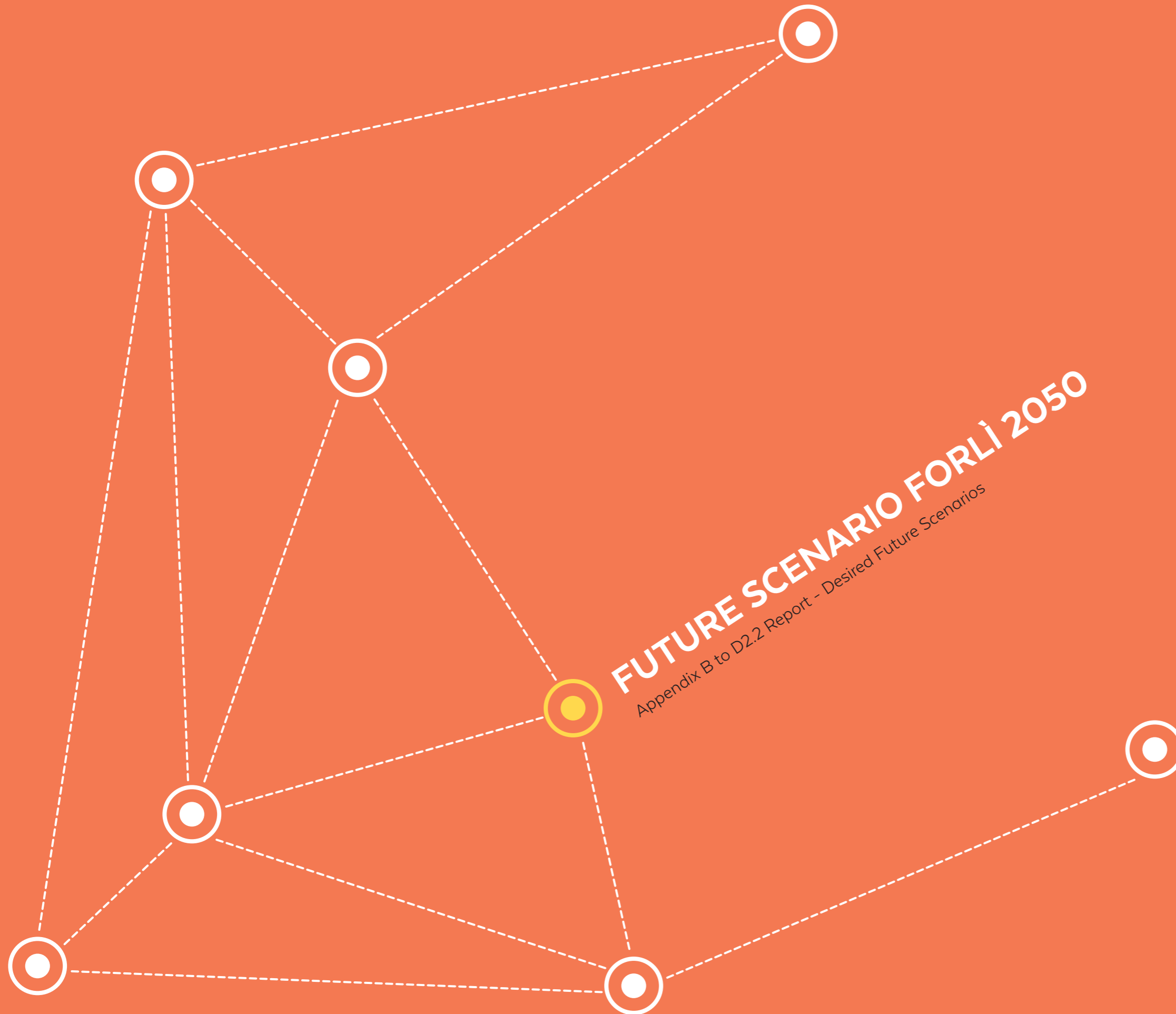




This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



15 June 2016

Francesca RAVAIOLI & Stefano BAZZOCCHI, Comune di Forlì  
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 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 |



# Contents Appendix B

- Desired future scenario Smart Buildings*
- Desired future scenario Smart Urban Spaces*
- The making of the desired future scenario*
- Ambition: History made smart in Forli*
- Drivers for change for the future of Smart Buildings in Forli 2050*
- Ambition: Renewed, thriving city life in Forli in2050*
- Drivers for change for the future of Smart Urban Spaces in Forli 2050*
- Contributions*

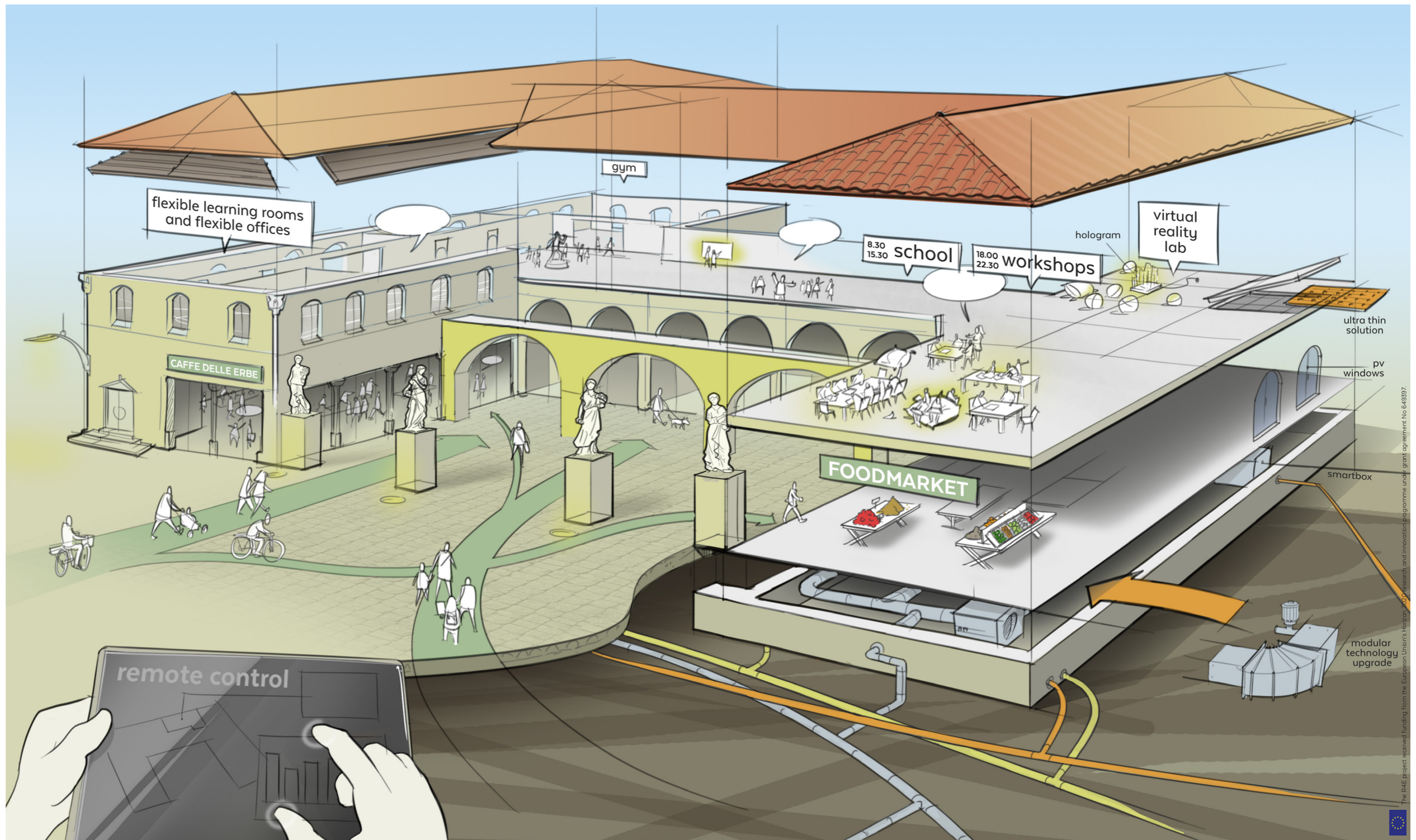
- B 4
- B 5
- B 7
- B 8
- B 9
- B 10
- B 11
- B 13

## 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 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.





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.

## 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.

## 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.

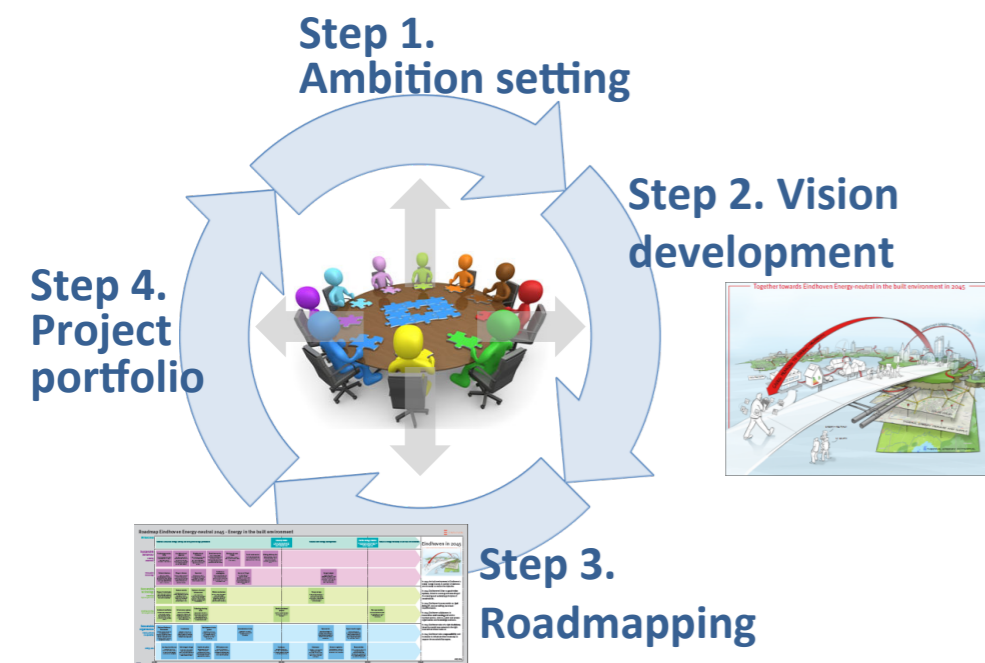
Two sessions are held for each focus area. In the morning session the outline for the vision and the desired future scenario is developed. The main stakeholders work with the set ambition for the focus area and the selected Drivers for Change to understand their impact on the city in 2050. Together, 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.

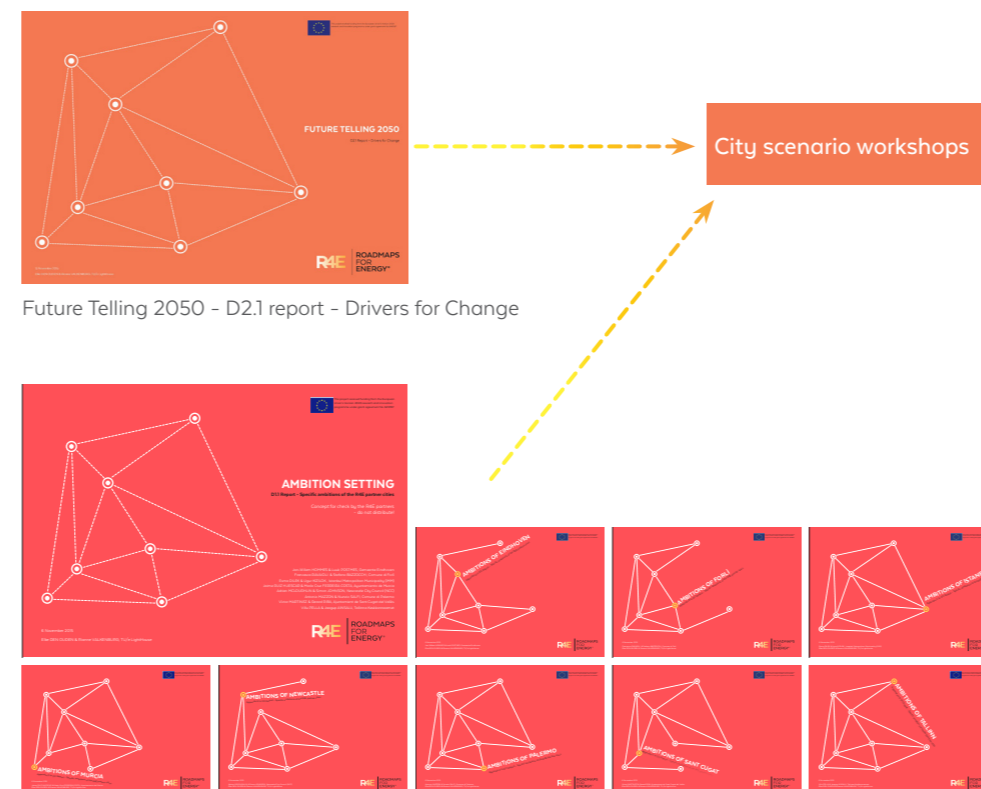
Day 1 - Focus area 1	Day 2 - Focus area 2	Day 3 - Reporting
<b>Outlining the vision</b> <ul style="list-style-type: none"> <li>Exploring the Drivers for Change in relation to the future of the city</li> <li>Selecting the main elements of the vision</li> </ul>	<b>Outlining the vision</b> <ul style="list-style-type: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

Program of the ambition workshops

The result of the vision development step is a visualisation of the desired future scenario. 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.



Four step approach of R4E



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

# 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.

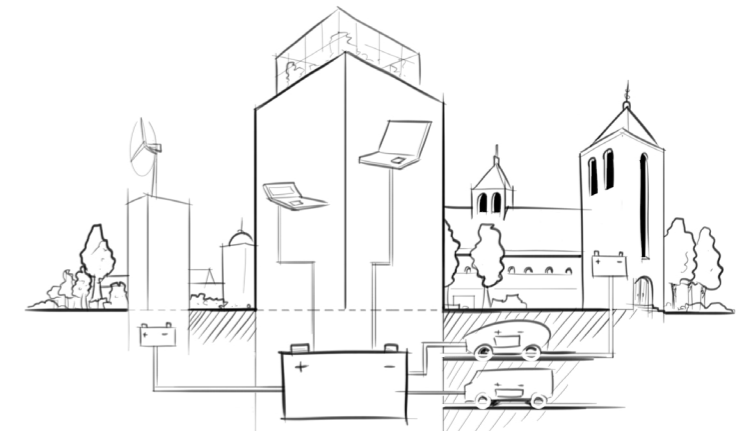
### Strategic ambitions

- 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

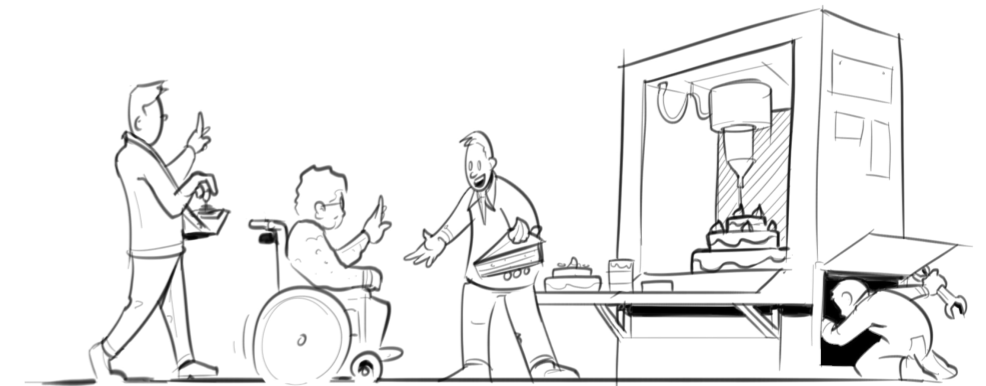
## Better buildings

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.



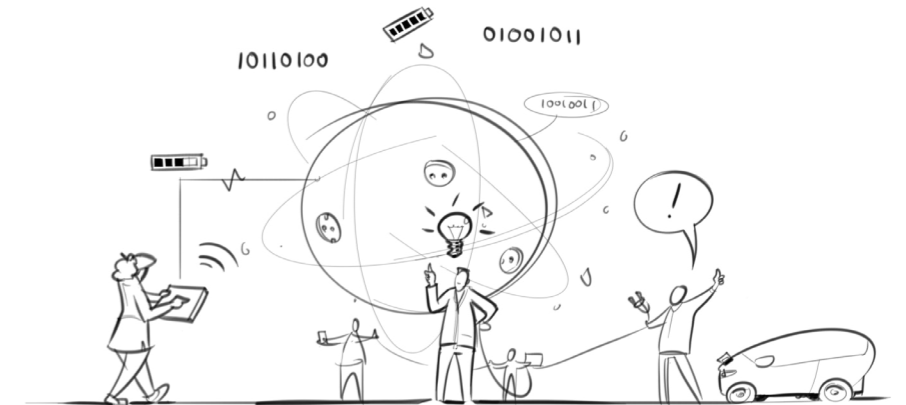
## Local, social businesses create community value

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.



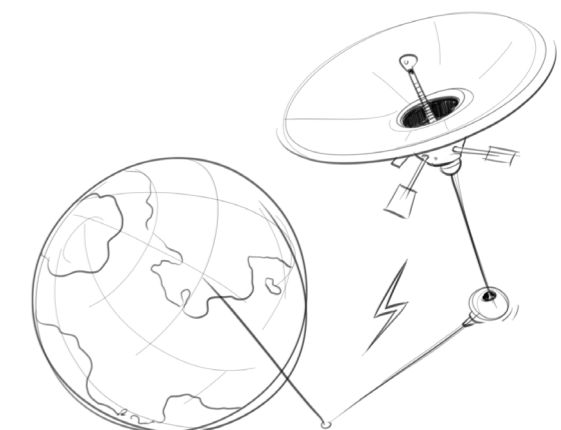
## Democratised energy systems based on open data

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 in 2050

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.

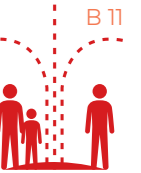
3

## 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.

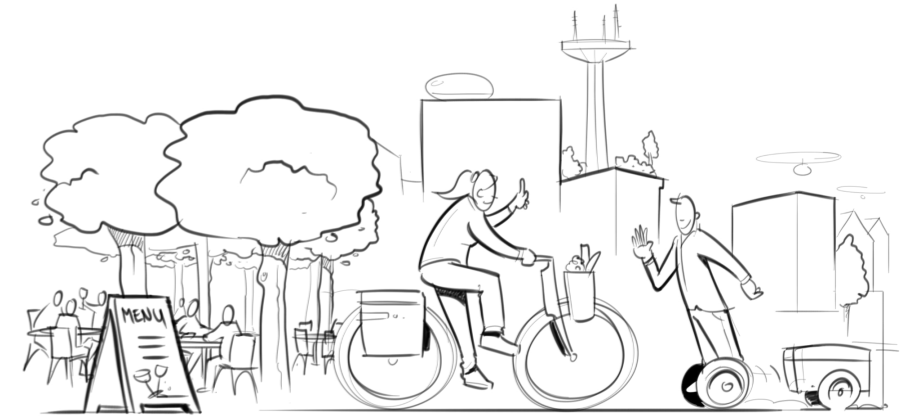


SMART URBAN SPACES

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

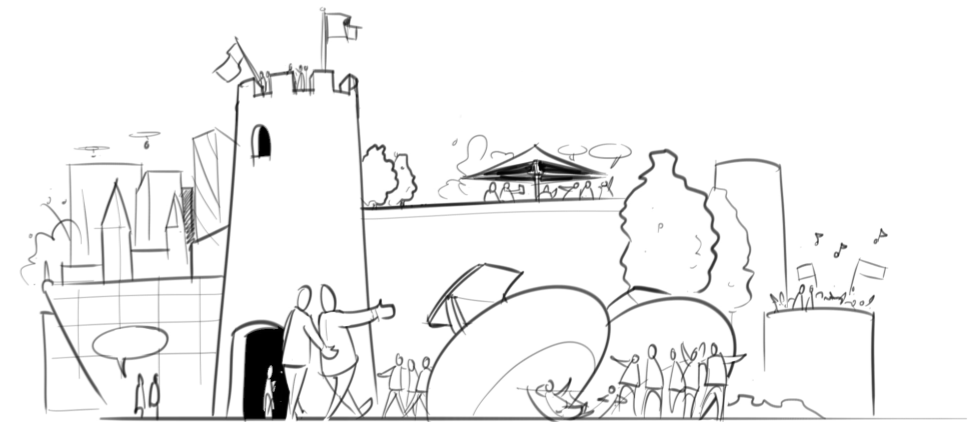
## Better living at a human scale

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.



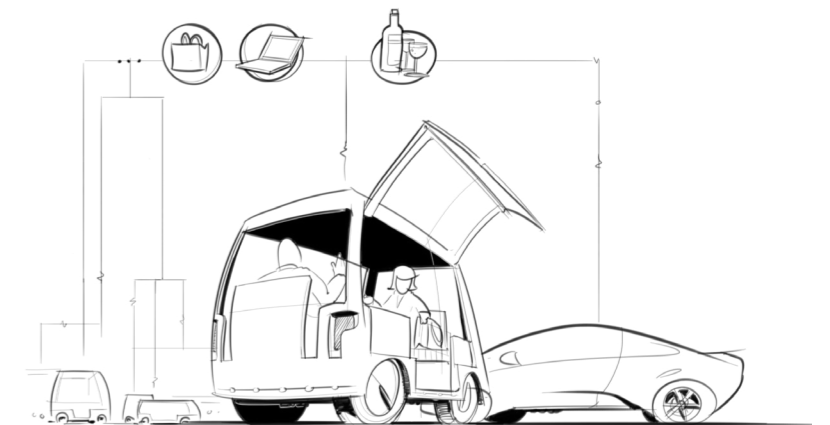
## Attractive cities with unique qualities

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.







# Contributions

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

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



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

**R4E**

ROADMAPS  
FOR  
ENERGY®