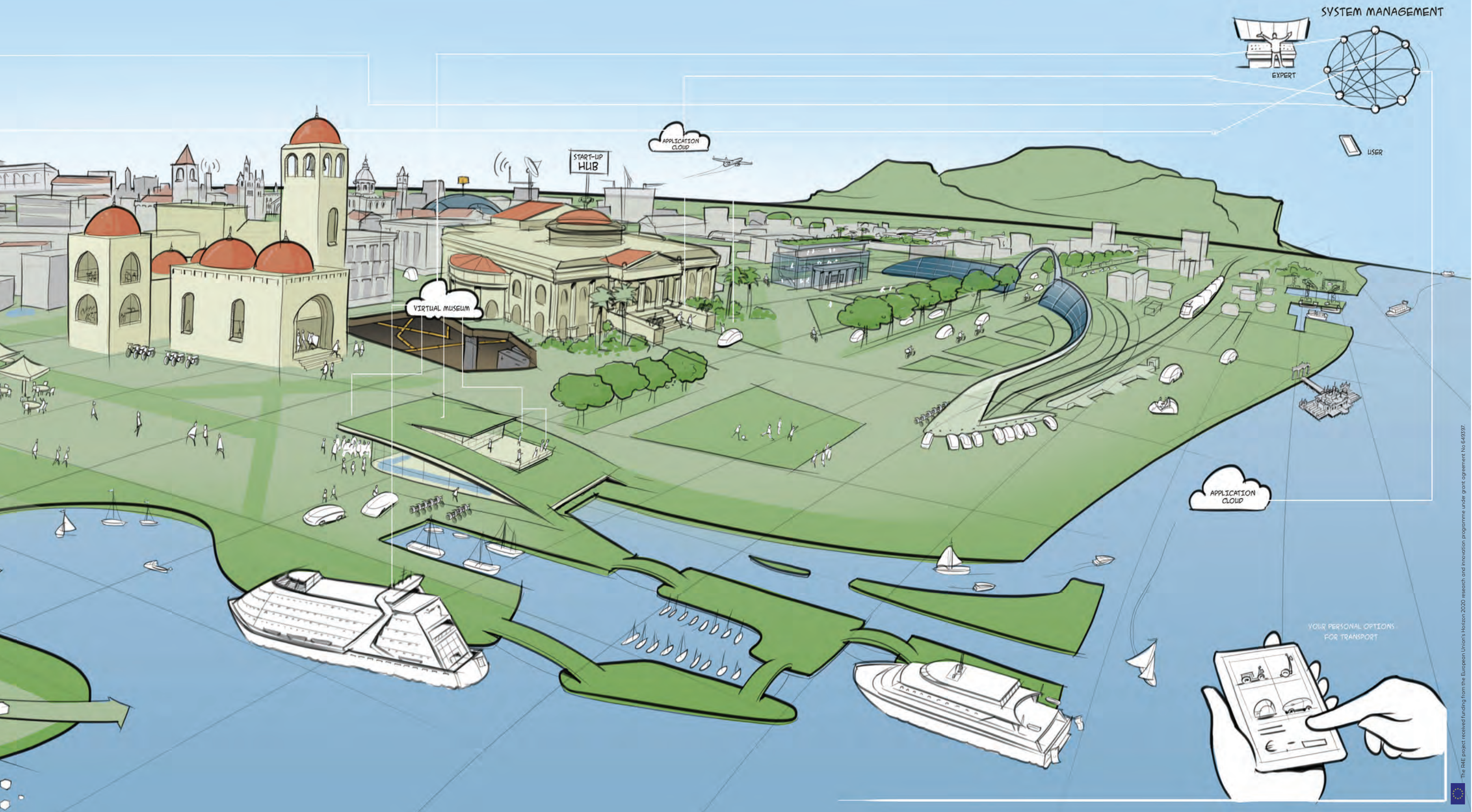
Energy infrastructure

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.

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.



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.

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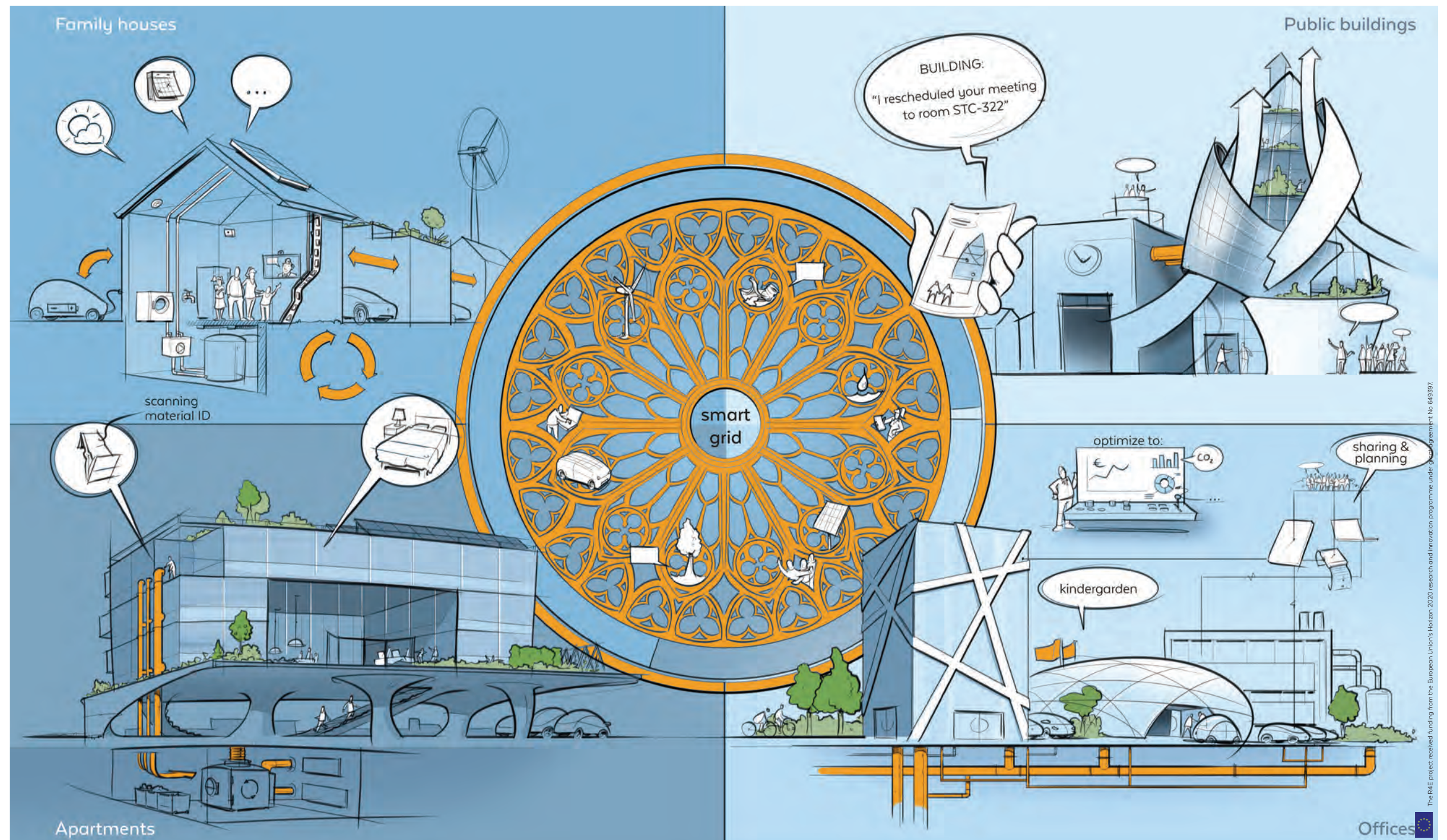
SMART CITIZENS ENJOY SMART BUILDINGS IN SANT CUGAT 2050

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.



The R4E project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 648397.

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

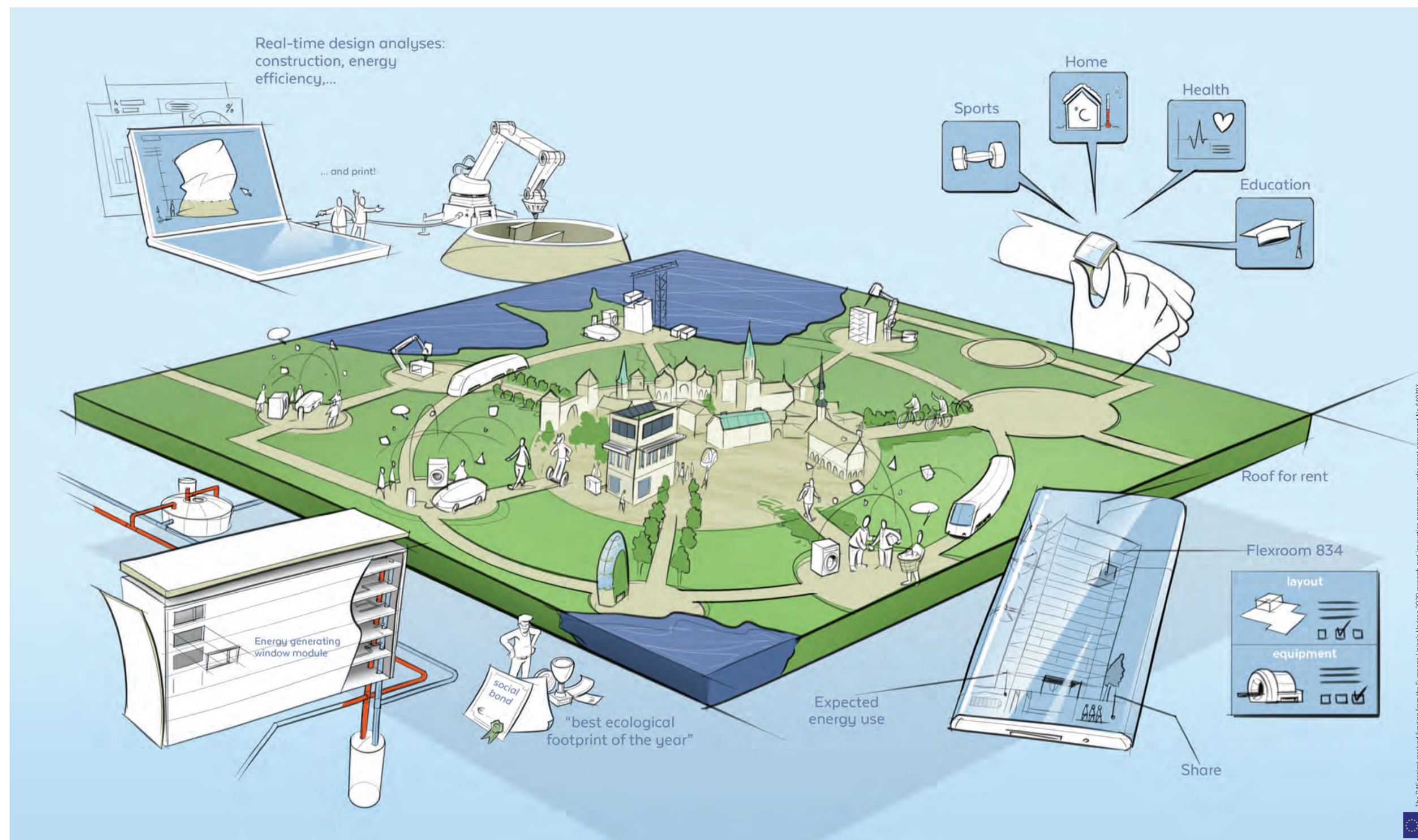
In 2050, a smart grid connects all buildings and public services. The system is accessible by all users and providers of energy, water and other resources (waste disposal). It allows users to choose from a range of available options. It brings together supply and demand, anticipating weather and other 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 CO₂-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 CO₂-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)

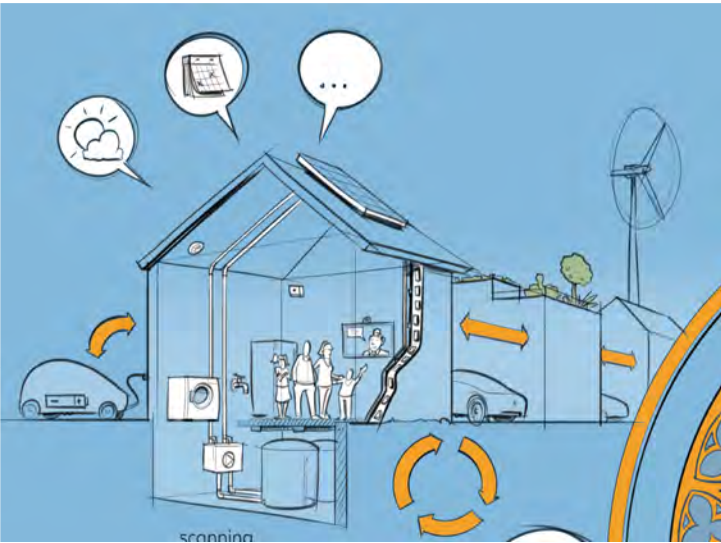
Energy-efficiency and sustainability

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

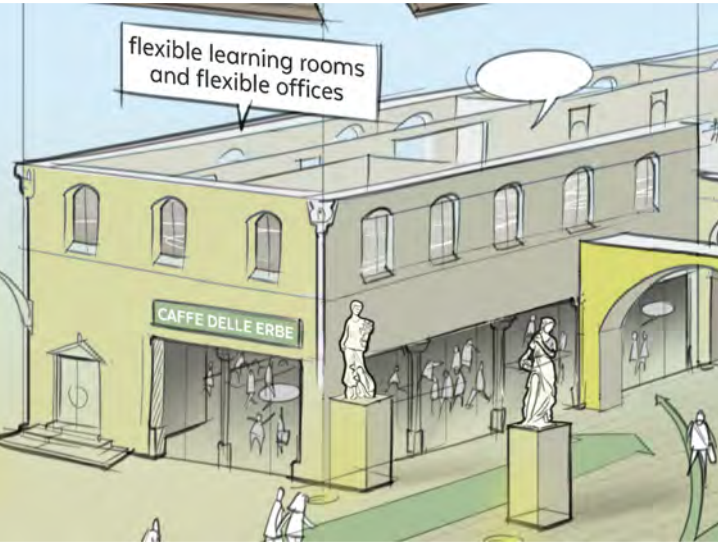
- people value their historical heritage: historical buildings are renovated with respect for their heritage, and have new uses that serve the community (F)
- each building has a different social and cultural background that is revived while it is transformed it to the needs of 2050: both the building 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 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)

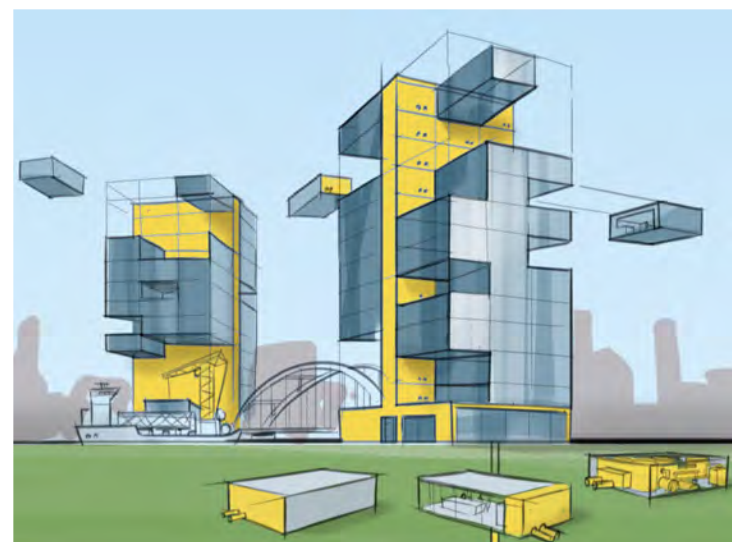
Enabling new (remote) services

- 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

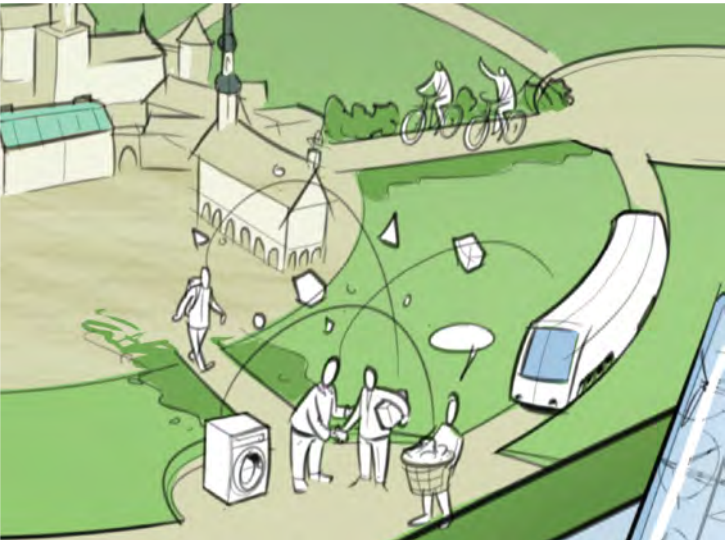
Community sharing

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 CO2-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 selfsufficient 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

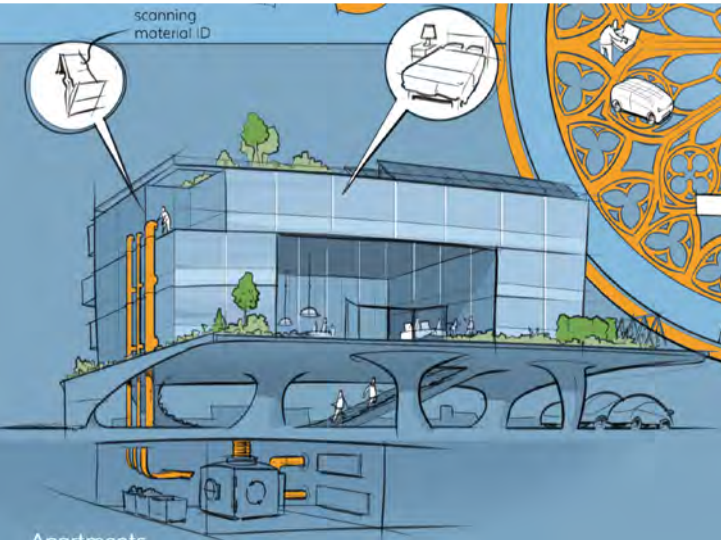
- individual energy schemes with personal roaming profiles allow the use of (wireless) energy and data where and when they are needed (N)
- Individual energy schemes with personal roaming profiles provide access to new services such as telecare or energy donations; the scheme enables localised trading,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

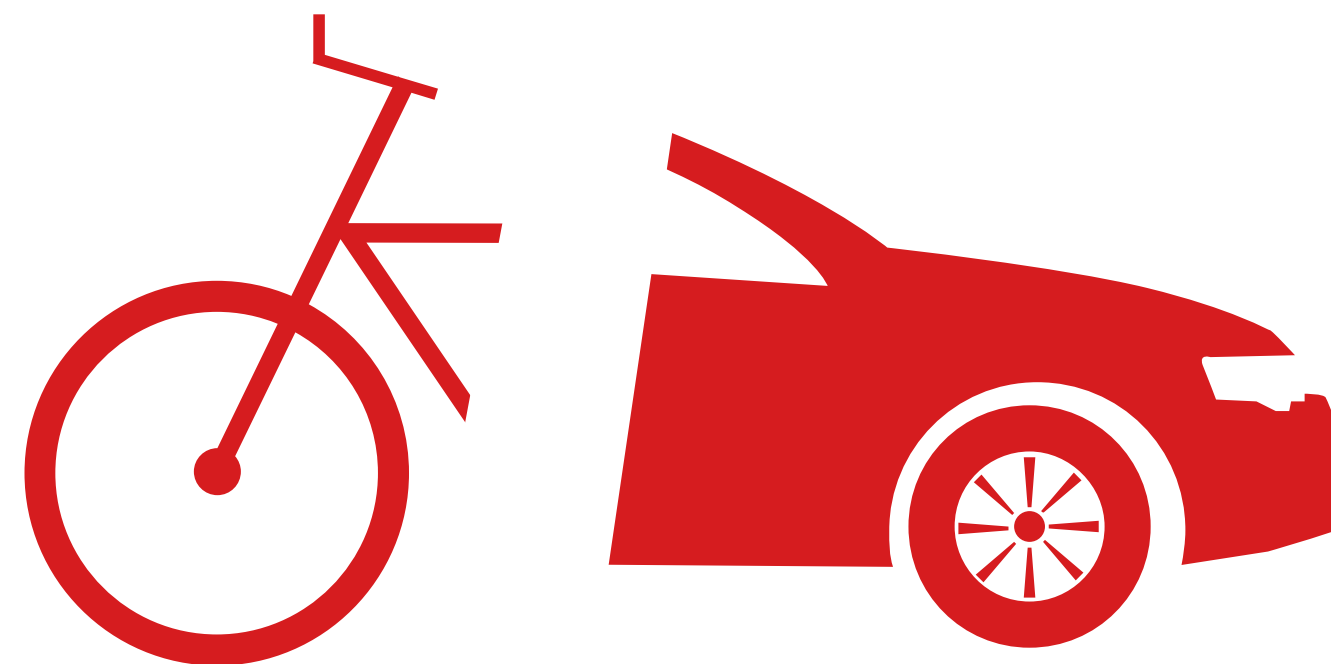
(Public buildings as) leading examples

- 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

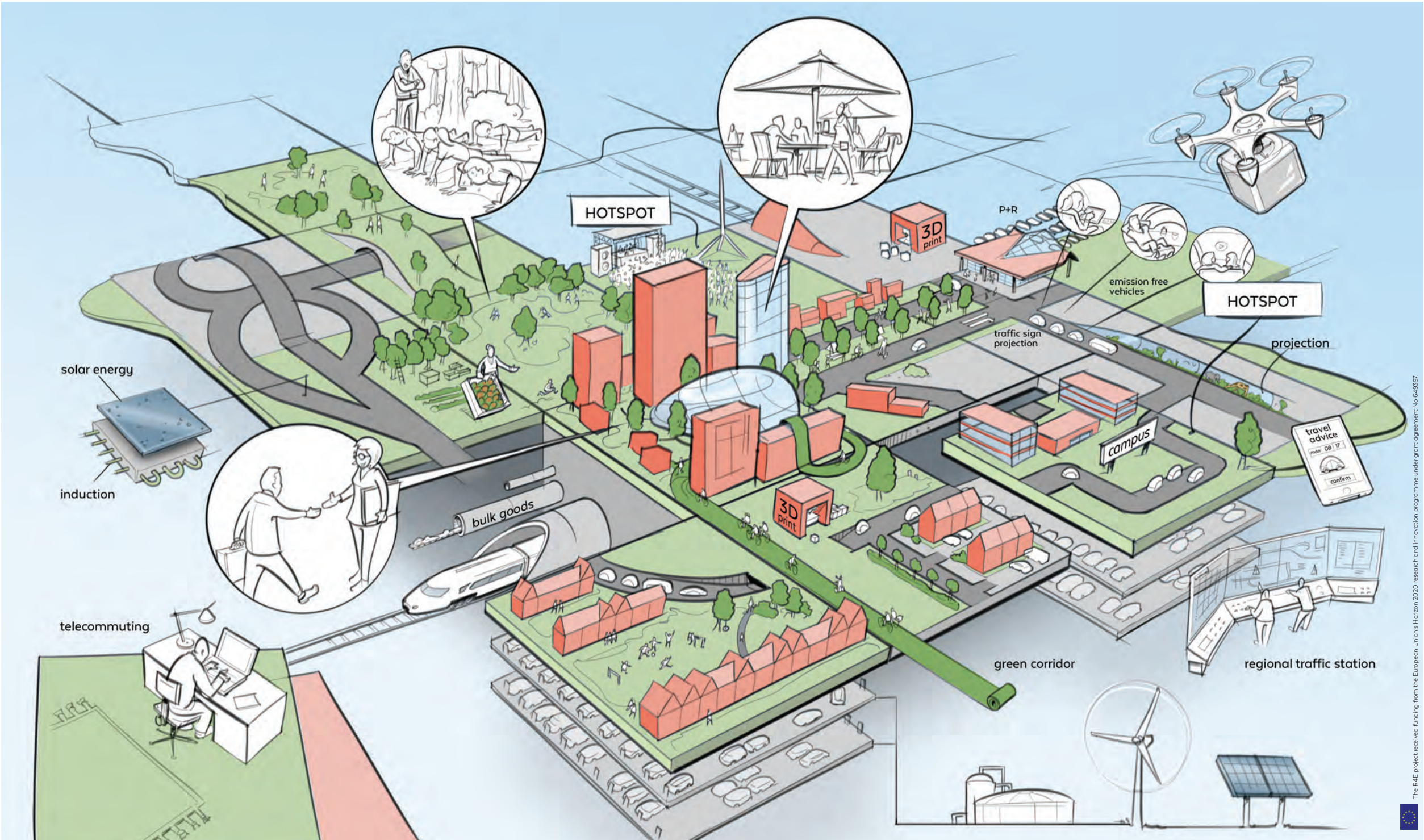


SMART, SUSTAINABLE MOBILITY IN EINDHOVEN 2050

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.



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.

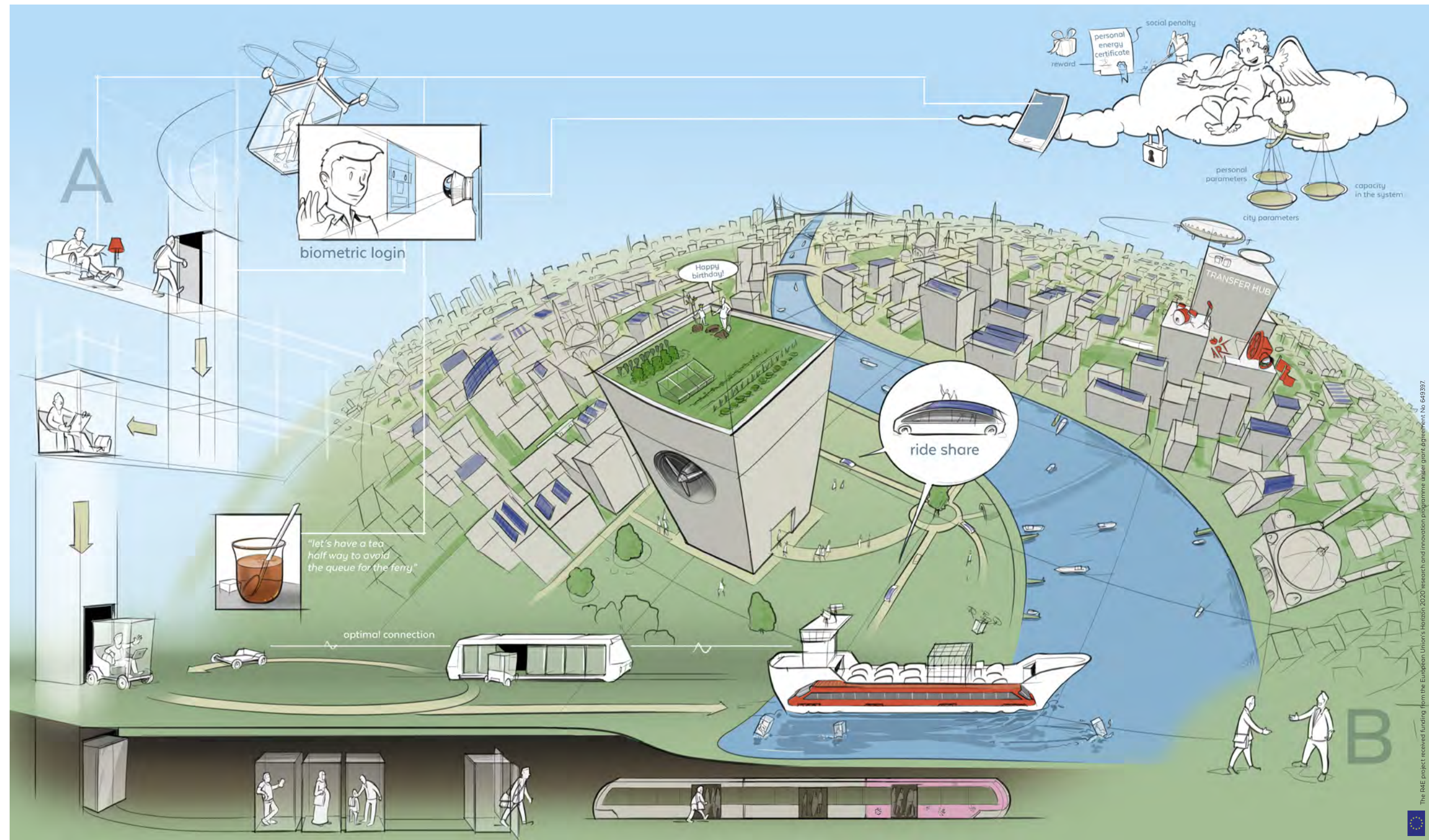
Local facilities

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.

The public transport systems use renewable energy resources.



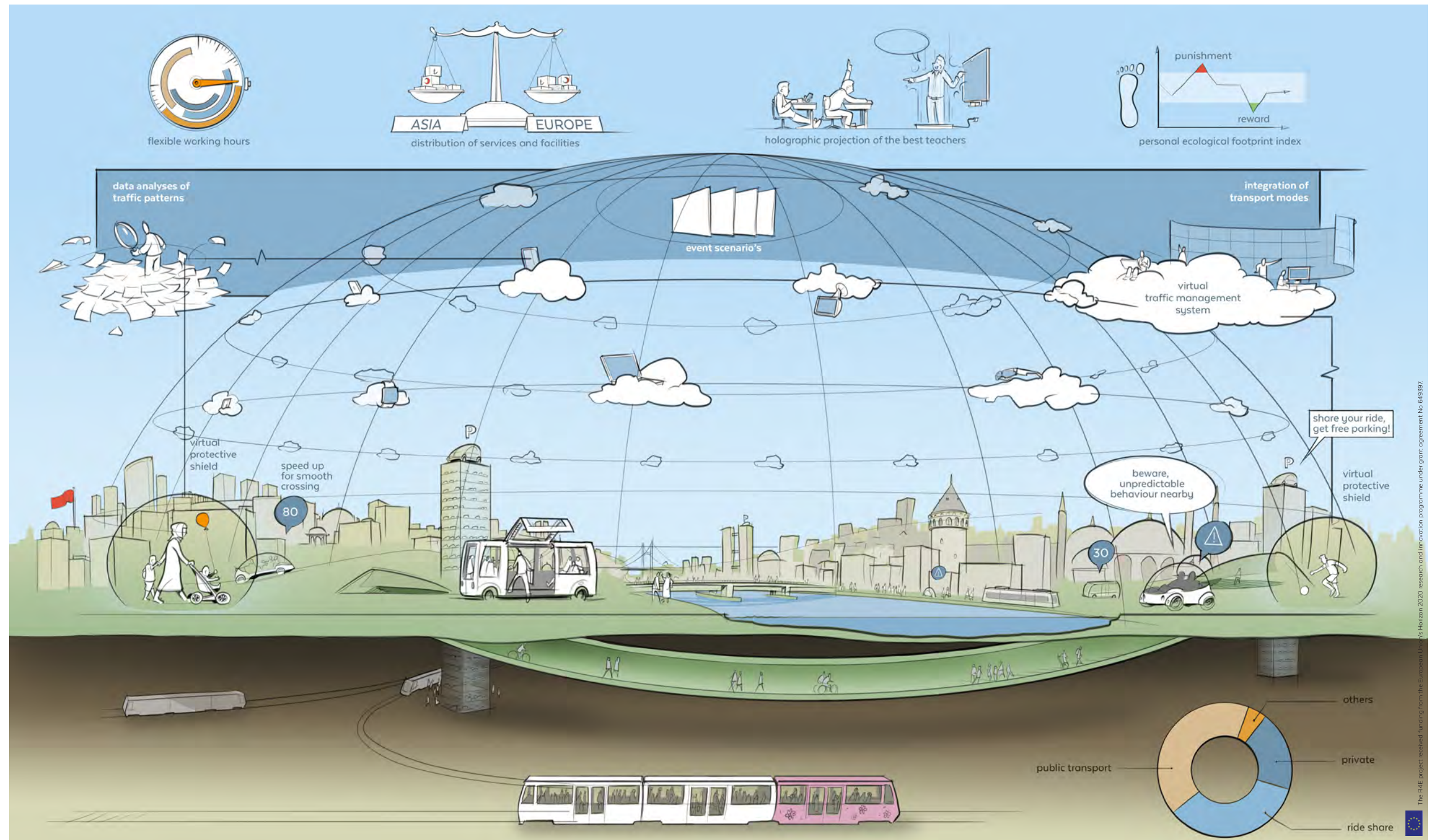
People feel comfortable and safe, because only the 'angels' have access to personal data. In 2050, the transport systems in Istanbul are also perceived as secure. For example, the biometric information used to identify people at entry points is also used to identify suspicious persons and activities. Personal data banks have a virtual shield to ensure confidentiality and privacy, and guard against hacking.

PERSONALISED, SMOOTH, SAFE TRAFFIC IN ISTANBUL 2050

In 2050, individual travellers in Istanbul are valued and facilitated by personalised travel advice. 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

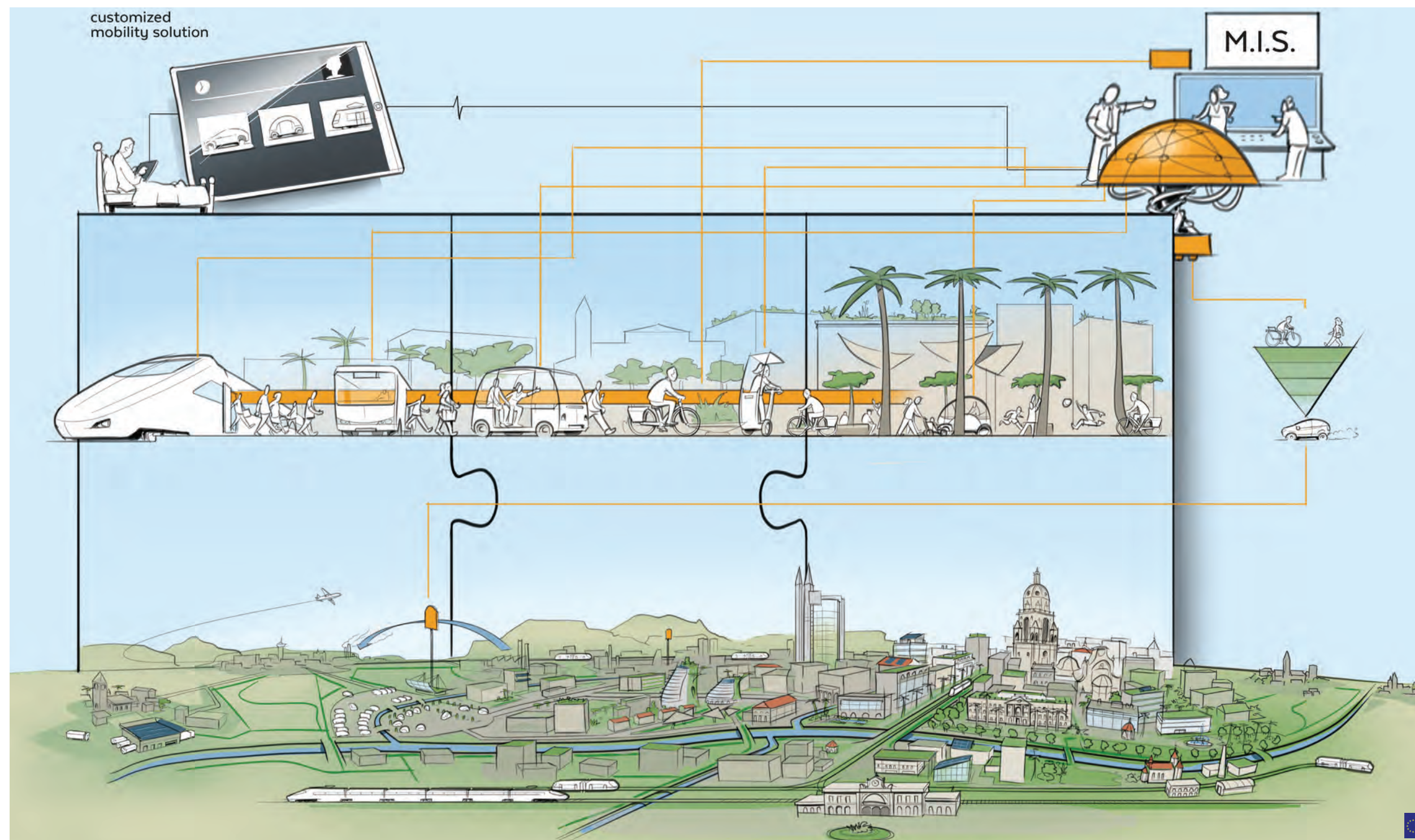
In 2050, people in the Murcia region enjoy a safe and clean city, with green and healthy areas and safe and clean mobility solutions.

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'.

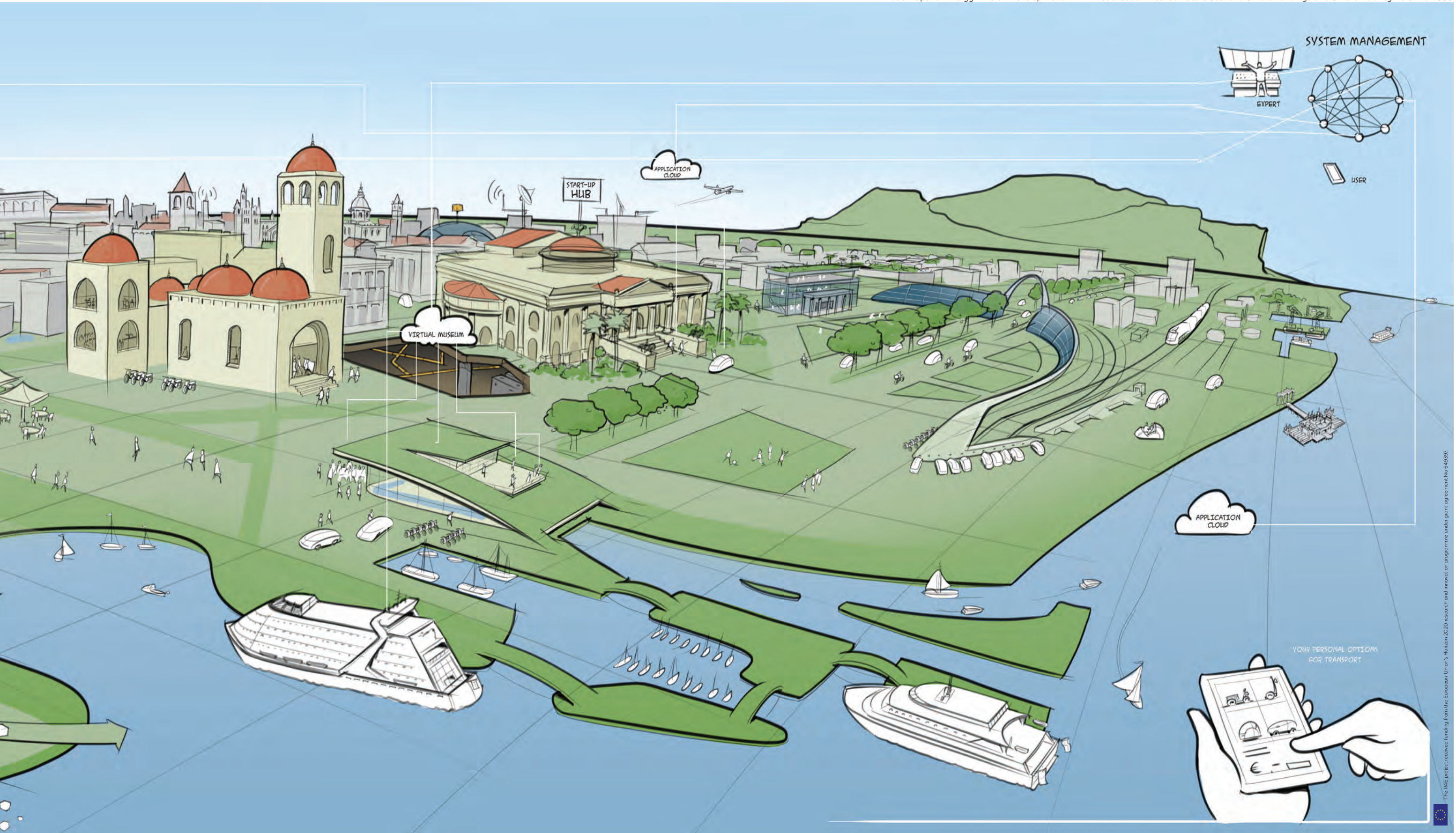
Master Intelligent System

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.

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.



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.

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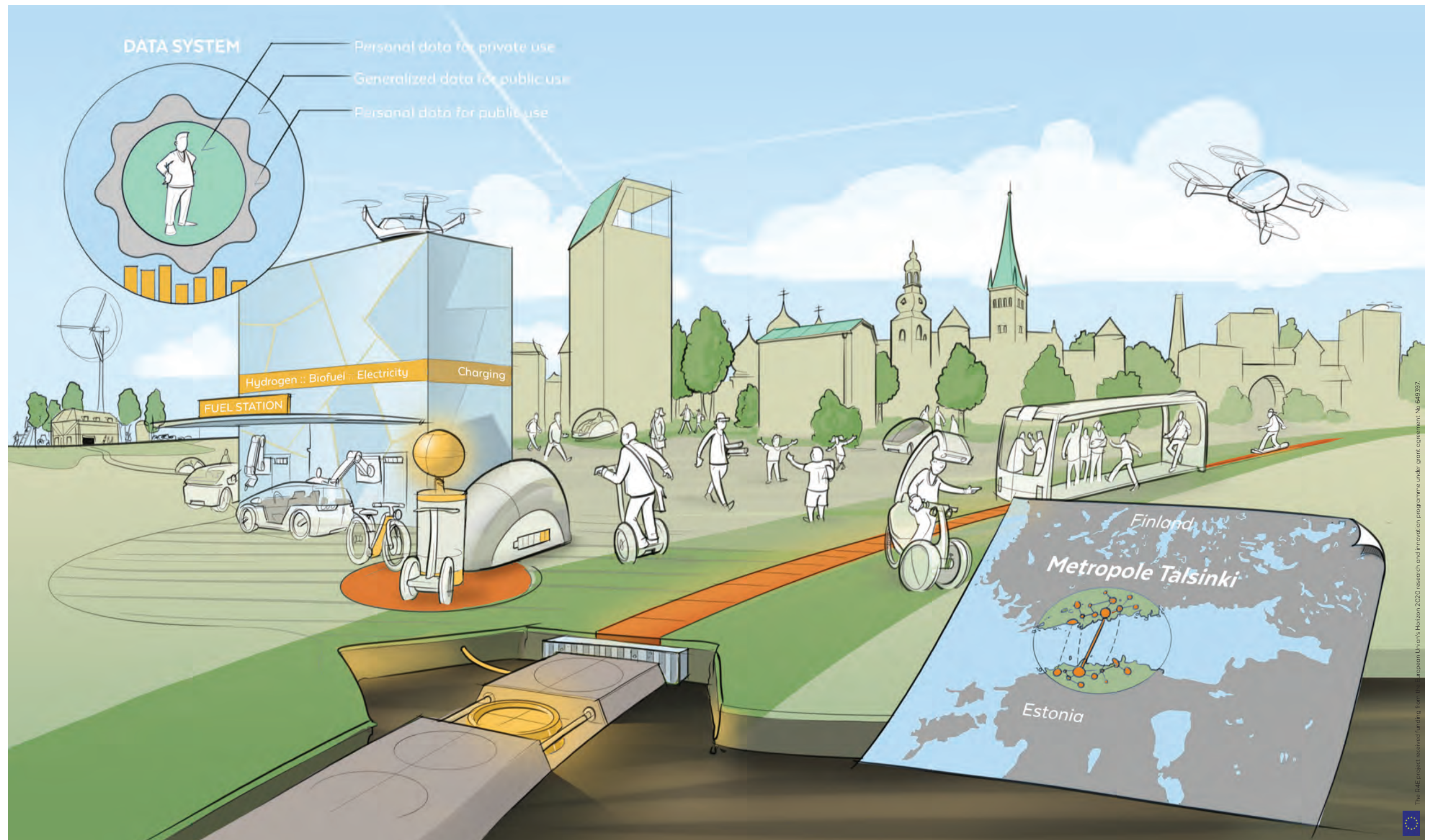


SMART MOBILITY ENABLES AN ENJOYABLE LIVING ENVIRONMENT IN TALLINN 2050

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

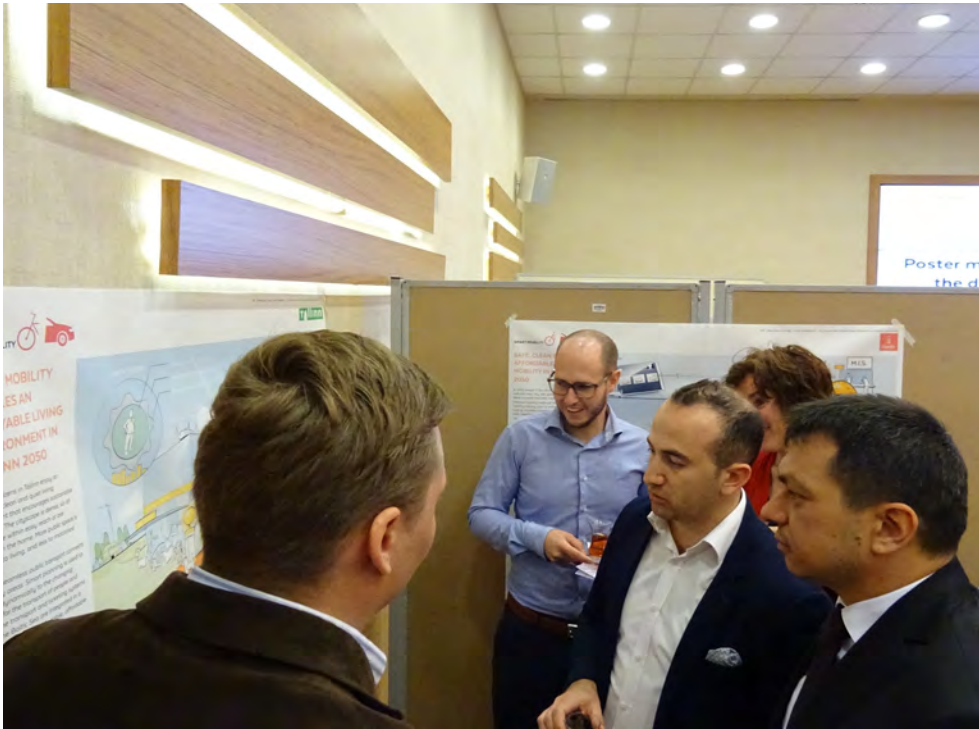
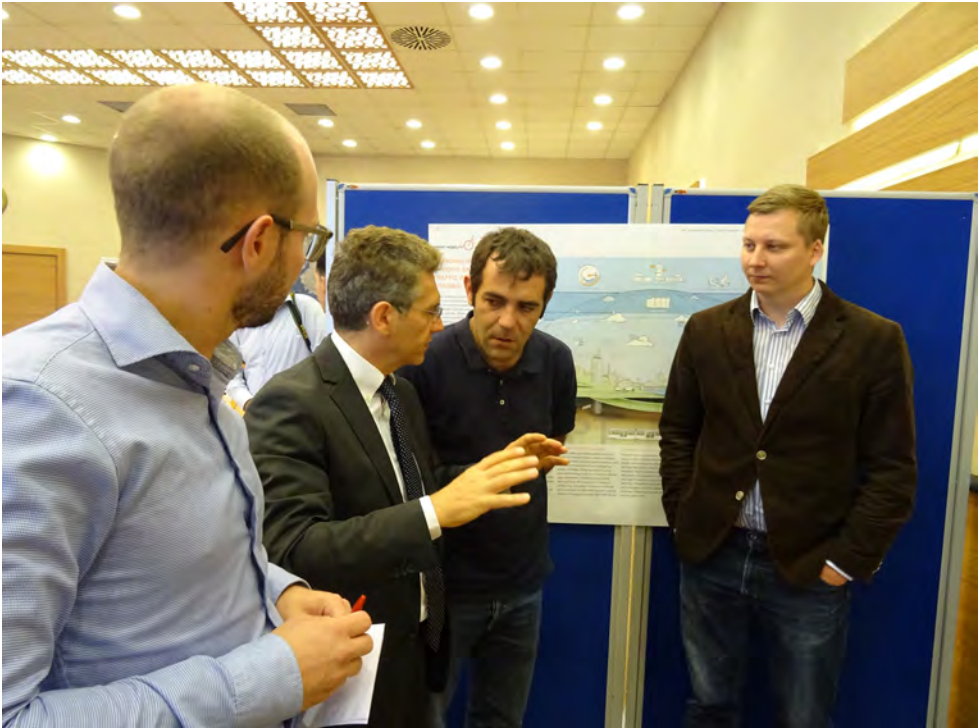
Different energy-efficient mobility modes include more flexible infrastructure, like trams with magnetic tracks for midrange distances between the neighbourhoods. The non-disruptive infrastructure allows shared use by all vehicles. For longer distances, an integrated public transport system covers Estonia, 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)



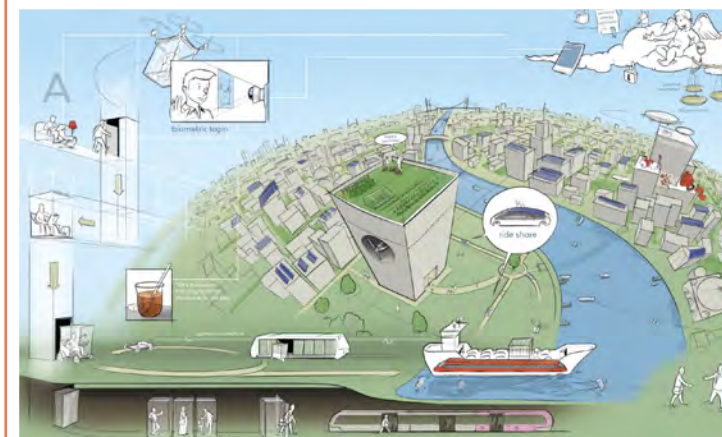
Relevant input from scenarios of the other focus areas:

- 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)

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)

Reducing the need for travel

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

Seamlessly connected networks

- **Networks for quick, easy access**
- **Smooth, seamless transport** ('single route')
- **Integrated system to provide 'door-to-door' service**
- **Integration of new modes 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

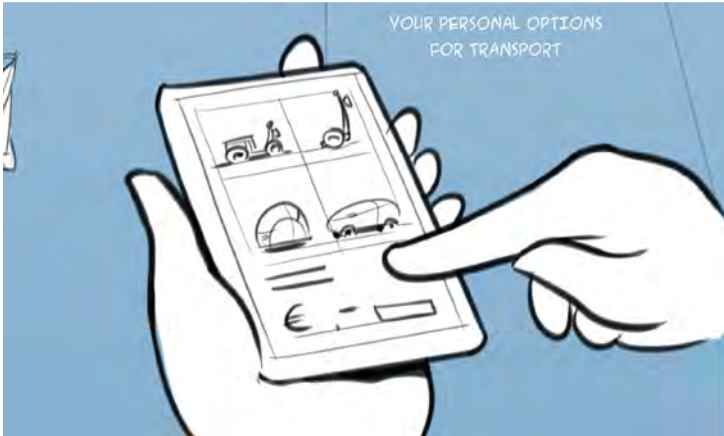
- public transport benefits everyone by providing good accessibility to all modes of transport (I)
- individual solutions are accessible and affordable for all, supported by local entrepreneurs, new business models and both public and private investments (P)
- safe, clean and affordable transport (M)
- 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)

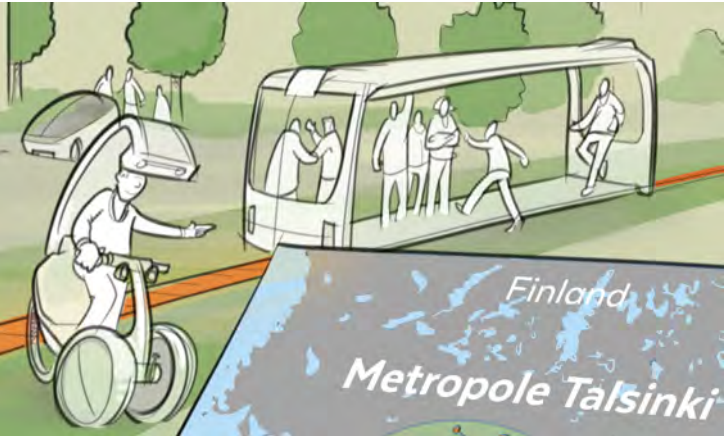
Safe

- 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



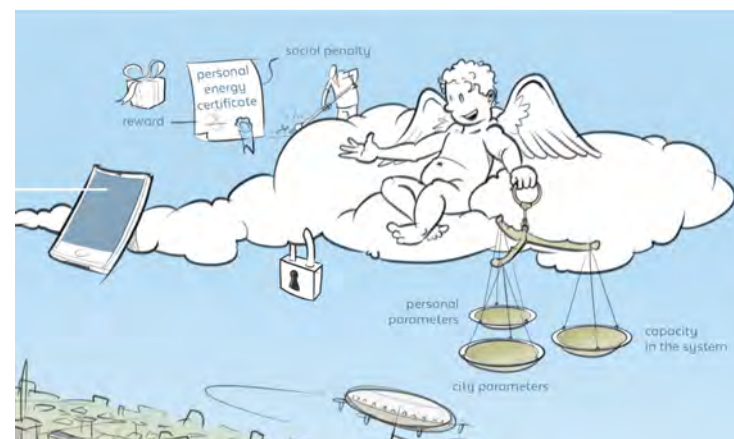
Personalised advice

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**

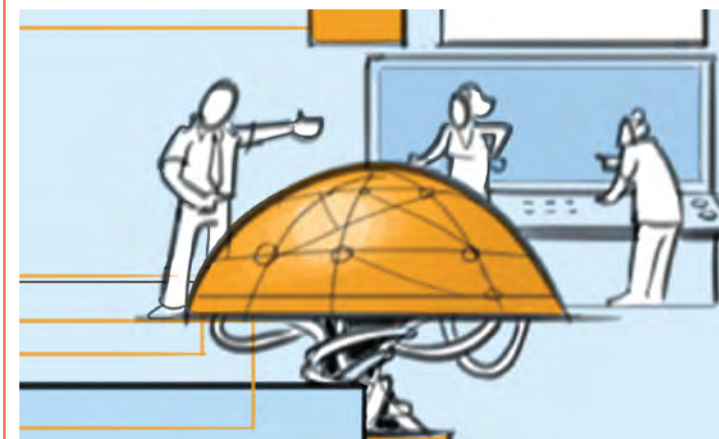
Connectivity for smart management

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

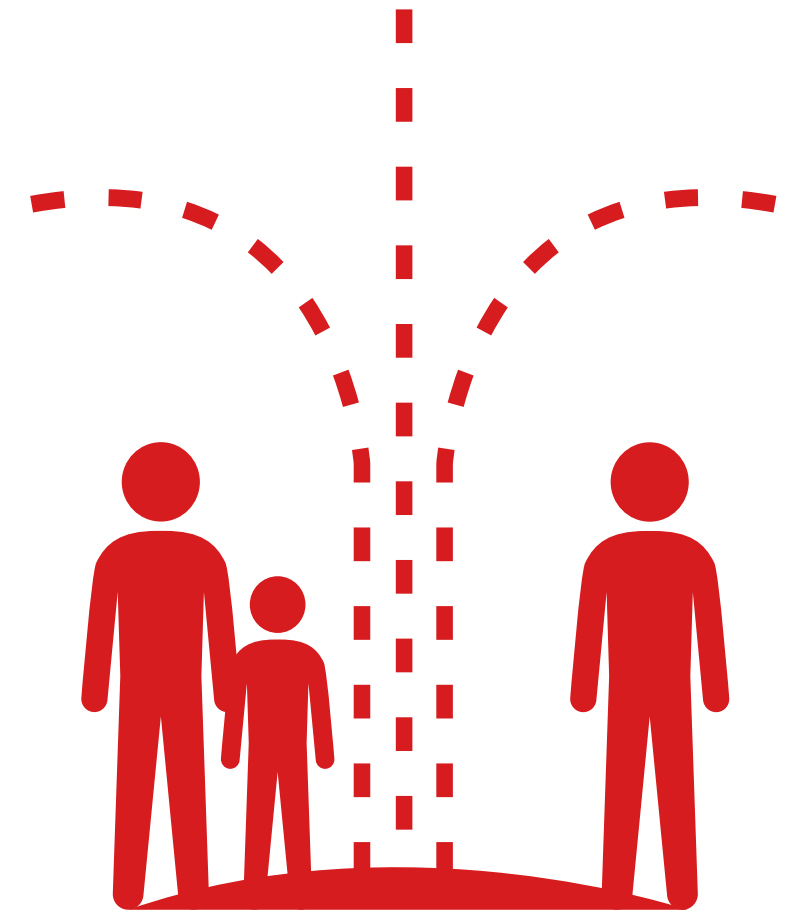
- all traffic is managed through a single, safe, reliable and efficient system: the system connects all public and private vehicles, devices and road users and is accessible from anywhere (I)
- communication between vehicles, drivers and infrastructure allows smart signalling (I)

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.

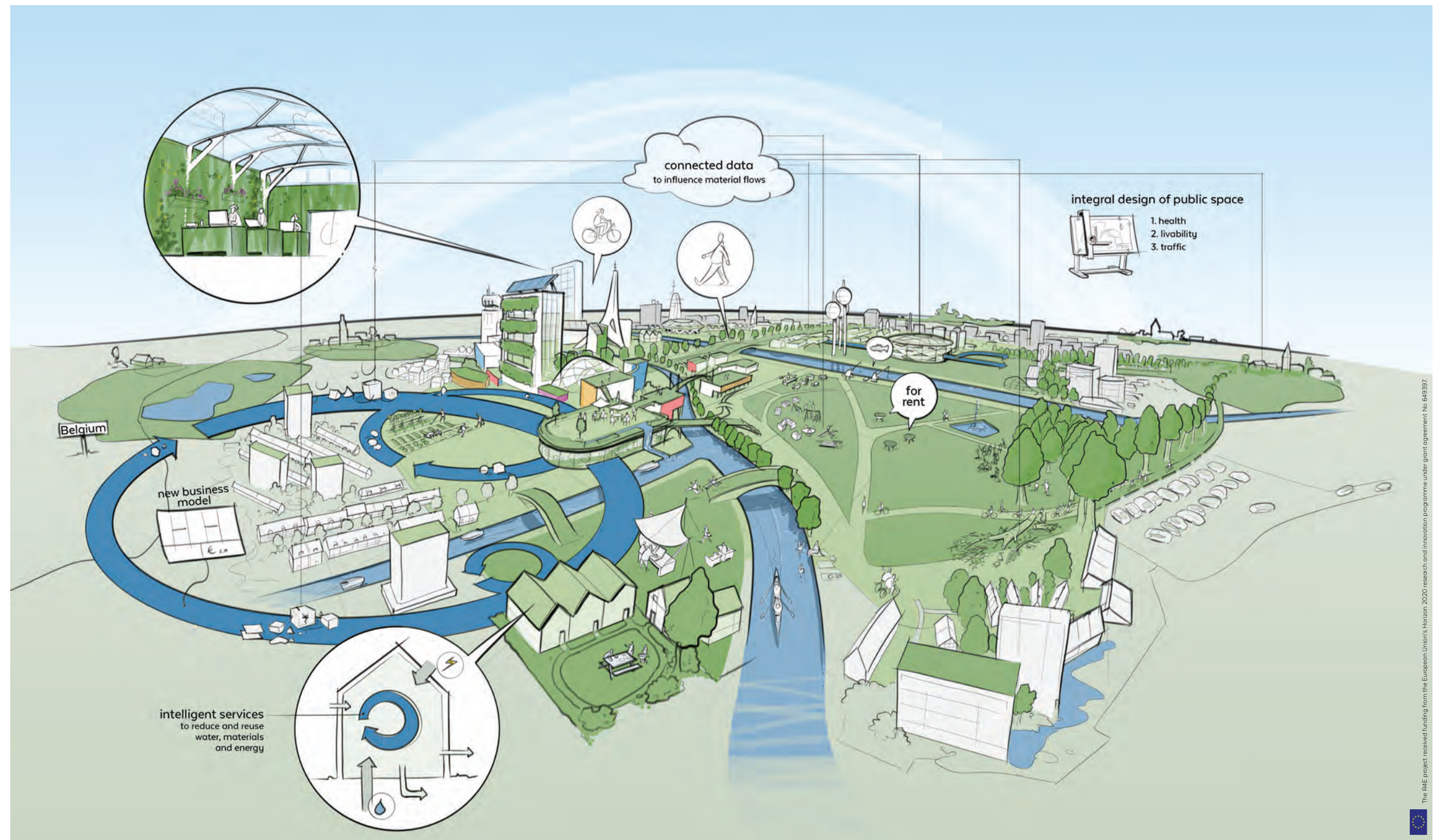
The region enjoys clean and safe water and green spaces that can be used actively for recreation (e.g. swimming, fishing) as well as to supply food (urban farming).

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

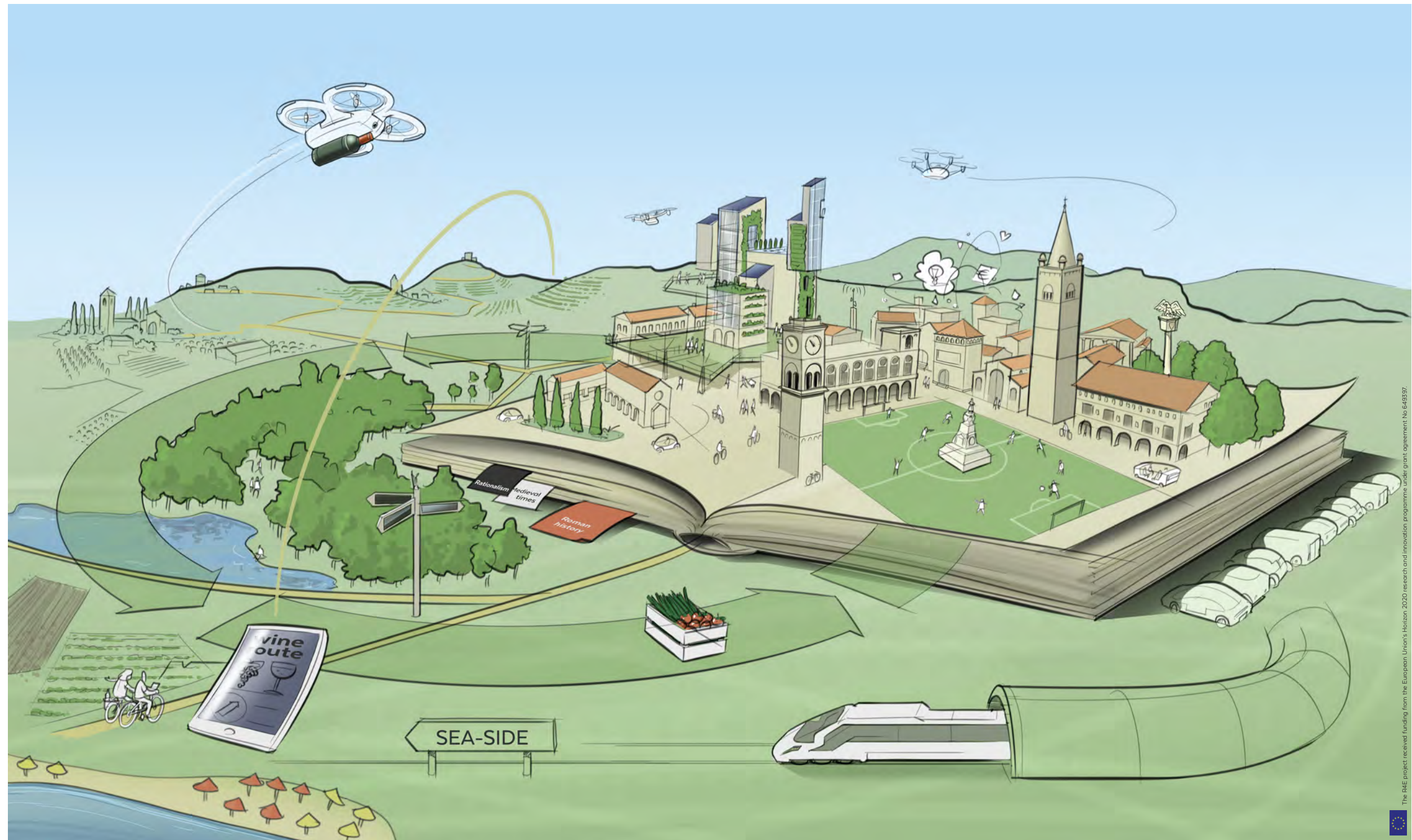
Public spaces are always freely accessible, and new business models are explored to provide added-value services. Decisions are based on an integrated view of value (economic, social, cultural and other) in both the short and long term. This 'Euro 2.0' approach enables new business with services in the 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.



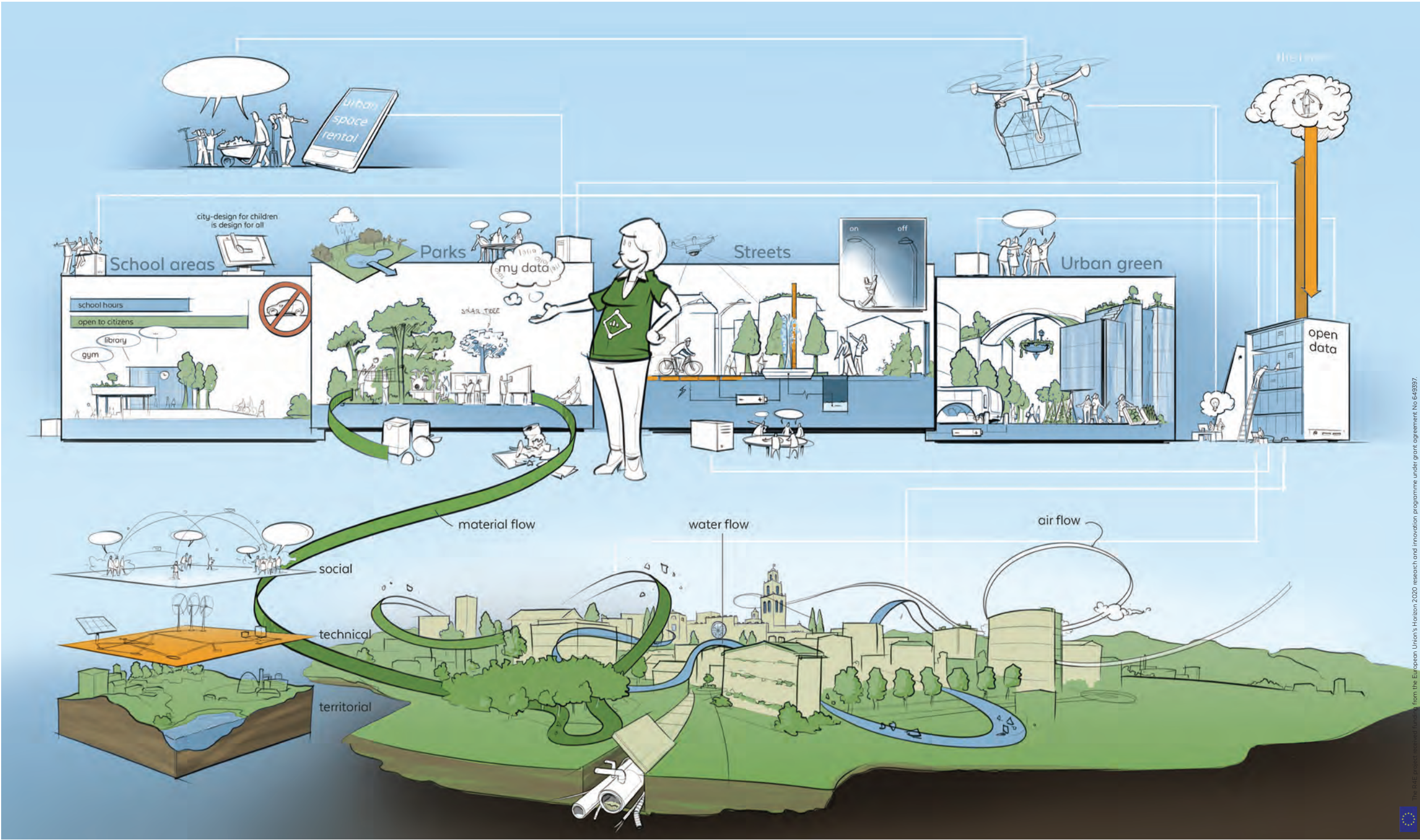
HIGH-QUALITY ENVIRONMENT FOR WELL-BEING IN SANT CUGAT 2050

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.

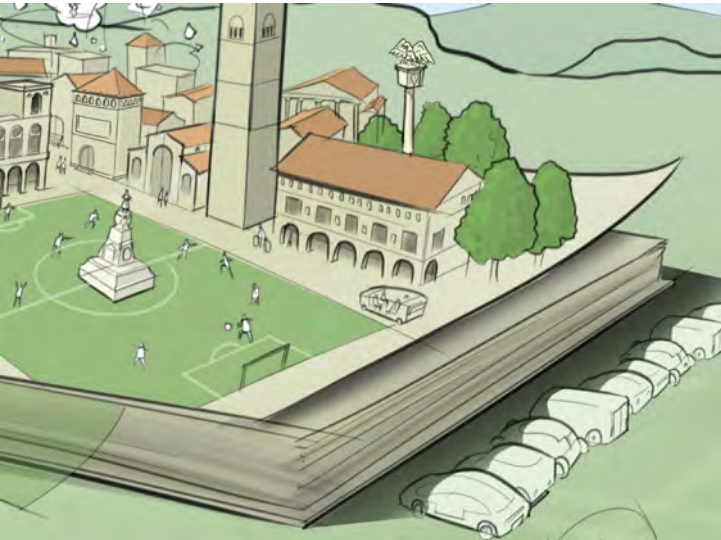
Flexible and attractive living environment

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)

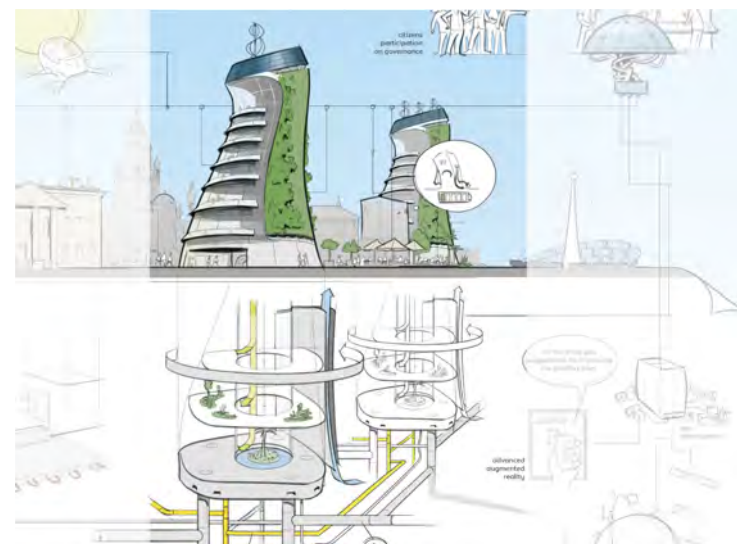
- integrated physical planning to create a resilient region by strengthening the interdependencies between 'blue' (water), 'green' (flora), 'grey' (pavement) and 'red' (buildings) (E)
- a safe living environment that is resilient to the changing climate through the smart use of solutions on the appropriate 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

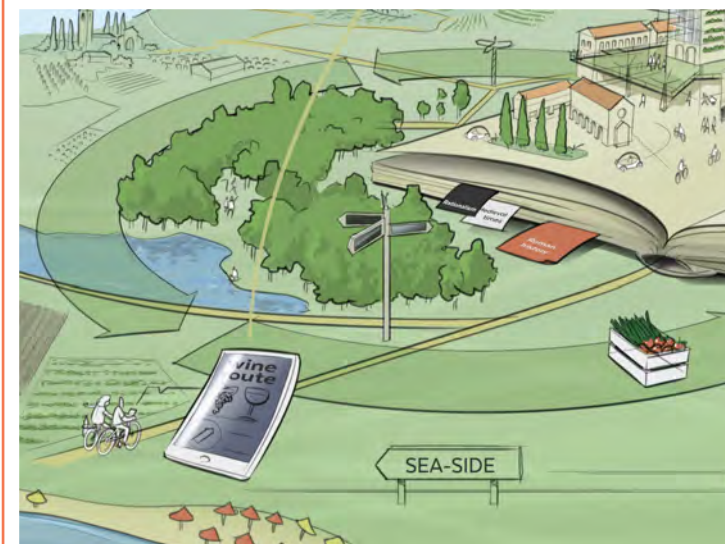
- synergy between urban and rural areas is strong (E)
- connected, integrated 'green and blue' (E)
- people benefit from the results of open territorial cooperation that encourages innovation and contributes to the city's economic development: at the same time the soil is protected for agricultural use 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

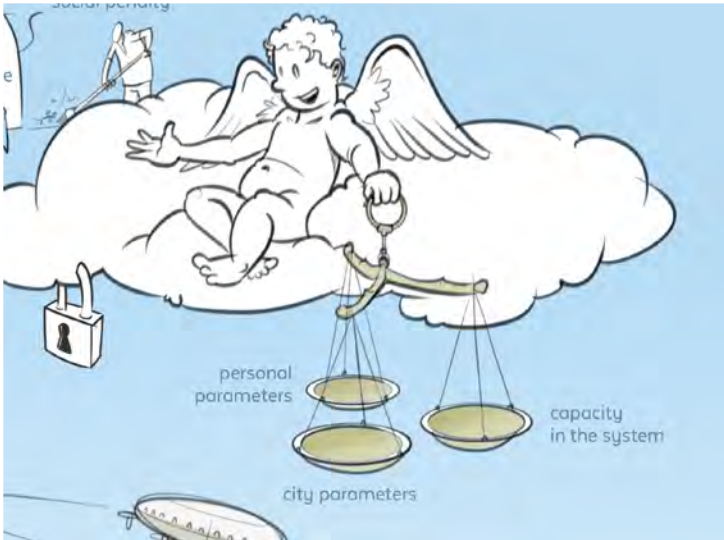
- new technologies are used to make the systems intelligent (E)
- people interact with the urban space, and have real-time information inviting them to engage in social activities (F)
- the spaces are supported by smart systems to allow for a variety of services: all subsystems are balanced by the city ‘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

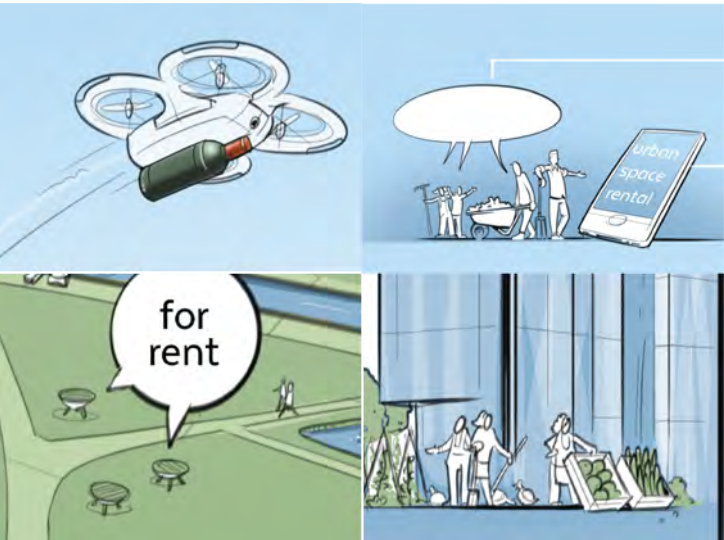
- decisions are based on an integrated view of value (economic, social, cultural and other) in both the short and long term: this ‘Euro 2.0’ approach enables new business with services in the public domain that create value for society at large as well as for individual citizens and enables investments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

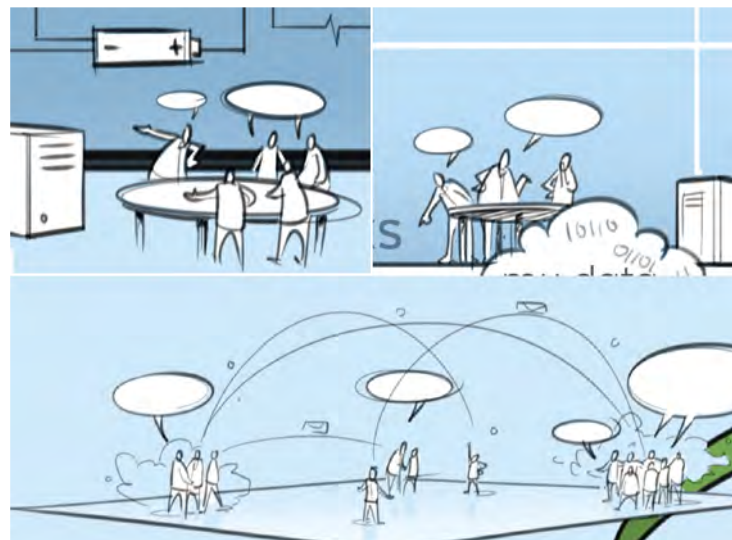
- the boundaries between public and private green areas are blurred, and people actively add green to roofs, gardens, squares and parks and make them accessible (E)
- people feel responsible for sustainability and engage in collaborative urban planning, use and maintenance (S)
- citizens use applications 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.

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

R4E ROADMAPS FOR ENERGY®

15 June 2016

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

R4E ROADMAPS FOR ENERGY®

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

R4E ROADMAPS FOR ENERGY®

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

R4E ROADMAPS FOR ENERGY®

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

R4E ROADMAPS FOR ENERGY®

15 June 2016

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

R4E ROADMAPS FOR ENERGY®

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

R4E ROADMAPS FOR ENERGY®

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

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®



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



15 June 2016

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R4E

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This appendix is part of the D2.2 Report – Desired future scenarios – and contains all results of the vision development activities held in the city of Eindhoven.



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:

11 December 2015	Concept for internal check in the city (limited distribution)
14 January 2016	Concept for sharing with R4E partners (limited distribution)
15 May 2016	Final version for public distribution
15 June 2016	Final version for public distribution – with minor corrections



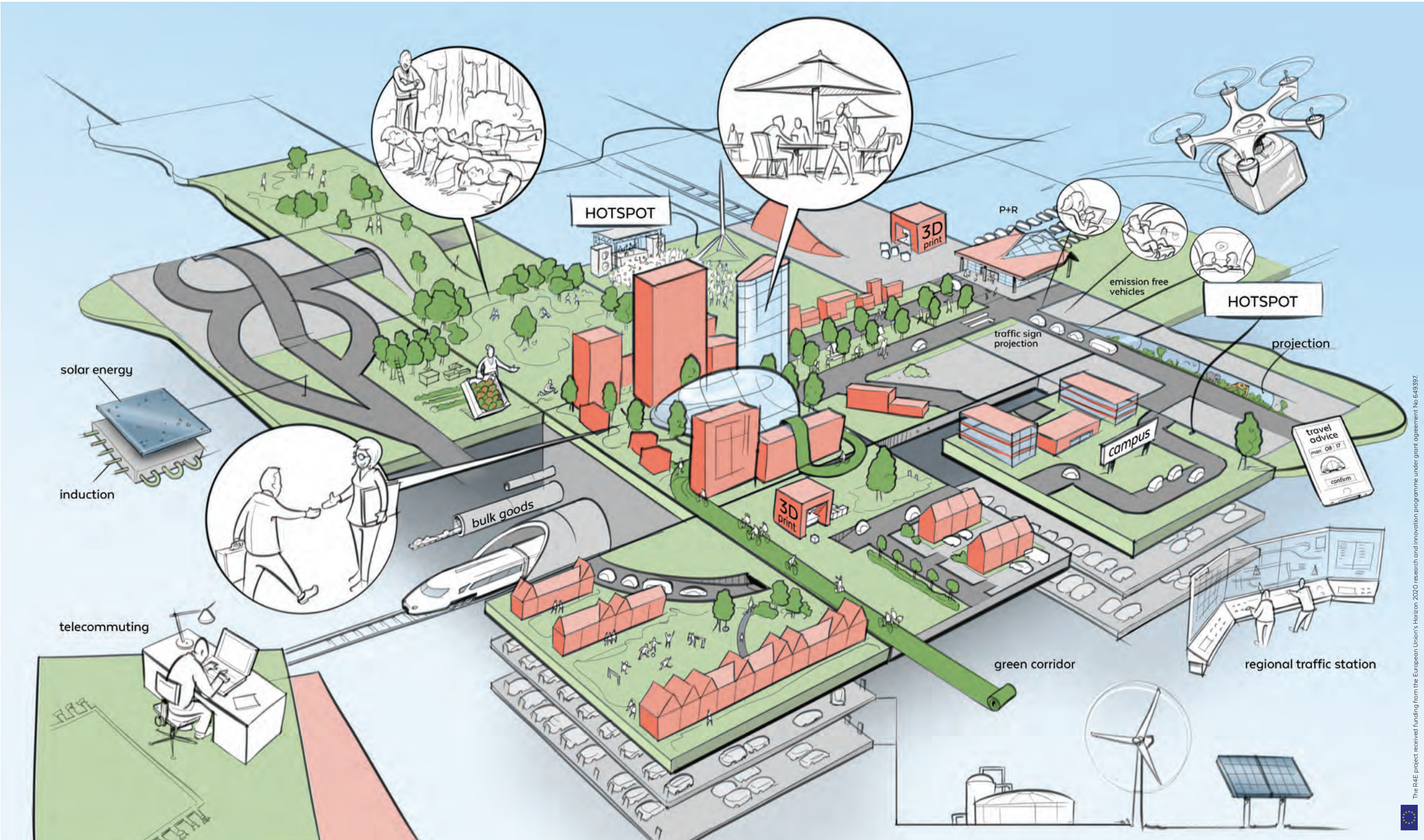
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SMART,
SUSTAINABLE
MOBILITY IN
EINDHOVEN 2050

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.



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.

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).

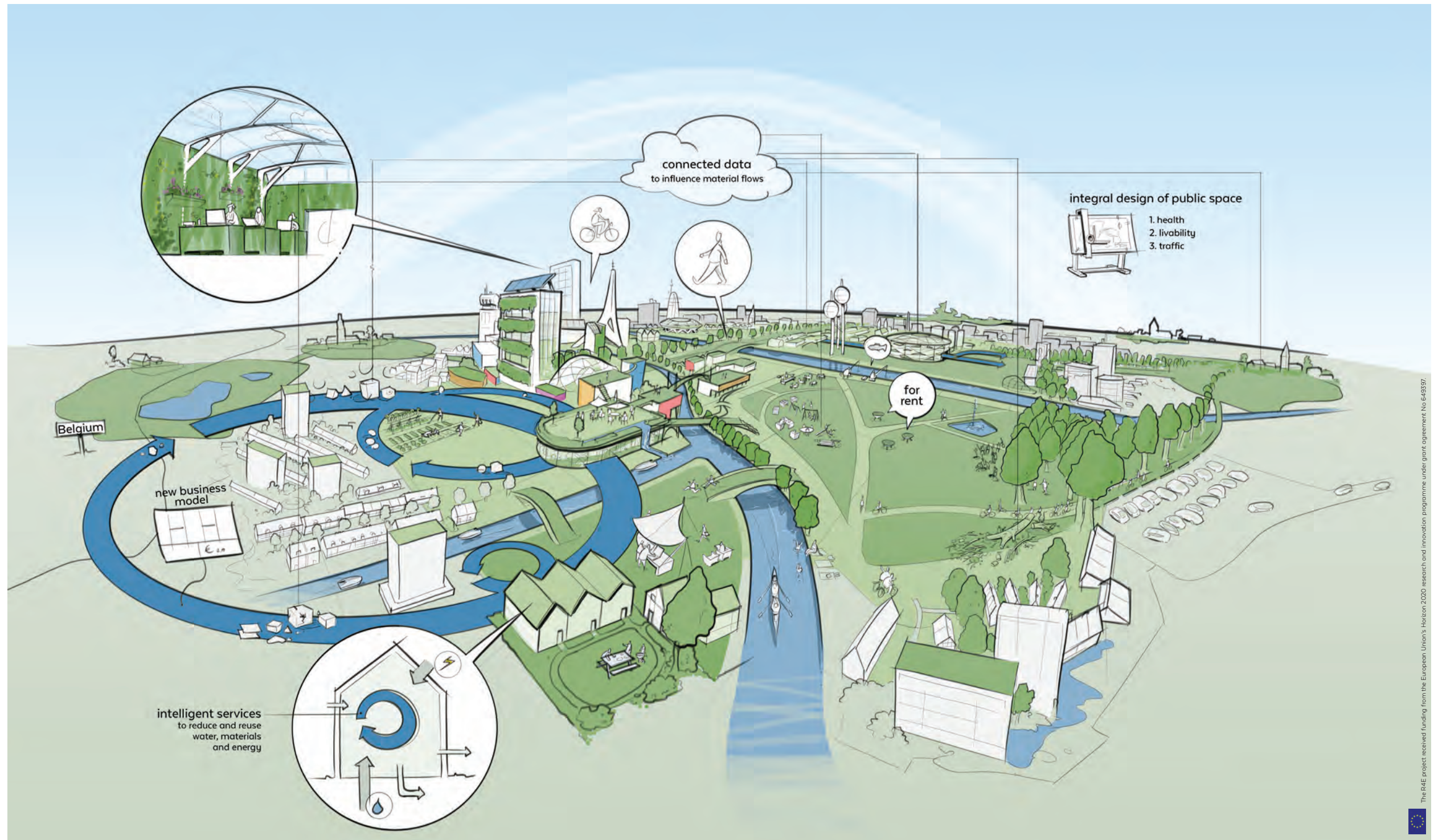
Citizens, public and private parties jointly take care of private and public spaces to create a safe, pleasant and healthy living environment. People are aware of the value of the interplay between the built environment and nature. They adopt healthy lifestyles and behaviour, through which they also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



Creating the visual of the desired future scenarios



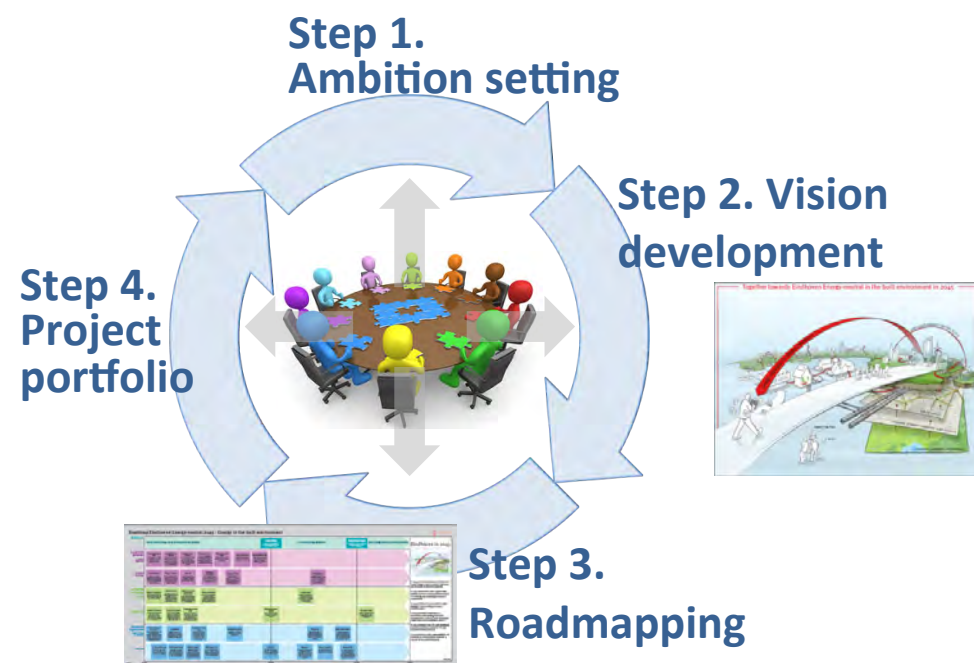
The making of the desired future scenario

The approach

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 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.



Four step approach of R4E

Step Two: 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

City 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. 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.

Day 1 - Focus area 1	Day 2 - Focus area 2	Day 3 - Reporting
Outlining the vision <ul style="list-style-type: none"> Exploring the Drivers for Change in relation to the future of the city Selecting the main elements of the vision 	Outlining the vision <ul style="list-style-type: none"> Exploring the Drivers for Change in relation to the future of the city Selecting the main elements of the vision 	Project team working session to prepare the report of the Scenario Workshop
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Program of the ambition workshops

The result of the vision development step is a visualisation of the desired future scenario. The visual is explained in this report and the main elements of the vision are described. The following pages also provide the background of the scenario: the ambition of the focus area, copied from the Ambition Setting D1.1 Report – Specific ambitions of the R4E partner cities and the selected Drivers for Change for each focus area, copied from the Future Telling 2050 D2.1 Report – Drivers for Change.

Ambition: Smart, sustainable mobility in Eindhoven 2050



1

Traveller-centric mobility

In 2050, mobility solutions are focused on what travellers want and expect. Their personal mobility needs are met by seamless services provided as and when they are needed (taking into account individual needs and usage, the frequency of use, weather conditions, traffic density etc.).

Travel is facilitated by accurate, up-to-date, personalised and reliable information on availability, travel times and connections to support decision-making. Different modes of transport (both public and individual) can easily be combined, and destinations are conveniently accessible in different ways. Easy access to mobility products and services makes them a logical choice. Citizens’ mentality is open and socially driven, leading to choices that benefit not only the individual but also the social and ecological environment.

The region is open, and offers good conditions for shared mobility solutions. We aim to facilitate personal mobility decision-making with seamless solutions, both public and individual.

Strategic ambitions

- In 2050 individual choices for the type of mobility are facilitated by (f)actual information and seamless mobility products and services that fit personal needs at that moment.
- In 2050 sharing of transport solutions is an obvious choice, driven by a socially responsible and open mentality.

2

Sustainable, healthy mobility

In 2050, citizens of Eindhoven value the number of available mobility options with high levels of convenience and freedom of choice. There’s a clear emphasis on sustainable, healthy choices. As a ‘garden city’ the Eindhoven region is ‘green’ and ecological, both in the public space and in the quality of the city air.

People and locations are connected through finely meshed walking and cycling routes, encouraging healthy lifestyle and behaviour. Quality of the living environment is high, with air quality, low emissions and road safety all above the national average.

The ambition to be energy-neutral by 2045 is reached by energy-saving transport and by the transition to renewable energy. Sustainable mobility and connectivity are key: sustainability for the environment, for people and for the city. We want versatile city transport, with high levels of convenience and freedom of choice. And we want to drive behavioural change towards a healthy lifestyle, with citizens choosing active mobility options.

Strategic ambitions

- In 2050 people obviously chose walking and cycling as means of mobility due to the attractive and safe routes created through ‘place making’: actually making place for more sustainable transport and the improvement of urban quality with more green.
- In 2050 mobility in the region is energy neutral and exclusively uses renewable sources and sustainable materials.

3

Thriving economic region

In 2050, people in Eindhoven value a thriving region with high levels of economic activity and employment. The Brainport region offers an attractive climate for business through multi-modal accessibility of the top economic locations. The places where people want to be, with strong economic activity, are easily and sustainably connected by different modes of transportation. Door-to-door travel times are acceptable and reliable. Smart systems based on real-time data direct traffic flows, benefiting quality, liveability and safety. Intelligent traffic management provides efficient guidance to the routes and directions users want.

The economic viability of the region is largely based on smart, sustainable mobility. The region functions as a ‘living lab’, in which innovative solutions are developed and proven in practice. Regional cooperation is a strong enabler for the leading position in technology development. We aim to be an economic hotspot for smart, sustainable mobility. And we want the new dynamics of the city and region to be supported by effective, convenient and reliable mobility solutions.

Strategic ambitions

- In 2050 new connections, routes and means of transportation facilitate the new dynamics in the city and the region, easily and sustainably connecting locations where people would like to be and where economic activity flourishes (the hotspots).
- In 2050 smart choices for regional flow and accessibility are based upon real-time analysis and predictions of traffic flow and transportation behaviour.
- In 2050 the region is an economic hotspot for smart and sustainable mobility and stimulates innovation and technological developments through living labs.

Drivers for change for the future of Smart Mobility in Eindhoven 2050



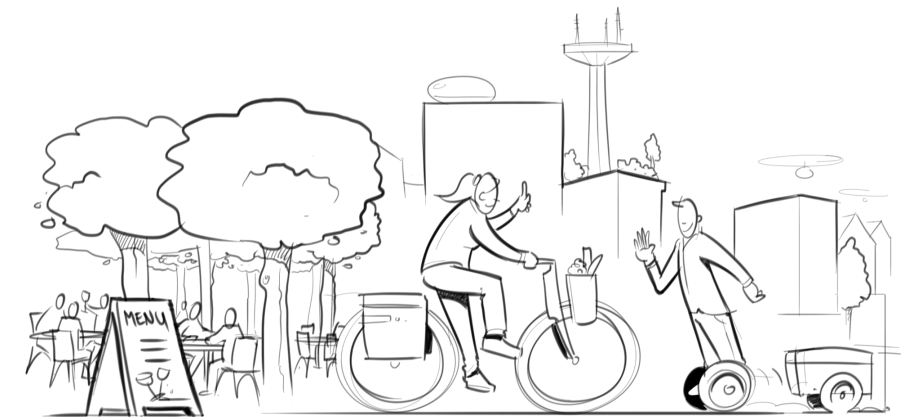
Experience, experience, experience

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



Better living at a human scale

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



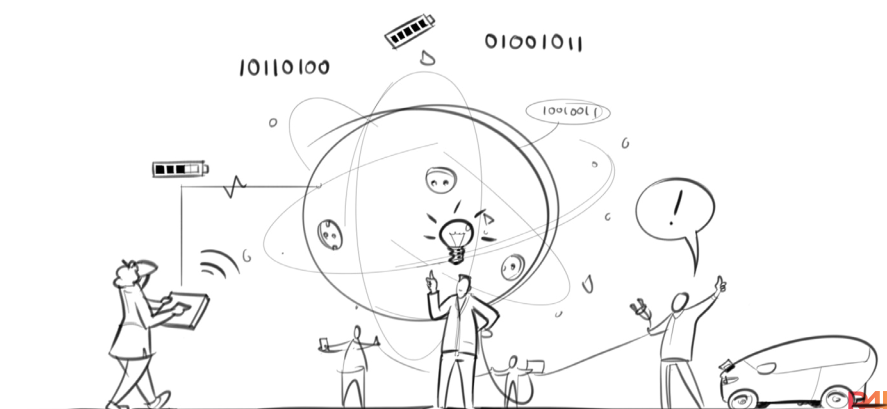
Flexible 're-purposing'

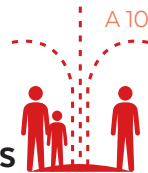
In 2050, we've adapted to continuous city dynamics. Buildings are part of the constant transformation of urban area. People know that 'things are always changing', so they have an open mind on how buildings and spaces are used. So this can change over time - or even during the day - in line with changing needs and events. As properties become available, they are used to meet the specific need at that time. Individuals and smaller collectives with shared interest have easy access to available properties, sites and services. Historic buildings and cultural heritage are 're-purposed', taking their specific qualities into account.



Democratised energy systems based on open data

In 2050, energy systems are open, bidirectional, multi-purpose platforms on which (renewable) energy and energy management services are open to all. Entrepreneurs have developed business models that provide value for them, for their users and for society at large. Citizens can choose freely from a range of available options. The system ensures privacy and security of users, who are always in control. Ambient energy networks provide connectivity for (wireless) access to data and energy. Increased computing power and artificial intelligence make system resilient: self-organising, self-sustaining and self-learning.





Ambition: ‘Green and blue’ spaces in Eindhoven 2050

1

Appreciation for nature in the living space

In 2050, people value a good, healthy and sustainable living environment with green and blue spaces. They are aware of the effects of climate change. That’s why people highly appreciate the interplay between city and nature. That in itself encourages a healthy lifestyle and behaviour.

A higher quality of life in Eindhoven is achieved by making room for green and blue spaces. Today, all the necessary fundamentals are in place. Perhaps they are even too well organised – people are freed from problems, and may no longer be aware of the importance of water in the living space. We aim to create value through a healthy, liveable urban environment. And we want to create awareness and appreciation of nature, driving behaviour change towards healthy lifestyles.

Strategic ambitions

- In 2050 citizens are water aware and appreciate the water and green spaces in their habitat (the garden city).
- In 2050 our society properly handles and anticipates changes (e.g. climate change).
- In 2050 citizens or companies experience no mortality, damage or nuisance by water.
- In 2050 water consumption is limited to the first necessity of life (other needs are used from different wells)

2

Working together in the value chain

In 2050, partners in the public space value chain appreciate the entire ecosystem. All (infrastructural) aspects of the urban environment and their interdependencies are clear, and the public space is designed right from the start as a healthy environment.

A higher quality of life in Eindhoven is achieved by integrated, physical city planning. Different disciplines support each other, contributing to a healthy city. The municipality, the water board (‘Waterschap De Dommel’) and other partners already work together on joint innovations. We aim for an integrated value chain covering blue (water), green (flora), grey (pavement) and red (buildings) elements. And we aim for an even better cooperation and sharing of responsibility in a Quadruple Helix model (partnerships between government, industry, academia and civil participants).

Strategic ambitions

- In 2050 the high quality of the (swimming) water and green spaces attracts people to Eindhoven and to spend more time outside.
- In 2050 city planning is done in new, democratic public private partnerships and the public space is designed in a way that it supports all it’s ambitions.
- In 2050 public space is planned with water and green spaces in a way that contributes to a healthy city (e.g. biodiversity and nature).
- In 2050 the public sector is a ‘value-ment’ (‘waardeschap’); this new governance (‘tussenheid’) is situated in the midst of society to maximise meaning for and with citizens.

3

Towards a circular water region

In 2050, the municipality of Eindhoven and the water board (‘Waterschap De Dommel’) value sustainability. That means a circular water region in Eindhoven, drinking water usage, waste water, the mining of raw materials, and energy from waste water.

To reach this aim, we need a deep understanding of new technology for water treatment, water usage, circular water systems and re-use of raw materials. Investments in new technologies are high, and we aim to optimise their use in the circular water region Eindhoven. At the same time, we want to make sure our investments in new technologies are future-proof.

Strategic ambitions

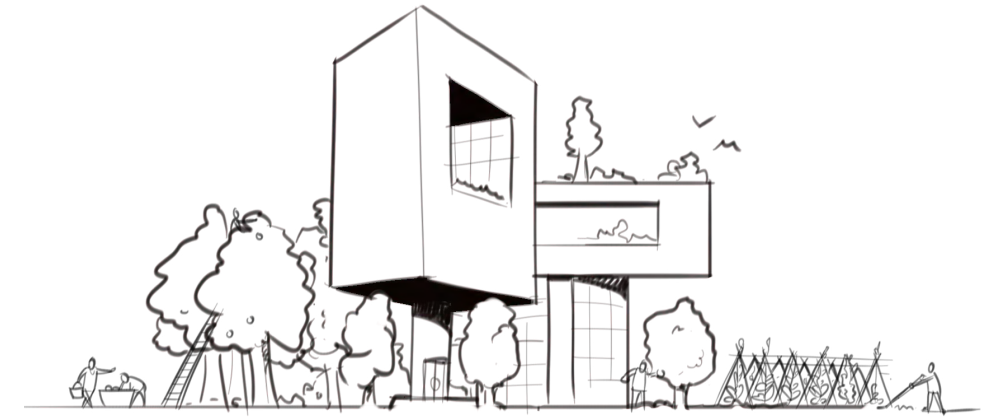
- In 2050 all meaningful elements from waste water will be reused (energy and raw materials).
- In 2050 the mining of raw materials and energy from waste water will be optimised.

Drivers for change for the future of Smart Urban Spaces in Eindhoven 2050



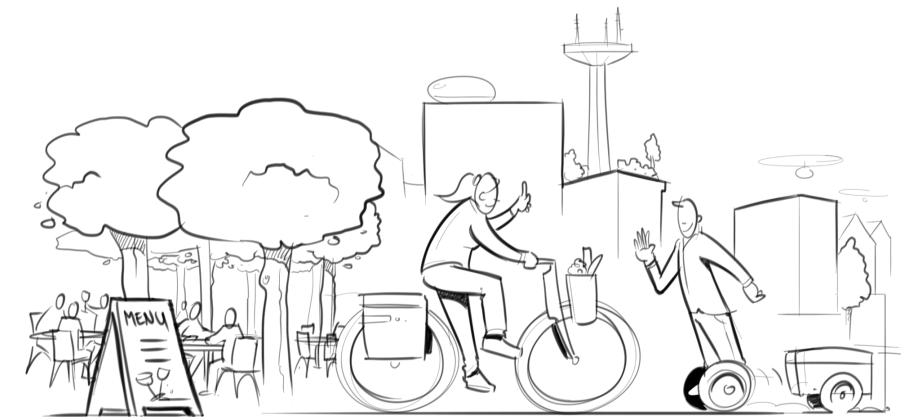
Connecting to 'green' and 'nature'

In 2050, people's need for 'green' and 'nature' is met by well-connected green spaces and landscapes all over the city. Soft birdsong and other nature sounds add an intangible quality and sense of well-being. Urban farming increases regeneration of resources, creating fresh, healthy foods, reconnecting with nature and mobilising local communities. People are aware of the effect of their living environment on health and well-being, and push for cleaner technologies. Advanced systems allow control of micro-climates, contributing to more resilient cities.



Better living at a human scale

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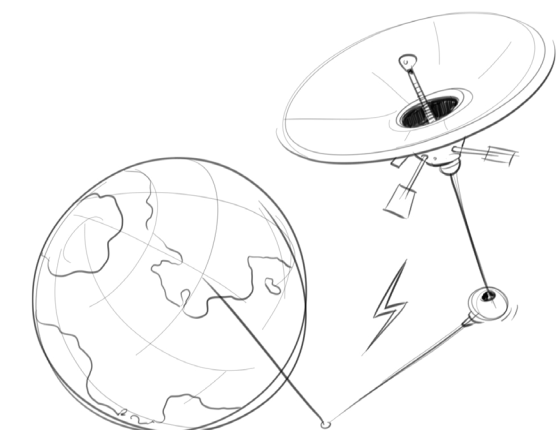
Regenerating resources in a circular economy

In 2050, the circular economy ensures self-sufficiency of cities. Renewable energy is abundant, and this ensures a secure supply of vital resources for life (energy, water, food and clean air), although other resources may still be scarce. Cities have implemented circular systems to regenerate all the resources needed by their populations. These mechanisms are based on small-scale, local solutions, enabled by changed decision-making levels.



Applying new technologies

In 2050, a range of new technologies are available and affordable. Some of them are already in development, others are still unknown. Cities apply those technologies in new solutions that contribute to the quality of life, and in particular to the creation of smart buildings, smart mobility and smart urban spaces.





Contributions



We would like to thank the participants for their contribution to the 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 Wetzer | Provincie Noord Brabant |
| • Jean van Zeeland | Gemeente Eindhoven |



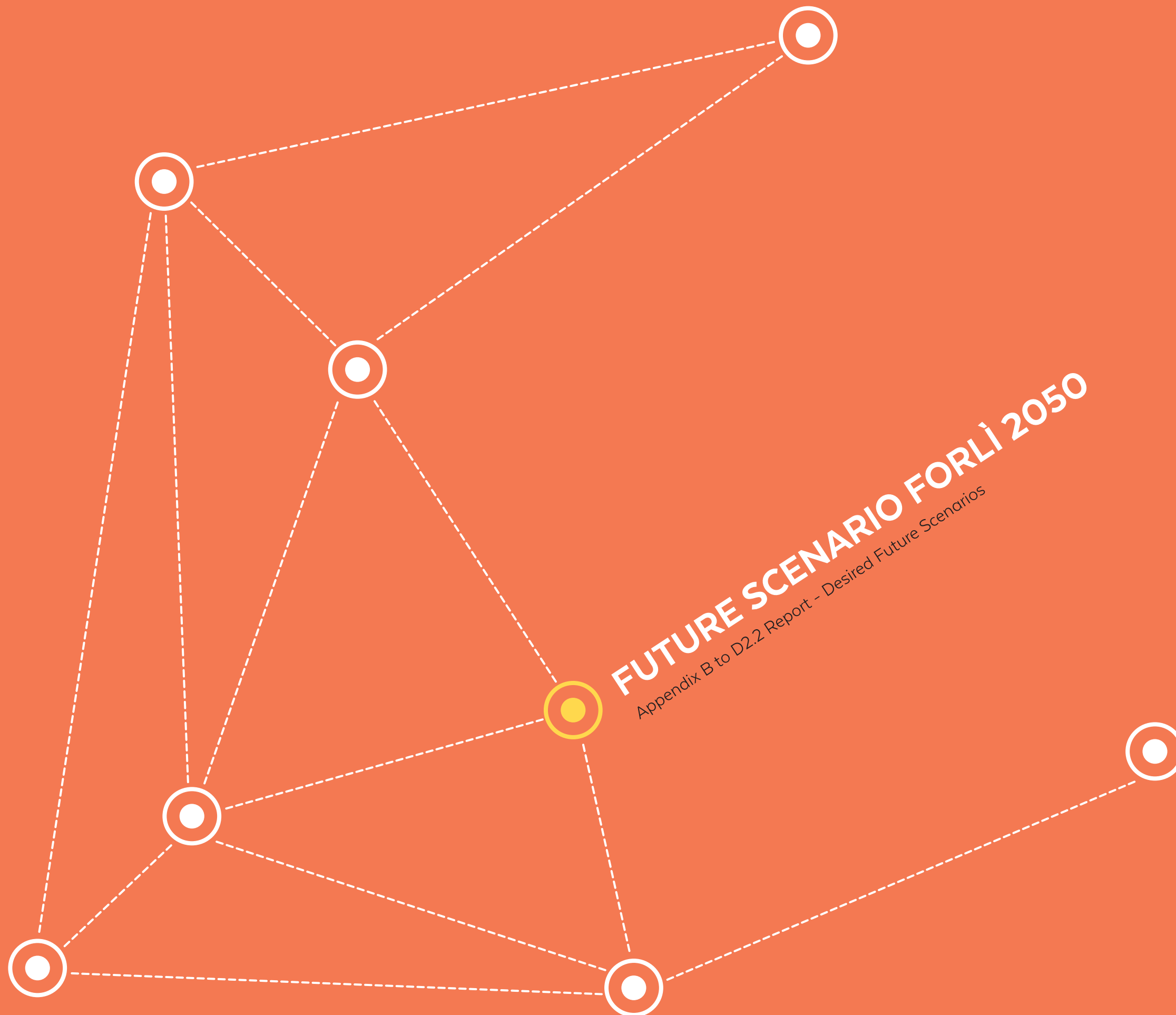
This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



ROADMAPS
FOR
ENERGY[®]



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15 June 2016

Francesca RAVAIOLI & Stefano BAZZOCCHI, Comune di Forlì
Elke DEN OUDEN & Jan-Jaap RIETJENS & Rianne VALKENBURG, TU/e LightHouse

R4E

**ROADMAPS
FOR
ENERGY®**

This appendix is part of the D2.2 Report – Desired future scenarios – and contains all results of the vision development activities held in the city of Forlì.



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:

2 May 2016	Concept for internal check in the city (limited distribution)
15 May 2016	Final version for public distribution
15 June 2016	Final version for public distribution – with minor corrections



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Desired future scenario Smart Urban Spaces

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Drivers for change for the future of Smart Urban Spaces in Forlì 2050

Contributions

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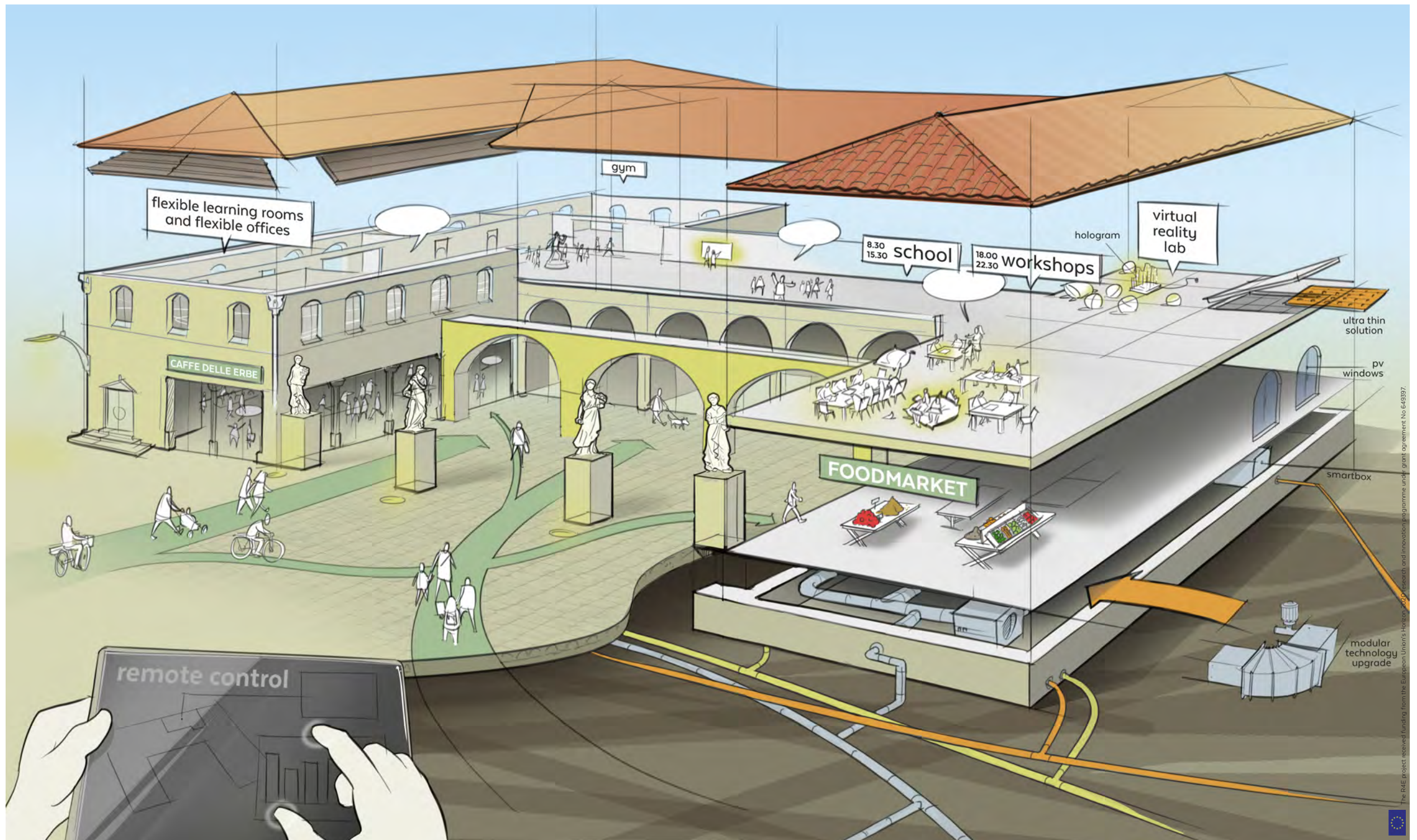
B 13

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 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.

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

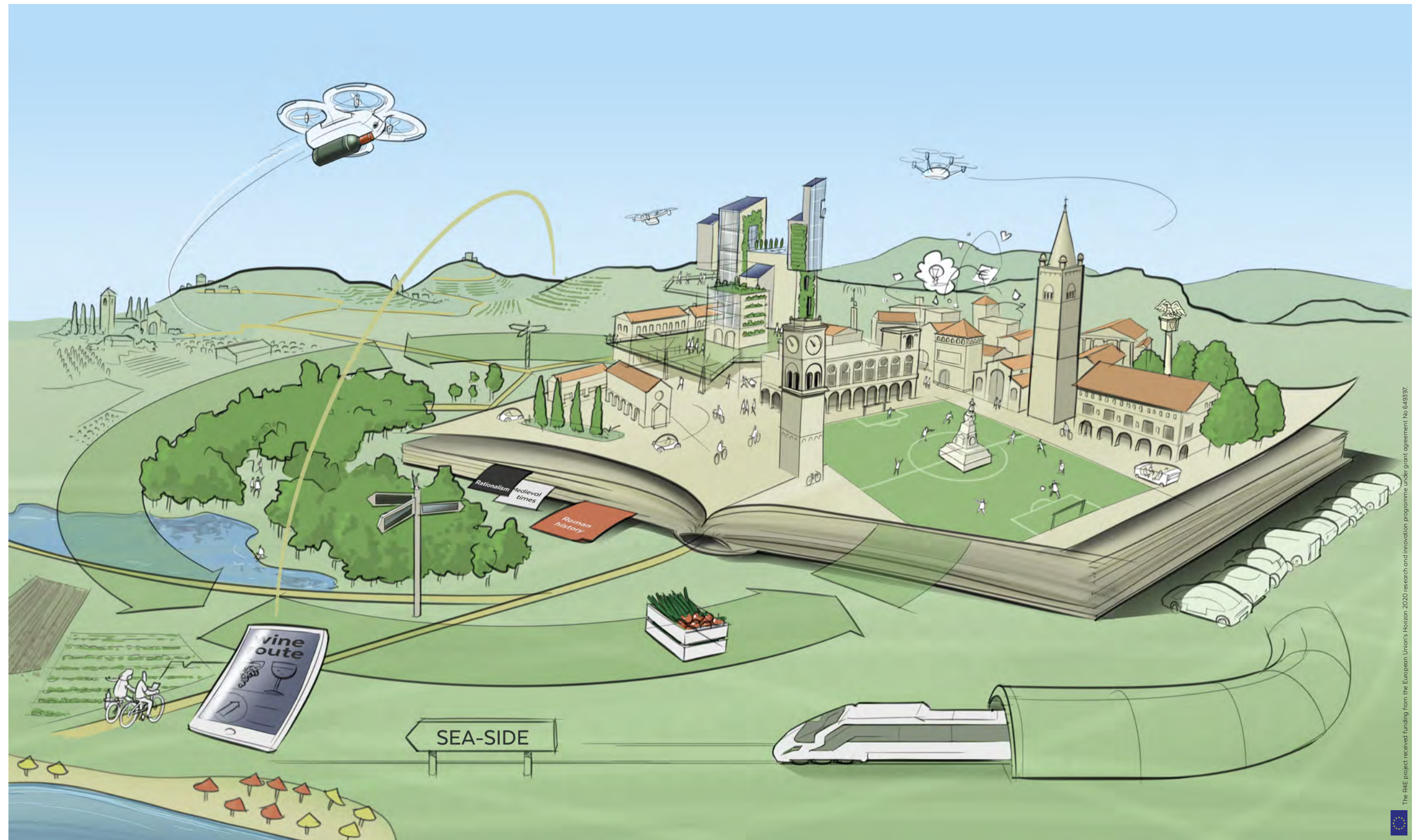
Good practices and leading examples are shared in the community and transformed into solutions for common use in other buildings. Public buildings (e.g. schools and hospitals) demonstrate the basic principles of sustainable construction and provide open platforms for citizens to engage in discussions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

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.



Creating the visual of the desired future scenarios



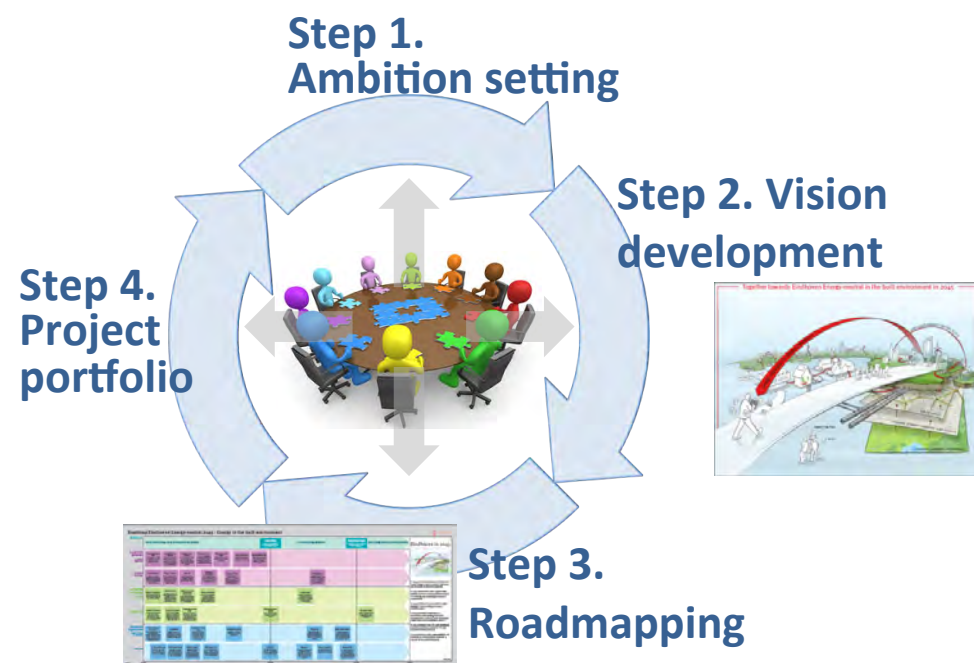
The making of the desired future scenario

The approach

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 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.



Four step approach of R4E

Step Two: 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

City 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. 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.

Day 1 - Focus area 1	Day 2 - Focus area 2	Day 3 - Reporting
Outlining the vision <ul style="list-style-type: none"> Exploring the Drivers for Change in relation to the future of the city Selecting the main elements of the vision 	Outlining the vision <ul style="list-style-type: none"> Exploring the Drivers for Change in relation to the future of the city Selecting the main elements of the vision 	Project team working session to prepare the report of the Scenario Workshop
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Ambition: History made smart in Forlì

1

Buildings that reflect the cultural heritage

In 2050, people in Forlì value their historical heritage. Historic 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.

Strategic ambitions

- In 2050 all buildings of historical value of Forlì are renovated and new use is created for them as a service for the community.
- In 2050 the (historical) buildings are energy efficient and resilient to nature and climate circumstances. Safety measures for renovation are developed and adopted. Schools have been the demonstrator to apply this integration of efficiency and safety in a right way.
- In 2050 the historical buildings are given a new life and new purpose by using them for cultural events or other means of leisure and social activities. Different approaches are used for public, private and mixed buildings to ensure ‘best’ use. Conditions for high quality living are met so people have moved back to the city centre. Policies enable differences in the areas of the city to meet the different groups of people (citizens, shops, banks, etc.)
- In 2050 the buildings in Forlì are more efficient in a respectful way. In top quality modern energy efficient buildings Forlì shows its courage to implement modern technologies. Respect is given for what is historical and precious, using new opportunities for elements that are less precious.
- In 2050 Forlì is a zero-risk city, concerning earthquakes and other nature disasters for all buildings.

2

Infrastructure that enables the social environment

In 2050, 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 local economy.

Strategic ambitions

- In 2050 Forlì is a leading example where people, spaces and new technology are meaningful connected. Technology is organised in a simple, yet effective way.
- In 2050 Forlì has high quality commercial routes, attracting companies to open new businesses. A more diverse set of activities and services (handicrafts, shops, banks, or headquarters) is present in the city. Young start-up companies use the suitable, smaller buildings all over town. Infrastructures (e.g. broadband connections) and set-up services for companies are at top level.
- In 2050 the population in the city has reached a level where people easily use technology (such as smart phones) that interact with urban space, so they are real time informed and invited to engage in social activities. The quality of the urban space increases the value of the buildings and the community of Forlì is involved in improving the value of the city.

3

Leading by example

In 2050, 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 with 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.

Strategic ambitions

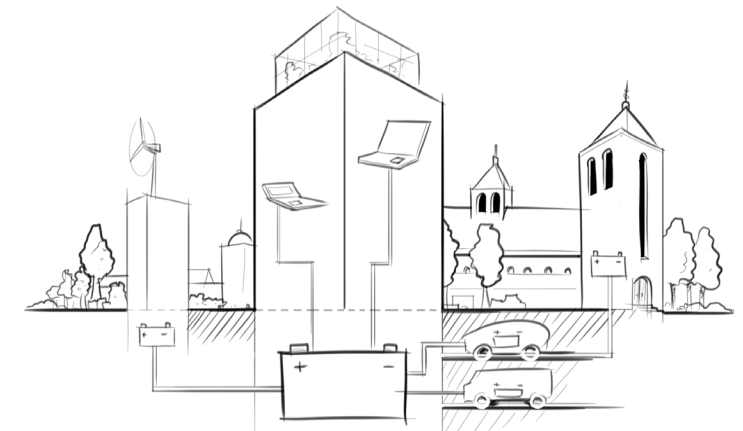
- In 2050 buildings of Forlì are smart in terms of technology as well as ‘people smart’ in enabling the service of the building (for instance improve healing in hospitals or learning in schools). The knowledge gained from redesigning hospitals and schools in this way is an example now for other buildings.
- In 2050 50% of the buildings in Forlì will be energy efficient, zero-emission and self-sufficient, using the newest technologies. Policies support this. Citizens are aware of the basic principles of sustainable living, already from a young age.
- In 2050 all new buildings in Forlì are 100% energy efficient and self-supportive as a result of targets. For existing buildings with less restrictions, the maximum improvement is reached. For historical buildings, new technologies are applied respecting the architecture and historical values.



Drivers for change for the future of Smart Buildings in Forlì 2050

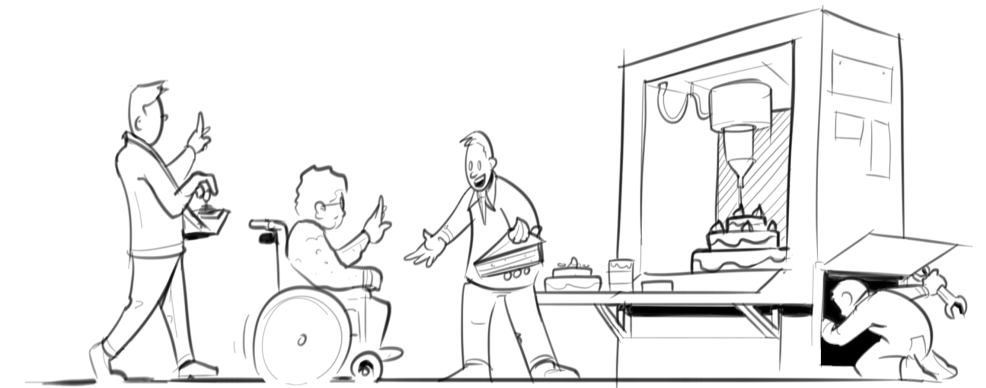
Better buildings

In 2050, new buildings combine historical qualities and new technologies, creating maximum comfort and functionality for their users. Historical expertise in building for specific local climates is used to design solutions for new buildings, and for thoughtful upgrading of those already existing. The latest technologies and materials are applied to make buildings self-sufficient or even energy positive, contributing to abundant of renewable energies in cities. Policies aim at improving the quality of neighbourhoods and strengthening the sense of community, and not only at reducing energy consumption.



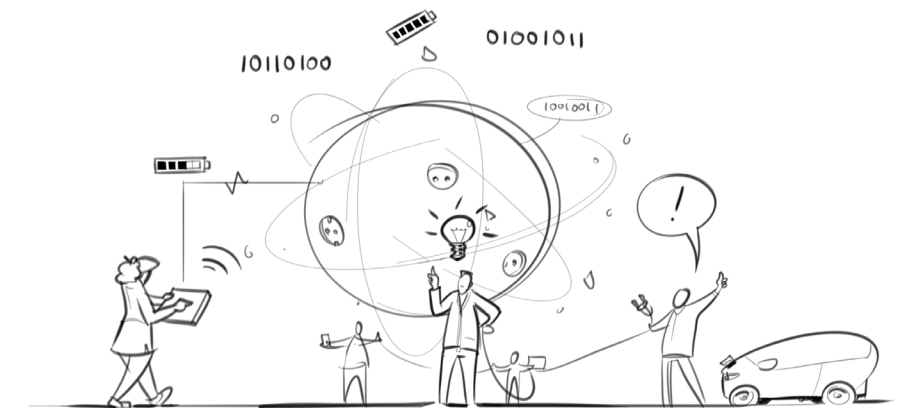
Local, social businesses create community value

In 2050, smaller businesses creating real social value at local level are the norm. Communities and cooperatives have developed new business models ensuring constant investments in infrastructure. These enable the development of new products and services delivering social and environmental value. Innovation means co-creation and cooperation, aimed at creating end-user values. Self organising, self-managing communities are the new social and market paradigm - all enabled by the new city governance models. These drive the transition to empowered citizens who demand a range of sustainable solutions. Municipalities facilitate this transition by creating the required economic and legal frameworks, and by constantly focusing on the public interests.



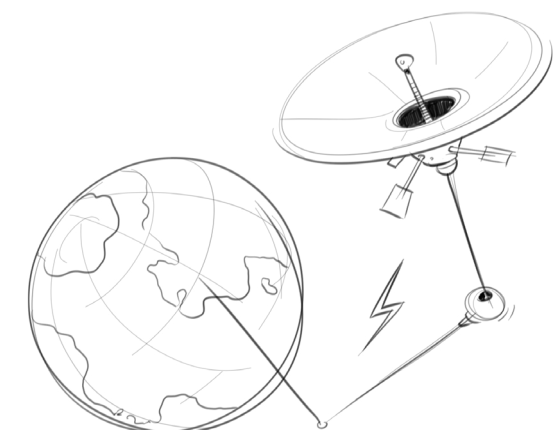
Democratised energy systems based on open data

In 2050, energy systems are open, bidirectional, multi-purpose platforms on which (renewable) energy and energy management services are open to all. Entrepreneurs have developed business models that provide value for them, for their users and for society at large. Citizens can choose freely from a range of available options. The system ensures privacy and security of users, who are always in control. Ambient energy networks provide connectivity for (wireless) access to data and energy. Increased computing power and artificial intelligence make system resilient: self-organising, self-sustaining and self-learning.



Applying new technologies

In 2050, a range of new technologies are available and affordable. Some of them are already in development, others are still unknown. Cities apply those technologies in new solutions that contribute to the quality of life, and in particular to the creation of smart buildings, smart mobility and smart urban spaces.



Ambition: Renewed, thriving city life in Forlì in2050

1

A lively centre in a compact city

In 2050, people in Forlì value a compact, well-planned city with a lively centre. This has regained its primary role as a social, business and residential hub. History and culture are respected, contributing to the attractiveness of the high-quality commercial areas. The city reflects the bold decisions to switch to new (multi-)functional use of buildings and spaces. People initiate and participate in social life and events that bring people of all ages together.

Strategic ambitions

- In 2050 the historic city centre looks the same as in 2015, but is at the same time completely different. With respect for the historical and cultural values the town has become resilient to the climate change and courageous decisions were made to change the functional use of spaces and buildings, resulting in a lively city centre where people meet, join and participate.
- In 2050 the city of Forlì is a compact city where spaces are ultimately re-used and fruitful connection is established between private and public property. This is enabled by facilitation, regulation and incentives for people to join actively in the transition of the town.
- In 2050 Forlì has an extremely lively centre, that enables participation and social cohesion initiated by citizens themselves, or facilitated by event organisers. People from the coast come to visit the events in Forlì – enabled by a good mobility infrastructure.
- In 2050 the city centre of Forlì is lively and attracts young and old people through services and events. The centre is a place to meet between generations.
- In 2050 the city of Forlì is more compact. The city is densified, to avoid excessive growth outside the current boundaries. The periphery of the city is preserved for agricultural use. A compact city adds to sustainable use of resources and soil.

2

High quality of the urban space

In 2050, people in Forlì value healthy, high-quality urban spaces. They enjoy accessible spaces and new, sustainable forms of transport. The city offers many well-connected, well-equipped green spaces that enhance social life. People are digital, environmental and social ‘natives’, who appreciate and take responsibility for their city.

Strategic ambitions

- In 2050 the people of Forlì are aware and take responsibility for their city. They are educated to be digital-, environmental-, and social natives, that appreciate sustainability and behave accordingly.
- In 2050 the urban space of Forlì is recovered and the qualitative value of the existing spaces is increased. The community benefits and respects the space by making better use of it. People gather for social meetings in the urban space.
- In 2050 the citizens of Forlì enjoy better and more accessible urban spaces. New ways of sustainable and improved quality transportation are used (e.g. bikes, public transport). The citizens are aware of the impact on their health.
- In 2050 Forlì will have the best air quality of Italy and therefore citizens suffer less from climate change. A micro-climate is developed that is ideal, because it makes use of waste/water/energy (re)generation and only exploits green-energy consuming mobility and systems.
- In 2050 the city of Forlì will have lots of small green spaces & squares that are well-equipped to enhance several types of social activities. New smart technologies are used to enhance this. Green spaces in private buildings (balconies, court yards, etc.) are also well-kept and contribute to the value of green spaces.

3

Open territorial cooperation

In 2050, people in Forlì benefit from the results of open territorial cooperation that encourages innovation in the use of the urban spaces. Ideas are turned into business, contributing to the city’s economic development. All public and private stakeholders work together to develop and implement new solutions for challenges in environmental resource management and a green circular economy.

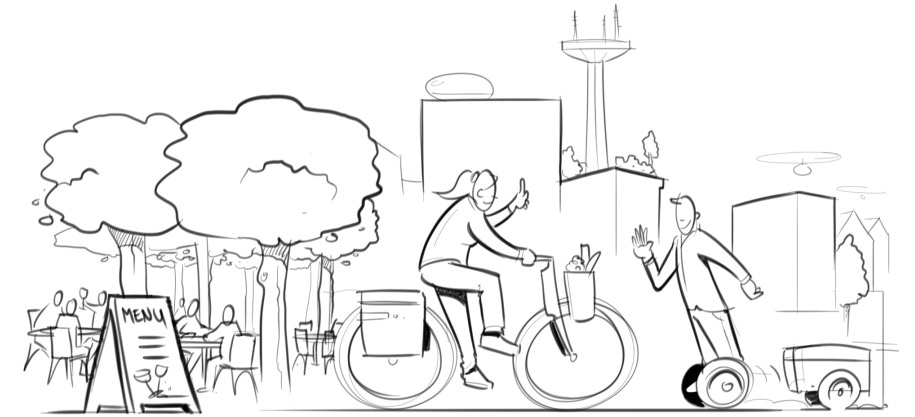
Strategic ambitions

- In 2050 the municipality of Forlì operates in a well-connected, cooperative region, where all stakeholders – public and private – join to connect infrastructure and green spaces. Cooperation is established to optimise energy, water and waste management, thus a green circular economy.
- In 2050 technological development & IT integration is developed to promote social cohesion & regional cooperation. In a living lab an integrated system for strategic thinking and cooperation is exploited.
- In 2050 Forlì is world-famous for technologies that were ‘born’ here in local enterprises. Innovative ways of working (e.g. marketing) are applied and contribute to the city as a whole. Young people turn their ideas into business. The city builds on its smart citizens. Good integration of citizens with people from the university and research centre. Forlì is open and connected. Collaboration between public and private sector is enhanced by aligning time-lines and through coordination.

Drivers for change for the future of Smart Urban Spaces in Forlì 2050

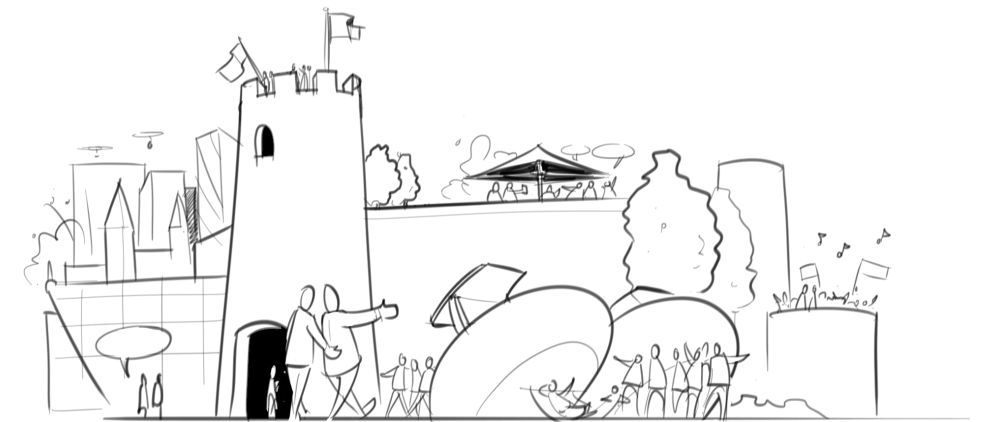
Better living at a human scale

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



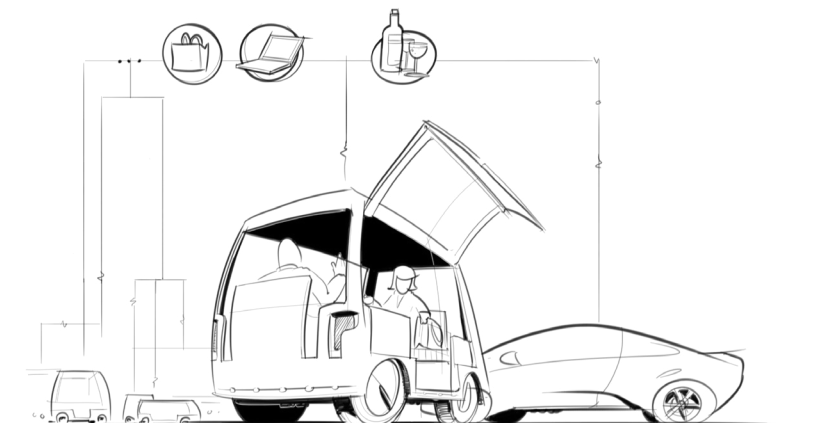
Attractive cities with unique qualities

In 2050, cities have unique qualities that embody their own history and culture as an integral part of their DNA. The differences between them make the cities distinctive and attractive places for business and visitors. And people of different backgrounds find them good places to work and live. The cities offer a good balance in the quality of neighbourhoods and infrastructure, with affordable services for all income levels. Social needs drive city design, which is constantly and organically reshaped to meet people's changing needs. The use of spaces and buildings is always under review to deliver maximum value for users.



Personal mobility as a service

In 2050, technology enables autonomous vehicles. These take affordable personal mobility to a whole new level. Technology makes sharing easy, so everyone has access to a vehicle whenever they need it. It also facilitates the transition to a circular economy, gradually replacing legacy systems with cleaner, safer options. Stakeholder resistance is overcome by the availability of complete, resilient system that meet the needs of city dwellers in full.



Regenerating resources in a circular economy

In 2050, the circular economy ensures self-sufficiency of cities. Renewable energy is abundant, and this ensures a secure supply of vital resources for life (energy, water, food and clean air), although other resources may still be scarce. Cities have implemented circular systems to regenerate all the resources needed by their populations. These mechanisms are based on small-scale, local solutions, enabled by changed decision-making levels.





We would like to thank the participants for their contribution to the scenario workshops:

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• Mara Rubino	Municipality of Forlì
• Tiziana Sabetta	Municipality of Forlì
• Gioia Sambenedetto	Municipality of Forlì
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• Chiara Ugolini	CertiMaC soc.cons. a r.l.
• Massimo Visani	Municipality of Forlì
• Nevio Zaccarelli	Municipality of Forlì – Councillor



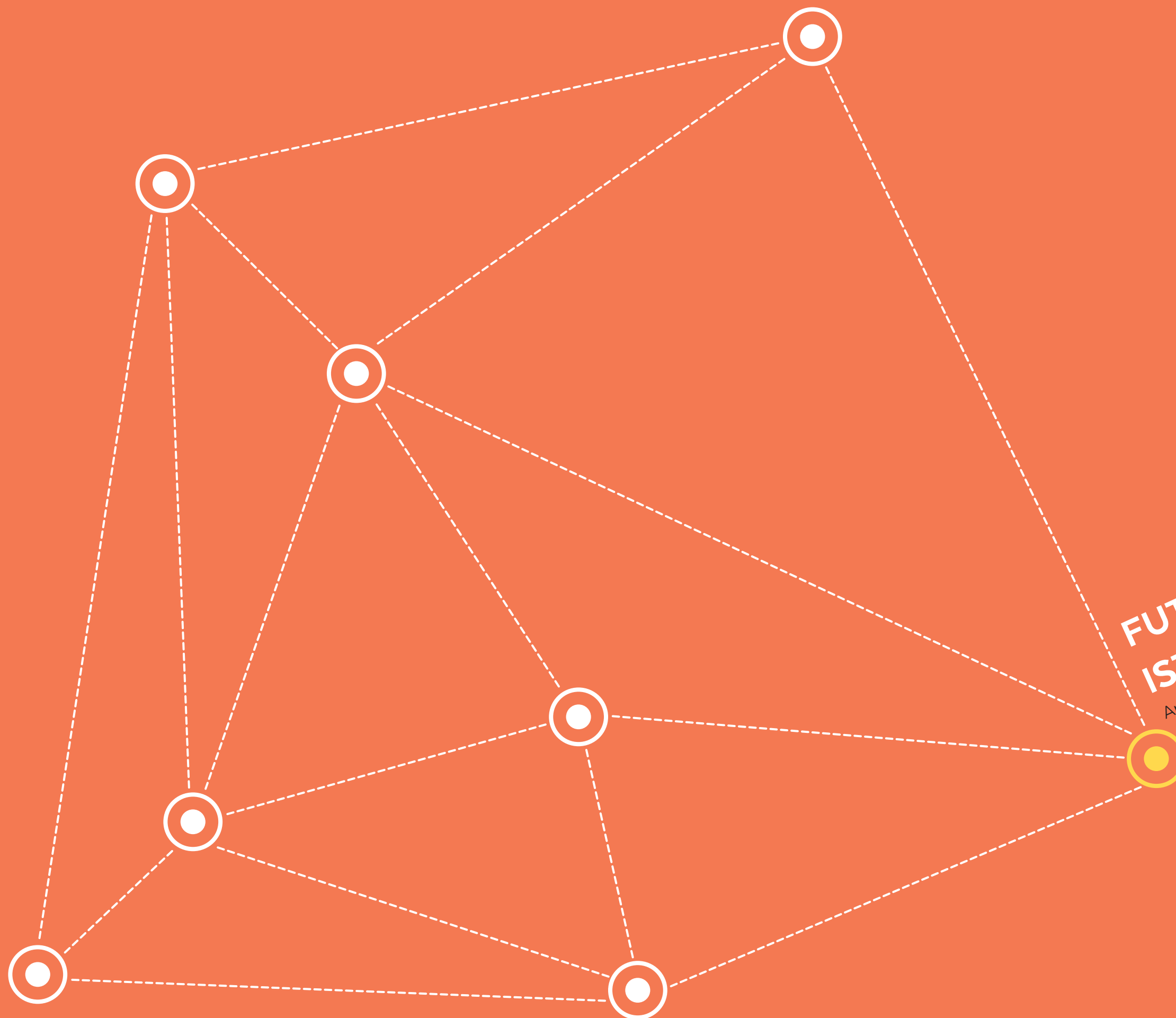
This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



ROADMAPS
FOR
ENERGY[®]



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FUTURE SCENARIO ISTANBUL 2050

Appendix C to D2.2 Report – Desired Future Scenarios

15 June 2016

Esma DILEK & Ugur KIZILOK , Istanbul Metropolitan Municipality (IMM)
Elke DEN OUDEN & Jan-Jaap RIETJENS & Rianne VALKENBURG, TU/e LightHouse

R4E

ROADMAPS
FOR
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This appendix is part of the D2.2 Report – Desired future scenarios – and contains all results of the vision development activities held in the city of Istanbul.



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

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

Versions of this report:

15 May 2016	Concept for internal check in the city (limited distribution)
15 June 2016	Final version for public distribution

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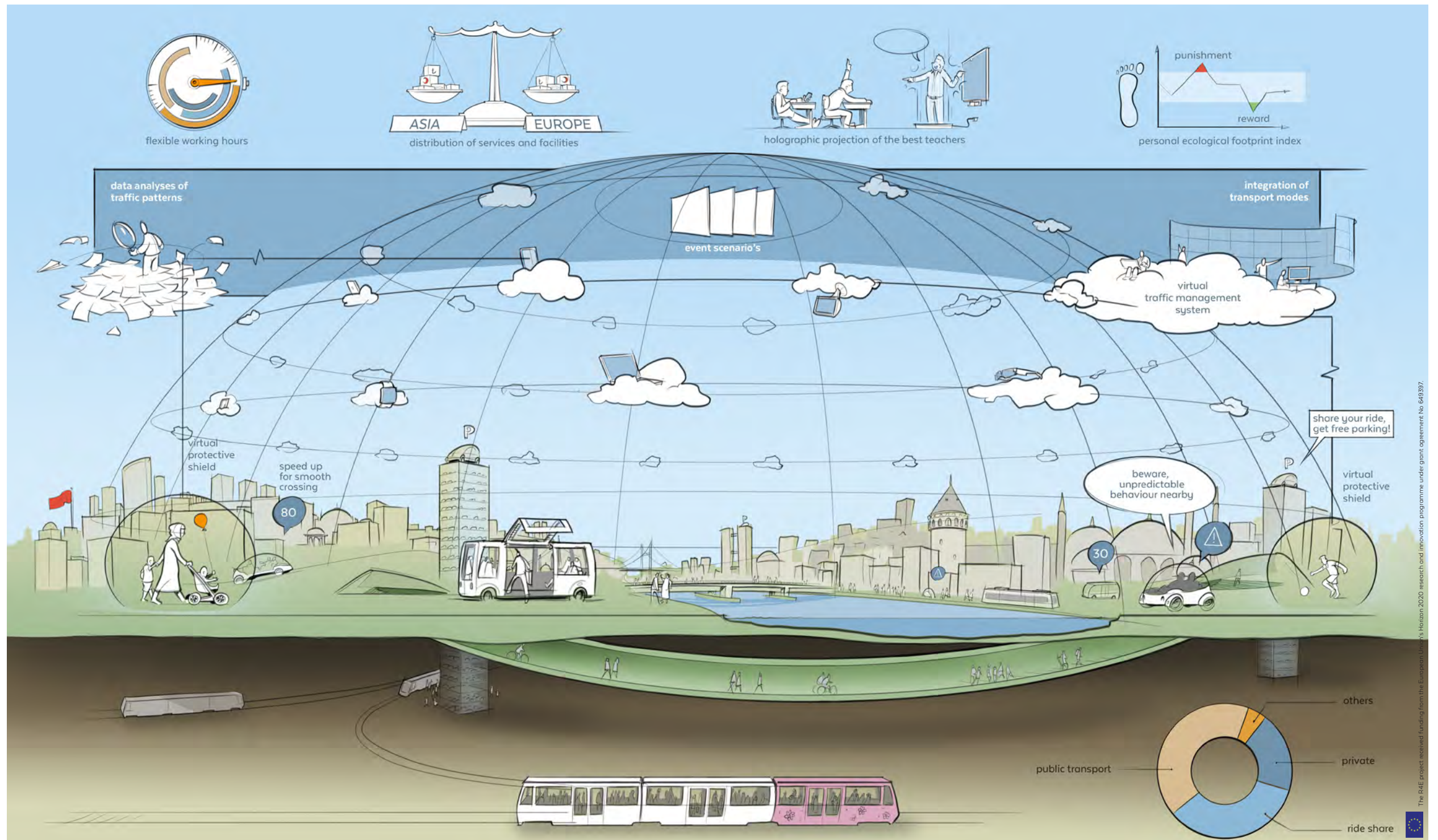
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PERSONALISED, SMOOTH, SAFE TRAFFIC IN ISTANBUL 2050

In 2050, individual travellers in Istanbul are valued and facilitated by personalised travel advice. 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).

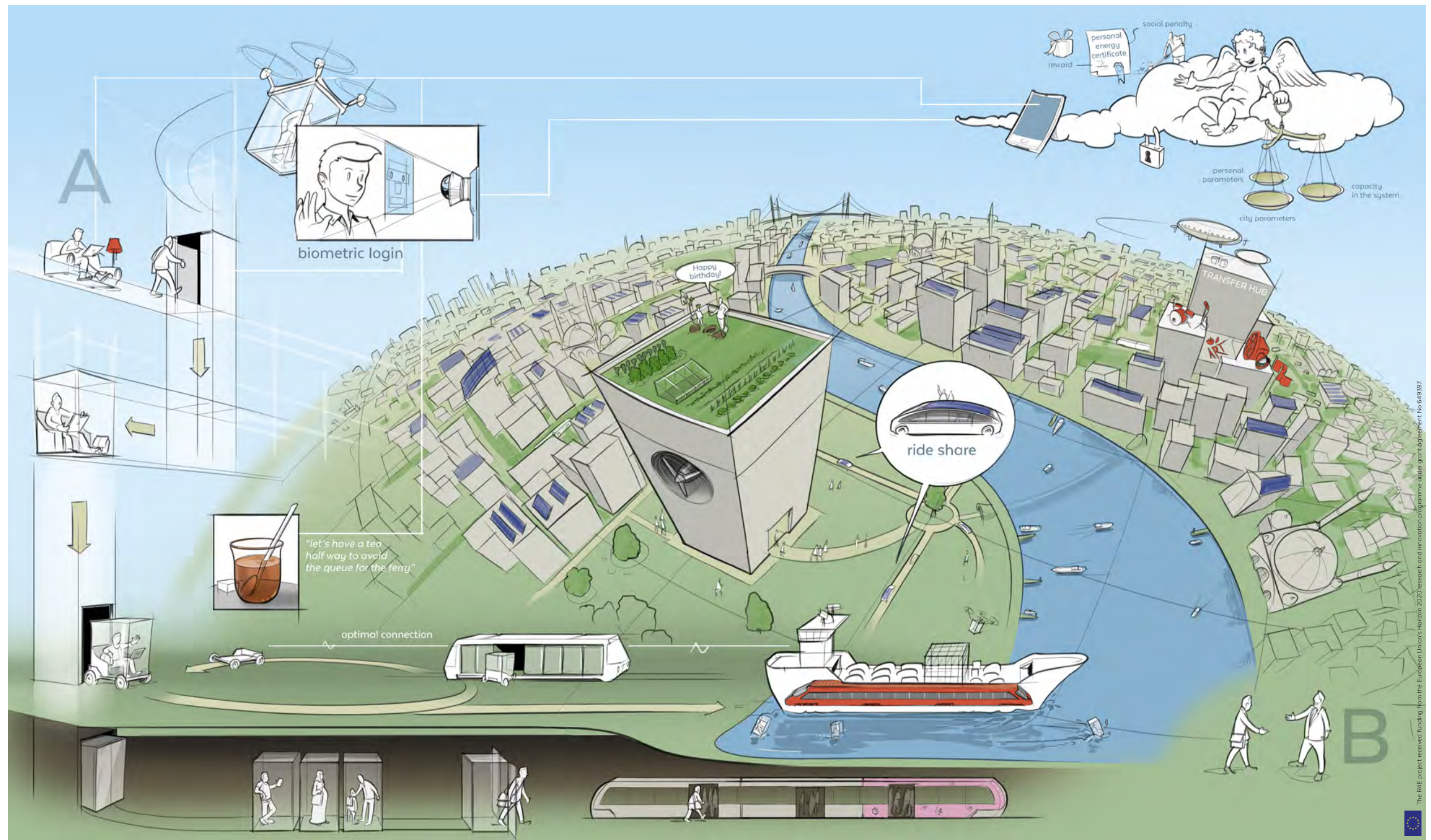
Sustainable, healthy behaviour

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.).

In 2050, a clean, green and healthy environment is valued by the citizens of Istanbul. Travellers appreciate the wide range of alternative routes and forms of transport. Public transport benefits everyone by providing good accessibility to all modes of transport. These are seamlessly integrated, providing a closely-knit network that reaches every part of the city while respecting its historical heritage.

Travellers choose sustainable and healthy options. Public transport provides a single route to people's destinations, without disruptions caused by changes between modes. 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.

The public transport systems use renewable energy resources.



The R4E project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649339.

Elements of the desired future scenario are:

A clean and green city

In 2050, Istanbul is a clean and green city. A whole new city concept has been created around emission-free and ecological buildings with green roofs and waste recycling. In green areas all over the city residents enjoy walking, cycling and (hobby and urban) gardening. Pedestrian tunnels and floating gardens connect the areas. Citizens are energy-aware; a tree is planted for each child's birthday. Energy efficiency and sustainability are monitored for continuous improvement.

Seamless transport and pleasureable travel experience

Istanbul has 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. New modes of transport and innovative vehicles are also integrated, like autonomous vehicles in the air and on water. The integration of smaller units (personal or larger) into larger ones (ferries or trains) avoids transfers. Management is by an autonomous system.

'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.

People can easily transfer between all vehicles at hubs. These are real experience centres, with shopping, cinemas, and theatres.

Personal travel assistant

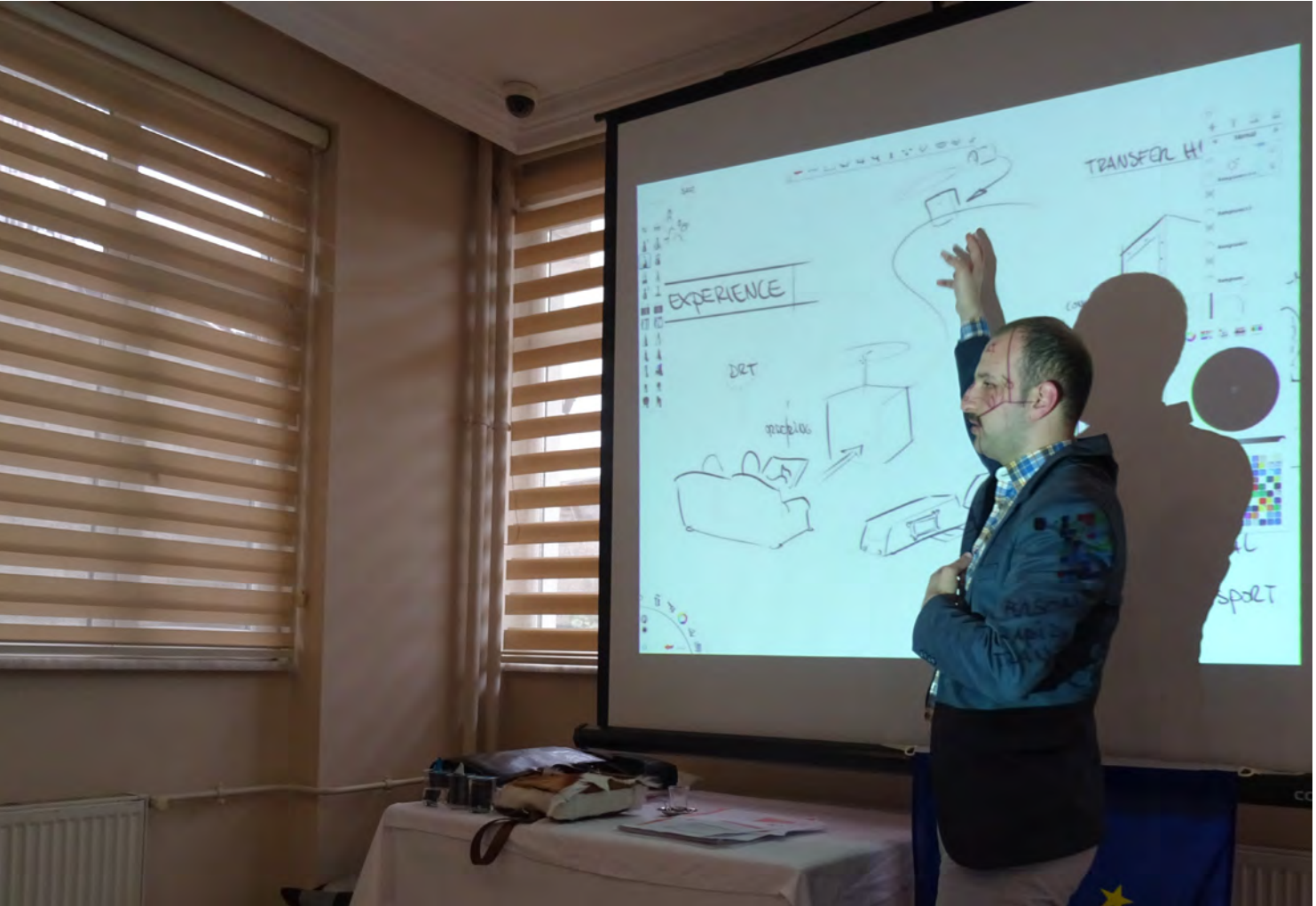
Everyone has a virtual 'guardian angel' for personal travel advice wherever they are, free of charge. All the 'angels' are connected to the cloud for accurate, up-to-date, cross-modal information. They give warnings of storms or snowfall, help to cancel or postpone trips when needed, help in case of emergencies or prevent accidents by warnings. They balance capacity in the system, important city parameters (energy, air quality, etc.) and personal health parameters.

Privacy & security

People feel comfortable and safe, because only the 'angels' have access to personal data. In 2050, the transport systems in Istanbul 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. Personal data banks have a virtual shield to ensure confidentiality and privacy, and guard against hacking.



Creating the visual of the desired future scenarios



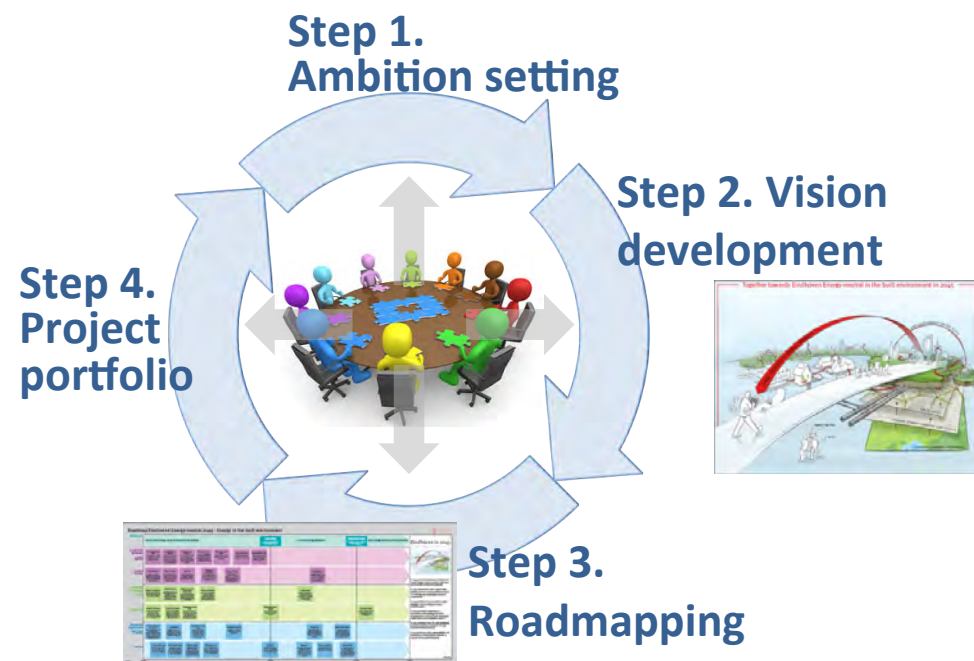
The making of the desired future scenario

The approach

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 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.



Four step approach of R4E

Step Two: 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

City 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. 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.

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

Program of the ambition workshops

The result of the vision development step is a visualisation of the desired future scenario. The visual is explained in this report and the main elements of the vision are described. The following pages also provide the background of the scenario: the ambition of the focus area, copied from the Ambition Setting D1.1 Report – Specific ambitions of the R4E partner cities and the selected Drivers for Change for each focus area, copied from the Future Telling 2050 D2.1 Report – Drivers for Change.

Ambition: Fully integrated, accessible & sustainable mobility in Istanbul 2050



1

Clean, green and healthy mobility

In 2050, a clean, green and healthy environment is valued by the citizens of Istanbul. Travellers appreciate the wide range of alternative routes and forms of transport. Travellers choose sustainable options: they use fewer cars and more public transport, and they frequently choose to travel by bike or to walk.

Public transport systems use renewable energy resources.

Strategic ambitions

- In 2050 we have energy-efficient, sustainable and green transportation.
- In 2050 we use less cars and more public transport and bikes.
- In 2050 we have increased the share of rail systems to beyond 50%.
- In 2050 we have attractive pedestrian and bicycle areas.
- In 2050 we use renewable resources for energy in public transport.

2

Fully accessible, seamless transport

In 2050, public transport benefits everyone by providing good accessibility of all modes of transport. These are seamlessly integrated, providing a finely meshed network that reaches every part of the city, while respecting its historical heritage. Public transport provides a single route to people’s destinations, without disruptions caused by changes between modes.

Strategic ambitions

- In 2050 we have accessibility of all modes of transportation through integration.
- In 2050 we achieved a 100% social inclusion in terms of mobility.

3

Well-informed travellers

In 2050, travellers value the availability of accurate, up-to-date and cross-modal information. This enables them to choose from the best option as and when they need them, taking into account changing situations and transport availability.

The information provided includes available routes, fares and car parking facilities.

Strategic ambitions

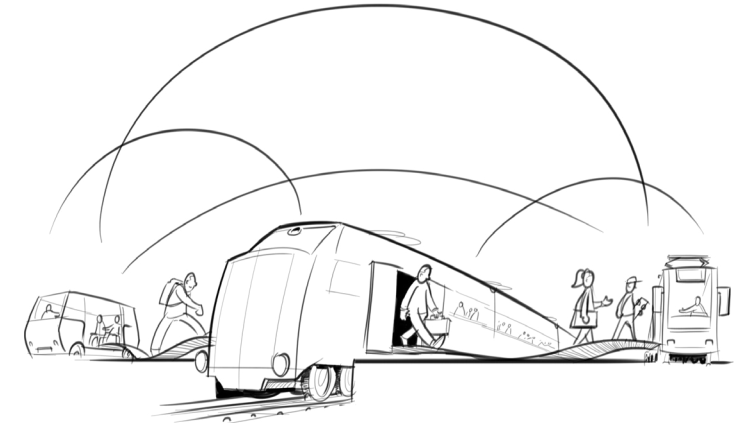
- In 2050 all mobility elements will be smart, using all effective Intelligent Transportation Systems (ITS) solutions.
- In 2050 we have better information in information systems.

Drivers for change for the future of Smart Mobility (public transport) in Istanbul 2050



Valuing public transport

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



Experience, experience, experience

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



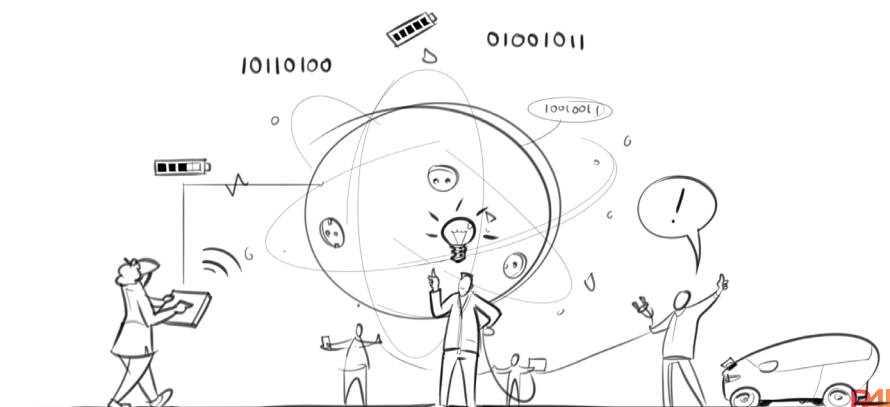
Connecting to 'green' and 'nature'

In 2050, people's need for 'green' and 'nature' is met by well-connected green spaces and landscapes all over the city. Soft birdsong and other nature sounds add an intangible quality and sense of well-being. Urban farming increases regeneration of resources, creating fresh, healthy foods, reconnecting with nature and mobilising local communities. People are aware of the effect of their living environment on health and well-being, and push for cleaner technologies. Advanced systems allow control of micro-climates, contributing to more resilient cities.



Democratised energy systems based on open data

In 2050, energy systems are open, bidirectional, multi-purpose platforms on which (renewable) energy and energy management services are open to all. Entrepreneurs have developed business models that provide value for them, for their users and for society at large. Citizens can choose freely from a range of available options. The system ensures privacy and security of users, who are always in control. Ambient energy networks provide connectivity for (wireless) access to data and energy. Increased computing power and artificial intelligence make system resilient: self-organising, self-sustaining and self-learning.





Ambition: Personalised, smooth, safe traffic in Istanbul 2050

1

Personalised travel advise

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

Strategic ambitions

- In 2050 everyone has it's own route-planner using smart apps and technologies provided. There is no need to ask anyone else for your own discretion.
- In 2050 we have individual signalisation so that communication with vehicles and drivers is possible.
- In 2050 green behaviour is stimulated

2

Fast, smooth traffic flows

In 2050, 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.

Strategic ambitions

- In 2050 traffic congestion is not among the primary 10 problems in Istanbul.
- In 2050 people move faster and fluently through the city, experiencing no congestion and using new transport modes (walking, cycling etc.). There is better air quality to stimulate healthier living and more walking and cycling.
- In 2050 there is no congestion due to the use of automation and automated solutions
- In 2050 we have low emissions and a healthy environment.

3

Traffic safety

In 2050, people in Istanbul value traffic safety. 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.

Strategic ambitions

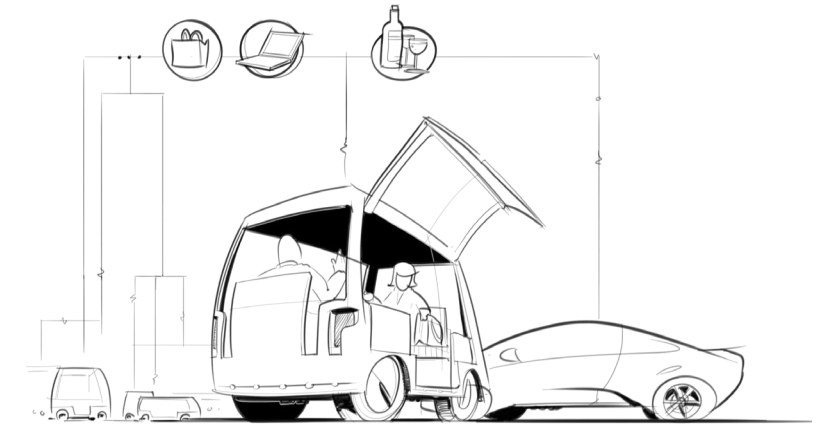
- In 2050 we have safe traffic management by communication between vehicles and infrastructure. Vehicles are equipped with smart safety measures to avoid accidents.
- In 2050 Istanbul will be in world top 5 regarding traffic safety statistics.

Drivers for change for the future of Smart Mobility (traffic management) in Istanbul 2050



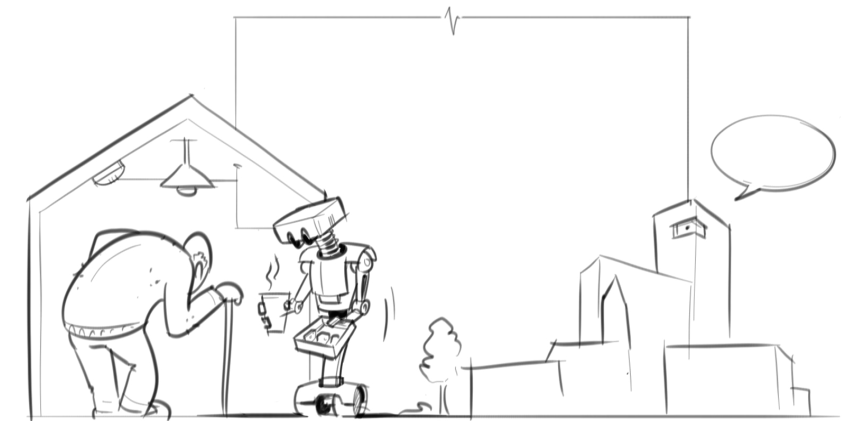
Personal mobility as a service

In 2050, technology enables autonomous vehicles. These take affordable personal mobility to a whole new level. Technology makes sharing easy, so everyone has access to a vehicle whenever they need it. It also facilitates the transition to a circular economy, gradually replacing legacy systems with cleaner, safer options. Stakeholder resistance is overcome by the availability of complete, resilient systems that meet the needs of city dwellers in full.



Technology with a human focus

In 2050, we've mastered the challenge of ever more complex, multifunctional systems and the need to make them easier to use. Those systems are user-focused: that means users can understand how the systems work, and how their own behaviour affects sustainability and energy use. Robotics and smart (home care) systems support living at home, helping people to live healthier lives and to stay in their homes longer as they get older. There's a range of available solutions that plug-in directly to the city's open energy platform.



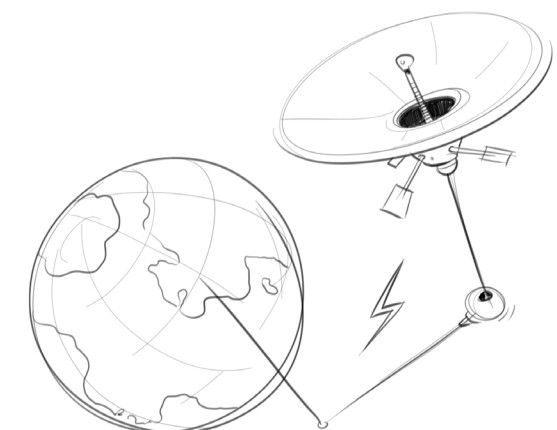
Valuing public transport

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



Applying new technologies

In 2050, a range of new technologies are available and affordable. Some of them are already in development, others are still unknown. Cities apply those technologies in new solutions that contribute to the quality of life, and in particular to the creation of smart buildings, smart mobility and smart urban spaces.







Contributions

We would like to thank the participants for their contribution to the scenario workshops:

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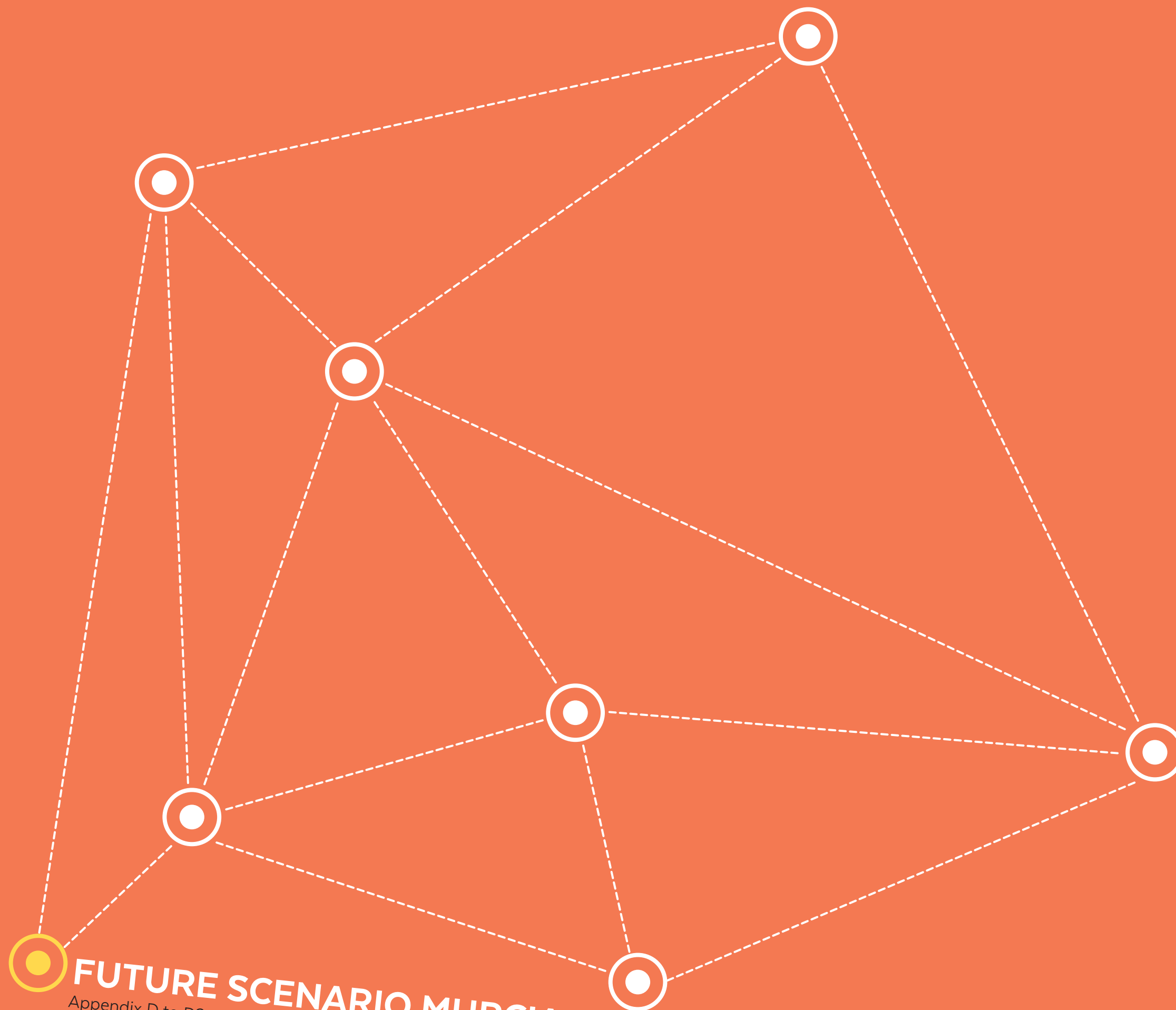
This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



ROADMAPS
FOR
ENERGY[®]



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FUTURE SCENARIO MURCIA 2050

Appendix D to D2.2 Report - Desired Future Scenarios

15 June 2016
Jaime RUIZ HUESCAR & María Cruz FERREIRA COSTA, Ayuntamiento de Murcia
Elke DEN OUDEN & Jan-Jaap RIETJENS & Rianne VALKENBURG, TU/e LightHouse



**ROADMAPS
FOR
ENERGY®**

This appendix is part of the D2.2 Report – Desired future scenarios – and contains all results of the vision development activities held in the city of Murcia.



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:

5 February 2016	Concept for internal check in the city (limited distribution)
15 May 2016	Final version for public distribution
15 June 2016	Final version for public distribution – with minor corrections



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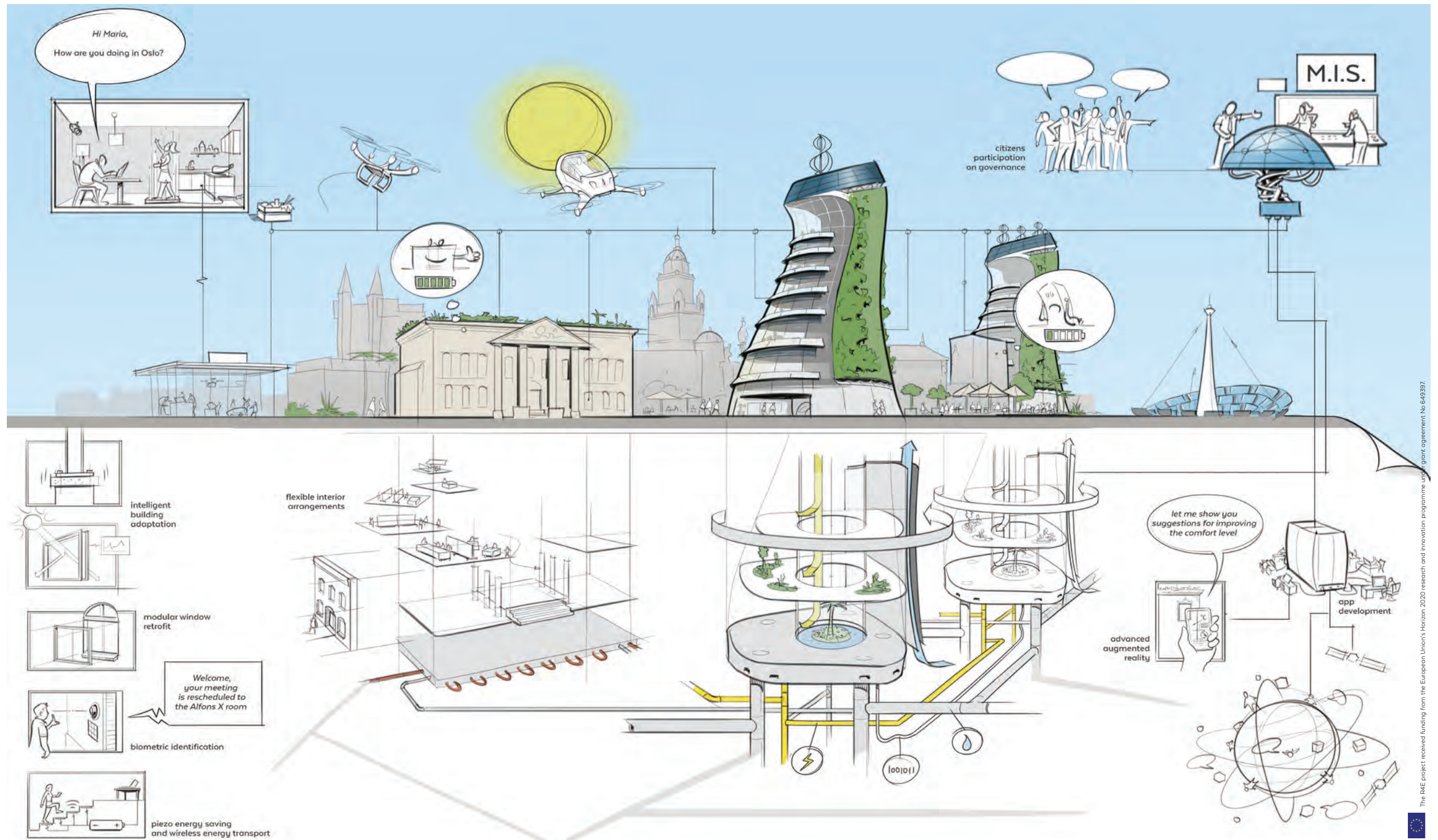
Desired future scenario Smart Buildings	D 4
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SMART, INTERCONNECTED GREEN BUILDINGS MAXIMISE USER COMFORT IN MURCIA 2050

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 CO₂-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

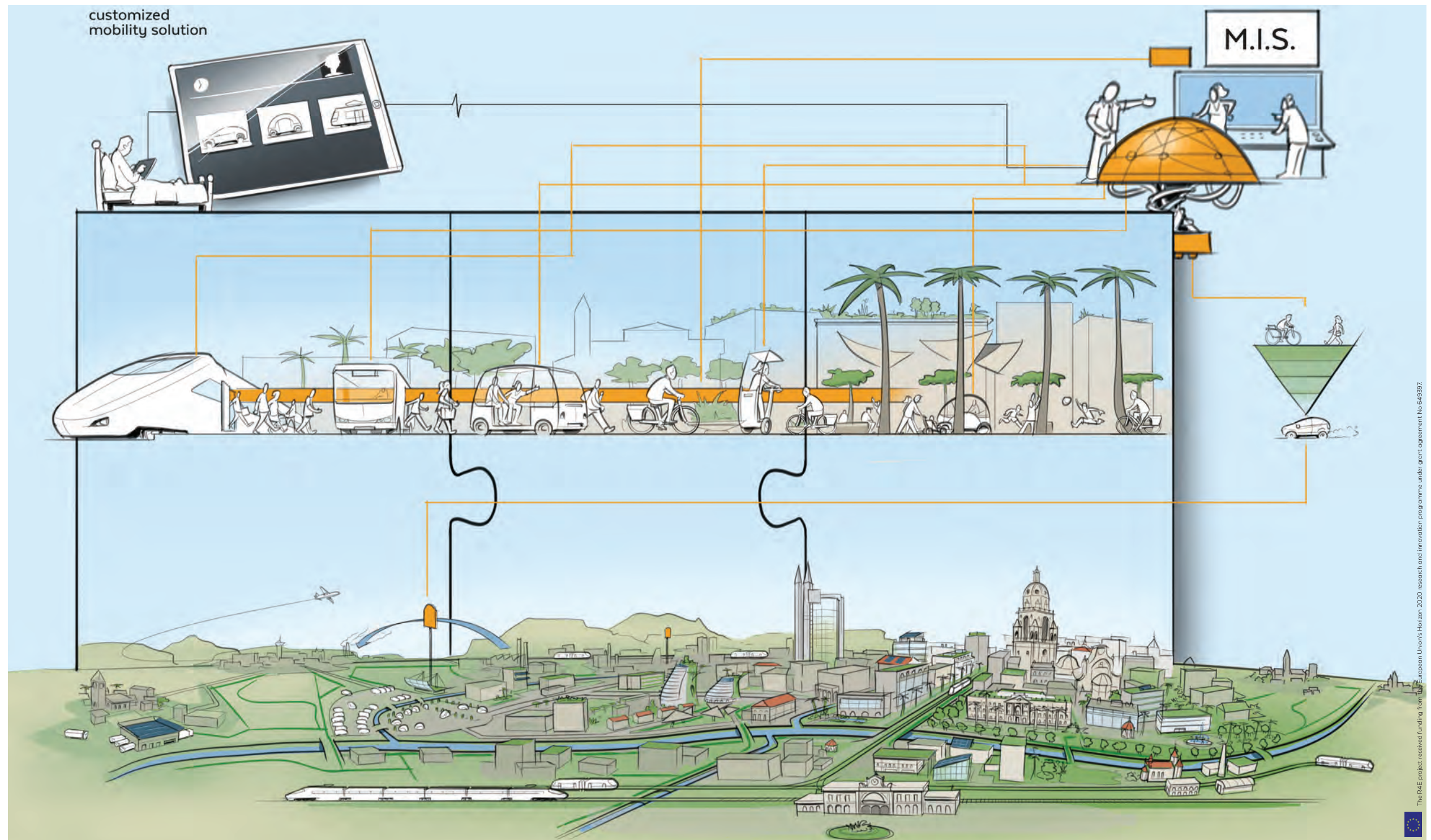
Murcia's Master Intelligent System uses open data and standard protocols all over the city, providing new services on an open platform. People can easily access and connect to the platform, wherever they are. Energy supply and demand are matched — and legally embedded — in the central system. The focus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

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

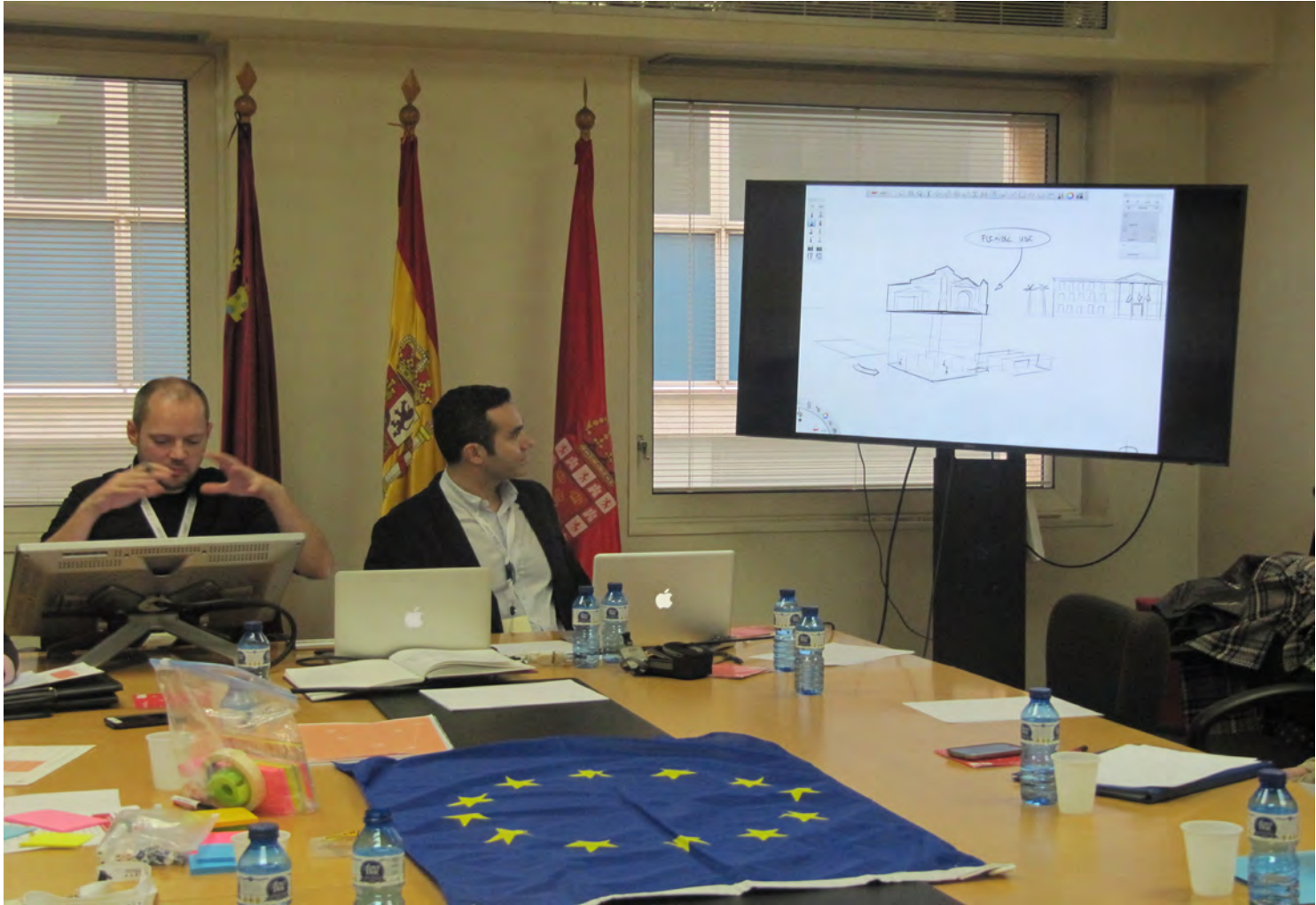
The 'pedanías' zone provides accessibility for people from the outlying areas and visitors. (Mass) public transport is provided by train, tram and bus, and is clean, fast and accessible. Free parking for private (unsustainable) cars is available at inter-modal transport hubs. These make it easy for people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

Smart citizens

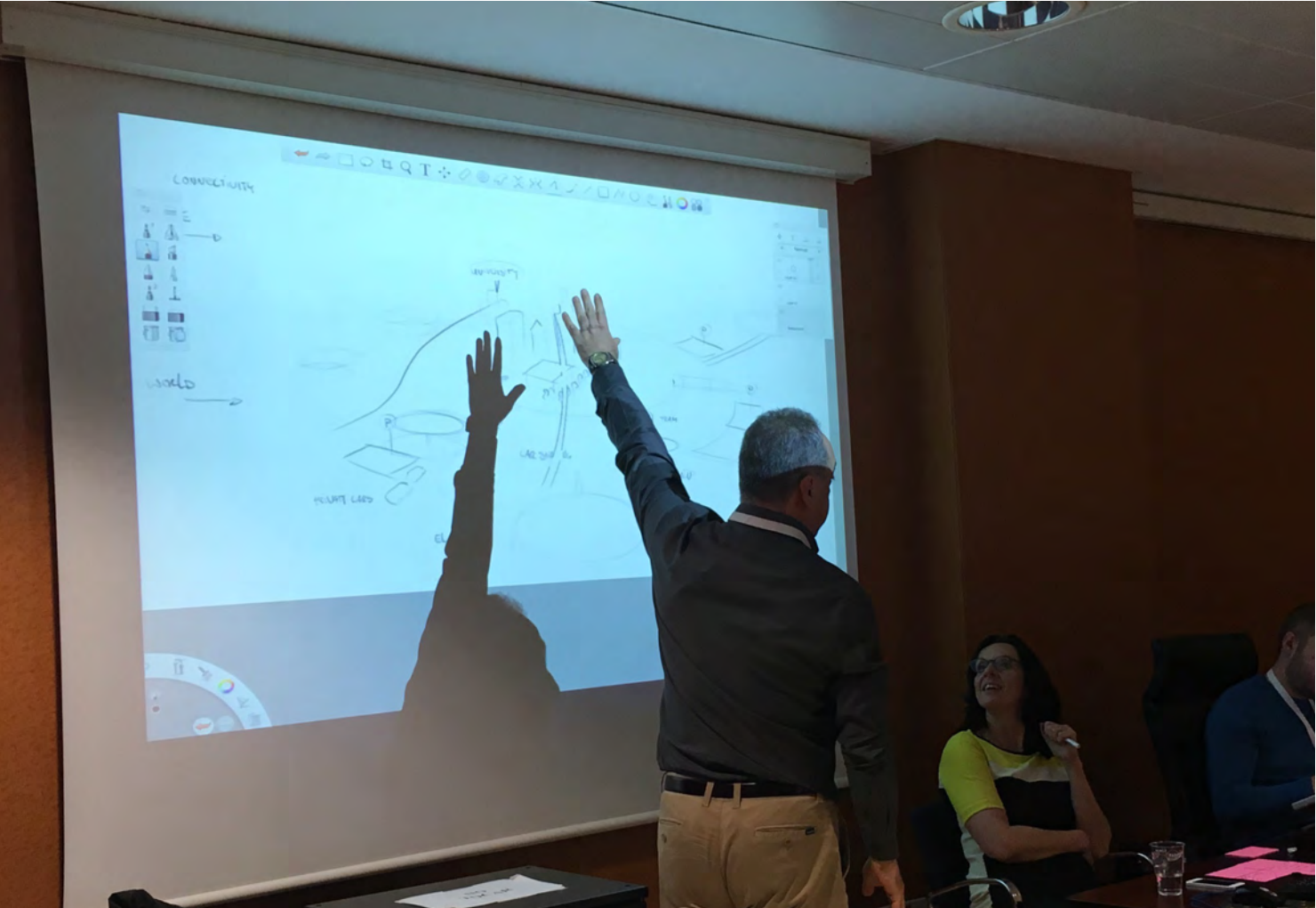
Citizens naturally choose sustainable and healthy solutions. Mentality and behaviour embrace healthy living. People value a clean and safe city, and are willing to contribute to achieving this. Education from an early age and co-creative workshops with citizens and companies, increase awareness and involvement,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



Creating the visual of the desired future scenarios





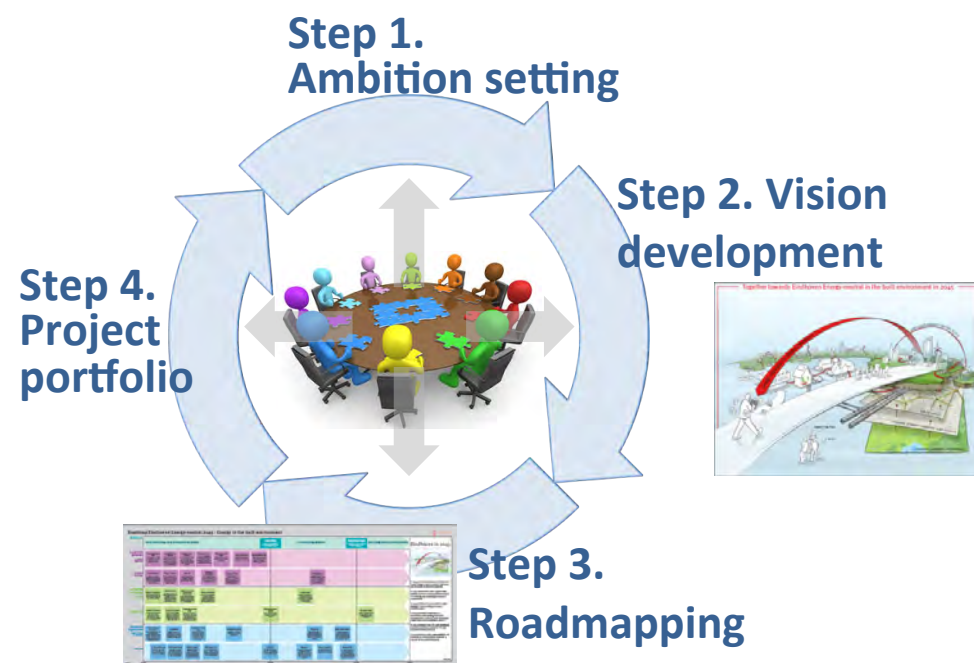
The making of the desired future scenario

The approach

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 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.



Four step approach of R4E

Step Two: 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

City 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. 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.

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

Program of the ambition workshops

The result of the vision development step is a visualisation of the desired future scenario. The visual is explained in this report and the main elements of the vision are described. The following pages also provide the background of the scenario: the ambition of the focus area, copied from the Ambition Setting D1.1 Report – Specific ambitions of the R4E partner cities and the selected Drivers for Change for each focus area, copied from the Future Telling 2050 D2.1 Report – Drivers for Change.

Ambition: Smart, interconnected green buildings maximise user comfort in Murcia 2050

1

Interconnected buildings optimise comfort and use of resources

In 2050, the buildings in Murcia are interconnected by a tele-management system that enables sharing of energy and resources. This makes a big contribution to users’ comfort and convenience, both inside and outside the buildings.

Strategic ambitions

- In 2050 buildings in Murcia inter-communicate, think and act in order to provide comfort and user-centered services with energetic autonomy.
- In 2050 in Murcia tele-management will allow buildings to inter-operate in order to optimise resources.

2

Buildings proactively adjusting to changing user needs

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

Strategic ambitions

- In 2050 the buildings in Murcia adjust themselves to the needs of their users and to external factors. The buildings being flexible and granted in terms of comfort by the use of centralised intelligent systems. The use is also optimised.
- In 2050 buildings in Murcia inter-communicate, think and act in order to provide comfort and user-centered services with energetic autonomy.

3

‘Clean & green’ buildings and city

In 2050, Murcia is among Europe’s top ‘clean & green’ cities. This is achieved by green urban planning that values CO2-neutral, energy-producing buildings. These use renewable energy sources and have a low impact on nature, both during their construction and in daily use.

Strategic ambitions

- In 2050 all buildings in Murcia are zero-net balanced throughout the city. The buildings generate clean produced energy to fit their use. The capacity to store the energy is also realised. A greener Murcia is energy self-sufficient.
- In 2050 in Murcia the buildings will run on renewable energies, will be build with reusable materials and will not generate waste that may have a negative impact on nature.
- In 2050 Murcia is amongst the top 10 green, eco-friendly cities in Europe. Urban planing creates enough green to minimize local CO2-emission and local heat stress. The citizens are aware of their energy consumption and reduce their use.



Drivers for change for the future of Smart Buildings in Murcia 2050

Better buildings

In 2050, new buildings combine historical qualities and new technologies, creating maximum comfort and functionality for their users. Historical expertise in building for specific local climates is used to design solutions for new buildings, and for thoughtful upgrading of those already existing. The latest technologies and materials are applied to make buildings self-sufficient or even energy positive, contributing to abundant of renewable energies in cities. Policies aim at improving the quality of neighbourhoods and strengthening the sense of community, and not only at reducing energy consumption.

Technology with a human focus

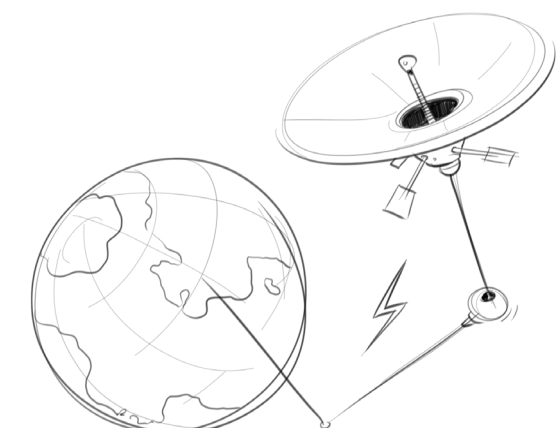
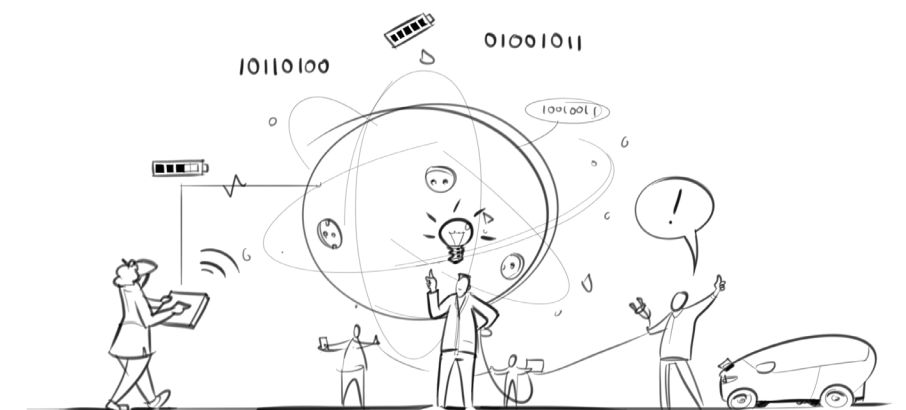
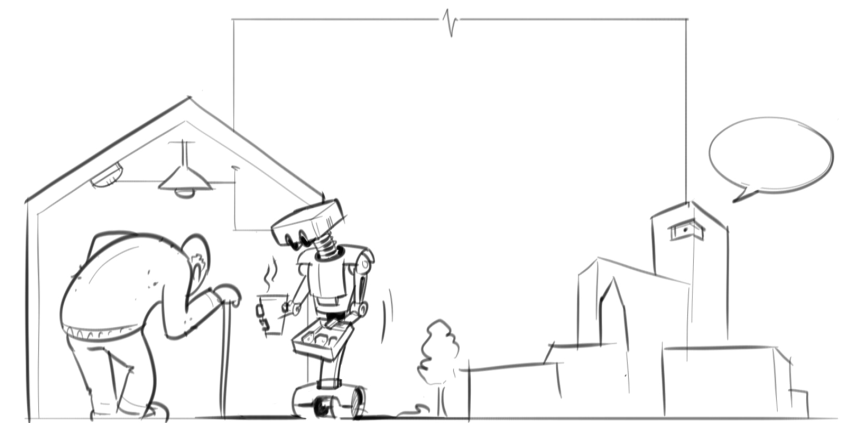
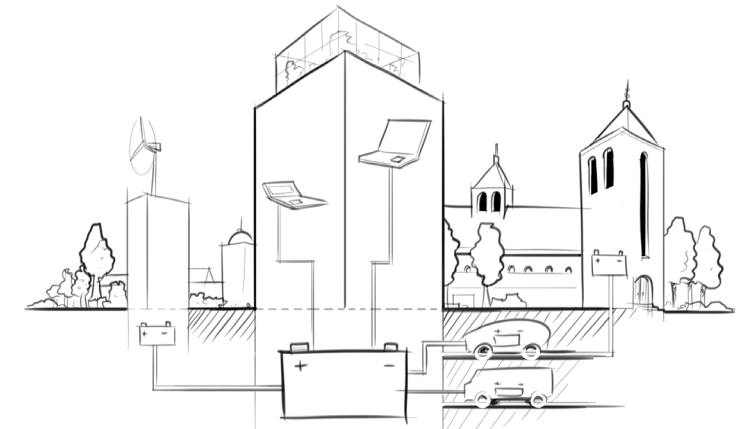
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In 2050, energy systems are open, bidirectional, multi-purpose platforms on which (renewable) energy and energy management services are open to all. Entrepreneurs have developed business models that provide value for them, for their users and for society at large. Citizens can choose freely from a range of available options. The system ensures privacy and security of users, who are always in control. Ambient energy networks provide connectivity for (wireless) access to data and energy. Increased computing power and artificial intelligence make system resilient: self-organising, self-sustaining and self-learning.

Applying new technologies

In 2050, a range of new technologies are available and affordable. Some of them are already in development, others are still unknown. Cities apply those technologies in new solutions that contribute to the quality of life, and in particular to the creation of smart buildings, smart mobility and smart urban spaces.





Ambition: Safe, clean and affordable mobility in Murcia 2050

1

Smart, integrated platform for mobility of people and goods

In 2050, people in Murcia value a smart, integrated mobility platform that gives them ‘one-click’, low-cost movement around the whole city and its surroundings. The system provides optimal transport of both people and goods.

Strategic ambitions

- In 2050 the transport system of vehicles and goods will be optimised through smart and integrated platforms.
- In 2050 I will be able to leave home and move around the city with non-polluting public transport, with ‘one click’ and at low cost.

2

Clean public transport and vehicle sharing systems

In 2050, people in Murcia enjoy a clean and effective public transport system throughout the city. Vehicles can be shared, and are safe thanks to smart traffic management. Transport modalities incorporate incentives to reduce the user of private cars.

Strategic ambitions

- In 2050 vehicles will use clean energies. We will be able to share them and we will be safer thanks to smart management of traffic and mobility and we will be preferably use public transport.
- In 2050 Murcia will use a collective transport system, moved by clean energies. The use of private cars will be restricted and subject to a car sharing system.

3

A safe, clean city for pedestrians in harmony with clean mobility

In 2050, Murcia is a city that allows pedestrians to enjoy large, pollution and noise-free areas. These are shared in perfect harmony with cyclists and other safe, clean forms of mobility.

Strategic ambitions

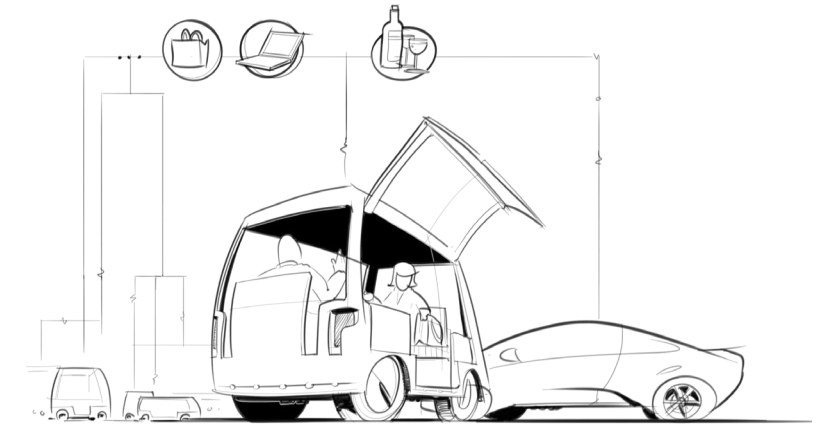
- In 2050 Murcia will be a town for and in favour of pedestrians. It has large areas free of pollution and noise and in perfect harmony with bicycles and other transport means.
- In 2050 extensive pedestrian areas will predominate in Murcia, and in these pedestrians and other safe and clean mobility means will live in harmony.

Drivers for change for the future of Smart Mobility in Murcia 2050



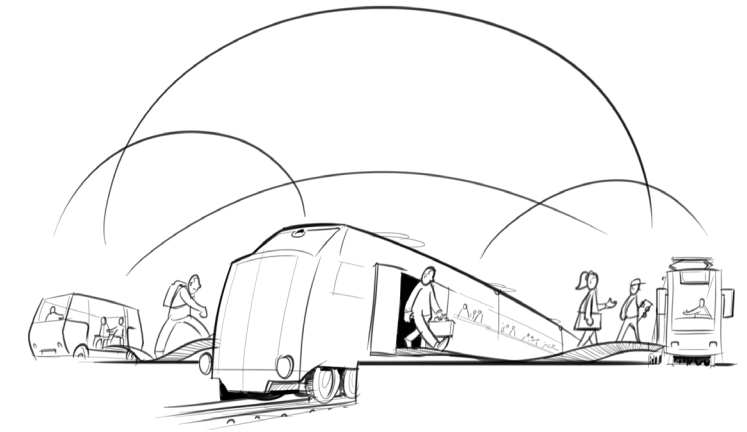
Personal mobility as a service

In 2050, technology enables autonomous vehicles. These take affordable personal mobility to a whole new level. Technology makes sharing easy, so everyone has access to a vehicle whenever they need it. It also facilitates the transition to a circular economy, gradually replacing legacy systems with cleaner, safer options. Stakeholder resistance is overcome by the availability of complete, resilient system that meet the needs of city dwellers in full.



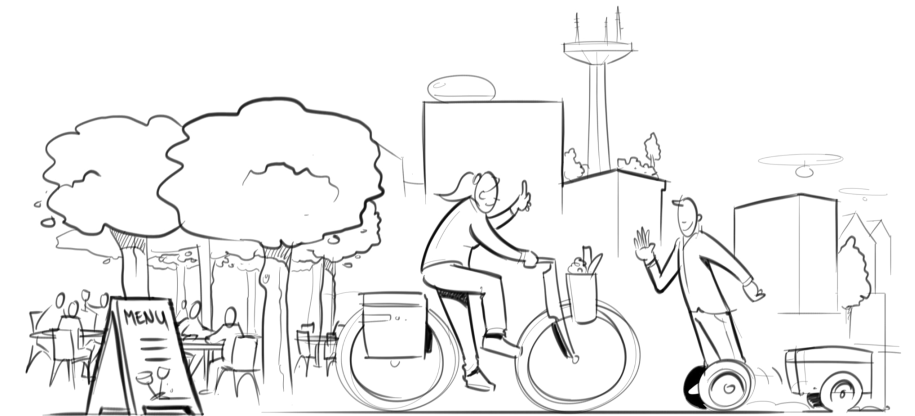
Valuing public transport

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



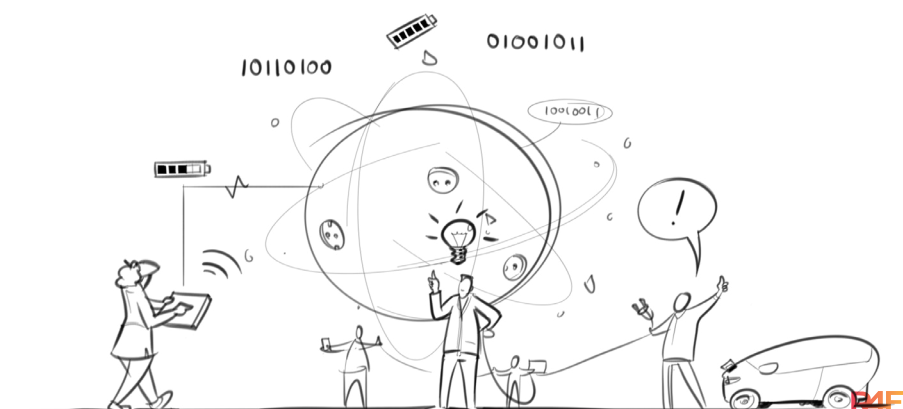
Better living at a human scale

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



Democratised energy systems based on open data

In 2050, energy systems are open, bidirectional, multi-purpose platforms on which (renewable) energy and energy management services are open to all. Entrepreneurs have developed business models that provide value for them, for their users and for society at large. Citizens can choose freely from a range of available options. The system ensures privacy and security of users, who are always in control. Ambient energy networks provide connectivity for (wireless) access to data and energy. Increased computing power and artificial intelligence make system resilient: self-organising, self-sustaining and self-learning.





Contributions



We would like to thank the participants for their contribution to the scenario workshops:

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• David Sanchez	IRSA		



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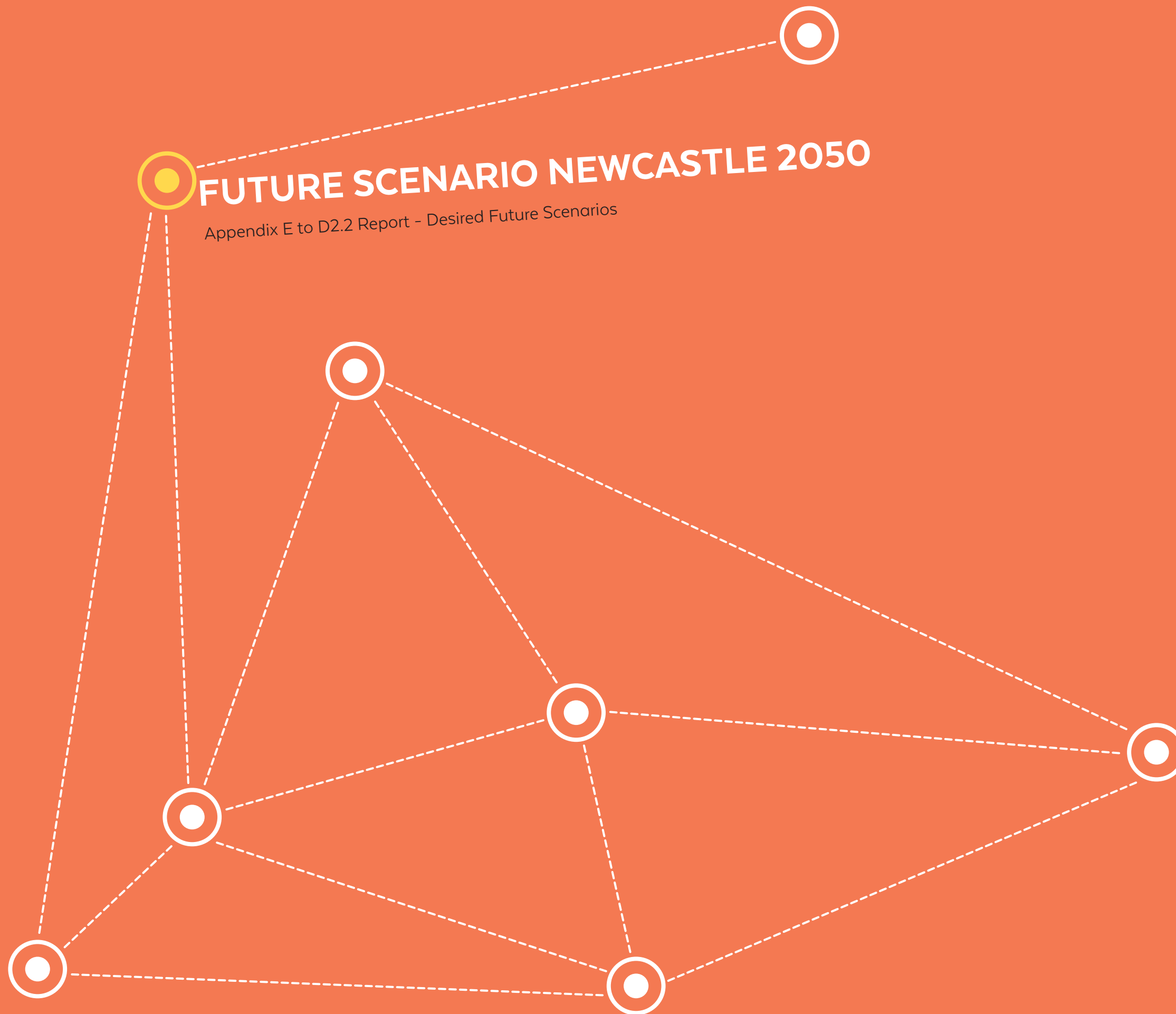
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This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397

FUTURE SCENARIO NEWCASTLE 2050

Appendix E to D2.2 Report - Desired Future Scenarios



15 June 2016

Adrian MCLOUGHLIN & Simon JOHNSON, Newcastle City Council (NCC)
Elke DEN OUDEN & Jan-Jaap RIETJENS & Rianne VALKENBURG, TU/e LightHouse

R4E

ROADMAPS
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This appendix is part of the D2.2 Report – Desired future scenarios – and contains all results of the vision development activities held in the city of Newcastle.



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:

25 March 2016	Concept for internal check in the city (limited distribution)
15 May 2016	Final version for public distribution
15 June 2016	Final version for public distribution – with minor corrections



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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.

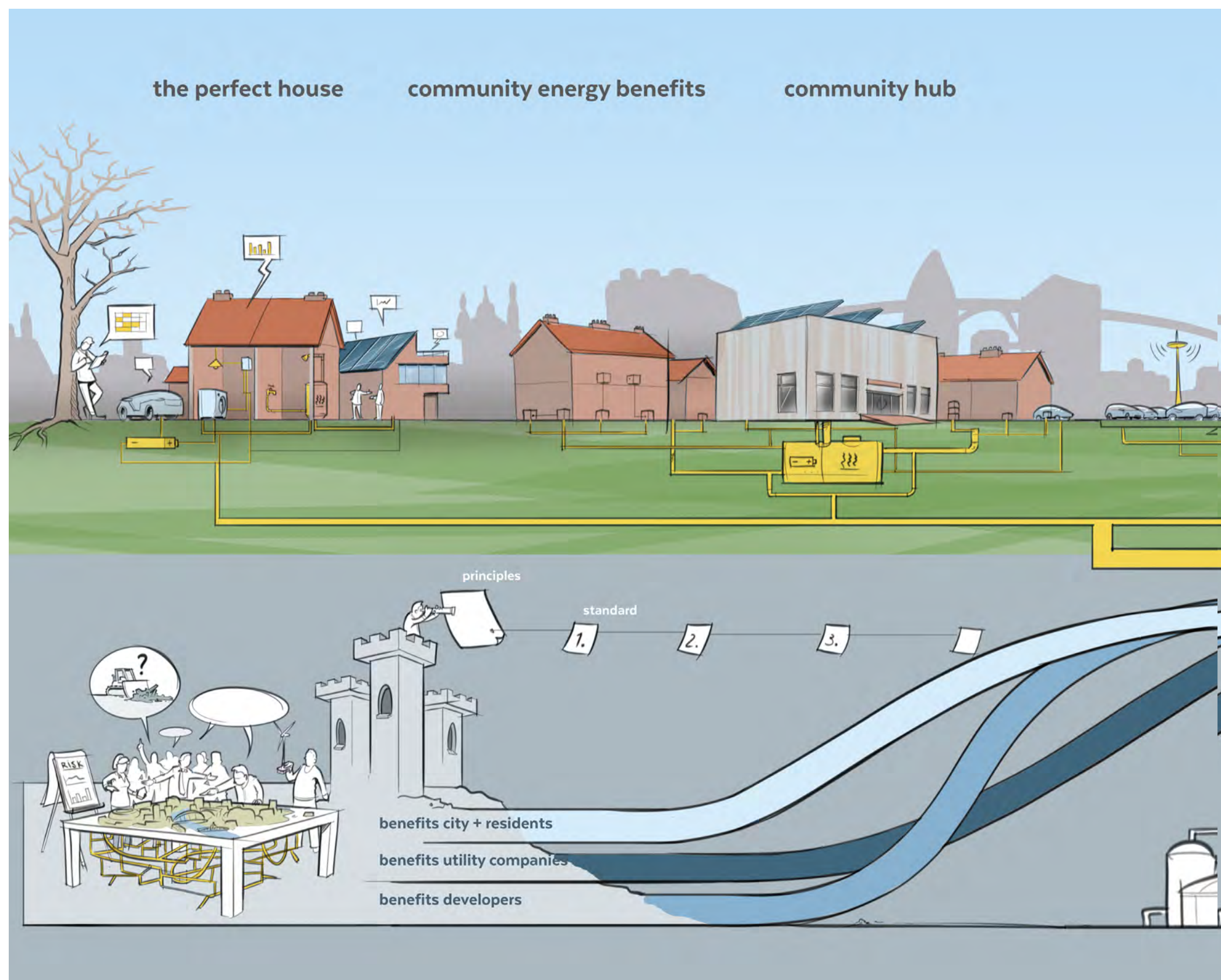
Smart infrastructures

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

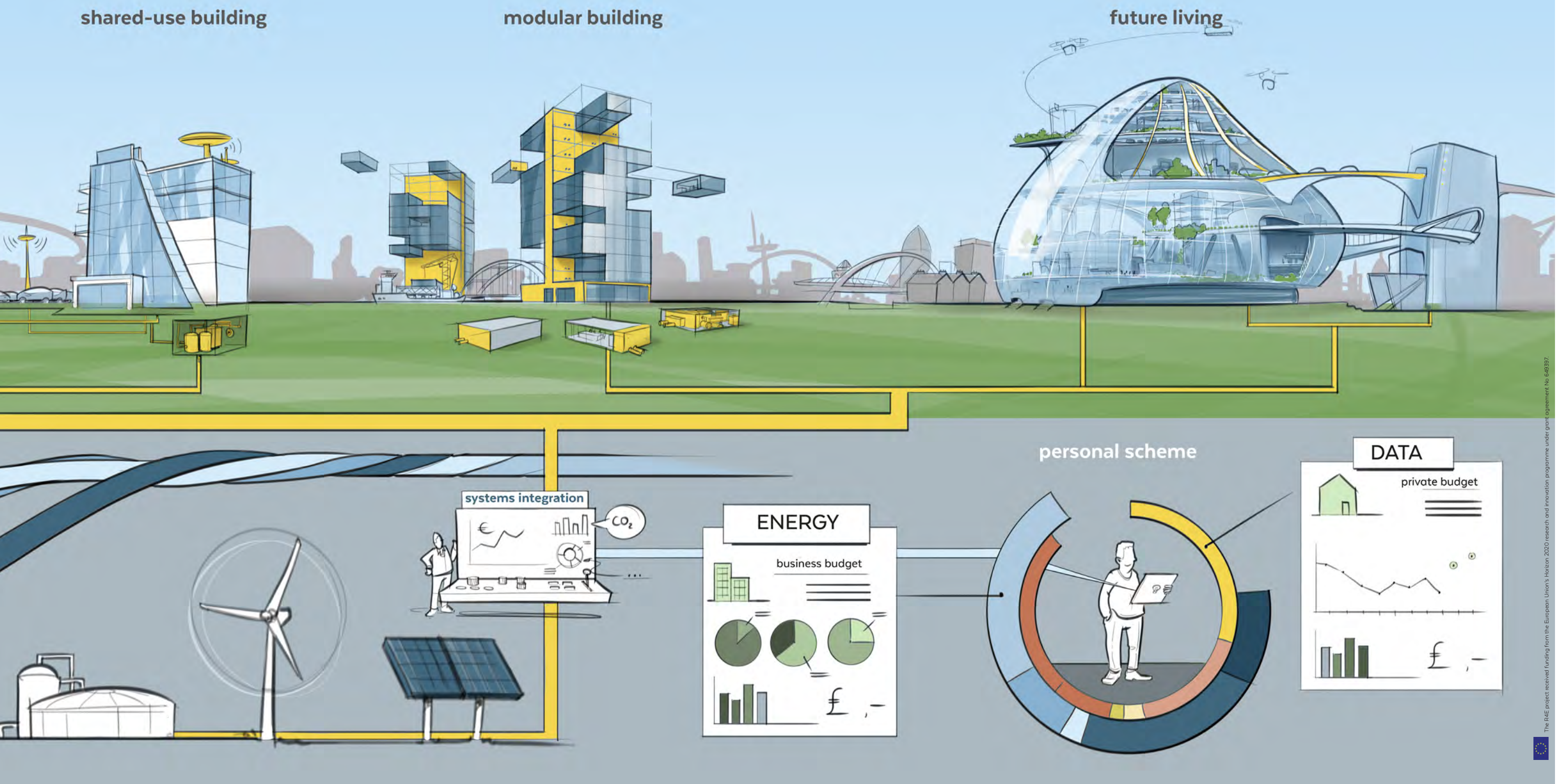
Policy-making and planning in Newcastle are based on a city-wide plan. This fully integrates all assets and their interactions, so the total impact on the surrounding can be considered. A collaborative approach together with all stakeholders drives alignment of information and leads to better decisions. 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.



Creating the visual of the desired future scenarios



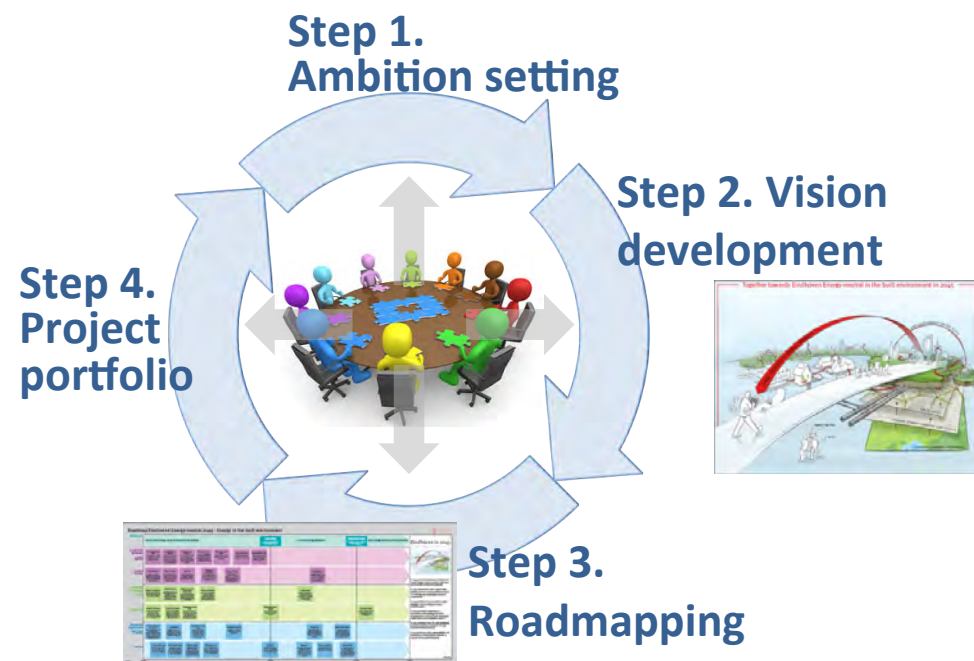
The making of the desired future scenario

The approach

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 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.



Four step approach of R4E

Step Two: 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

City 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. 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.

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

Program of the ambition workshops

The result of the vision development step is a visualisation of the desired future scenario. The visual is explained in this report and the main elements of the vision are described. The following pages also provide the background of the scenario: the ambition of the focus area, copied from the Ambition Setting D1.1 Report – Specific ambitions of the R4E partner cities and the selected Drivers for Change for each focus area, copied from the Future Telling 2050 D2.1 Report – Drivers for Change.

Ambition: Smart homes enabling a high quality of life in Newcastle 2050

1

Comfortable housing, affordable energy

In 2050, residents of Newcastle value living in the city because of the high quality of life and comfortable housing. Good data management supports an effective energy system, in which all the homes have zero energy usage from the grid. Controllability is achieved by new collaboration and business models for sustainable energy solution. These make energy accessible and affordable for all, in both new and existing housing.

Strategic ambitions

- In 2050 Newcastle domestic buildings have zero energy import from the grid.
- In 2050 the energy system is affordable, accessible, sustainable and fair.
- In 2050 all domestic housing enjoy energy efficient, comfortable and de-carbonised heating. Affordable retrofitting solutions and suitable business models have made it possible for all residents in both existing and newer housing to install such solutions.

2

Empowering residents

In 2050, residents of Newcastle have the means and the wish to make responsible choices in their energy usage. Retrofitting domestic heating systems and adding intelligent controls enables the most efficient, low-carbon options. At the same time it creates jobs in the local economy and helps to tackle fuel poverty. Residents are empowered to control their own energy usage, ensuring affordable, low-carbon heating and enabling healthy, safe energy consumption levels.

Strategic ambitions

- In 2050 the residents of Newcastle have the means and the desire to control their energy environment and make responsible choices.
- In 2050 fuel poverty is zero.
- In 2050 energy consumption in households uses a more diverse range of technologies. Distributed power generation, electrification of heat and connection to district systems are the norm. Other sources of local heat could include geothermal and a wider variety of heat pumps. This more complex, more local energy system offers jobs to the local economy; Many of the traditional jobs in the fossil fuel sector have diversified into the green economy, (e.g. services for offshore wind).

3

City leadership

In 2050, Newcastle City Council is valued for its strong leadership and clear vision. It has created a sustainable society, in which people themselves take responsibility and set the right example. Through the open data centre the City Council and its partners are able to implement evidence-based policies and decision-making. Through consistent, evidence-based programmes, partnerships have created a secure, self-sufficient and low-carbon energy system for the city.

Strategic ambitions

- In 2050 Newcastle City Council considers the local (regional) authority footprint, looking beyond the boundaries of a house, of a property, of a land ownership and creating shared responsibility.
- In 2050 Newcastle is low-carbon energy secure and self-sufficient.
- In 2050 Newcastle City Council benefits from their clear message, strong leadership and leadership by example.



Drivers for change for the future of Smart Buildings (domestic) in Newcastle 2050

Better buildings

In 2050, new buildings combine historical qualities and new technologies, creating maximum comfort and functionality for their users. Historical expertise in building for specific local climates is used to design solutions for new buildings, and for thoughtful upgrading of those already existing. The latest technologies and materials are applied to make buildings self-sufficient or even energy positive, contributing to abundant of renewable energies in cities. Policies aim at improving the quality of neighbourhoods and strengthening the sense of community, and not only at reducing energy consumption.

Technology with a human focus

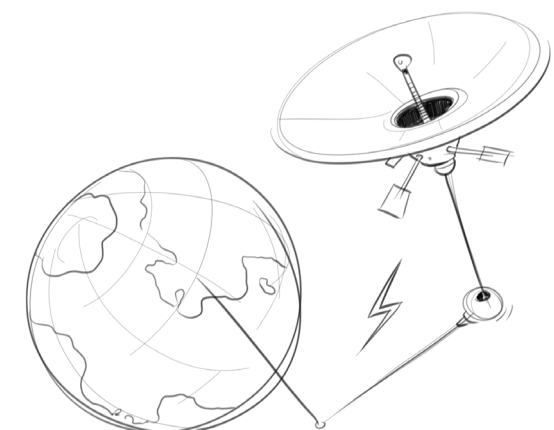
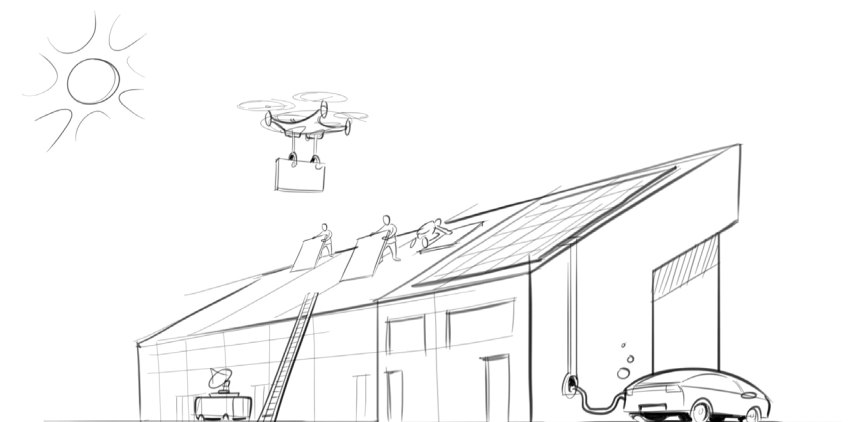
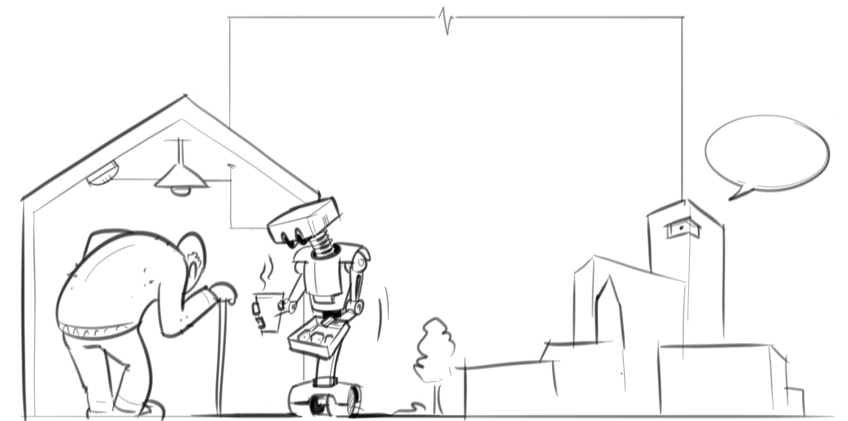
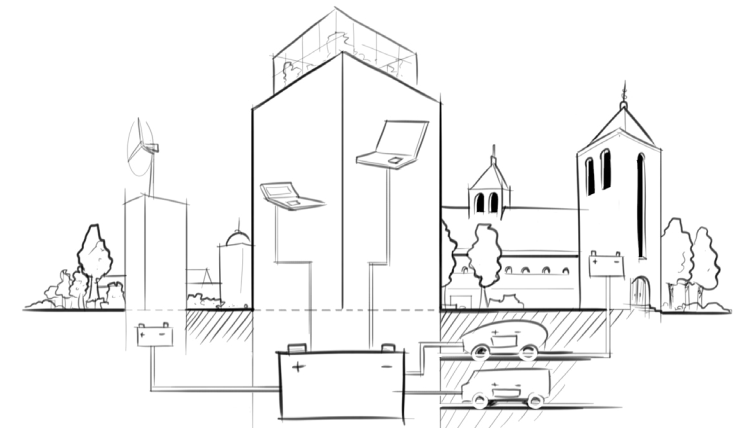
In 2050, we've mastered the challenge of ever more complex, multifunctional systems and the need to make them easier to use. Those systems are user-focused: that means users can understand how the systems work, and how their own behaviour affects sustainability and energy use. Robotics and smart (home care) systems support living at home, helping people to live healthier lives and to stay in their homes longer as they get older. There's a range of available solutions that plug-in directly to the city's open energy platform.

Building business for social living

In 2050, suitable financing structures and revenue models are available, offering solutions that are affordable while also boosting the local economy. Both individuals and small communities act as entrepreneurs. They benefit from good infrastructure and technology options, so they can self manage and at the same time improve their lives and the living environment.

Applying new technologies

In 2050, a range of new technologies are available and affordable. Some of them are already in development, others are still unknown. Cities apply those technologies in new solutions that contribute to the quality of life, and in particular to the creation of smart buildings, smart mobility and smart urban spaces.



Ambition: Smart buildings and infrastructure enable a thriving economy in Newcastle 2050

1

Fit-for-purpose, energy efficient buildings

In 2050, occupants and users of non-domestic buildings in Newcastle enjoy flexible, energy-efficient spaces which they can easily adapt to their own, changing needs. They use on-going retrofit solutions to adapt the buildings to their specific usage and maximise efficiency. Buildings are exemplary in the use of innovative, sustainable technologies. High visibility of the solutions contributes to a thriving building sector that ‘exports’ design and consulting services. Newcastle City Council shows leadership and informs, supports and cooperates in creating efficient buildings.

2

Collective approach to infrastructure

In 2050, Newcastle has adopted a collective approach that enables joint decision-making with partners and stakeholders in the city. All buildings are smart – so they both receive and transmit information – and are connected to a physical infrastructure of all kinds of networks (grids, transport, heating, electricity, data etc.). Urban planning takes a broad, wide-area view to take full advantage of opportunities extending beyond site boundaries and city limits.

3

Vibrant economy, happy people

In 2050, Newcastle has a thriving economy based on new industries that attract young people. The smart buildings policy makes the city attractive to investors, resulting in new jobs and new forms of collaboration with stakeholders. Citizens enjoy high-quality facilities, community life and an attractive, green living environment.

Strategic ambitions

- In 2050 all buildings are as efficient as they can be with the newest technologies, despite when they were built. All buildings are flexible adaptable to changing occupancy needs and user requirements. The use of innovative solutions is visible in the city.
- In 2050 the buildings in Newcastle are affordable and fit-for-purpose. Occupants will have the necessary technology to flexibly adapt the spaces to their needs.
- In 2050 Newcastle is a leader in a smart cities approach and an exemplar in sustainable energy efficient buildings. This approach is adopted by all stakeholders. The City Council is a national leader in driving business participation through policy making and by getting things done.

Strategic ambitions

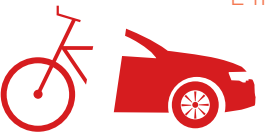
- In 2050 a collective approach is realised that enables joint decision making as well as a physical infrastructure that connects all buildings. In urban planning a broader view and wider area is considered to link smart buildings into smart grids to reap the opportunities beyond the specific site boundaries
- In 2050 Newcastle City Council has both direct service provision and a strong mix of innovative, collaborative and cooperative models for partnership and participation that supports the smart development of the city.

Strategic ambitions

- In 2050 Newcastle has a vibrant economy based on new industries (like digital and software) that attract young people.
- In 2050 the city of Newcastle is a catalyst for job creation and industry investments for ethical and environmental developments.
- In 2050 Newcastle is internationally recognised as an innovative area where investments are rewarded through policy. Collaboration between policy and businesses is facilitating continuous investments for a sustainable city.
- In 2050 the outcomes of the smart buildings policy are visible and explicitly of value to all stakeholders, in the sense of health, jobs, cooperation, citizens and community experience. The economy is vibrant, with green jobs, maximising the potential of the city.
- In 2050 Newcastle attracts young people with a growing economy and attractive living environment (facilities, entertainment options, walking and cycling routes). The jobs in the gas/oil industry have been replaced by new jobs in the green economy (such as services for off-shore wind). The new economy in e.g. software and digital industries benefit from Newcastle’s heritage as international trading city.

Drivers for change for the future of Smart Buildings (non-domestic) in Newcastle 2050

SMART MOBILITY



Flexible 're-purposing'

In 2050, we've adapted to continuous city dynamics. Buildings are part of the constant transformation of urban area. People know that 'things are always changing', so they have an open mind on how buildings and spaces are used. So this can change over time - or even during the day - in line with changing needs and events. As properties become available, they are used for meet the specific need at that time. Individuals and smaller collectives with shared interest have easy access to available properties, sites and services. Historic buildings and cultural heritage are 're-purposed', taking their specific qualities into account.



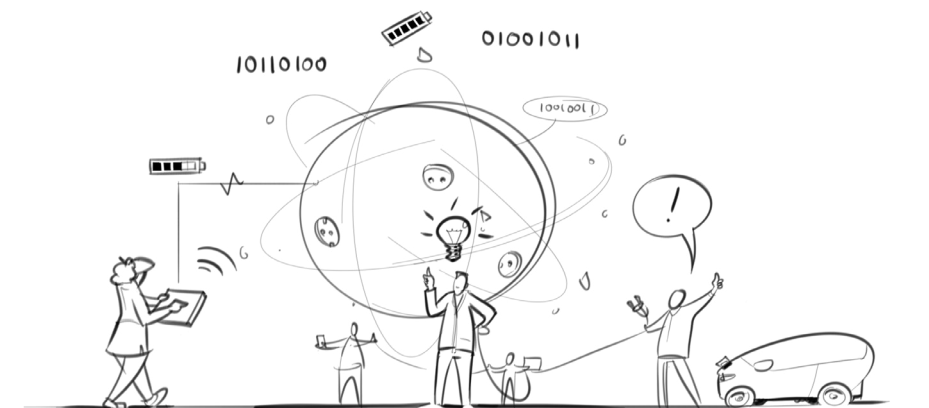
Enabling human development

In 2050, city residents are resilient, and can consciously adapt their behaviour to enable personal development. The middle class have largely disappeared. People have found new ways to live meaningful lives, building on opportunities at all levels - from local to global. They can handle large amounts of information to make personal choices. Smart, human-centric city environments provide inspiring places for lifelong learning.



Democratised energy systems based on open data

In 2050, energy systems are open, bidirectional, multi-purpose platforms on which (renewable) energy and energy management services are open to all. Entrepreneurs have developed business models that provide value for them, for their users and for society at large. Citizens can choose freely from a range of available options. The system ensures privacy and security of users, who are always in control. Ambient energy networks provide connectivity for (wireless) access to data and energy. Increased computing power and artificial intelligence make system resilient: self-organising, self-sustaining and self-learning.



Regenerating resources in a circular economy

In 2050, the circular economy ensures self-sufficiency of cities. Renewable energy is abundant, and this ensures a secure supply of vital resources for life (energy, water, food and clean air), although other resources may still be scarce. Cities have implemented circular systems to regenerate all the resources needed by their populations. These mechanisms are based on small-scale, local solutions, enabled by changed decision-making levels.





Contributions

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• 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
• Padraig 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



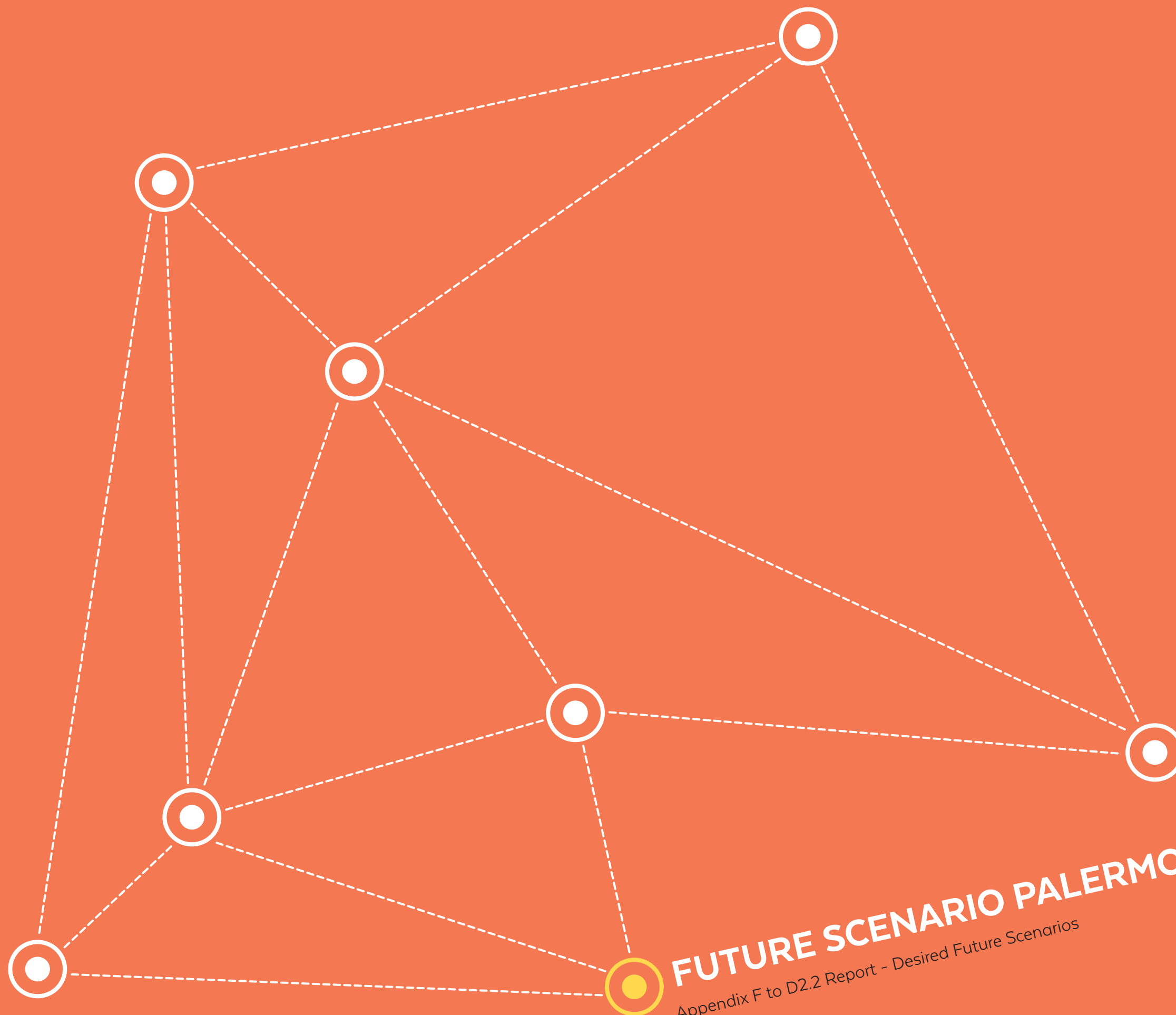
This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



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FUTURE SCENARIO PALERMO 2050

Appendix F to D2.2 Report - Desired Future Scenarios

15 June 2015

Antonio MAZZON & Nunzio SALFI, Comune di Palermo
Elke DEN OUDEN & Jan-Jaap RIETJENS & Rianne VALKENBURG, TU/e LightHouse

R4E

ROADMAPS
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This appendix is part of the D2.2 Report – Desired future scenarios – and contains all results of the vision development activities held in the city of Palermo.



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- Ambition: Cultural and social harbour Palermo 2050
- Drivers for change for the future of Smart Buildings in Palermo 2050
- Ambition: 'Sweet & green' mobility in Palermo 2050
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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.

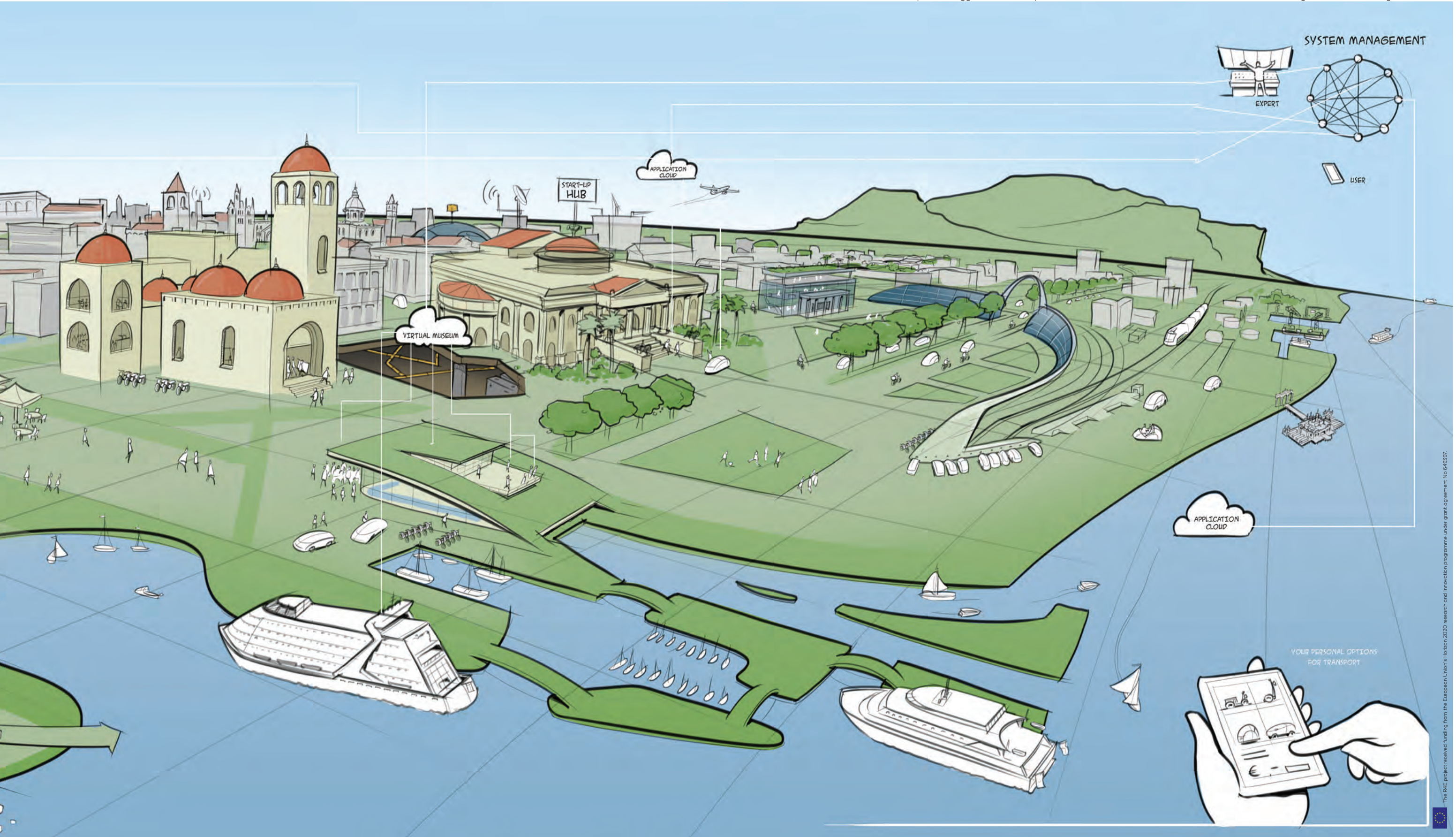


City for the people of Palermo

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.



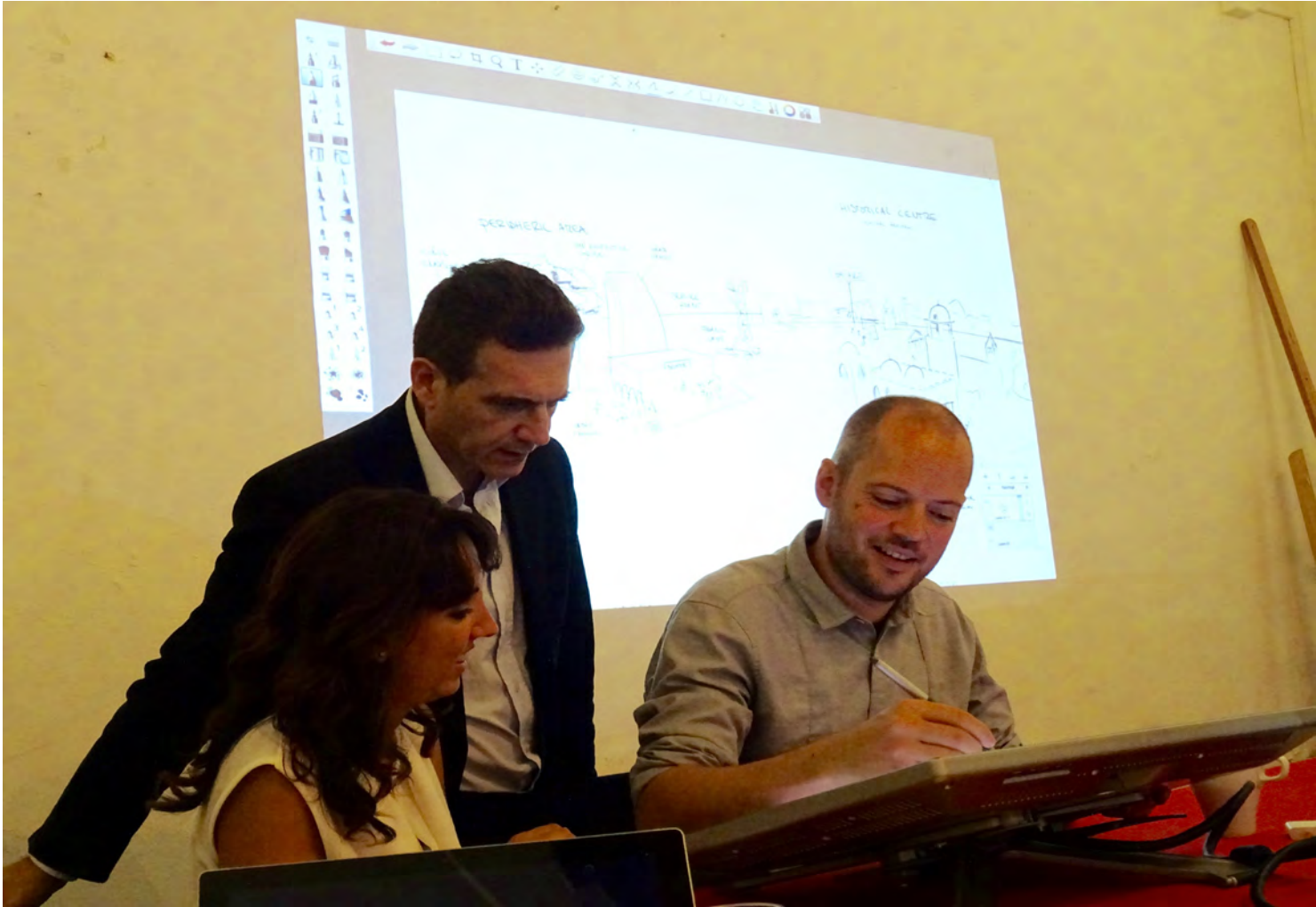
‘Sweet and green’ mobility

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.

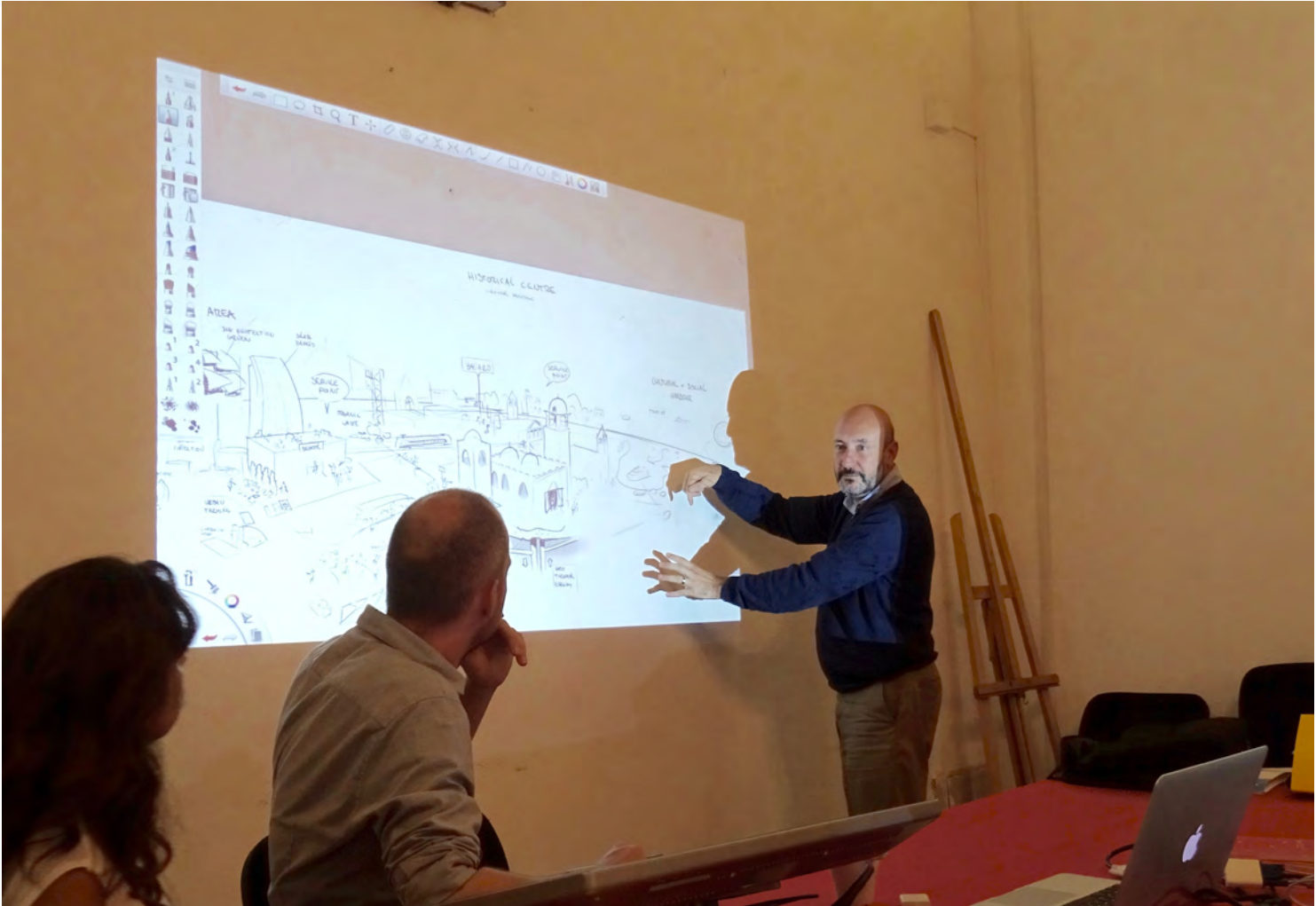
Sea motorway and central distribution centre

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



Creating the visual of the desired future scenarios





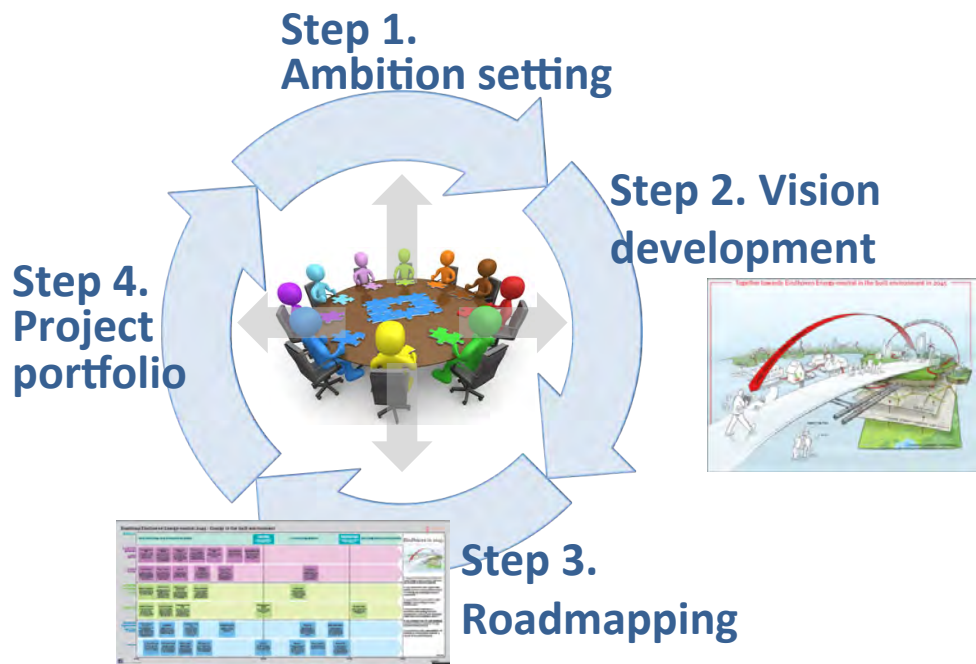
The making of the desired future scenario

The approach

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 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.



Four step approach of R4E

Step Two: 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

City 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. 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.

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

Program of the ambition workshops

The result of the vision development step is a visualisation of the desired future scenario. The visual is explained in this report and the main elements of the vision are described. The following pages also provide the background of the scenario: the ambition of the focus area, copied from the Ambition Setting D1.1 Report – Specific ambitions of the R4E partner cities and the selected Drivers for Change for each focus area, copied from the Future Telling 2050 D2.1 Report – Drivers for Change.

Ambition: Cultural and social harbour Palermo 2050

1

Smart, ecological buildings

In 2050, the city of Palermo values smart, ecological buildings and spaces. All buildings (both historic and new) use renewable energy and sustainable solutions for their architecture. (Re-)location of pubic service buildings supports sustainable living in the city. All waste is re-used completely, so it is no longer a cost but a valuable resource in itself.

Strategic ambitions

- In 2050 public buildings in Palermo are sustainable & energy efficient.
- In 2050 new buildings are zero-emission compliant.
- In 2050 services for citizens, such as schools, health care, etceteras, are located along public transport lines to decrease mobility.
- In 2050 there is regulation for the use of renewable energy systems in the historical centre.
- In 2050 all buildings in Palermo are smart & ecological, including energy and waste management.
- In 2050 all buildings in Palermo use smart technology, including technology for the full re-use of waste.

2

Integrating new and historical knowledge

In 2050, Palermo’s cultural heritage enriched with new technologies is greatly valued. Palermo builds on its historic strengths to design comfortable, energy-efficient houses and neighbourhood areas. The city explicitly using its mild climate, as well as its past knowledge (such as the building of Palazzos and villas), enriched with today’s technology solutions.

Strategic ambitions

- In 2050 Palermo uses its historical strength to built comfortable and energy efficient houses and neighbourhoods.
- In 2050 the mild climate of Palermo is used to its full extend for sustainable buildings & energy production.

3

Cultural hub

In 2050, people in Palermo value their city as a hub for meeting each other and for all kinds of social activities. Cultural exchanges enrich people’s lives in the city. Behavioural change is achieved by incorporating the city’s cultural and artistic heritage in education.

Strategic ambitions

- In 2050 Palermo is a cultural hub: a harbour for cultural exchange where people meet and bring in their own culture.
- In 2050 Palermo uses culture and art in education to improve the quality of life by stimulating behavioural change.



Drivers for change for the future of Smart Buildings in Palermo 2050

Better buildings

In 2050, new buildings combine historical qualities and new technologies, creating maximum comfort and functionality for their users. Historical expertise in building for specific local climates is used to design solutions for new buildings, and for thoughtful upgrading of those already existing. The latest technologies and materials are applied to make buildings self-sufficient or even energy positive, contributing to abundant of renewable energies in cities. Policies aim at improving the quality of neighbourhoods and strengthening the sense of community, and not only at reducing energy consumption.

Building business for social living

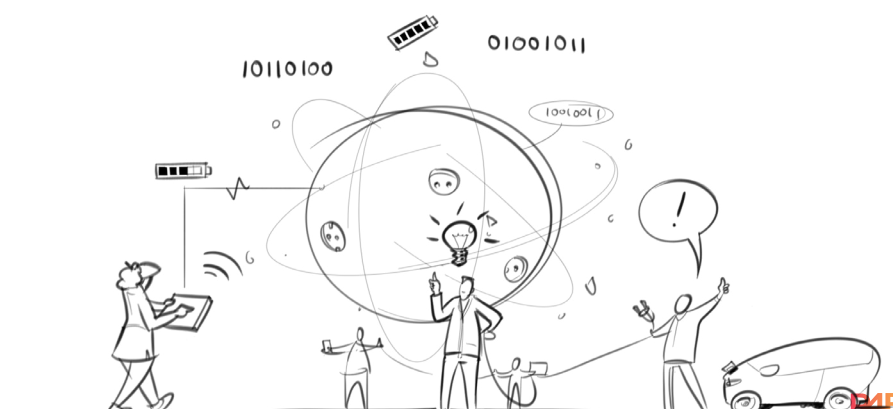
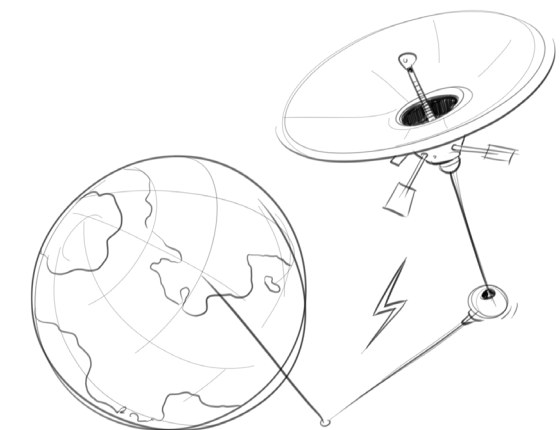
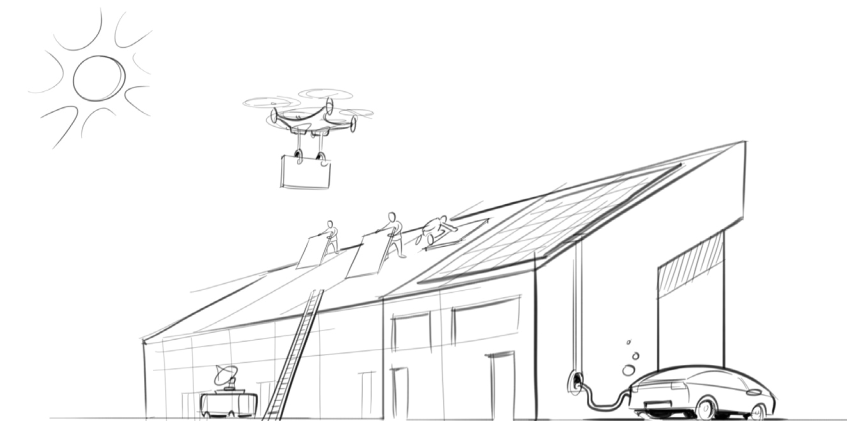
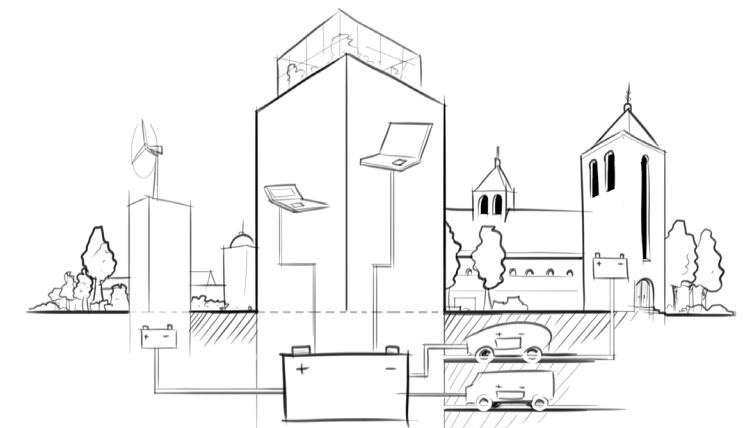
In 2050, suitable financing structures and revenue models are available, offering solutions that are affordable while also boosting the local economy. Both individuals and small communities act as entrepreneurs. They benefit from good infrastructure and technology options, so they can self manage and at the same time improve their lives and the living environment.

Applying new technologies

In 2050, a range of new technologies are available and affordable. Some of them are already in development, others are still unknown. Cities apply those technologies in new solutions that contribute to the quality of life, and in particular to the creation of smart buildings, smart mobility and smart urban spaces.

Democratised energy systems based on open data

In 2050, energy systems are open, bidirectional, multi-purpose platforms on which (renewable) energy and energy management services are open to all. Entrepreneurs have developed business models that provide value for them, for their users and for society at large. Citizens can choose freely from a range of available options. The system ensures privacy and security of users, who are always in control. Ambient energy networks provide connectivity for (wireless) access to data and energy. Increased computing power and artificial intelligence make system resilient: self-organising, self-sustaining and self-learning.





Ambition: ‘Sweet & green’ mobility in Palermo 2050

1

‘Sweet mobility’

In 2050, people in Palermo value ‘sweet mobility’: cycling, walking and sharing mobility services are obvious choices. These enable people to enjoy the city’s green spaces to the full. All areas of the city are easily accessible by all.

Strategic ambitions

- In 2050 Palermo provides safe mobility for all people: families, children, elderly, disabled, pedestrians and cyclists.
- In 2050 sweet mobility is an obvious choice: such as bike- and car sharing and walking.
- In 2050 the people of Palermo will use biking, because the foundation and infrastructure is available and accessible.
- In 2050 Palermo provides green areas and restricted areas for mobility to stimulate walking.
- In 2050 the coast and nature are preserved and more green areas in the city are realised.
- In 2050 the citizens of Palermo value walking and cycling as obvious part of life and mobility.

2

Safe, reliable public transport systems

In 2050, people in Palermo value safe, reliable public transport options. They enjoy a finely meshed transport network in the city and surrounding areas, all of which are easily accessible.

Strategic ambitions

- In 2050 Palermo provides reliable public transport options for the people through a large network of railways that connect all parts of the town and a subway to connect the city centre.
- In 2050 energy consumption will be reduced for mobility, buildings and public lighting.
- In 2050 a profound public transport system is realised (rail & subway).

3

A valued cultural heritage

In 2050, people in Palermo value their cultural heritage. They enjoy a good education that gives them ecological awareness. Good citizenship and sustainable behaviour come naturally to everyone.

Strategic ambitions

- In 2050 Palermo will use education as a foundation for good citizenship and sustainable behaviour.
- In 2050 cultural and historical tourism will be a showcase for other cities.

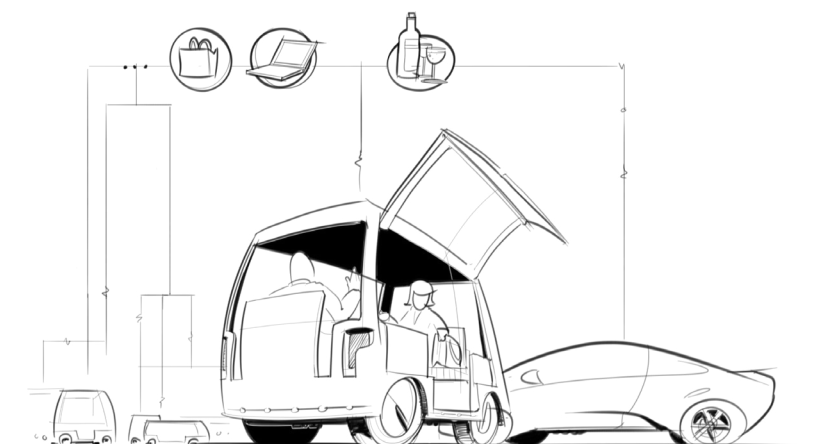
Drivers for change for the future of Smart Mobility in Palermo 2050

SMART MOBILITY



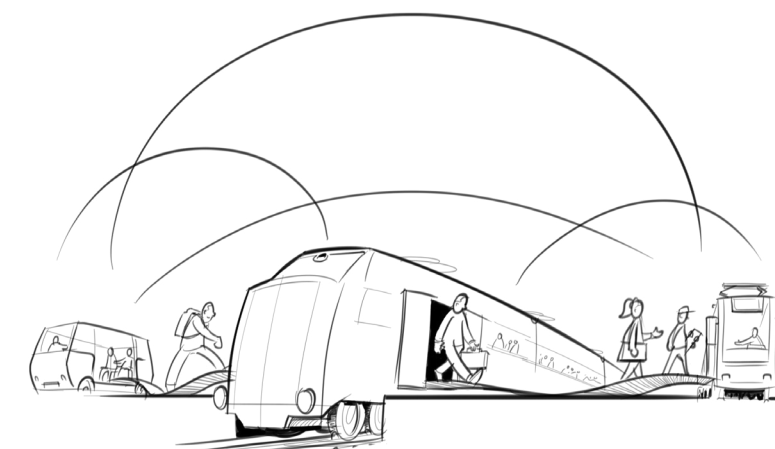
Personal mobility as a service

In 2050, technology enables autonomous vehicles. These take affordable personal mobility to a whole new level. Technology makes sharing easy, so everyone has access to a vehicle whenever they need it. It also facilitates the transition to a circular economy, gradually replacing legacy systems with cleaner, safer options. Stakeholder resistance is overcome by the availability of complete, resilient system that meet the needs of city dwellers in full.



Valuing public transport

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



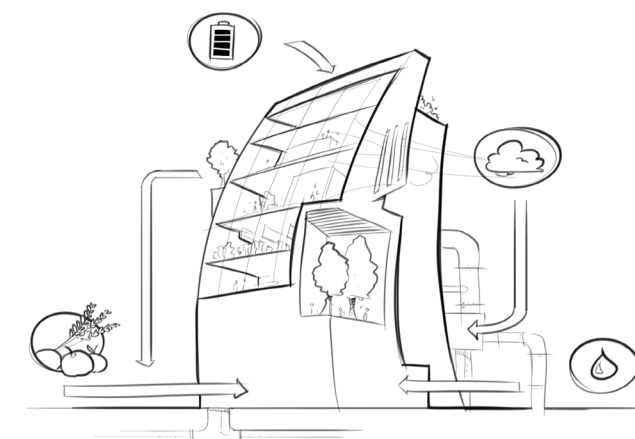
Attractive cities with unique qualities

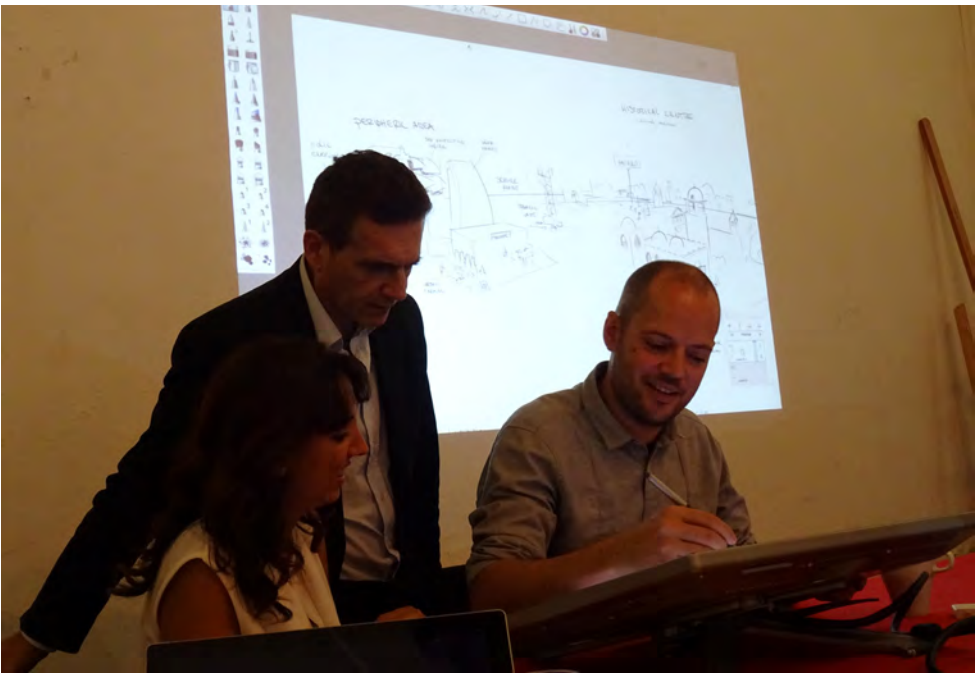
In 2050, cities have unique qualities that embody their own history and culture as an integral part of their DNA. The differences between them make the cities distinctive and attractive places for business and visitors. And people of different backgrounds find them good places to work and live. The cities offer a good balance in the quality of neighbourhoods and infrastructure, with affordable services for all income levels. Social needs drive city design, which is constantly and organically reshaped to meet people's changing needs. The use of spaces and buildings is always under review to deliver maximum value for users.



Regenerating resources in a circular economy

In 2050, the circular economy ensures self-sufficiency of cities. Renewable energy is abundant, and this ensures a secure supply of vital resources for life (energy, water, food and clean air), although other resources may still be scarce. Cities have implemented circular systems to regenerate all the resources needed by their populations. These mechanisms are based on small-scale, local solutions, enabled by changed decision-making levels.





Contributions



We would like to thank the participants for their contribution to the 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 |



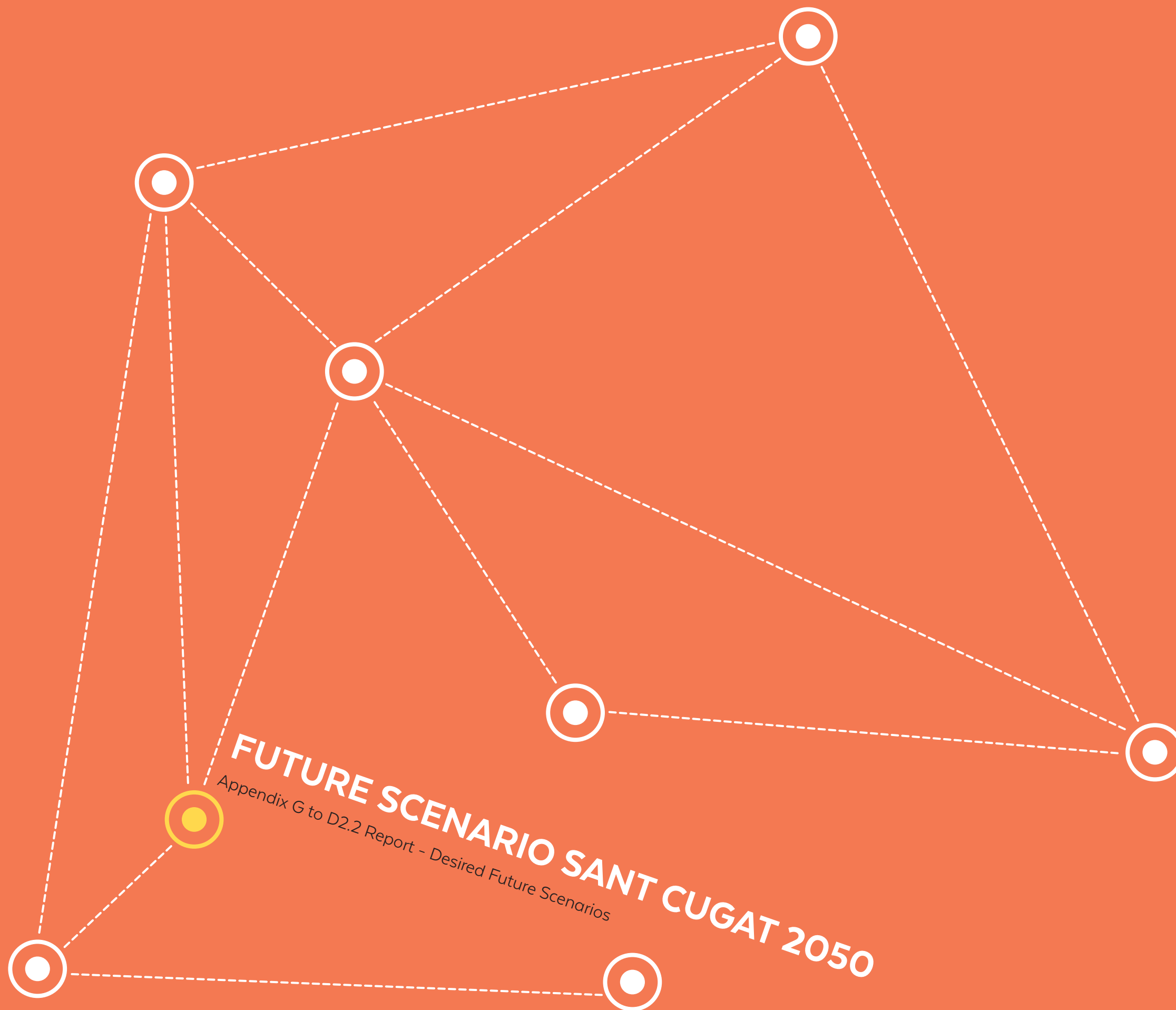
This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



ROADMAPS
FOR
ENERGY®



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15 June 2016

Víctor MARTINEZ & Gerard RIBA, Ajuntament de Sant Cugat del Vallès
Elke DEN OUDEN & Jan-Jaap RIETJENS & Rianne VALKENBURG, TU/e LightHouse

R4E

**ROADMAPS
FOR
ENERGY®**

This appendix is part of the D2.2 Report – Desired future scenarios – and contains all results of the vision development activities held in the city of Sant Cugat del Vallès.



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:

7 March 2016	Concept for internal check in the city (limited distribution)
25 March 2016	Concept for sharing with R4E partners (limited distribution)
15 May 2016	Final version for public distribution
15 June 2016	Final version for public distribution – with minor corrections

Contents Appendix G

- Desired future scenario Smart Buildings
- Desired future scenario Smart Urban Spaces
- The making of the desired future scenario
- Ambition: Smart citizens enjoy smart buildings in Sant Cugat 2050
- Drivers for change for the future of Smart Buildings in Sant Cugat 2050
- Ambition: High-quality environment for well-being in Sant Cugat 2050
- Drivers for change for the future of Smart Urban Spaces in Sant Cugat 2050
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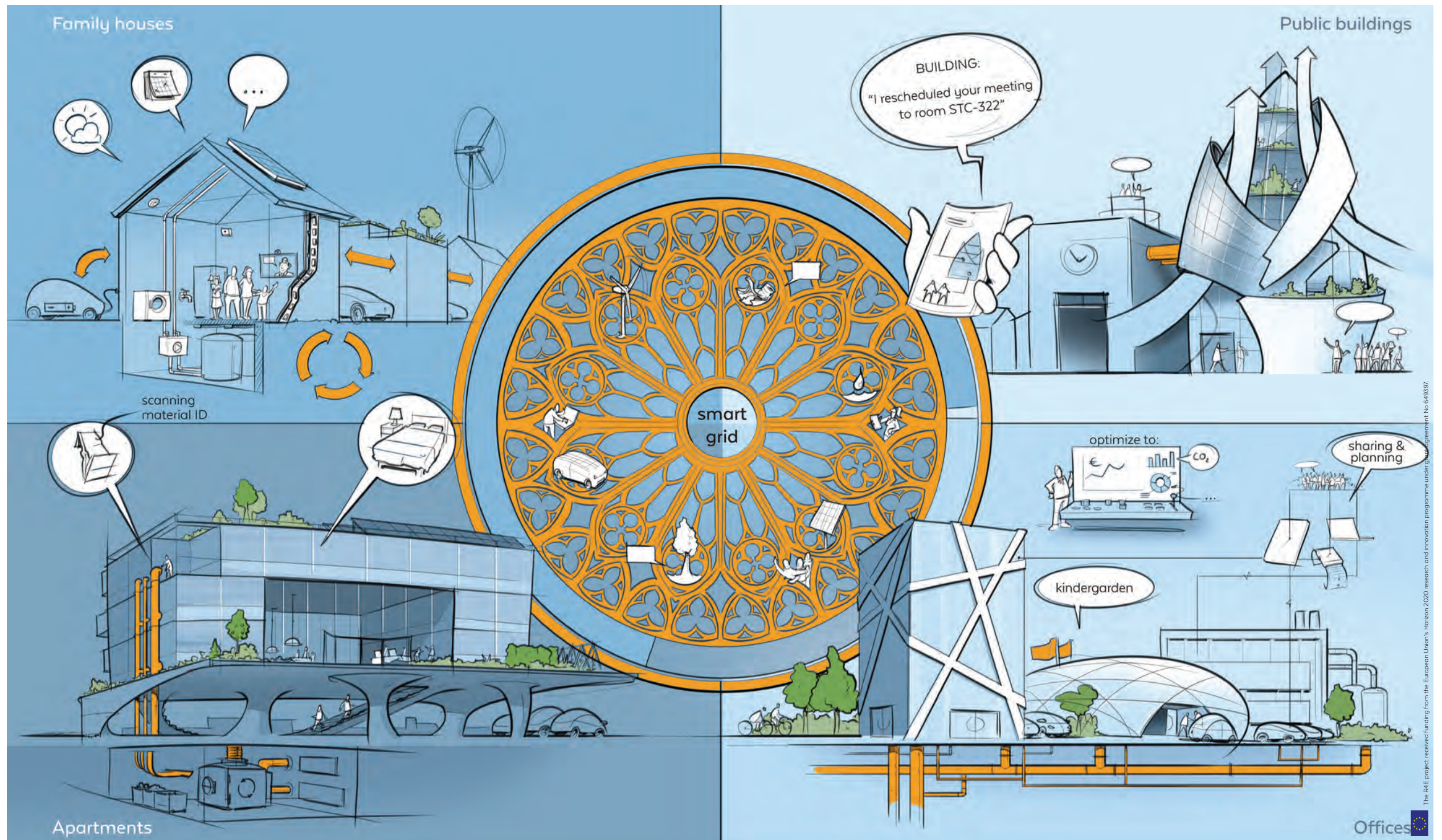
SMART CITIZENS ENJOY SMART BUILDINGS IN SANT CUGAT 2050

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.

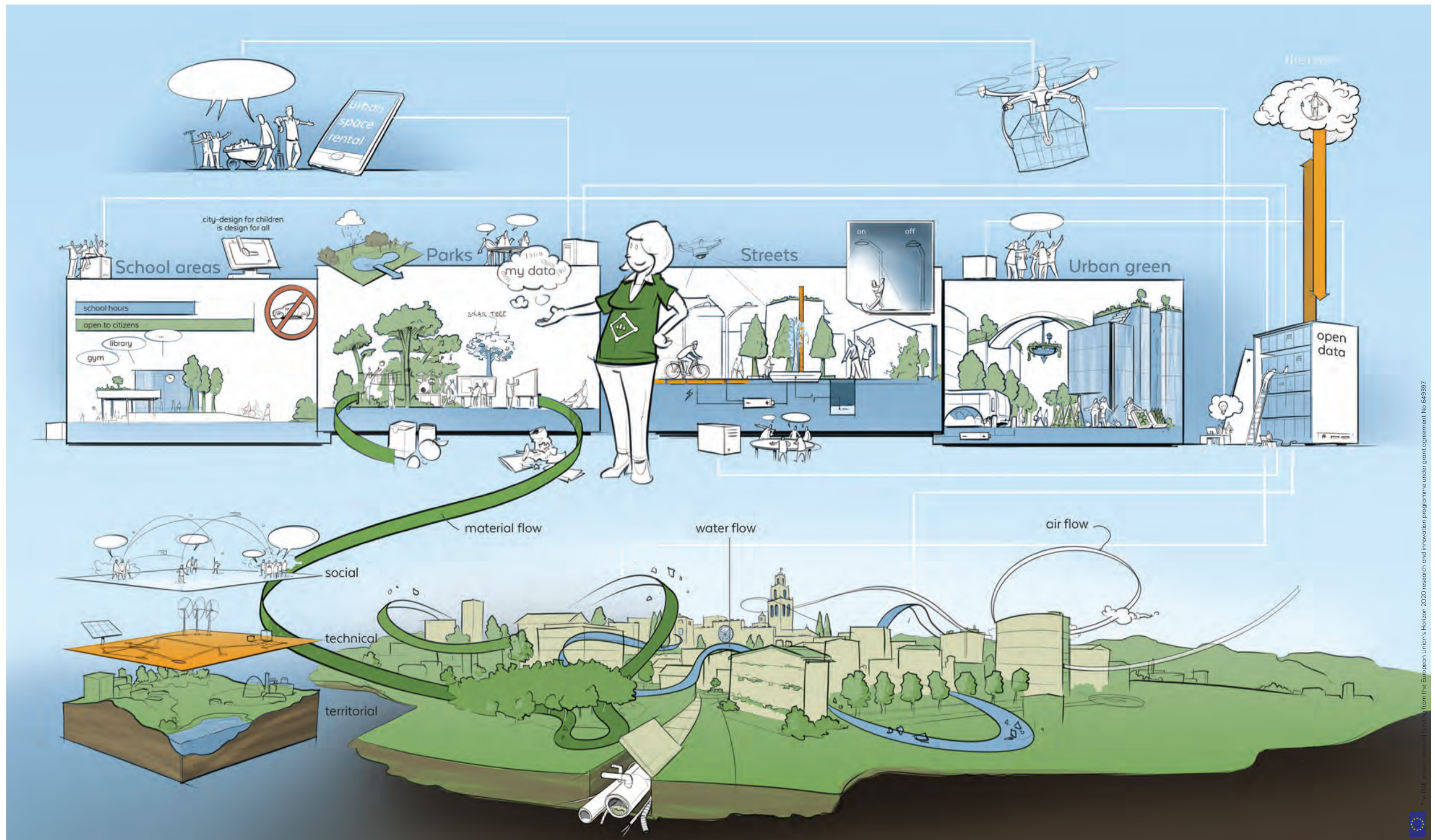
HIGH-QUALITY ENVIRONMENT FOR WELL-BEING IN SANT CUGAT 2050

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

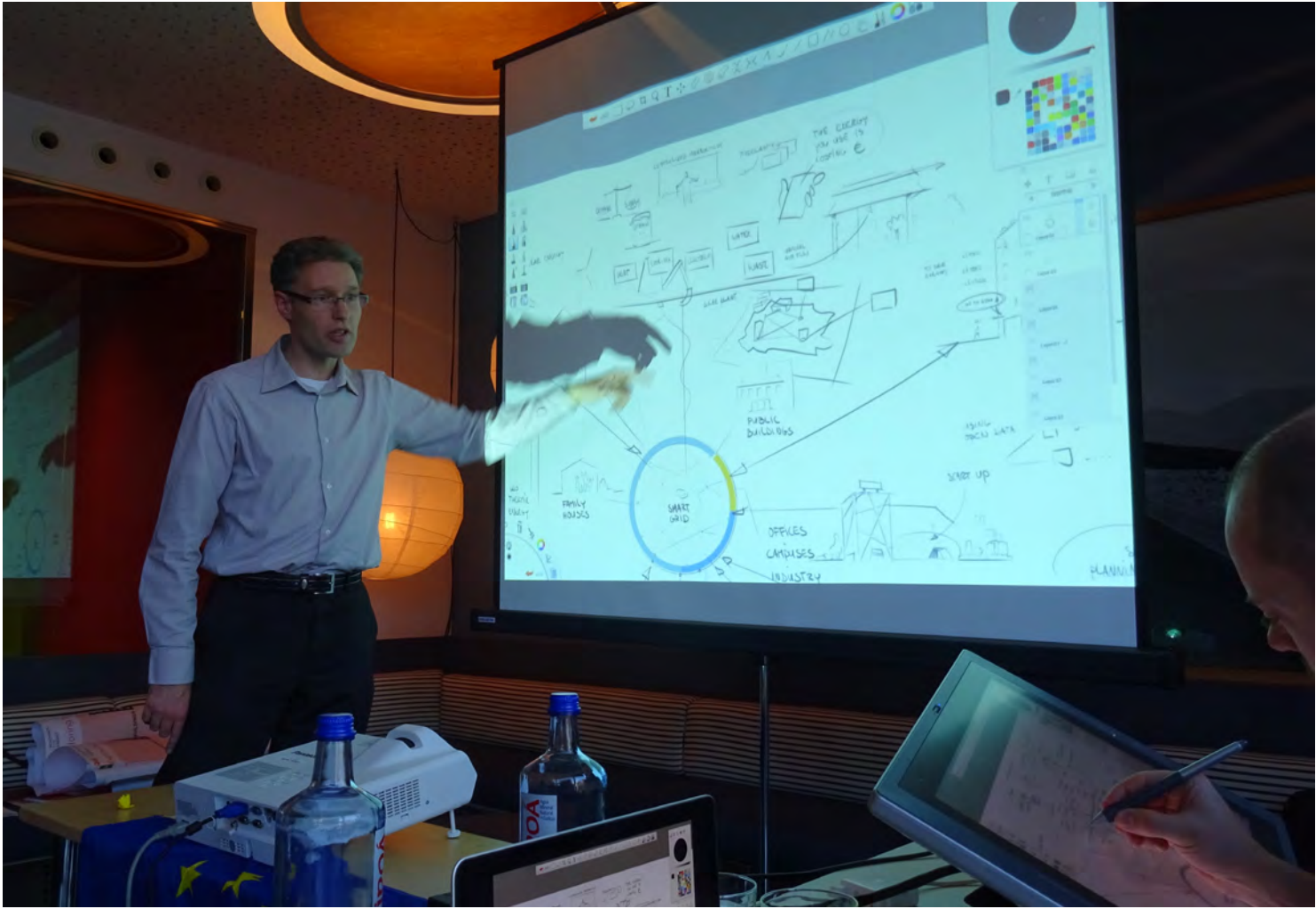
The system includes a centralised data base containing different types of data from different stakeholders on all services and assets in the city. The 'brain' of the system anticipates the expected use and conditions, suggests actions suited to users' needs and optimises the use of the infrastructure 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.



Creating the visual of the desired future scenarios



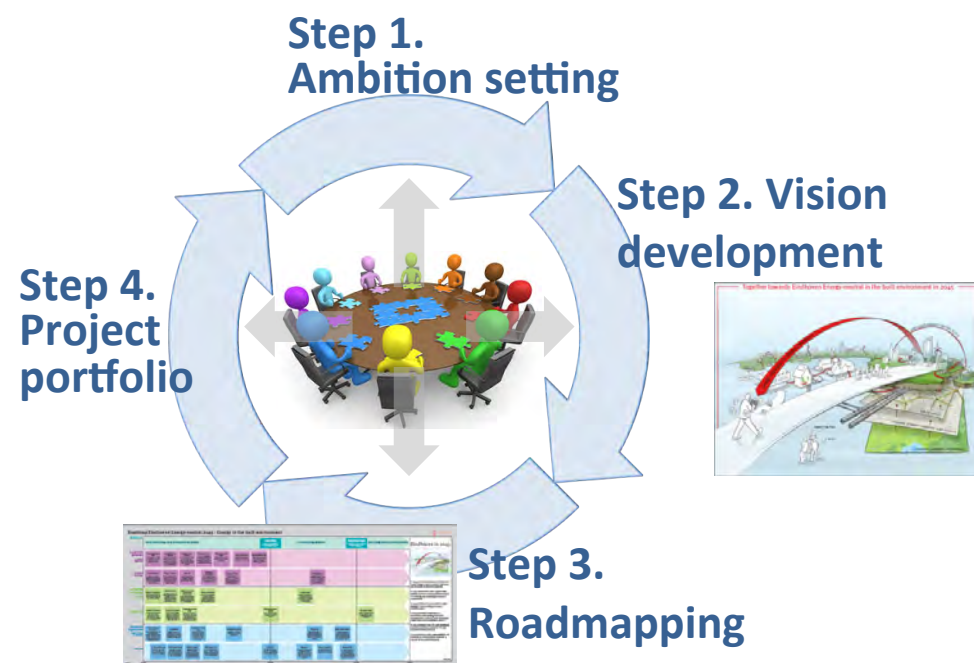
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Four step approach of R4E

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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

City 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. 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.

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Program of the ambition workshops

The result of the vision development step is a visualisation of the desired future scenario. The visual is explained in this report and the main elements of the vision are described. The following pages also provide the background of the scenario: the ambition of the focus area, copied from the Ambition Setting D1.1 Report – Specific ambitions of the R4E partner cities and the selected Drivers for Change for each focus area, copied from the Future Telling 2050 D2.1 Report – Drivers for Change.

Ambition: Smart citizens enjoy smart buildings in Sant Cugat 2050



1 Energy-aware, proactive citizens and other stakeholders

In 2050, all the stakeholders of Sant Cugat value collaboration and shared responsibility to manage their energy proactively. This approach is based on monitoring and management systems that provide a wide range of indicators to meet people’s needs. It also helps them to understand their own energy footprint and to act accordingly.

Strategic ambitions

- In 2050 the citizens of Sant Cugat are 100% smart citizens.
- In 2050 the citizens of Sant Cugat are engaged and energy literate in achieving the energy goals and actively manage their energy use, supported by monitoring- and management system that fit their needs and understandings and that predict their future bills.
- In 2050 Sant Cugat provides a showcase for energy issues, through a holistic view on the urban metabolism, including: citizens that are in control and receive the revenues of the network, stakeholders that are involved and stimulated to share, and the use of a broad scope of indicators.

2 Smart, energy-efficient buildings

In 2050, owners and occupants of buildings in Sant Cugat value the opportunity to save energy and water. They do this by using the latest energy-saving technologies and energy-efficient system designs. Although these concepts add up to significant energy savings, people don’t have to make any compromise in the comfort of their living environment.

Strategic ambitions

- In 2050 In 2050 the newest technology will be used (e.g. the internet of things) to reduce energy use in buildings.
- In 2050 the buildings in Sant Cugat are designed (by materials, production and construction) to consume less energy and use mostly renewable energy.
- In 2050 The owners of Sant Cugat’s buildings know in real time the occupancy of the building, it’s use, and the important energy parameters, and based on that provides different modes to enable energy savings as well as the realisation of a comfortable environment.

3 Self-sufficient, renewable resources city-wide

In 2050, renewable resources are valued to create a self-sufficient smart energy grid that connects all buildings, both new and existing. Resources, both of energy and water, are used – and wherever possible re-used – responsibly.

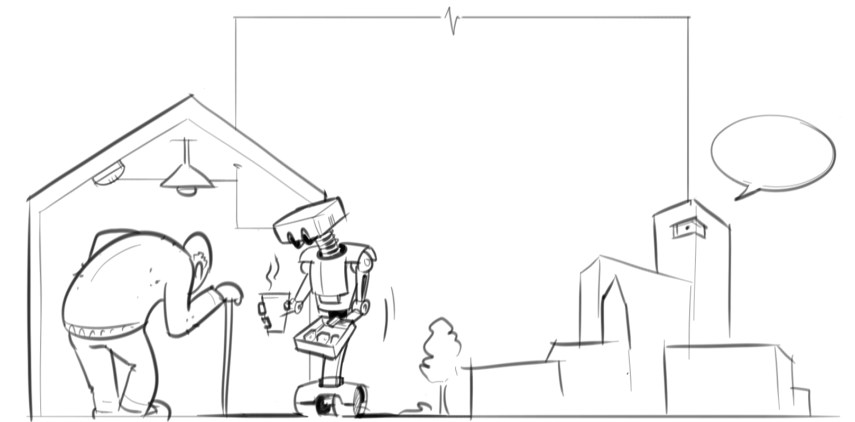
Strategic ambitions

- In 2050 In 2050 Sant Cugat is self-producing all energy resources needed for smart buildings.
- In 2050 all new building projects and refurbishing of existing buildings will lead to an energy positive average. The city and the building owners act responsibly for energy and sustainability, using smart designs and smart information systems.
- In 2050 the city of Sant Cugat produces more (renewable) energy than it consumes. Each building is connected to the smart grid that also allows energy storage, using new technologies.

Drivers for change for the future of Smart Buildings in Sant Cugat 2050

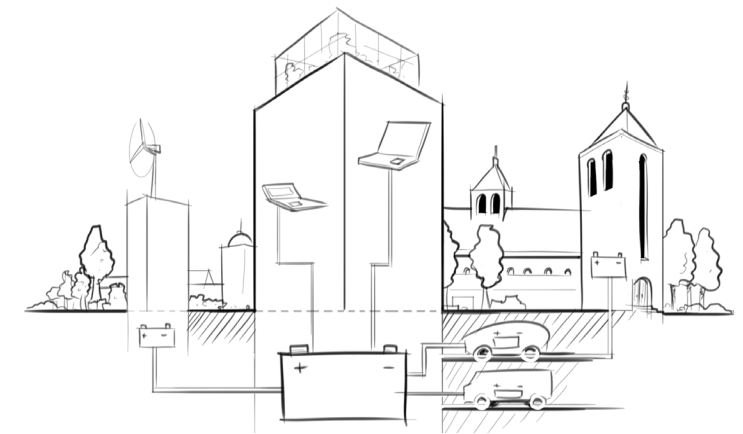
Technology with a human focus

In 2050, we've mastered the challenge of ever more complex, multifunctional systems and the need to make them easier to use. Those systems are user-focused: that means users can understand how the systems work, and how their own behaviour affects sustainability and energy use. Robotics and smart (home care) systems support living at home, helping people to live healthier lives and to stay in their homes longer as they get older. There's a range of available solutions that plug-in directly to the city's open energy platform.



Better buildings

In 2050, new buildings combine historical qualities and new technologies, creating maximum comfort and functionality for their users. Historical expertise in building for specific local climates is used to design solutions for new buildings, and for thoughtful upgrading of those already existing. The latest technologies and materials are applied to make buildings self-sufficient or even energy positive, contributing to abundant of renewable energies in cities. Policies aim at improving the quality of neighbourhoods and strengthening the sense of community, and not only at reducing energy consumption.



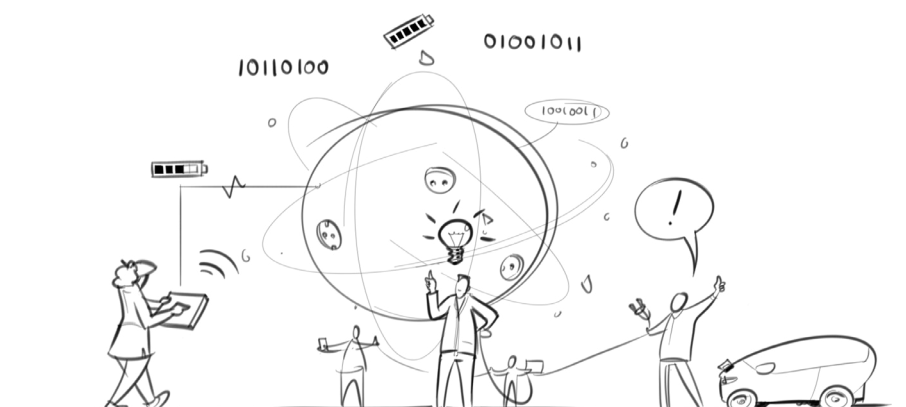
Regenerating resources in a circular economy

In 2050, the circular economy ensures self-sufficiency of cities. Renewable energy is abundant, and this ensures a secure supply of vital resources for life (energy, water, food and clean air), although other resources may still be scarce. Cities have implemented circular systems to regenerate all the resources needed by their populations. These mechanisms are based on small-scale, local solutions, enabled by changed decision-making levels.



Democratised energy systems based on open data

In 2050, energy systems are open, bidirectional, multi-purpose platforms on which (renewable) energy and energy management services are open to all. Entrepreneurs have developed business models that provide value for them, for their users and for society at large. Citizens can choose freely from a range of available options. The system ensures privacy and security of users, who are always in control. Ambient energy networks provide connectivity for (wireless) access to data and energy. Increased computing power and artificial intelligence make system resilient: self-organising, self-sustaining and self-learning.



Ambition: High-quality environment for well-being in Sant Cugat 2050



1

Citizens engage in urban planning, use and maintenance

In 2050, citizens of Sant Cugat value engagement in the planning, use and maintenance of their living environment. They are empowered by the democratic processes and smart information systems.

Strategic ambitions

- In 2050 the citizens of Sant Cugat are 100% smart citizens.
- In 2050 the Sant Cugat urban space (design, use and maintenance) is driven by the citizens, using the advise of seniors and innovative minds of students, who are empowered by democratic administrative processes and using information systems to take evidence based decisions.
- In 2050 the citizens of Sant Cugat feel responsible for the urban space, in the sense of sharing, water use and maintenance of the greenery.

2

High-quality, healthy living environment

In 2050, people in of Sant Cugat value a high-quality, healthy living environment. This consists of an ecological system that connects green areas and enables multifunctional use of urban spaces. The result is an increase in walking and cycling.

Strategic ambitions

- In 2050 the city of Sant Cugat offers an healthy environment with mobility solutions that avoid air pollution and noise, and enable the creation of multifunctional use in urban spaces.
- In 2050 all mobility in Sant Cugat is low carbon (mobility in general).
- In 2050 the citizens of Sant Cugat enjoy a city free of noise and stress; a healthy, clean and green environment that consists of an ecological system that maintains itself with a minimum level of intervention. The ecosystem connects green areas and contributes to a good living (micro-) climate with a balance between 'controlled' parts and real nature, allowing a mixed use of urban space and nature.

3

Circular systems for water, waste, energy and food

In 2050, the eco-strategic city of Sant Cugat values a circular system for water, waste, energy and food. The system matches local supply and demand by efficient management for maximum re-use of resources.

Strategic ambitions

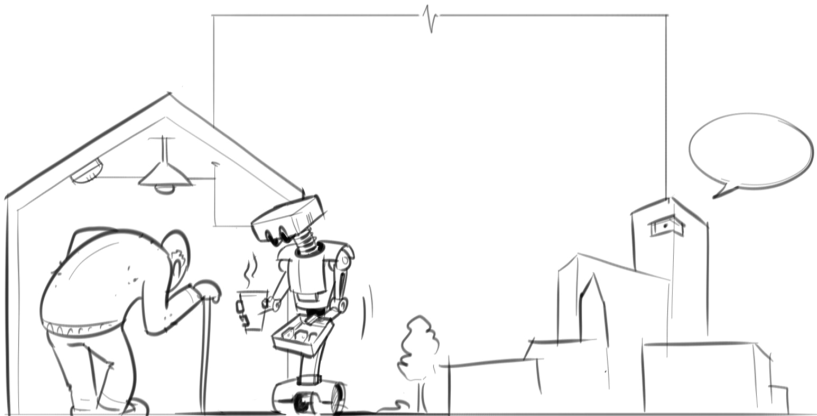
- In 2050 Sant Cugat is an eco-strategic city, where all needs (e.g. local food, water and energy) are available within a 0-kilometer range and the urban landscape is of high quality (e.g. by distribution of the greenery and trees).
- In 2050 all Sant Cugat municipal services are managed through the city control centre, enabling more efficiency and quality and adaptation to the real needs of the people and the town.
- In 2050 sustainable energy production will be decentralised and will cover the demand, also re-use of water and organic waste to achieve circular systems, through enabling functional solutions and new business models (to foster closed loops).

Drivers for change for the future of Smart Urban Spaces in Sant Cugat 2050



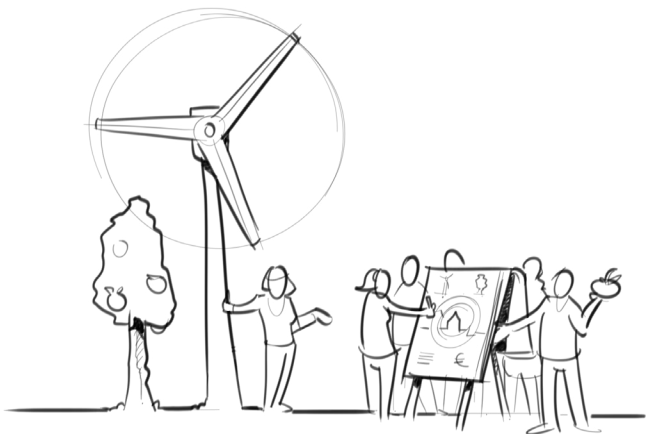
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Self-sufficient communities

In 2050, cities and their surrounds are self-sufficient through cross-sector collaboration at local and regional levels. Strong links with the immediate environment let cities use shared resources efficiently and in environment-friendly way, with respect for nature and agricultural spaces. Socially inclusive communities are self-sufficient in foods, fresh water, renewable energy and production of tools and systems. People take responsibility for their own well-being, as well as that of the community, and co-design the physical environment and services.



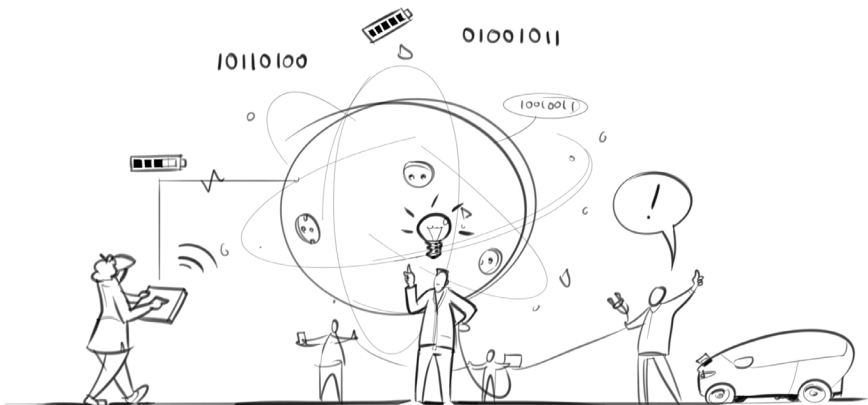
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Contributions

We would like to thank the participants for their contribution to the scenario workshops:

• Jordi Abadal	BCN Ecologia	• Joan Naval	Ajuntament Sant Cugat del Vallès
• Elena Albareda	UPC	• Marta Oliver	Ajuntament Sant Cugat del Vallès
• Angel Andreu	Veolia	• Cristina Paraira	Ajuntament Sant Cugat del Vallès
• Santiago Andrés	Connatura	• Joan Pons	Citelum
• Adriana Anguera	Everis	• Joan Puigdomenech	Ajuntament Sant Cugat del Vallès
• Kim Arcas	Cíclica	• Josep Antoni Ramon	UdG
• Alejandro Asensi	Citelum	• Gerard Riba	Ajuntament Sant Cugat del Vallès
• Blanca Avellano	UPC	• Víctor Romera	Citelum
• Joana Barbany	Ajuntament Sant Cugat del Vallès	• Carlos Rubio	Valoriza
• Jordi Barot	Interlands	• Pau Soler	Opticits
• Araceli Belmonte	Ajuntament Sant Cugat del Vallès	• Jordi Torrijos	Ajuntament Sant Cugat del Vallès
• Eduard Benasques	Everis	• Jelle Bart Van Breest	IDP
• Dani Bennasar	Citelum	• Isa Vega	UPC
• Ignasi Bonet	Ajuntament Sant Cugat del Vallès	• Albert Vidal	Effilogics
• Mikel Borrás	IDP	• Alberto Vilardell	Citelum
• Eloi Burriel	l'Origen	• Climent Vilatersana	Moba
• 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 Architectes		
• 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		





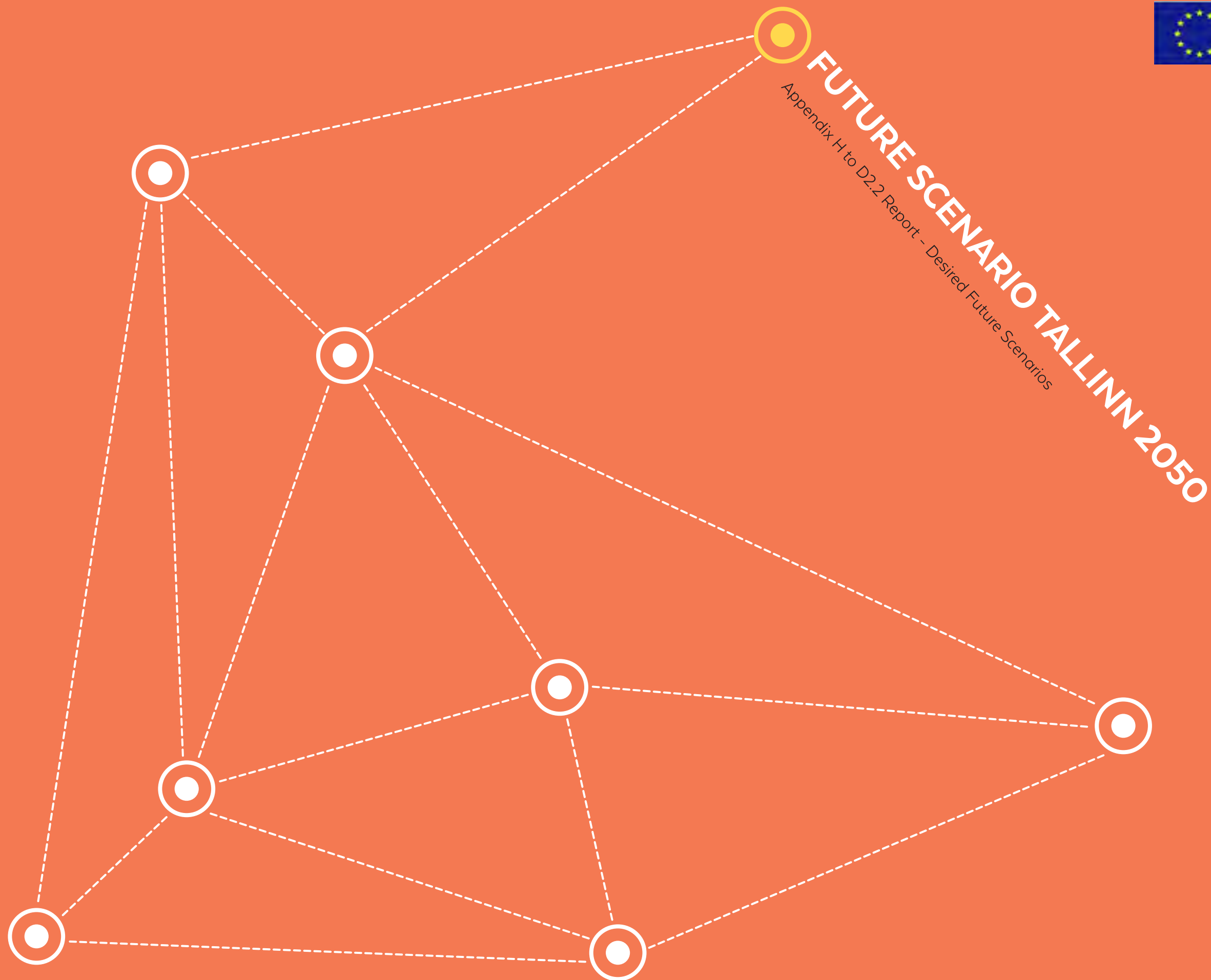
This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



ROADMAPS
FOR
ENERGY[®]



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15 June 2016

Villu PELLA & Jaagup AINSALU, Tallinna Keskkonnaamet
Elke DEN OUDEN & Jan-Jaap RIETJENS & Rianne VALKENBURG, TU/e LightHouse



ROADMAPS
FOR
ENERGY®

This appendix is part of the D2.2 Report – Desired future scenarios – and contains all results of the vision development activities held in the city of Tallinn.



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

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

Versions of this report:

18 April 2016	Concept for internal check in the city (limited distribution)
15 May 2016	Final version for public distribution
15 June 2016	Final version for public distribution – with minor corrections



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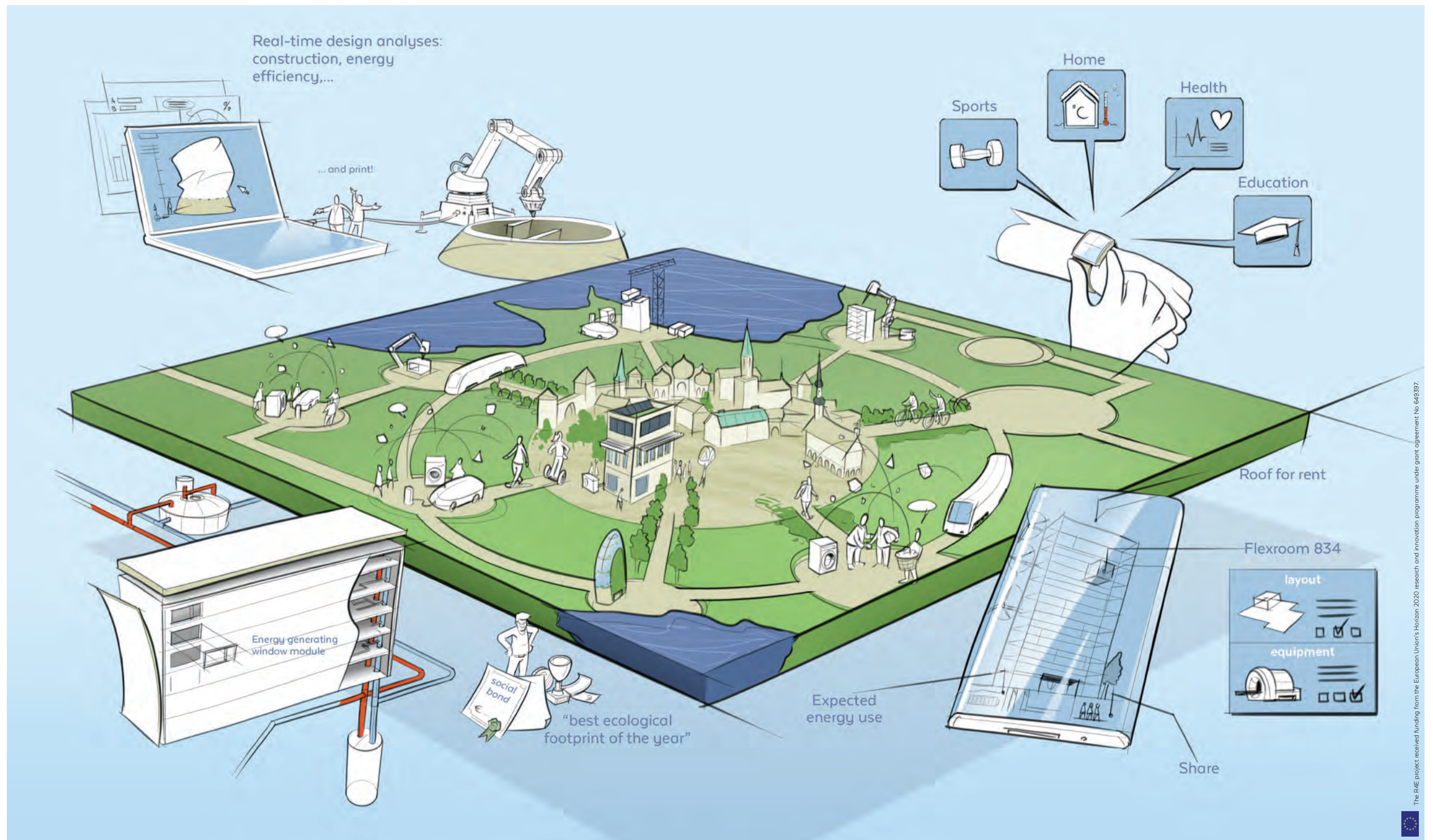
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Ambition: Smart buildings and smart people in energy-neutral Tallinn 2050	H 8
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SMART BUILDINGS AND SMART PEOPLE IN ENERGY-NEUTRAL TALLINN 2050

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 CO₂-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 CO₂-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.

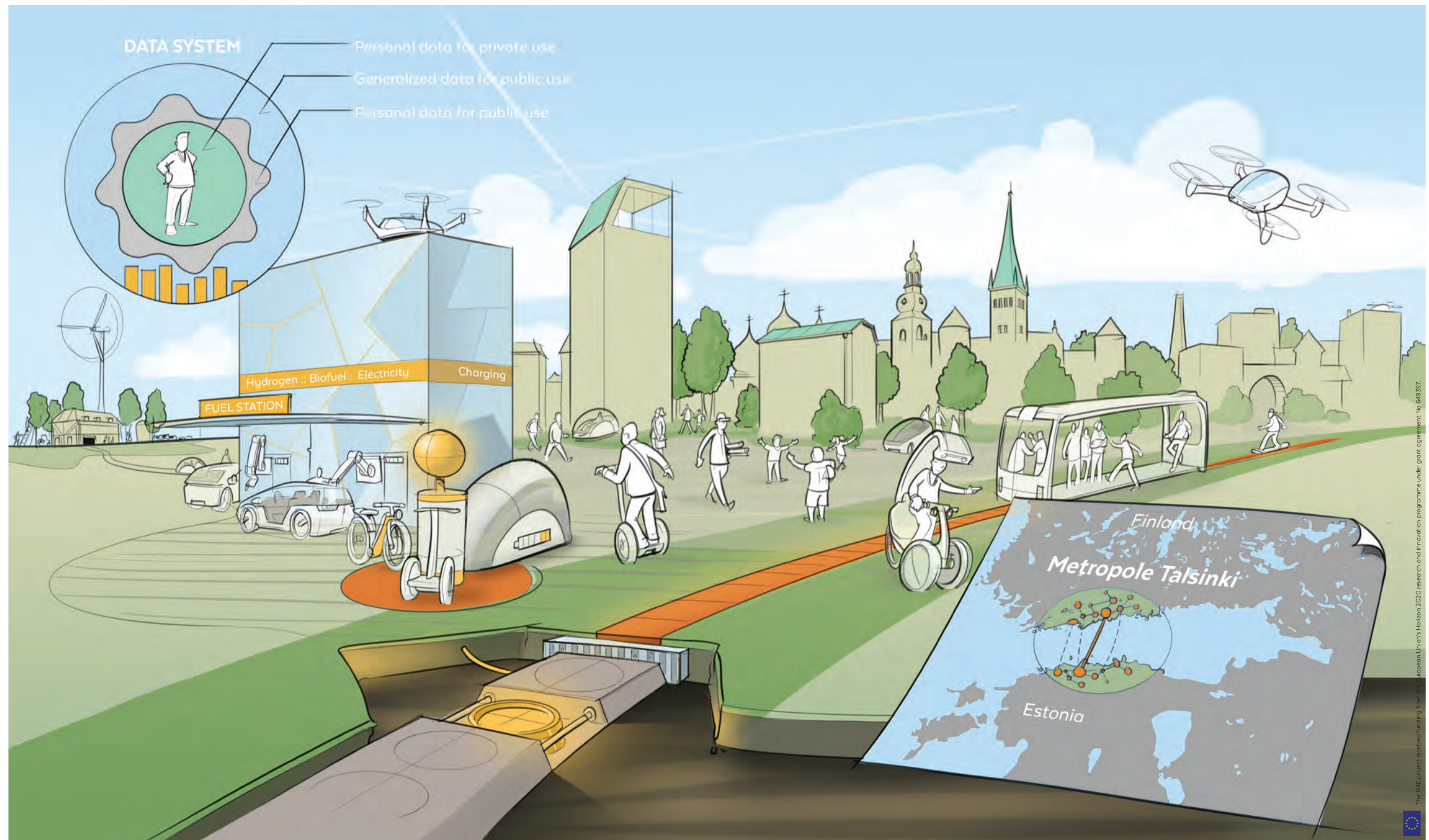


SMART MOBILITY ENABLES AN ENJOYABLE LIVING ENVIRONMENT IN TALLINN 2050

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.



Creating the visual of the desired future scenarios





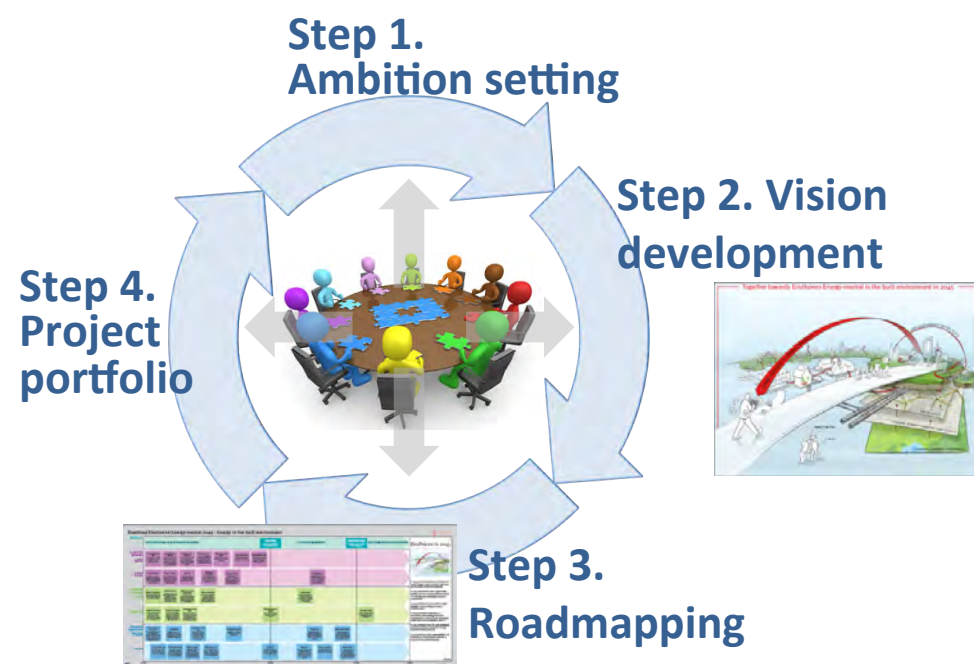
The making of the desired future scenario

The approach

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 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.



Four step approach of R4E

Step Two: Vision development

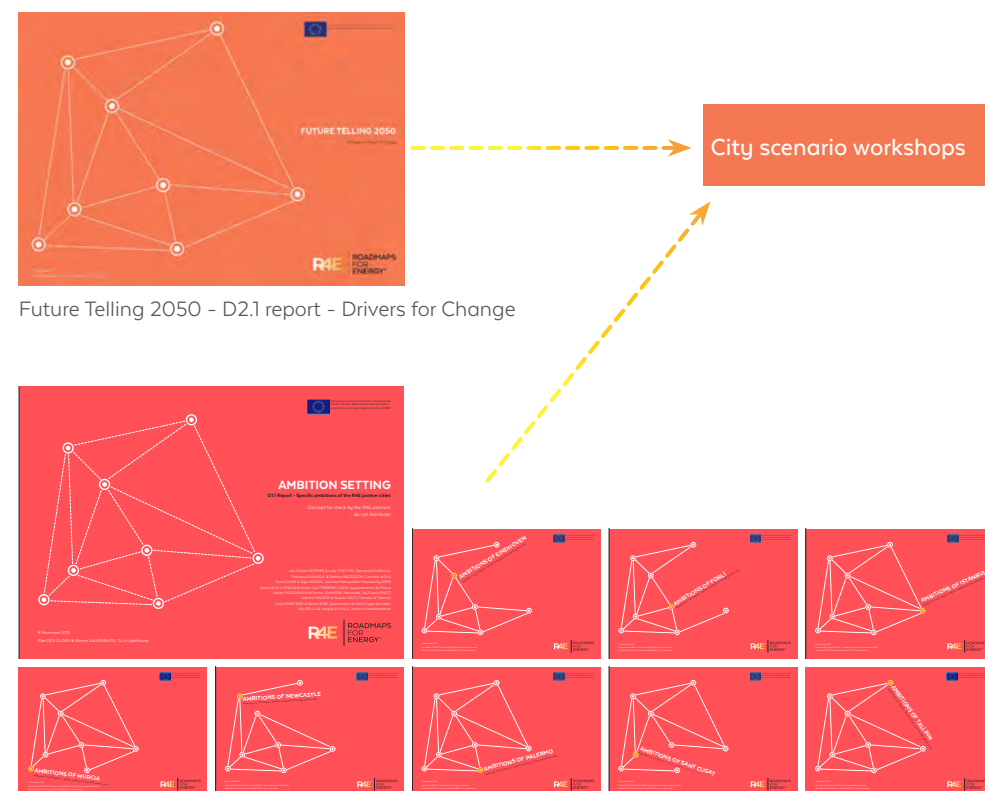
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Ambition Setting - D1.1 report - Specific ambitions of the R4E partner cities

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Ambition: Smart buildings and smart people in energy-neutral Tallinn 2050

1

Sustainable behaviour and renewable energy

In 2050, people in Tallinn value sustainability. Their behaviour and energy usage are based on individual responsibility. That means their remaining energy demand is affordable for all. It is achieved by renewable energy sources, such as heat pumps, biofuels and energy from the sea. Thanks to all these measures, Tallinn is a CO2-neutral city.

Strategic ambitions

- In 2050 the citizens of Tallinn have guaranteed affordable heating. More renewable sources for heat production, such as bio-fuels, and heat plants, are used. The realised hospital is a demonstrator where a good climate is realised that is affordable in a smart way.
- In 2050 smart solutions and smart behaviour has led to a strong reduction of energy consumption. The remaining energy use stems from the newest renewable energy systems for energy production to achieve high energy efficiency.
- In 2050 the people of Tallinn regard the city as being open to the sea. The sea is also used as a heating source for a CO2 neutral city.

2

Energy-neutral city

In 2050, Tallinn is an energy-neutral city. All the existing buildings are deeply renovated and modernised, while respecting their historical heritage. All the city’s energy systems are automated and connected, which supports new services. The energy-saving measures include smart materials and equipments.

Strategic ambitions

- In 2050 all buildings and districts in Tallinn use zero-energy. The heritage and history of older buildings is respected, also when new purpose is given to buildings.
- In 2050 all energy used in buildings comes from renewable sources. Smart materials and equipment are applied to save energy.
- In 2050 all buildings in Tallinn have automation systems that are connected and easy to understand. These smart systems also provide new IT-based services, such as guidance or information.
- In 2050 all existing buildings in Tallinn are deeply renovated and modernised. They reach high energy classes and all energy systems are connected and online. Soviet time apartment blocks are either demolished or renovated.

3

Integrated, flexible city planning

In 2050, land use planning in Tallinn 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 the relevant issues, and provides the flexibility to adapt to changing situations. These policies are implemented in practise through specific, integrated district plans.

Strategic ambitions

- In 2050 land use planning in Tallinn is done on an integrated system level, taking into account all sustainability issues, demographic changes, and mobility demands. The planning is also flexible to adapt to developments we do not know yet. The administrative units create specific district plans to integrate and implement these policies.
- In 2050 we gained the knowledge and awareness to plan the city of Tallinn as an energy efficient smart city.



Drivers for change for the future of Smart Buildings in Tallinn 2050

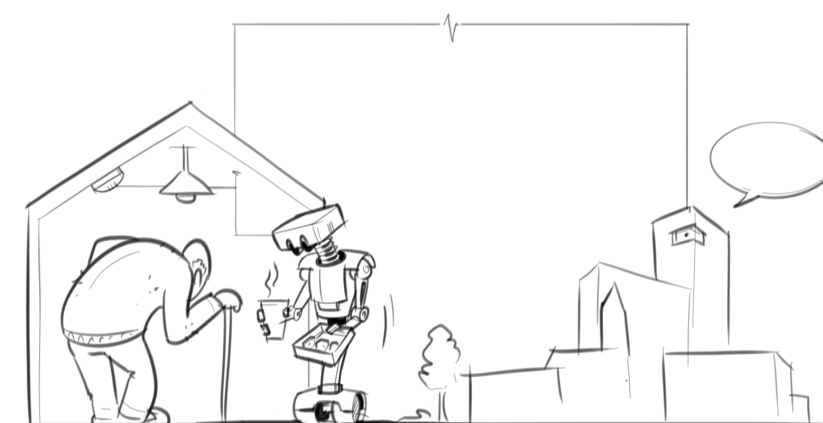
Enabling human development

In 2050, city residents are resilient, and can consciously adapt their behaviour to enable personal development. The middle class have largely disappeared. People have found new ways to live meaningful lives, building on opportunities at all levels – from local to global. They can handle large amounts of information to make personal choices. Smart, human-centric city environments provide inspiring places for lifelong learning.



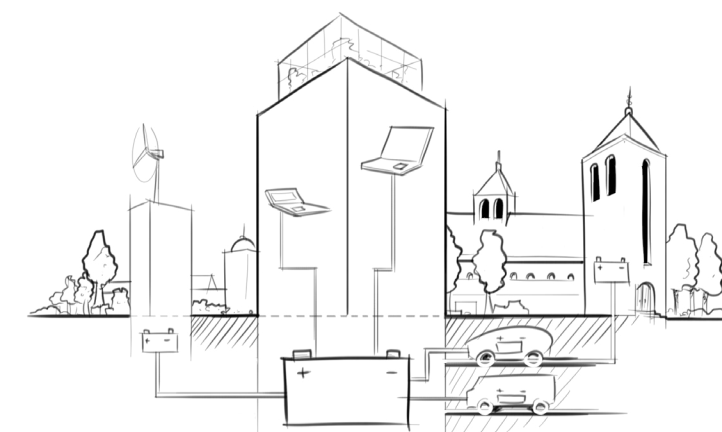
Technology with a human focus

In 2050, we've mastered the challenge of ever more complex, multifunctional systems and the need to make them easier to use. Those systems are user-focused: that means users can understand how the systems work, and how their own behaviour affects sustainability and energy use. Robotics and smart (home care) systems support living at home, helping people to live healthier lives and to stay in their homes longer as they get older. There's a range of available solutions that plug-in directly to the city's open energy platform.



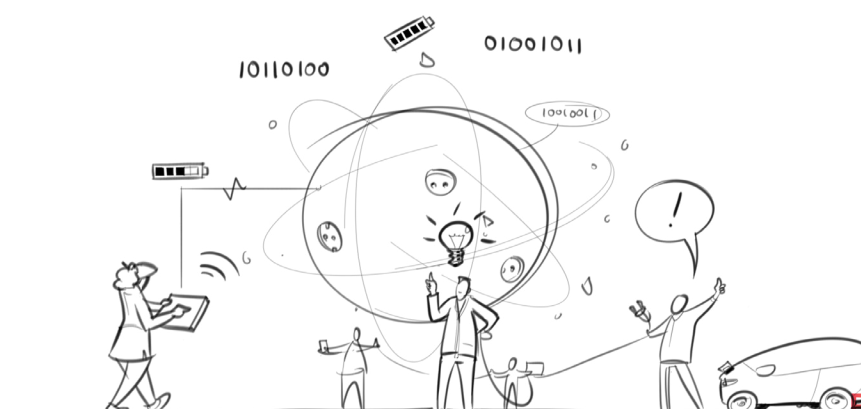
Better buildings

In 2050, new buildings combine historical qualities and new technologies, creating maximum comfort and functionality for their users. Historical expertise in building for specific local climates is used to design solutions for new buildings, and for thoughtful upgrading of those already existing. The latest technologies and materials are applied to make buildings self-sufficient or even energy positive, contributing to abundant of renewable energies in cities. Policies aim at improving the quality of neighbourhoods and strengthening the sense of community, and not only at reducing energy consumption.



Democratised energy systems based on open data

In 2050, energy systems are open, bidirectional, multi-purpose platforms on which (renewable) energy and energy management services are open to all. Entrepreneurs have developed business models that provide value for them, for their users and for society at large. Citizens can choose freely from a range of available options. The system ensures privacy and security of users, who are always in control. Ambient energy networks provide connectivity for (wireless) access to data and energy. Increased computing power and artificial intelligence make system resilient: self-organising, self-sustaining and self-learning.





Ambition: Smart mobility enables an enjoyable living environment in Tallinn 2050

1

Enjoyable living environment

In 2050, citizens of Tallinn enjoy an attractive, clean and quiet living environment that encourages them to behave sustainably. More and integrated green and blue areas, with an extensive network of cycle tracks and pedestrian-only areas enables people to commute conveniently by bike or on foot.

The cityscape is dense, so all services are within easy reach or are provided in the home. More public space is allocated to living, and less for motorised transport.

Strategic ambitions

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

2

Smooth, seamless public transport

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

Strategic ambitions

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

3

Open, collaborative decision-making

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

Strategic ambitions

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

Drivers for change for the future of Smart Mobility in Tallinn 2050



Better living at a human scale

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



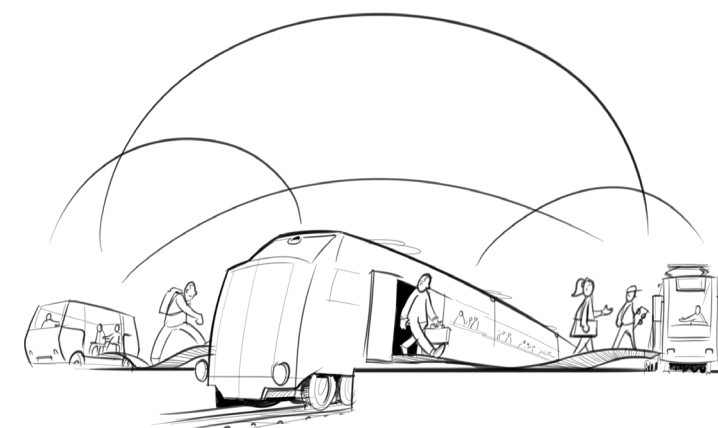
Experience, experience, experience

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



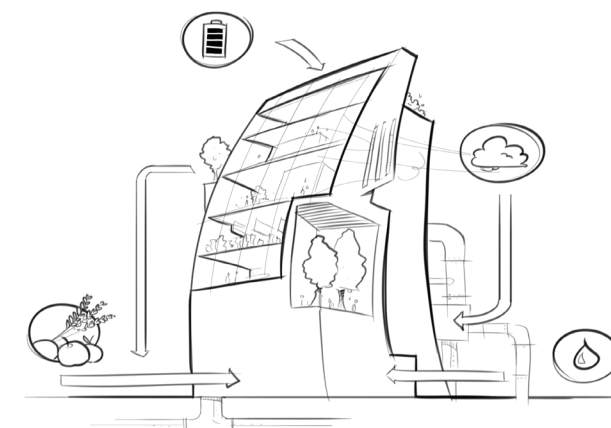
Valuing public transport

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



Regenerating resources in a circular economy

In 2050, the circular economy ensures self-sufficiency of cities. Renewable energy is abundant, and this ensures a secure supply of vital resources for life (energy, water, food and clean air), although other resources may still be scarce. Cities have implemented circular systems to regenerate all the resources needed by their populations. These mechanisms are based on small-scale, local solutions, enabled by changed decision-making levels.







Contributions

We would like to thank the participants for their contribution to the scenario workshops

- | | |
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