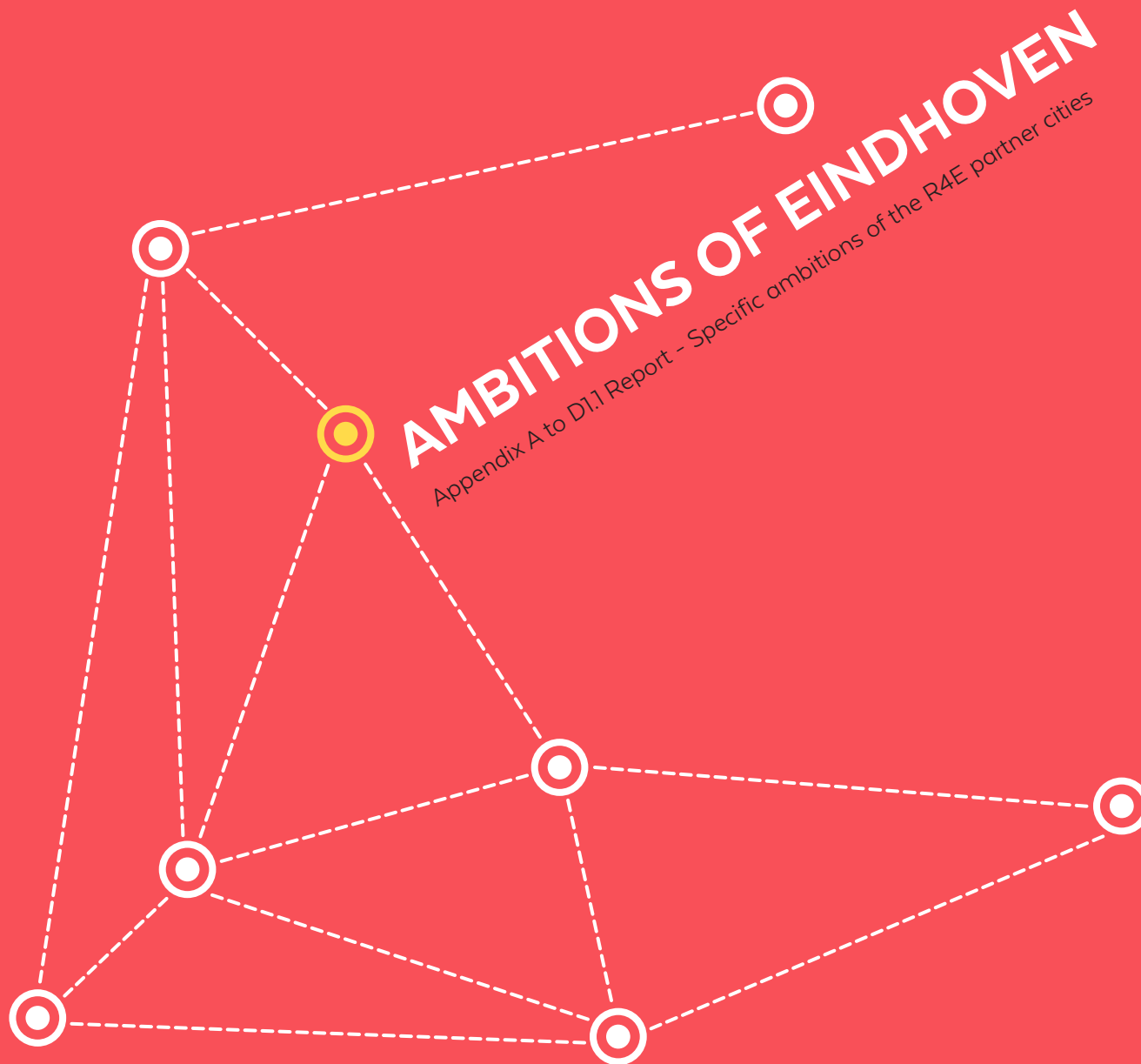




This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



15 December 2015

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Elke DEN OUDEN & Rianne VALKENBURG, TU/e LightHouse



ROADMAPS  
FOR  
ENERGY®

This appendix is part of the D1.1 Report - Specific ambitions of the R4E partner cities and contains all results of the ambition setting activities held in the city of Eindhoven.

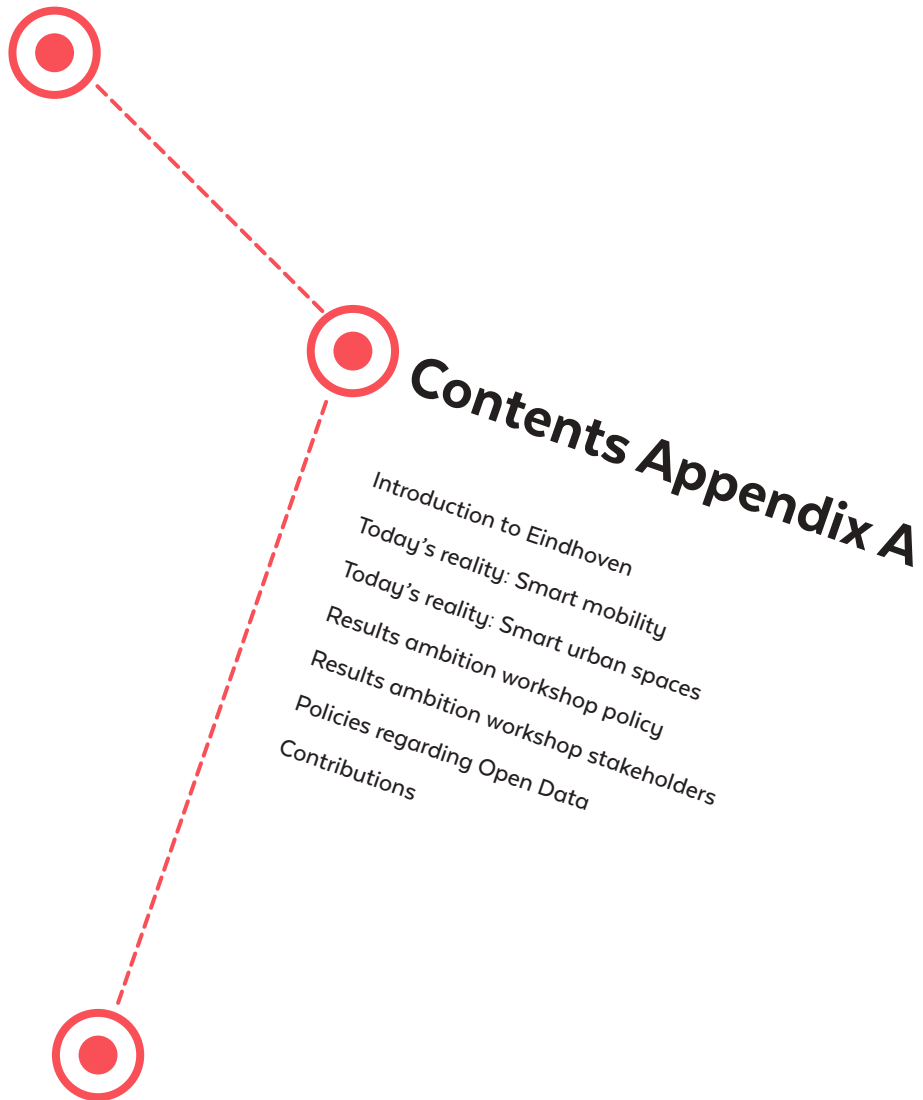


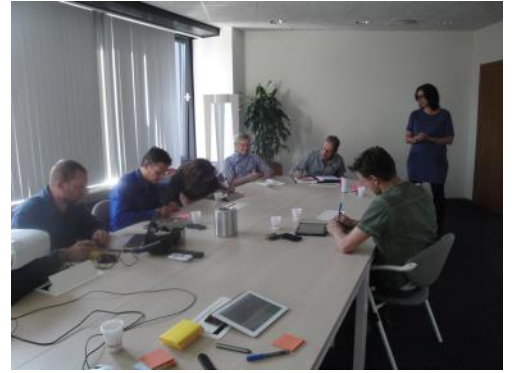
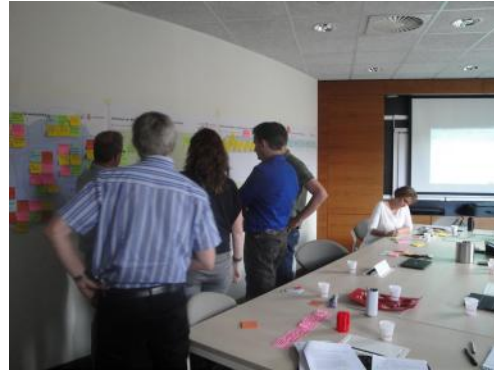
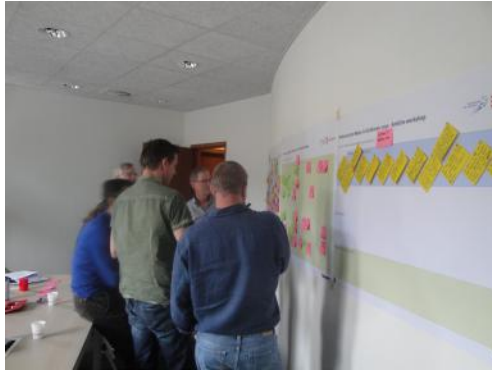
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Disclaimer: This report presents the views of the authors, and does not necessarily reflect the official European Commission's view on the subject.

**Versions of this report:**

23 April 2015	Draft for internal check in the city (limited distribution)
13 May 2015	Concept for sharing with R4E partners (limited distribution)
6 November 2015	Version for final check
15 December 2015	Final version for public distribution





# Introduction to Eindhoven

## Introduction to the city

Eindhoven is located in the province of North Brabant in the south of the Netherlands, originally at the confluence of the Dommel and Gender streams. The Gender was dammed short of the city centre in the 1950s, but the Dommel still runs through the city. The population was 221,402 in 2014, making it the fifth-largest city in the Netherlands and the largest in North Brabant.

Neighbouring towns and cities include Son en Breugel, Nuenen, Geldrop-Mierlo, Heeze-Leende, Waalre, Veldhoven, Eersel, Oirschot and Best. The agglomeration has a population of 337,487. The population of the metropolitan area is 419,045. The city region has a population of 749,841. Also, Eindhoven is part of Brabant Stad, a combined metropolitan area with a population of more than 2 million inhabitants.

Eindhoven has grown from a small town in 1232 to one of the biggest cities in the Netherlands. After the independence of the Netherlands in 1815, Eindhoven was a small village of some 1250 people in an economically backward and mostly agricultural area. Cheap land, cheap labour and the existence of pre-industrial home-sourcing made Eindhoven an attractive area for industry. During the 19th century Eindhoven grew into an industrial town with factories for textiles, cigars and matches. Most of these industries disappeared after World War II. In 1891 the brothers Gerard and Anton Philips founded the small light bulb factory that would grow into one of the world's largest electronic companies. Philips' presence was probably the largest single contributing factor to the major growth of Eindhoven in the 20th century. It attracted and spun off many high-tech companies, making Eindhoven into today's major 'Brainport' technology and industrial hub. In 2005, a full third of the total spending on research in the Netherlands was in or around Eindhoven. A quarter of the jobs in the region are in technology and ICT, with companies such as FEI Company, NXP Semiconductors, ASML, Simac, Newways, Philips and DAF.

Eindhoven has long been a centre of cooperation between research and industry. This tradition started with Philips, and has since expanded to large cooperative networks. Eindhoven University of Technology (TU/e) hosts an incubator for technology start-ups (the Twinning Centre), and the Philips Research (formerly the 'NatLab') has developed into the High Tech Campus Eindhoven.

Due to its high-tech environment, Eindhoven is part of several initiatives to develop and promote the knowledge economy in the region. Some examples are:

- Brainport: a cooperative initiative by local government, industry and Eindhoven University of Technology to develop the local knowledge economy in the Eindhoven region.

- MRE (Metropolitan Region Eindhoven): a cooperative agreement among the municipalities in the Eindhoven metropolitan area.
- ELAt (Eindhoven-Louvain-Aachen triangle): an extensive cooperation agreement between the universities and surrounding regions of Eindhoven, Louvain (Belgium) and Aachen (Germany).
- Within the Eindhoven region (and particularly Helmond), several parties are working together in the automotive sector. In particular in the Automotive Campus – a testing facility on a European scale – for testing and European certification of vehicles. This cooperation involves the Eindhoven University of Technology, TNO Automotive and a number of automotive companies in and around Helmond and Eindhoven.

As a result of these efforts, the Intelligent Community Forum named the Eindhoven metropolitan region as Intelligent Community of the Year in 2011.

Source: Wikipedia

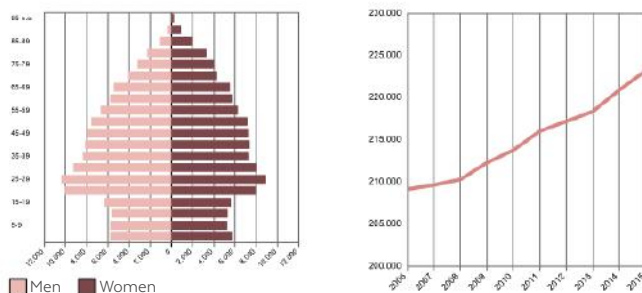


Map of Eindhoven

Source: Google

### Demographical aspects (2015)

- Size in km<sup>2</sup> 88,87 km<sup>2</sup>
- Number of inhabitants 223.220
- Population trends: growing (see graph below)



### Social aspects

- Level of education of citizens 18% low standard of education
- Share of population with energy poverty none ??
- Percentage of people that require special care/needs:
  - 21% suffers from prolonged illness
  - 13% has poor health conditions
  - 4% is hampered at home
  - 6% is severely hampered in spare time
- Percentage of people from foreign origin (see also table below):
  - 70% of the inhabitants of Eindhoven is Dutch
  - 17% is of non-western origin
  - 13% is of western origin

Immigrant populations	No in 1995	No in 2013
Turkish Dutch	6590	10305
Indonesian Dutch	7111	6236
Moroccan Dutch	3183	5743
Surinam Dutch	3227	3714
Chinese Dutch	958	3129

### Economical aspects

- Income per head in comparison to the national average income Eindhoven €30.600,-- ( €13.400,-- per inhabitant)
- Level of infrastructure maintenance Basic
- Maintenance costs (green areas, roads, infrastructure) Approximately 45 million (inclusive big repairs)

### Environmental aspects

- Total m<sup>2</sup> public green area within the urbanised area 1168 ha. and outside 366 ha
- Climate conditions: average temperature 10,3 degree C, rainfall 750 mm per year)
- Impact of climate change & measures taken to handle climate change. Most important, at this moment is heavier rainfall events
- Renewable energy production in the city: Biomass energy plant
- Air quality & noise data for the last 2 years online measuring of air quality: <http://www.eindhoven.nl/artikelen/Meetwaarden-luchtkwaliteit.htm>
- Water consumption per head 120 lit/day; 100% of underground water sources
- Supply and distribution of water: water company: Brabant Water
- Type of waste collection underground containers and small containers
- Biological sewage plant

### Energy usage

- Energy performance of buildings in the city: average energy index: 1,82 (2014, source: klimaatmonitor databank)
- Residential Energy consumption (for houses): 5363 kWh/pp/yr (2012, source: monitoring report)

- Total energy consumption: 4722222 MWh/yr (2012, source monitoring report)
- Total CO<sub>2</sub> emission per head: 6346 kg/pp/yr (2012, source monitoring report)
- Total energy consumption in the local industry: 2450000 MWh/yr (2012, source monitoring report)
- Municipal buildings energy consumption: 1,53 kW/m<sup>2</sup> (2014, source: klimaatmonitor databank)
- Renewable energy production in the city: 122222 MWh/yr biomass (2012, source monitoring report).

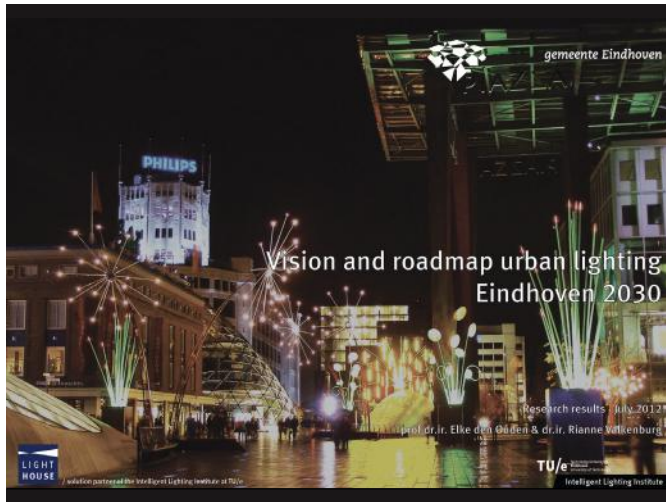
### Decision making process

- Organisation of responsibilities: municipality, no 'outsourcing' to company
- Process of decision making regarding energy and sustainability: The college van burgemeester en wethouders (abbreviated as college van B&W or simply B&W) is the executive board of a municipality in the Netherlands. This local government body plays a central role in municipal politics in the Netherlands. It consists of the mayor (burgemeester) and the members of the municipal executive (wethouders).
- Extensive involvement of stakeholders
- Extensive participation of citizens

### Recent projects

- Vision and roadmap urban lighting in Eindhoven 2030
- Eindhoven started the process of creating visions and roadmaps in 2012 when the city was wondering how it would handle the transition to LED technology for urban lighting. Where many cities were replacing traditional lighting systems with LED technology to save energy, the municipality of Eindhoven was seeing an opportunity to use the urban lighting grid also as an opportunity to realise the smart city ambition.

The city was not sure about the exact vision and route to achieve the vision and asked TU/e LightHouse to facilitate the creation of such a vision and roadmap for urban lighting in 2030 as a co-creation process.



The project resulted in a shared vision for the future of urban lighting in Eindhoven, and a roadmap that indicates possible technologies in the field of lighting and smart cities to achieve the desired future.

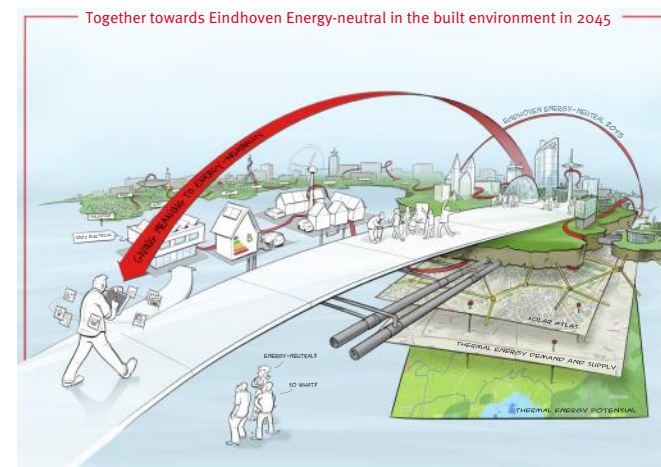
The vision and roadmap urban lighting Eindhoven 2030 has been established as the official policy for the municipality in November 2012. Currently the municipality is working on the implementing the vision and roadmap by executing a first tender for an innovation relation to develop, implement and continuously innovate the smart lighting grid. As the tendering process requires different approach than the more traditional 'product based' procurement processes, the municipality decided to have dialogue rounds with different consortia. More information on the tender can be found on the site of the municipality: <http://www.eindhoven.nl/smartlight>

In parallel to the tendering process the city is experimenting with living labs for smart urban lighting solutions, such as on Stratumseind. This living lab was visited during the kick-off

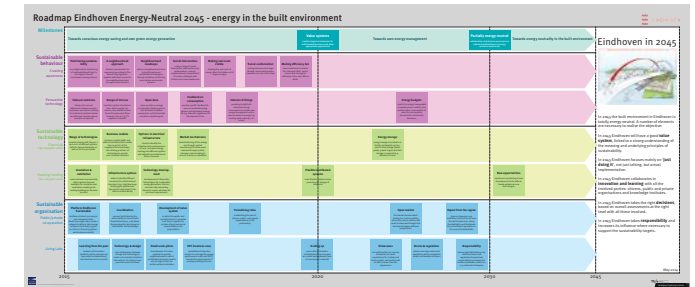
meeting of the R4E project. For more information: <https://nl-nl.facebook.com/LivingLabStratumseind>

- Vision and roadmap Eindhoven energy-neutral 2045

Eindhoven set itself the ambition to become energy-neutral by 2045. Ensuring that this goal is actually achieved in practice will require cooperation between government, business and industry, research institutes and the citizens of Eindhoven. A series of short-term activities with a long-term focus will have to be defined. To make the goal achievable, Eindhoven will need a shared vision and roadmap. Because of the interrelationships between the different Smart City related roadmaps, LightHouse has been asked to support the process of the creation of a vision and roadmap for Eindhoven Energy-neutral in 2045. In the project the focus is put on energy in the built environment. The project was done in co-creation with the housing association Woonbedrijf, various companies and knowledge institutes. Together a vision was made of the desired future scenario of energy in the built environment.



With the vision a roadmap was developed that indicated possibilities in technology and organisational set-up to achieve the desired future scenario.



Currently a more in-depth study is done in the required infrastructure in Eindhoven to become energy neutral by 2045.

The experience to co-create visions and roadmaps in collaboration with industry, knowledge institutes and citizens has encouraged Eindhoven to develop more roadmaps for smart city related themes.

Moreover, as Eindhoven has now experienced that collaboration with other cities also improves with having roadmaps. Therefore it embarked on the opportunity to develop a proposal for the EE7 call in the Horizon 2020 program to collaborate with other cities to develop visions and roadmaps for sustainable energy.

## Selection of focus areas

The city has selected two focus areas for the R4E project:

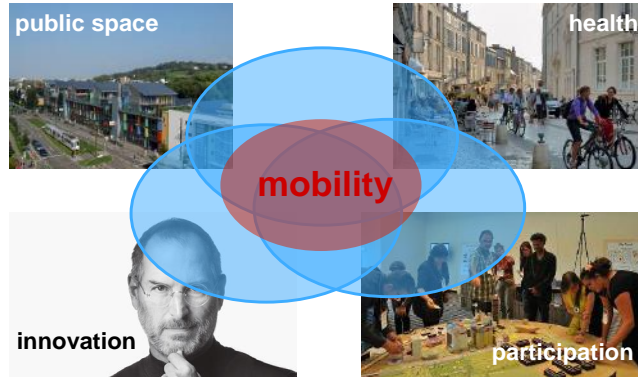
- Smart mobility
- Smart urban spaces

# Today's reality: Smart mobility



## Smart mobility in Eindhoven 2015

Current ambition: Eindhoven - City of the connected traveller

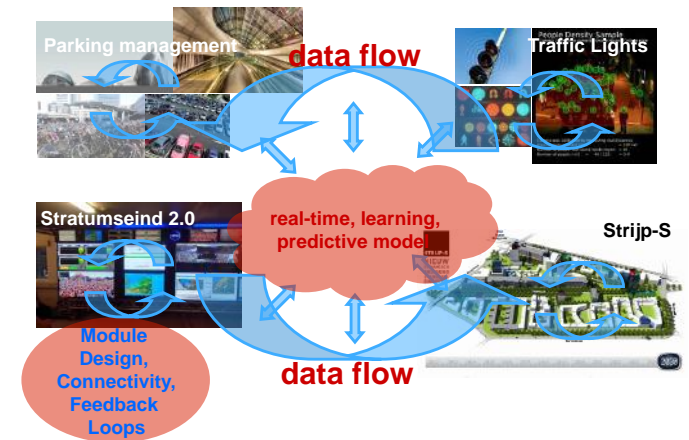


Traffic plan with more attention for pedestrians and cyclists.

Cycle paths, e.g. Veldhoven.



Sensor city - status quo



Brainport: strategy 2040 available.

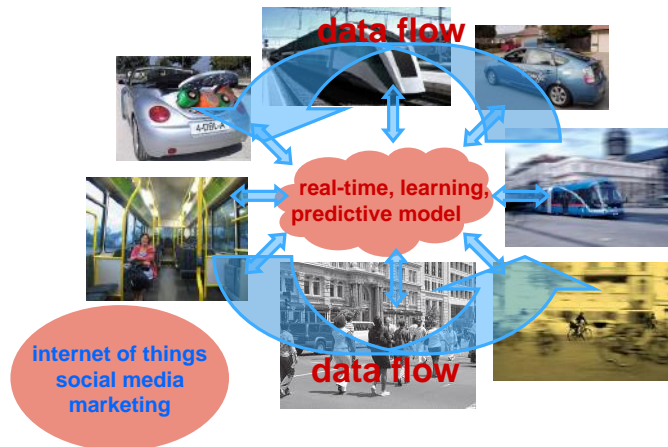


Modal split: current and ambition

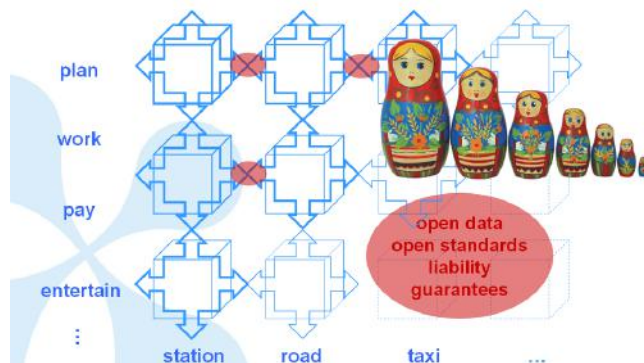
	% 2012	% 2025	total numbers '12 - '25
Pedestrians	13	14	+35%
Bicycles	40	44	+35%
Public Transport	5	7	+55%
Car	42	35	+ 5%
Totaal	100%	100%	



Current strategy: towards an open, modular platform  
 The use of different transport modes feels very similar.



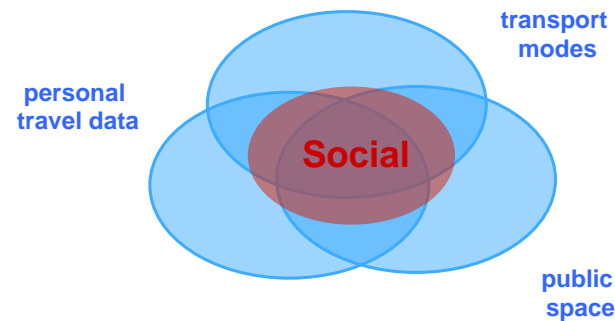
Modular: open = able to include future services



Innovation strategy: merging collective and private transport

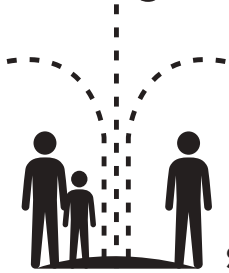


Community: 'seamless mobility is sharing'



More information: [www.eindhoven.nl/opweg](http://www.eindhoven.nl/opweg)

# Today's reality: Smart urban spaces



## SMART URBAN SPACES

### Smart urban spaces in Eindhoven 2015

Roadmap light: light and data



- First implementations of smart lighting available, e.g. in Strijp-S



### Eindhoven goes Greener

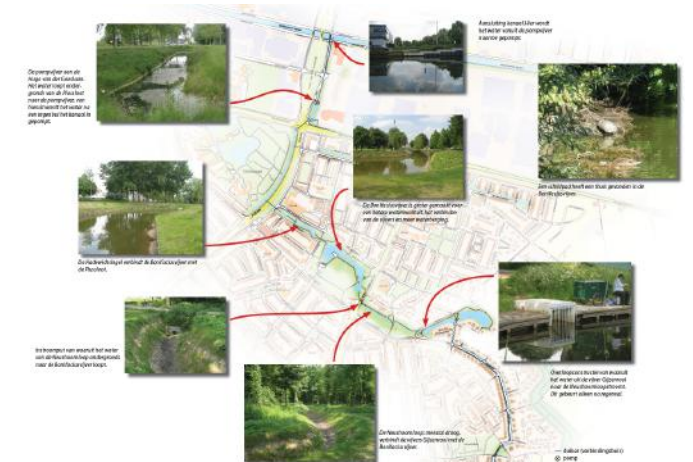
- Eindhoven is creating a greener environment: "Eindhoven goes Greener" -> Garden city



- Traffic plan which includes more space for pedestrians and cyclists
- Vision on green space and its functions in Eindhoven
- We're working on plan for a more liveable, healthier and sustainable city



- Reconstruction of watercourses and creation of more 'green and blue' spaces



- Traffic plan which includes more space for pedestrians and cyclists

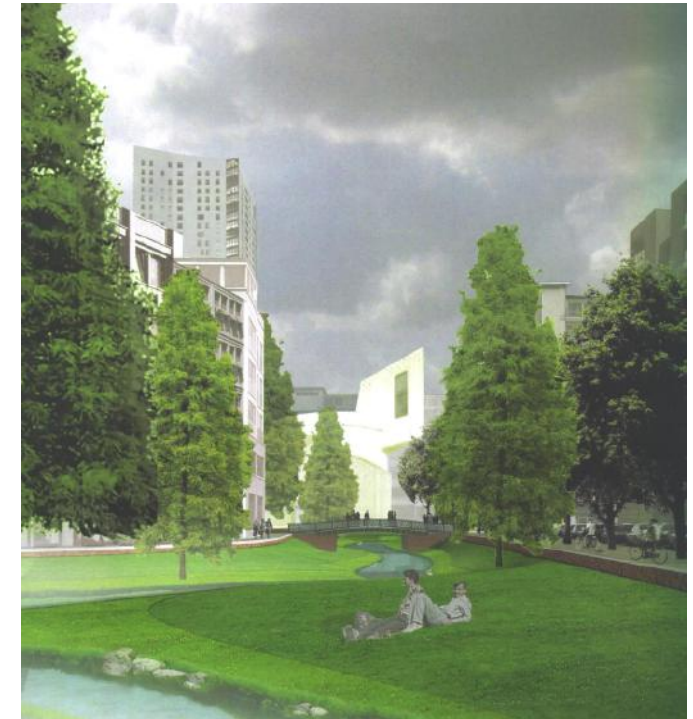


- Current satisfaction level of citizens regarding urban spaces: 6,6 (on a scale from 1 to 10)

### Wishes for the R4E project in 2050

Creating a more liveable, healthier and sustainable city:

- Public space is designed accordingly and also accessible for everyone. Affordability e.g. maintenance is part of the design
- Linking initiatives and identifying missing elements (e.g. Intensive use of public space)
- Waste water as source of energy and “natural” resources (circular economy)
- Eindhoven as garden/liveable city: the place to be!



# Results ambition workshop policy

# 2015

## High Lights

The top three aspects in the city the municipality is most proud of:

- The cooperation of the region with all partners (e.g. municipality in Eindhoven and the waterboard (het waterschap de Dommel), DITCM (cooperation in the automotive industry), cities in the region, industry partners), which includes the definition of a joint assignment and responsibility. The cooperation is result-driven and results in hands-on implementations.
- The basic quality of the urban space is high. There is a balance in urban and rural space, 'green' enters the city, the Dommel meanders through the built environment, the quality of drinking water and surface water is high, StrijpS is an example where space is used for mobility solutions.
- Still many opportunities for transformation and development in the future. As opposed to other cities, in Eindhoven the riverside is not fully built and creates opportunities for (re) designing for healthy and pleasant environments for people to enjoy.

## Priority in Policy

Which topics have the highest priority in the current policy:

- Climate change and its impact on living climate in the city. The aim is for energy neutral in 2045. Pro-active anticipation on CO2 reduction and creating a garden city. Priority is given to clean air and health policies.
- Integrated approach to public space, taking into account green, blue, red and grey, but always from the perspective of it's user. This approach is broader than the city itself and includes the region.
- Circular region and value creation. Including the ecology of the water, gaining raw materials and other products (medicines) from waste water, priority for sustainable solutions and materials.

# 2050

## General Ambitions for the City

In 2050 there will no longer be contra-positions or compromises for human interest, economical interest or ecological interest: it will all be integrated into one value. This is also reflected and expresses in the awareness and behaviour of people and policy makers.

### General aspirations

- Awareness of people
- Actual change of behaviour realised
- Quality of the living environment
- Integration of city and region no contradictions in economic, ecological and human interests
- Stimulate the planet through profit
- Looking for 'green deals'

## Specific ambitions for smart mobility

1

In 2050 we value the traveller as premise of mobility solutions. S/he is facilitated in his/her mobility needs by seamless services and products that fit his or her personal needs at that moment.

### Aspirations

- Appreciation for healthy and sustainable living
- Traveller centric
- Attention for pedestrian and cyclist
- Real time and reliable information
- Seamless accessibility
- Freedom of choice
- Social climate embraces sharing of solutions

2

In 2050 the Eindhoven region is “green”, both for the public space and green air in the city (‘garden city’), as well as ecologically. Sustainable and healthy choices are obvious, both for the municipality as for citizens.

### Aspirations

- Sustainable city
- Healthy lifestyle and behaviour
- Healthy citizens choose walking as cycling as obvious choices
- Initiate behaviour change towards healthy lifestyle and choices
- CO2 and energy reduction
- Liveability and health

3

In 2050 the Eindhoven region is an economical vital region with plenty employability and economic activity. This is for a large part based on smart and sustainable mobility. The region is a living lab where innovative solutions are developed and tested in practice.

### Aspirations

- Economic viable region
- Employability
- Innovation, technology, design
- Living labs for innovation
- Regional cooperation in the quadruple helix



## Specific ambitions for smart urban spaces

1

In 2050 people value a good, healthy and sustainable living together with water and green spaces. People are aware and appreciate the interplay of nature and city. An interplay that compels healthy lifestyle and behaviour.

### Aspirations

- Appreciation for nature in living environment
- Garden city
- Liveability and health

2

In 2050 all partners in the value chain value the entire ecosystem. All (infrastructural) elements of the urban environment and their interdependences are clear, being water in interplay with flora, pavement and built environment.

### Aspirations

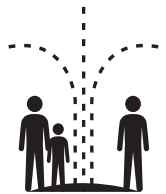
- Integral approach of public space

3

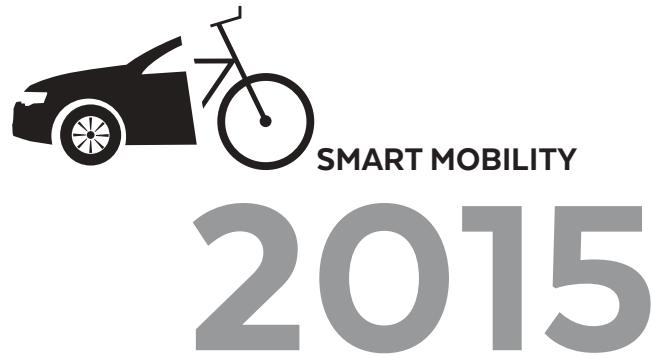
In 2050 the municipality of Eindhoven and the waterboard (het waterschap De Dommel) value sustainability and therefore a circular water region in Eindhoven for water, drinking water consumption, waste water and the mining of raw materials and energy from waste water.

### Aspirations

- Circular region
- Closed water system for Eindhoven
- Mining raw materials



# Results ambition workshop stakeholders



## High Lights

The top three aspects in the city the external stakeholders and strategic partners are most proud of:

- Eindhoven Traffic Plan as integrated approach for mobility in the city and with specific attention for pedestrians and cyclists.
- Eindhoven region as a hot spot for smart mobility, with an automotive campus, university strategic area and plenty of innovative companies working on mobility of the future.

1  
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.

### Aspirations

Personal, well-advised & well-informed choices

- Context driven choices (e.g. time pressure, diversity of choice)
- Human centred: the way in which s/he would like: by foot, bike, bus, car, etcetera.
- Offerings according to needs (possession of mobility products is of less importance than access).
- Supply of transformation means efficiently tuned to demand.
- Destinations accessible by all means of transportation.
- Easy transfer between means.
- Centre ring road as a pleasant boulevard, where pedestrians and cyclists are acknowledged, public transport is good and parking slots are accessible.
- Enable interwoven displacements for living-working, living-shopping, social and business traffic.
- Seamless connections of means of transportation in mobility chain to offer flexibility and choice to people.
- Personal choices based upon occasion, weather, companionship, or activities on the road.
- Accurate and actual information on availability (time, place and costs), facilities (e.g. WiFi) and transfers to enable seamless combinations of transport modes and enable selection before and during the trip.
- Alternative choices with special added value without having to give in on freedom of choice (both public and personal transport modalities)
- Facilitating people not vehicles
- Seamless mobility is information driven (plan, book pay for multi-modal options), flexible (prepared for the unpredictable, modular expansion, using crowd control infrastructure), visibility as an

experience (with travel chain resilience), simplicity (easy to use, easy access and participation) community building (public space, transport modes, personal travel data)

- Innovation: balancing private and collective transport (sharing, demand responsive and self-organising)
- Demand driven: transport modes and services are building blocks of an individual journey
- Modular: no passenger is left behind (open data, open standards, liability, guarantees)
- Reduce travel time regardless of travel mode and focus on higher quality of travel time
- Focus on the needs of the individual traveller to provide him a door-to-door journey - 'from any A to any B' - linked seamlessly from the 'first kilometre/mile' to the 'last kilometre/mile' using the most convenient and appropriate combination of transport modes, including public transport, walking, cycling, taxi service and car usage
- The quality of the journey matters as much as its duration
- The focus becomes the overall door-to-door journey, not just the individual elements (journeys become coordinated, integrated and easy to use,
- With points of friction between different stages removed or reduced)
- The traveller only sees the 'tip of the iceberg' (while the delivery of transport services involves considerable underlying complexity for providers, it is simple for travellers to use)
- Journeys are more productive and enjoyable
- Support the strong aspects of transport modalities and co-modality instead of forcing people to use less attractive modalities (modal shift)
- Reduce restrictions
- Traveller centric thinking
- Facilitate the individual to optimal choices
- Stimulate behaviour change of traveller

### Today's challenges

- Nowadays traffic systems and mobility modalities do not adjoin one another: the mean is the central concept instead of the traveller.

## 2

In 2050 sharing of transport solutions is an obvious choice, driven by a socially responsible and open mentality.

### Aspirations

#### Social cohesion

- Maximum use of knowledge and experience of the users of the city. Involve residents, businesses, employees and visitors in shaping mobility in the future city.
- Attractive public spaces to meet and relax.
- Use of shared, clean facilities in transport: road car, auto-date, urban distribution, bikes.
- Public areas with a vibrant social-cultural atmosphere focused on personal encounters.
- The pedestrian is central and there is an urban dynamic of come and go in a public area with a high quality.
- Open, social city where everyone is welcome, with much diversity and mixed residential and cultures where each district has its own identity.
- Smart and social mobility: share management to increase loading factor of vehicles.
- Communal mobility services: bringing down mobility costs.
- Community building: contributing to community enhancement and social networks.
- A social city with good conditions for the sharing of transport modalities.
- Easily accessible and open to broad participation
- Contributions to community formation and strengthening of social networks.
- The number of citizens connected with a multi-modal transport library.
- Citizens “connected”

## 3

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.

### Aspirations

#### Green and healthy environment

- Improving the quality of public spaces
- Attractive living environment, free from nuisance and inconvenience of traffic
- Good quality of public spaces and green that enhances the spatial coherence: a beautiful face, cleaner air, a better feeling
- Green with significance for the quality of city life: living in districts bordering on a quiet, green ‘natural’ area and large parks
- Renovation of the environment encourages physical activity, making walking and cycling a natural choice
- Clean city, comfortable and nice to stay
- A city with plenty of space for flora (and water)
- Landscape and ecology are spared
- Structurally green is designed to improve the quality of public space and to compensate for harmful emissions from traffic
- Clean air (minimum emission of harmful substances) and sound from a comfortable level (quieter)
- Urban promenades and extensive network of walking routes
- Fast and comfortable cycling routes
- Healthy city that is inviting to be active
- Facilities on walking distance
- Human scale city
- Green entrée
- Safety: ambition to limit the traffic fatality to zero
- Shift to active travel modes to achieve positive health impact
- Better air quality
- Higher traffic safety
- Residential areas with less traffic and pollution nuisance
- A clean and healthy city with minimal emissions

# 2050

- A safe city with minimal traffic casualties
- Assuring quality of tranquillity and environment
- Improve air quality
- Acceptable quality of life and safety
- Reducing the number of road casualties
- Limiting the harmful effects of traffic
- Quality of life: air quality, sound quality, climate (CO2 emissions) and external security
- Road safety better than the national average

### Today's challenges

- Nowadays air quality in the city is a serious problem.
- Nowadays lack of exercise is a serious health threat (obesity).

## 4

In 2050 mobility in the region is energy neutral and exclusively uses renewable sources and sustainable materials.

### Aspirations

#### Sustainability

- Better for the people, better for the city
- Sustainable mobility giving priority to sustainable modes of move: more walking, cycling and use of public transport (change in the distribution of the use of modes = declining share car for shorter journeys to and from the city)
- Ensure sustainable transport for more and more people will be a logical choice
- Well accessible and sustainable for people and goods
- Principle: 'slow motion - fast forward'
- Principle: 'make room' for sustainability and urban quality with space for green
- Nice walkways and good facilities for pedestrians (pedestrian bridges, etc.)
- Shared facilities (eg. district cars and flex transport)
- Purchased or produced materials are extracted in a fair manner or formed
- Energy neutral in 2040: energy in traffic and required energy comes from renewable sources (even with the expected increase in traffic volume)
- Transition to renewable fuels (independent of fossil fuels)
- Intelligent traffic management to direct traffic to the appropriate routes and to use it as efficiently as possible
- Objectives for sustainable mobility have a positive impact on the four basic principles of The Natural Step
- Priority for people and sustainability (people counting traffic lights)
- Surface public transport is the obvious choice, compared to the private car or plane (for many journeys within cities and between cities, and especially compared with short-haul air within Europe)
- Sustainable accessibility city with change of mode (more walking, cycling and more use of public transport)
- Reducing the number of vehicles within the centre ring road
- Despite the growth of mobility still a liveable city

## 5

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).

### Aspirations

#### Attractive and versatile city

- Attractive public space, attracting different audiences to stay there longer, with a varied offer of shops and restaurants, but also with a recognisable identity and a place where it feels good
- Pleasant and healthy living, working, doing business, stay and relax
- 'Cosy' squares and streets
- Peace and space for the people themselves
- Diversity in arrangement of squares based on history and districts with an instantly recognizable identity for its residents
- Inspiring place that breathes creativity
- With all sorts of things to do
- Plenty of culture
- Striking city combining old and new
- Wide and varied range of shops and amenities
- Visibility of urban characteristics of major transformations from the economic developments that have occurred in the past (medieval market town, industrial town, 'company town' and garden city, city reconstruction, and Brainport city)
- Characteristic radial road structure plus the centre ring road with his service roads as historical beam of the city retained alongside new compounds and other routes to facilitate the new dynamics in the city
- City of design, technology and knowledge
- Connecting the 'places to be'
- Supporting the City Vision 2040: experimental, open, faster and better, cosmopolitan city, courage and leadership, and collaboration
- Dynamic environment to live and work
- An attractive living environment in the city centre
- Space for sustainable and balanced growth

#### Today's challenges

- Nowadays accessibility of some locations is problematic (e.g. congestion on A67, or no public transport facilities at all).

## 6

In 2050 smart choices for regional flow and accessibility are based upon real-time analysis and predictions of travel flow and transportation behaviour.

### Aspirations

#### Accessibility

- Maintain the accessibility even with increasing growth of mobility due to spatial, economic and demographic trends
- Public transport that brings you within walking distance from key facilities
- Connecting the 'places to be' (e.g. campus) by new routes and sustainable means
- Good connections to many destinations from stations and airport
- Solve and prevent problems associated with mobility
- Multi-modal accessibility of economic locations
- Eliminate annoying barriers and unsafe situations, particularly for pedestrians and cyclists in the growing town (crossing the inner centre ring road)
- Alternatives to traffic through the heart of the city and district strange traffic in residential areas
- Removing bottlenecks on the main road and on the track and the transitions from main road to urban roads and transfers (inter national and regional urban public transport or other means of transport)
- Using historical radials and centre ring road and modern new radials to form the ideal (faster and better) traffic structure with its own spatial recognition
- Traffic management to accommodate peak times
- Robust alternatives to encounter extreme situations and calamities
- Meet normative arrival times for emergency services and thereby desired route network
- Good accessibility concerns not only passengers but also transport of goods - partly because of the growth in freight transport on the road (even at low economic growth), the regional accessibility pressure
- Parking management: better use of public space
- Durable accessible for both passenger and freight
- Acceptable travel times from door to door: traveller central
- Cooperation for an accessible region
- Travel times from surrounding communities to key economic areas is 2005 level (in the future)





# 7

In 2050 the region is an economic hotspot for smart and sustainable mobility and stimulates innovation and technological developments through living labs.

- Promoting road safety
- In the coming years improve the biggest bottlenecks 10%
- Focus on logistics / freight
- Multi-modal accessibility of urban areas

## Aspirations

### Economic vitality

- Attractive and competitive business climate for companies and organisations in the city and region
- Multi-modal accessibility of the economic top locations
- Good (inter-)national connections with other economic hotspots, both national as well as worldwide (by train, road, air and waterways)
- Supporting new forms of collaboration and sharing of knowledge and experience between knowledge intensive companies, research facilities and production facilities
- Facilitating the shift that is taking place in the new economic dynamics towards new locations with new buildings in green for the knowledge industry - enabling the development of campuses in the city as the new 'villages'
- EU top-region where innovation is visible and intelligent solutions are applied in practice
- Entrepreneurship: innovation is leading to added economic activity and jobs
- Creating a really attractive business climate for the Brainport region
- Mobility as prerequisite for economic growth
- A vital economy by keeping accessibility of the villages and business locations in the cities in the Brabant province
- Exploiting the opportunities that good mobility provides for the development of the city and region
- Strengthening the position in the automotive branch
- Infrastructure as opportunity for new entrepreneurship

### Eindhoven as a living lab

- Collaboration within Brainport, with the knowledge institutes and companies to develop innovative ideas for smart and efficient mobility
- The municipality in the role of director to support initiatives and facilitate collaboration between partners to enable the desired developments and practical realisation in the public space
- The city as a living lab to test new products in practice and research effectiveness

- Employers in the region are collaborating with the city to make commuter traffic and business related travelling more sustainable
- Creating room for innovation by eliminating regulatory hindrances
- Making available data open to business parties to enable the development of new solutions within the smart and sustainable mobility strategy
- Making innovation visible (buildings, routes, urban structure, identity of the city)
- Pentahelix stakeholder involvement
- Visibility: contributing to image of innovative city, attractive for critical mass of users
- Stimulate innovation in the area of mobility by active support of pilots
- Regional collaboration to ensure execution and implementation of integral solutions
- Addressing challenges that extend the local level in regional collaboration
- Leading the way in the stimulation of technology development and pilots
- Contribute to the Eindhoven spirit as innovative hotspot

## Today's challenges

- Nowadays legal frameworks hinder innovative pilots for smart mobility solutions.
- Nowadays there is a lack of joint focus of all stakeholders in the region.

# Results ambition workshop stakeholders



## High Lights

The top three aspects in the city the external stakeholders and strategic partners are most proud of:

- The integration of green and water in the city urban space with The Dommel as aorta.
- Well functioning storm water system.
- Hands-on mentality where solutions are realised in cooperation.

# 1

In 2050 citizens are water aware and appreciate the water and green spaces in their habitat (the garden city).

### Aspirations

The citizens:

- A water aware water user
- Water awareness reward
- Water aware society, appreciating nature and green spaces
- Water aware citizen understanding the functionality of the water system
- Large-scale sewer and centralised water treatment are no longer needed
- (Re)learning to live again with nature
- Awareness that nature happens: not everything is solvable, nor the responsibility of the municipality
- Biodiversity
- Telling stories: explaining this is why and what it is

### Today's challenges

Nowadays citizens are unburdened and lack awareness to realise our ambition.

# 2

In 2050 our society properly handles and anticipates changes (e.g. climate change).

### Aspirations

- Climate change and its consequences
- Anticipate climate change
- Appreciation and respect for nature in direct living environment
- Rediscovery of the garden city
- Liveability and healthy living
- Energy neutral ambitions

### Today's challenges

Nowadays our efforts have decreased extreme water nuisance.

3

In 2050 citizens or companies experience no mortality, damage or nuisance by water.

#### Aspirations

Safety and 'dry feet':

- No water damage in the city/ houses
- Efficient water system
- Water safety is extreme high and the chance for damage is limited
- Robust system
- A planning for urban space that is water robust (storage, retention, drainage)
- Redefinition of "nuisance" and awareness that things will happen
- Taking responsibility as citizens
- Citizen awareness of own role and responsibility

#### Today's challenges

Nowadays our efforts have decreased extreme water nuisance.

4

In 2050 water consumption is limited to the first necessity of life (other needs are used from different wells).

#### Aspirations

Drinking water:

- Drinking water reduction down to 30 litres a day
- Still availability of high quality drinking water
- Drinking water out of waste water
- Drinking water out of surface water
- Integrated water system
- Every household processes its own water
- Plenty and usable supply from nature (tap drinking water)
- Still ground water as drinking water (no bottled water)
- Flush toilets with rain water

#### Today's challenges

Nowadays the Eindhoven region has the best drinking water in the world, however the consumption is too high.

5

In 2050 the high quality of the (swimming) water and green spaces attracts people to Eindhoven and to spend more time outside.

#### Aspirations

Experience / recreation:

- Urban area that breaths nature
- Swimming in de Dommel, Gender and Canal
- People enjoying water and flora in the city
- Beautiful and safe swimming water
- Swimming in the Eindhoven's canal
- Green building facade as acoustics and climate control
- Balancing nature and humans
- Water as a USP to attract people to the city
- Enjoying water and recreation in the city
- Knowledge workers in Brainport
- Healthier people through recreation and green spaces
- Less CO2 and NO2, link to smart mobility
- Social benefits due to social contracts

#### Today's challenges

Nowadays we still neglect opportunities despite of our right intentions.

2050

## 6

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 its ambitions.

#### Aspirations

##### Health:

- Healthy sanitation
- Healthy living environment
- No mortality
- Water directing the design of public space

#### Today's challenges

Nowadays we still miss opportunities despite of our right intentions.

## 7

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).

#### Aspirations

##### Physical space:

- Self-regulatory city areas
- No pollution of surface water with humane excreta
- Plenty of water and green in the city
- The water structure as a platform for nature in the urban environment
- Combination with tourism
- Buffering waste water on green roofs
- Clean surface water
- City farming, local circuit
- Nurturing craftsmanship and knowledge
- Water is clean enough for swimming
- Physical visibility of water in direct surroundings

#### Today's challenges

Nowadays the planning of the urban environment has improved a lot but our ambition is to gain even higher quality.

## 8

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.

#### Aspirations

##### Organisation:

- No taxes
- Co-creation with citizens and companies
- No more water taxes
- 'Tussenheid' instead of 'overheid'
- The waterboard (het waterschap De Dommel) no longer exists
- "Water" in one organisation: optimal cooperation
- The waterboard (het waterschap De Dommel) and the municipality work jointly in everything
- The waterboard (het waterschap De Dommel) becomes 'waardeschap': value creation by integrating water + ...
- Seek for new balance in democracy: new public private partnerships
- The user pays
- Sponsoring maintenance of city parks
- new democracy working together in public private partnerships

#### Today's challenges

Nowadays innovations are hindered and delayed by legal frameworks and financial flows (distinction concerns, payments and authority).

## 9

In 2050 all meaningful elements from waste water will be reused (energy and raw materials).

#### Aspirations

Raw materials and energy:

- No more waste water
- We mine everything valuable
- No more water in waste water
- Locally processing of waste water
- Circular society: mining of materials
- Water treatment producing energy and useful materials
- Maximum reuse of heat, energy, fertilizer, etcetera's
- Use of Big Data?

#### Today's challenges

Nowadays the municipality of Eindhoven and The waterboard (het waterschap De Dommel) are learning organisations that cooperate successfully. However the ambition should include risk taking to seize opportunities.

## 10

In 2050 the mining of raw materials and energy from waste water will be optimised.

#### Aspirations

Sustainability:

- Sustainable society
- Cradle to cradle
- Citizens own their own energy plant
- Public private energy co-operations
- Innovate on integrated needs: water & nature, water & health, water & waste
- Water as buffer for sustainable energy (wind / sun)
- Optimal scaling
- Rational decision on economy of scale: house / district / city
- Consequences for infrastructure and investments
- Circular system in the region of Eindhoven
- Less use of energy

#### Other aspirations

In 2050 everyone understands his role and takes responsibility in an integrated approach for operations and asset management.

Asset management:

- Citizens take care of their environment (maintenance or even investments)
- Better understanding and control of rainfall
- Regulation of ground water
- Water systems free of maintenance
- A control system for sewer and water treatment

In 2050 people value a strong connectedness between urban, rural and nature areas and, therefore, a healthy balance between nature, living and working.

Biodiversity / nature:

- Coherence city and ecology
- Connecting the city and the region
- Nature
- Programmatic approach:
- More nature in the city and
- More (economic) activity in rural areas

# Policies regarding Open Data

The open data of the city of Eindhoven is available on: <https://data.eindhoven.nl/>

Eindhoven has defined the policies regarding use and distribution of open data in Terms of Service.

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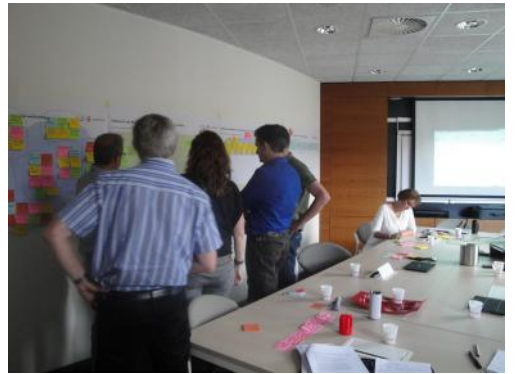
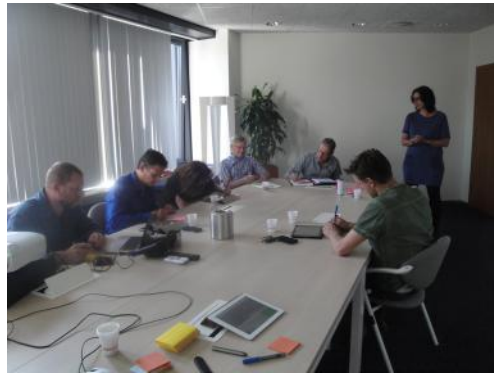


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# Contributions

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

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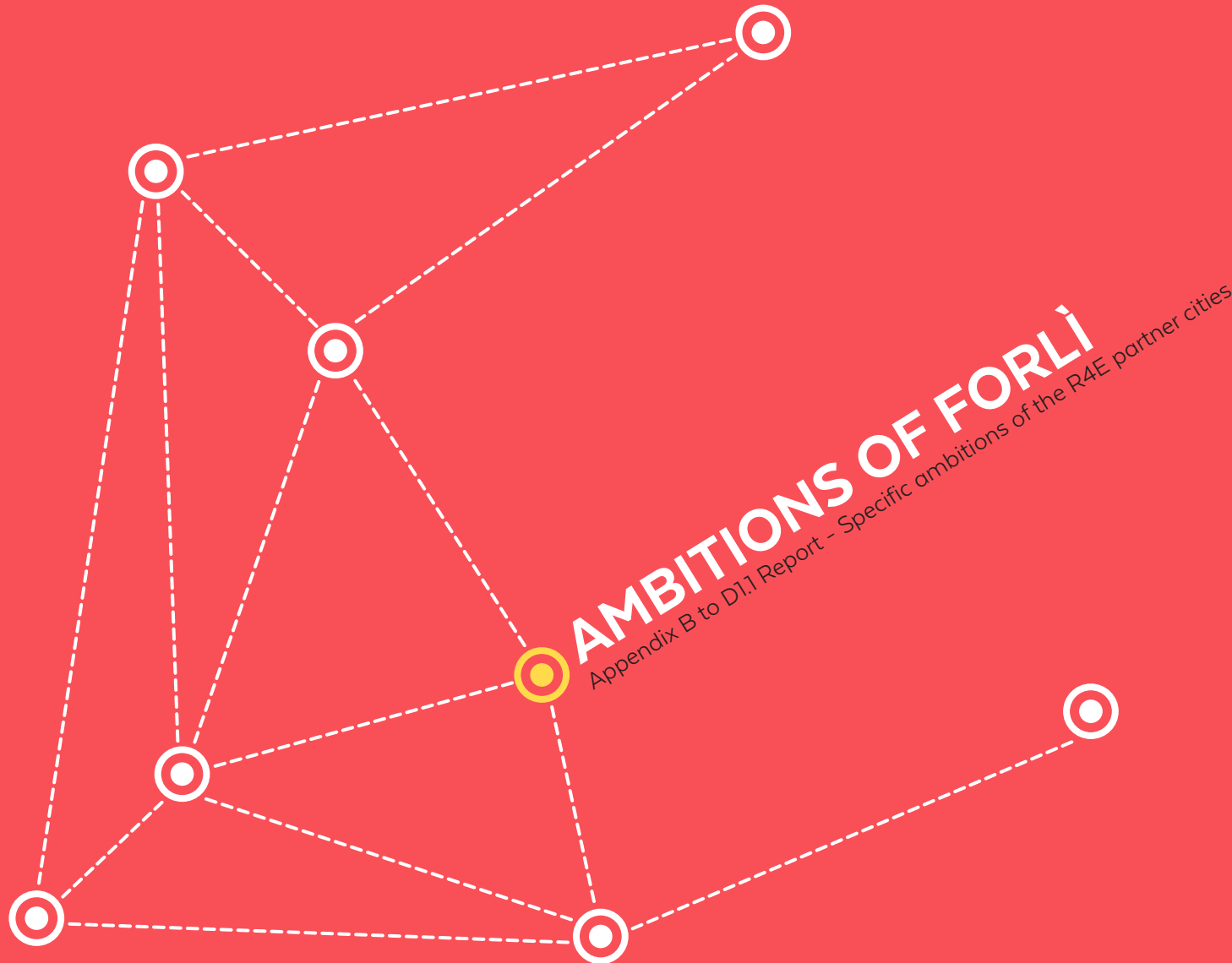
This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



ROADMAPS  
FOR  
ENERGY®



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15 December 2015

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



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This appendix is part of the D1.1 Report - Specific ambitions of the R4E partner cities and contains all results of the ambition setting activities held in the city of Forlì.




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

**Versions of this report:**

11 September 2015	Concept for internal check in the city (limited distribution)
17 September 2015	Concept for sharing with R4E partners (limited distribution)
6 November 2015	Version for final check
15 December 2015	Final version for public distribution



# Contents Appendix B

Introduction to Forlì	B 5
Today's reality: Smart buildings	B 14
Today's reality: Smart urban spaces	B 16
Results ambition workshop policy	B 18
Results ambition workshop strategy	B 20
Results ambition workshop stakeholders - morning session	B 24
Results ambition workshop stakeholders - morning session	B 26
Results ambition workshop stakeholders - afternoon session	B 28
Results ambition workshop stakeholders - afternoon session	B 30
Contributions	B 33





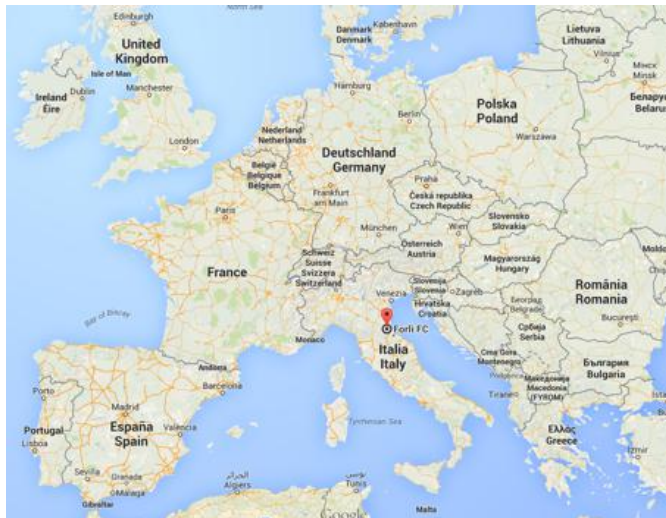
# Introduction to Forlì

## Introduction to the city

Forlì is located in the Emilia-Romagna Region (Northern Italy - Po Valley). Along with the nearby city of Cesena, Forlì is the administrative centre of the Province of Forlì-Cesena and is located between Bologna (capital of the region) and Rimini along the Via Emilia. It is located at about 35 km from the Adriatic coast.

The city, founded as 'Forum Livii' on the Via Emilia by the ancient Romans in 2<sup>nd</sup> century BC, is located in the area between two rivers (Ronco and Montone-Bidente). It covers an area of 228,45 km<sup>2</sup> and has a population of 118.517 (at 31.12.2014), of whom 12,25% are foreign citizens, with 52.564 families.

The historic centre keeps many testimonies of the past, such as the Romanesque church of San Mercuriale (in the main Saffi square) with an impressive 12<sup>th</sup> century bell tower, the 15<sup>th</sup> century Sforza Fortress and many buildings from the



Source: Google maps

Renaissance period.

Forlì shows many examples of fascist architectures, mainly concentrated in the area between the railway station and the Victory Square, that have been included in the 'Atrium' European cultural route specifically dedicated to the architecture of the 20<sup>th</sup> century totalitarian regimes.

The city hosts a university campus (part of the multicampus system of the University of Bologna). The university campus is located in the area of the old Morgagni Hospital, whose buildings were recovered and integrated with new spaces and modern buildings. There are degree courses in economics, management, statistics, aerospace engineering, mechanical engineering, political science and a school for language interpreters and translators.

The 'San Domenico Museum' is a main attraction centre. It hosts the Town Art Gallery, where important temporary exhibitions of painting and sculpture are organized, attracting



Source: Google maps

many visitors each year from all over Italy.

The airport was recently assigned to a new private management responsible for relaunching its activities in late 2015. Next to the airport area there is the Technological Aeronautical Center with the Academy of ENAV (Flight Assistance National Agency), a school for air traffic controllers, and the Aeronautical Institute, the headquarters of the degree course in Aerospace Engineering.

The main Morgagni-Pierantoni Hospital complex, located on the outskirts of the city, is part of the regional health centre of excellence.

The city is served by Adriatic Railway, connecting with Bologna, and a dedicated railway goods delivery point is located in the southern area. The A14 highway from Bologna to Taranto (in the south of Italy) runs through the Municipality of Forlì.



Historic centre map. Source: [www.turismoforlivese.it](http://www.turismoforlivese.it)

Some of the main manufacturing enterprises that have factories in Forlì, are Electrolux (cooktops), Cantiere del Pardo (racing boats) Ferretti Group (luxury motor-yachts), Quorzoli (precast concrete), Bonfiglioli Group (gear motors), Marcegaglia (stainless steel tubes). Forlì hosts a specialised district of manufacturers of upholstered furniture and furnishing accessories.

The city of Forlì is characterized by a predominantly old housing stock. Therefore, for Forlì it is very important to recover and redevelop existing buildings in a sustainable way. Equally it is important to take action on urban spaces to make them more accessible and useful to all citizens.



Saffi Square (Main Square)



Saffi Square (Main Square)



Romanesque Church of San Mercuriale in the main square

## Selection of focus areas

The city has selected two focus areas for the R4E project:

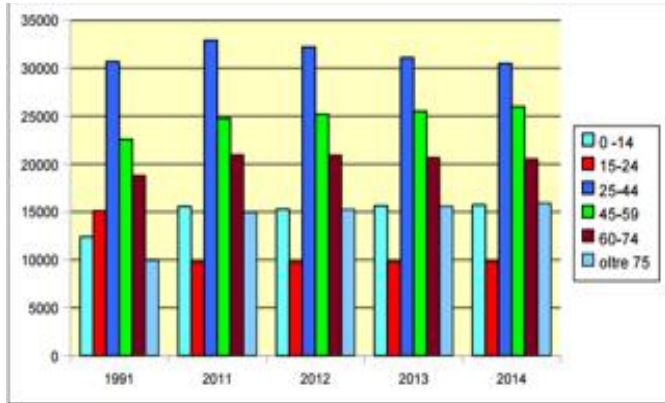
- Smart buildings
- Smart urban spaces





Sforza Fortress (XV century)

Demographical aspects

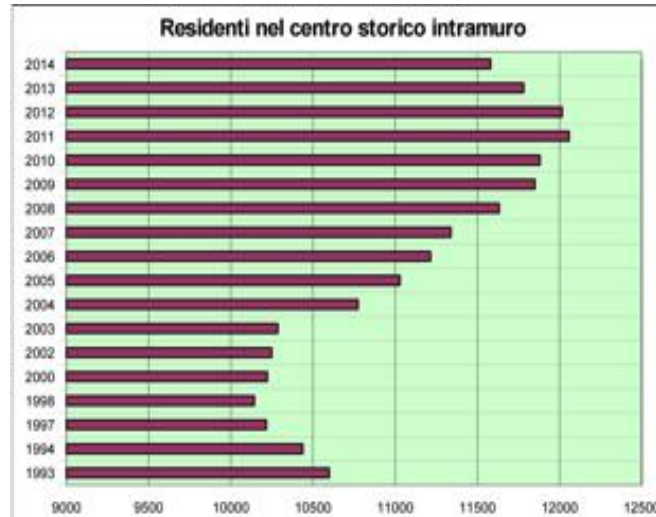


Resident population by age groups. Source: <http://www.comune.forli.fc.it/>



Ageing index (number of old people every 100 young people): Source: <http://www.comune.forli.fc.it>

Level of education of citizens: within Emilia-Romagna Region, the rate of university enrolment in 2004 was 37.46 % (number of enrolled young people, aged 19-25, every 100 ), increased compared to the previous years (Source: <http://sitis.istat.it/sitis>)



Number of residents within the historical city centre. Source: <http://www.comune.forli.fc.it>

Social aspects

Connectivity level: Data from the Report issued by the Region Emilia Romagna (benchmarking of information society in the Region, 2015) indicate that in the Province for Forlì-Cesena, which includes the municipalities of Forlì, Cesena and a number of small municipalities:

- 92.5% of the population has broadband access on fixed lines with a speed higher than 2Mb/sec;
- 70.1% of the population has access to ADSL cable line with speed higher than 7Mb/sec;
- In Forlì the 66.9% of the population has access to broadband up to 30Mb/sec.

Unemployment rate: the unemployment rate in Forlì in 2009 was 5.89 % while the national rate is 7,8% (Source: <http://sitis>).

[istat.it/sitis/html/](http://istat.it/sitis/html/)

Share of population with energy poverty: it has been estimated that about 2.100 people, in 2014, in Forlì have requested public subsidy to pay energy and fuel bills. The funds are granted basing on an income index (ISEE) lower than 7500 Euros. (source: [www.comune.forli.fc.it](http://www.comune.forli.fc.it))

Inclusive accessibility policies / indicators (e.g. related to access to public transport): number of passengers per year in 2014 was of 6.863.255 (year 2014, source FMI).



## Economical aspects

Income per head in comparison to the national average income: 15.456 euro within Emilia Romagna region in comparison with 15.000 euro as the national average (year 2005). (source: <http://www.istat.it/it/archivio/159634>)

The strongest sectors in the city and its relevancy in the local economy: the city has 10.872 businesses (31.12.2014) of which: 13,04% agriculture, 14,95% Construction and Housing, 11,77% Manufacture, 23,62% Commerce, 36,62% Services.

The number of existing buildings is 38.400 and 370 new buildings have been constructed in the last 5 years.

Mobility modal share: % use of different modes of transportation (bicycle, car, taxi, bus, train, trolley, ...) in Forlì in 2014 (source FMI):

• car	67.2%
• motorbikes	6.7%
• public transport	9.1%
• bicycles	13.1%
• on foot	3.9 %

Level of infrastructure maintenance: the maintenance contracts are regularly monitored by the Municipality :

Urban space type	Quantity	U.M.	Unitary costs
Roads	4,041,978.66	mq	1,20 €/mq/year + VAT
Green Areas	2,306,183.88	mq	0,25 €/mq/year + VAT
Trees	30,000.00	n	6,50 €/tree/year + VAT
Public Lightings	22,656.00	n	140 €/lighting point/year + IVA

The overall maintenance costs of the green areas are about 1.450.000 euros (VAT excluded)/year.

The cost of road maintenance has been of 9.284.256,53 + VAT between 2007 and 2010 and for the years from 2010 to 2015 it is estimated to be of 15.354.006,00 + VAT.



Green areas and open urban spaces in the centre of Forlì (Source: SITL Comune di Forlì)

## Environmental aspects

Use of public space:

- PARCO URBANO: the most important open public space of the city of Forlì is the “Parco Urbano” (Urban Park), with its 20ha surface, it's the biggest park of the city. It is situated near the historical city center and it is skirted by one of the most important rivers of the area, Montone River. The park is a recreational site, characterized by lush nature and a varied fauna.

- PIAZZA SAFFI: the most important square of Forlì is “Piazza Saffi” (Saffi Square), situated in the very middle of the historical city center. It is where the head office of many public functions (such as the municipality of Forlì) are based and where the majority of local events take place.

The cycling lanes present in Forlì are of four types (Year 2014, source FMI):

- Cycling lanes separated from roads for a total of 32952km
- On reserved lanes for a total of 4494km
- On pavements for a total of 4764km
- On pavements with dual use (pedestrian and bicycles) for a total of 40640km.

Climate conditions : in 2013 the average temperature was 14.4°C, the precipitation 762 mm/y, the average speed of the wind is 2 m/s (source: [http://www.arpa.emr.it/cms3/documenti/\\_cerca\\_doc/aria/fc/annuali/relazione\\_rrqa\\_2013.pdf](http://www.arpa.emr.it/cms3/documenti/_cerca_doc/aria/fc/annuali/relazione_rrqa_2013.pdf))

Impact of climate change & measures taken to handle climate change: the Municipality of Forlì has not evaluated the impact of climate change and no plan had been made regarding this.



Photovoltaic installation on the roof of Palmezzano school



Solar thermal plant

Energy consumption per head (residential) & total in city: in 2013 the energy consumptions per head has been of 4,58 MWh for the residential sector and 17,78 MWh for the whole municipality (total energy excluding industry consumption) (source: Nomisma Energia, SEAP monitoring)

Total CO2 emission per head has been 4,57 tons of CO2/head in 2013 (source: Nomisma Energia, SEAP monitoring), accounting for a reduction of 9% compared to CO2 in 2000 that was of 4.97tonCO2/head (SEAP Forli, 2011). Total energy consumption in the local industry: 287.129 MWh in 2010 (Source: Regione Emilia Romagna).

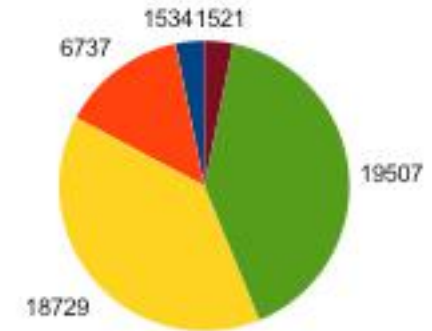
Public transport km/vehicles 2.595.669 for the Urban Area Forli uses a total of 61 vehicles, of which 12 fuelled by methane and 5 electric/hybrid. (Year 2014, source FMI)

The data consumption from offices and other municipal buildings are not yet organized in one single database, although the municipality is working toward such system. Details are available in one single system for schools and that allows the following estimates: the average thermal energy consumption in 2013 is 155 KWht/m2 while the electric energy consumption is 15,7 KWh/m2

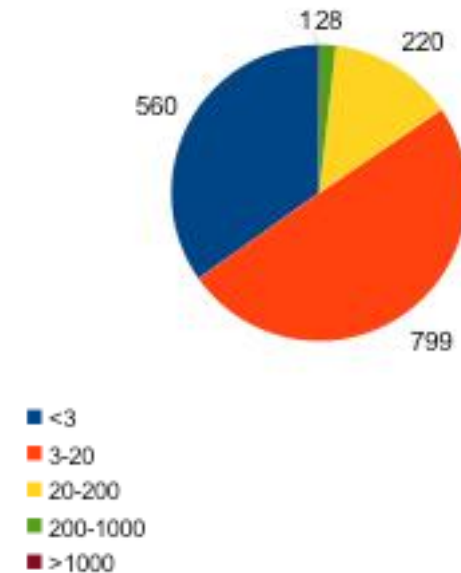
Renewable energy production in the city, divided by source: the main renewable energy source within the Municipality of Forli is photovoltaic. To date the national agency managing renewable energy incentives (GSE) reports a total of 1.608 installations in Forli with a total capacity of 48.027 kW.

Public Buildings: 23 public buildings owned by the municipality host photovoltaic plants with a total production of 430.303 kWh produced in 2014. These buildings are mainly schools and the electric energy produced is used for internal consumption. Excess electricity production is exchanged with the national grid ("scambio sul posto"). Solar installations for the production of thermal energy are also present in 13 structures, mainly sport centres, for a total surface of 613m2. Energy production in the form of hot water for hygienic uses (showers and toilets) is not being monitored for these installations.

Total capacity of pv (in KWh) installation by capacity group



Number of pv installation by capacity groups



Data source: Photovoltaic in Forli, Atlasole, GSE, 2015



### Air quality & noise

During 2012 and 2013 the air quality has been classified by ARPA, the regional environment agency, as “Acceptable” for 224 and 234 days per year and as “Good” for 43 and 76 days per year. The main pollutants are PM10 during the winter period and Ozone during the summer period. Concerning the PM10, a concentration exceeding the European daily average concentration limit was reported for a number of days over the legal limit of 35 days. The number of days in 2013 was 45 with a decrease of numbers compared to 2012. (source: Report provincial 2013 arpa FC) . During the 2014 winter, measurements have confirmed the trend of the previous two years, with 44 recorded days over the legal limits.

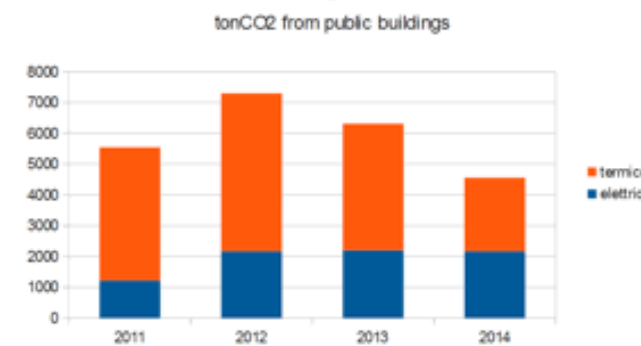
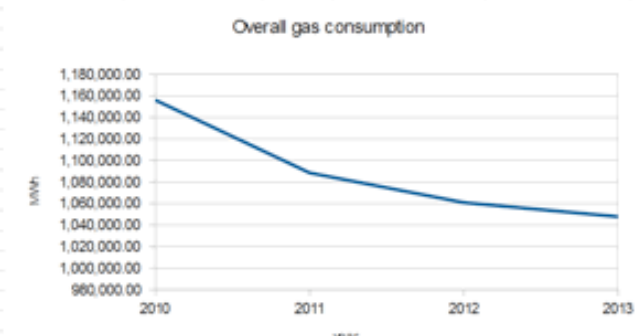
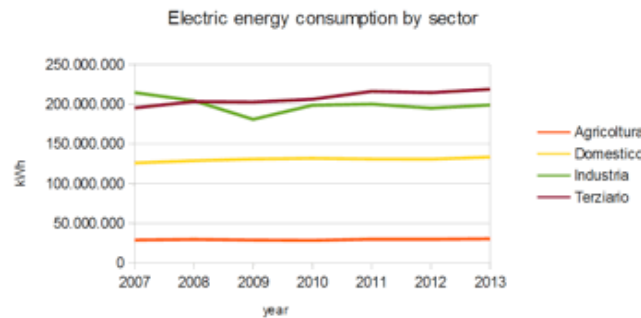
The percentage of not-recycled waste in the period 2008-2014 has been 38%.

The collection of waste is a road collection with bins for undifferentiated, plastic and cans, organic and glass fractions. In many parts of the city a door to door collection is active. Recycling rate in 2014 was of 56%.

The Municipality of Forlì has signed the Covenant of Mayors and committed to reduce CO2 production by - 25% in 2020 compared to 2000 level. Monitoring of CO2 emissions and energy use within its territory are regularly undertaken according to the time-scale set by the Covenant of Mayors.



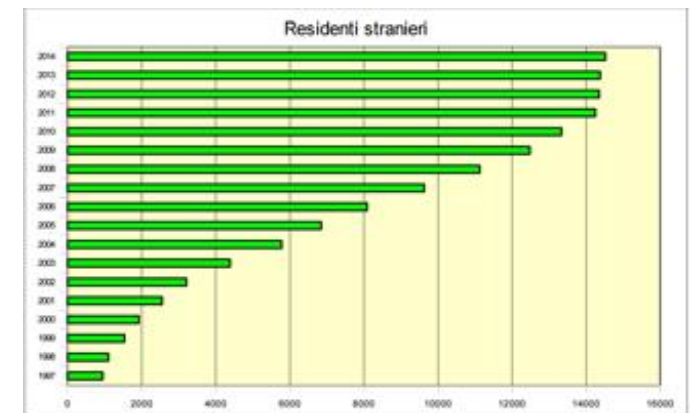
Separate waste collection at home



### Historical & cultural aspects

The historical centre covers 1.642.934 m2, the number of historical buildings is 2762. 435 of them belong to the monumental preservation area.

Foreign people living in the city (last 5 years):



Source: [http://www.comune.forli.fc.it/upload/forli/gestionedocumentale/stranieri%20per%20cittadinanza14\\_784\\_15997.pdf](http://www.comune.forli.fc.it/upload/forli/gestionedocumentale/stranieri%20per%20cittadinanza14_784_15997.pdf)

In Forlì there are more than 2 cars per inhabitant, one of the highest in Italy (Source: www.aci.it)

### Organisation

The internal organization has been recently revised in order to align services to the new strategic objectives of the Mayor’s mandate and to initiate the transfer of functions to the Union of Municipalities of Romagna Forlivese.

The reorganization process, that started in January and ended in July, was aimed to improve efficiency and to rationalize the different structures in line with the containment of public spending. In particular, the new structure is characterized by:

- Extension of the powers assigned to top management, the Director General and the Secretary-General
- Maintenance of the three main functional areas and reduction in the number of services from 17 to 15 services.

The decision-making process is based on the separation of political bodies, which are responsible for defining the strategies and operating control over the achievement of results and the technical structures, responsible for organizing activities and managing resources.

### Decision making process:

- The Mayor is responsible for the administration and chairs the Municipal Board that is the body responsible for proactive activities towards the City Council, which exercises functions of administrative and political control;
- Each main organizational department within the Organizational Area has one Director, that is responsible for organizing work, contracting with external companies, managing human and financial resources and adopting orders and sanctions;
- The General Director ensures that the organizational structure is functional to objectives and supervises the effectiveness of actions.
- All external contracts longer than 20 years are signed by the Director, further to political approval by the City Council;
- All contracts with external companies are previously approved by the Municipal Council and signed by the Directors which ensure correct administrative process and lawful procedures;
- All directors take responsibility in relation to the objectives assigned annually, the good management of human and financial resources, the correctness of administrative acts and proceedings of the service.

### Involvement of stakeholders

In 2014 a new Regulation for the engagement neighbourhoods of has been approved and presented in December of 2014. The regulation has been the result of work with the coordinators of neighbourhoods and discussion with stakeholders at dedicated meetings. In particular, the definition of neighbourhoods and their organization was discussed openly. The format of the meeting was designed to engage a large number of direct stakeholders: about 100 stakeholders, mainly citizens, participated.

### Participation of citizens

A recent example of participatory process has been deployed for the project “ a community welfare”. The project had the objective of building innovative thinking on community, facilitating the spread of computing practices of social policies, promoting the transformation of the services by placing it in a district territory and closer to citizens. It included a high number of meeting carried out at different locations and the employment of a professional facilitator.

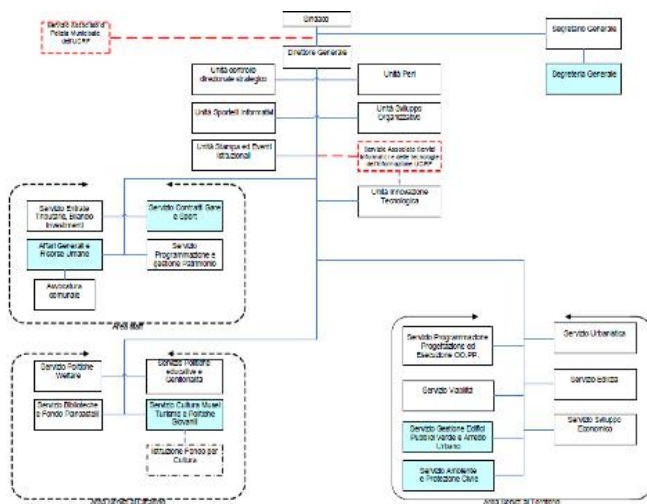
### Contracting schemes for energy related activities

Different types of contracting are being used for energy related activities according to opportunities and legal obligations.

The Italian municipalities have the obligation of making use of contracts made available by the Regional Purchasing Agency (Intercent) or the Central Purchasing Agency (CONSEP) for Public Administrations. These agencies define contractual items, undertake tendering procedure and make contracts available with third parties to all Public Administrations on the provision of specific goods and services. The Municipality is allowed to stipulate different contracts for the purchase of such goods and services only if applying contractual conditions that are economically more advantageous than regional and national contracts made available by Intercent or CONSEP.

### Process of decision making regarding energy and sustainability

On Energy and Sustainability, directives are given by the City Council. The Municipal Council ensures their implementation by the relevant unit. Being a cross-sectoral area, many departments are involved including the Environment Unit (e.g. waste collection), Public Building Service (e.g. energy consumption of buildings), Planning Department (e.g. planning regulations). For specific cross-sectoral targets, internal working groups encompassing more services are created.





Electric Energy and Heat (including associated services) are included within the goods and services made available by Intercent and CONSIP contracts. The Municipality of Forlì purchases electric energy for its public buildings through an Intercent contract, while heating and maintenance of heating systems is contracted to a private company.

Renovation of schools for energy efficient reasons is mainly contracted to the in-house company Forlì Città Solare through energy performance contracts (EPC).

Public Lighting (energy purchase, maintenance and management of lights) is contracted to a private company, outside regional and national agencies' contracts.

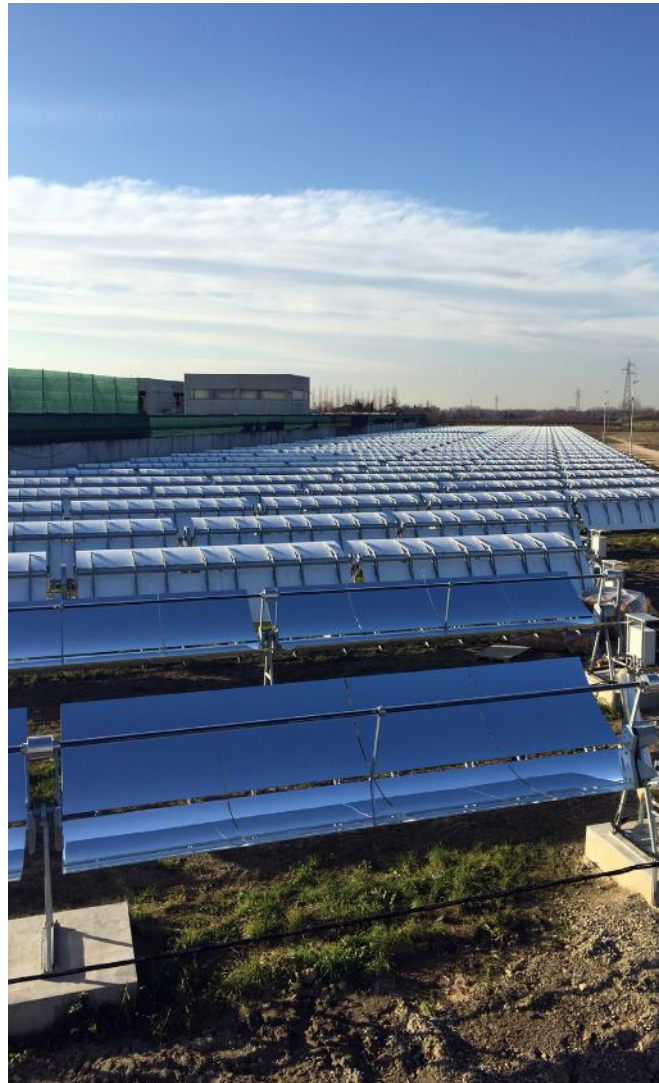
#### Financing

Energy efficiency renovation are financed mainly through EPC contracts. Renovation involving structural works such as seismic strengthening of buildings is financed mainly through municipal revenues (taxes). Large scale renovation projects have been undertaken with public-private-partnerships;

National financing schemes are available for local administration for energy efficient investments; the main tool being the "conto termico" that refunds up to 40% of costs incurred. Another scheme called TEE (energy efficiency certificates) pays back an amount corresponding to obtained energy savings.

#### Regulations

Local taxes are established according to national directives, the main local taxes being on building ownership and municipal services. The current taxation schemes are designed to cover the costs that the municipality affords for services.



The renewable energy platform

#### Recent projects

- Signatory of the Covenant of Mayors; Sustainable Energy Action Plan approved in 2011;
- Supporting a network of 14 small neighbouring municipalities (Unione dei Comuni della Romagna Forlivese) for the Covenant of Mayors initiative.
- Solar thermal plant for local energy district of Villa Selva. The Solar Field is an energy platform that produces thermal energy from solar radiation. It uses parabolic mirrors rotating on one North-South axis (solar tracking) and focusing sunlight on a receiver fluid (thermal oil) that accumulates heat. This solar heat is then transferred to the local users through a district network heating. It uses the very simple principle of heat exchange.
- Energy efficient renovation of the Aquilone and Rodari schools undertaken in 2013-2014

#### Relevant EU projects

- SMARTSET (Sustainable Market Driven Terminal Solutions for Efficient Freight Transport) co-funded by the Intelligent Energy Europe Programme 2012 and coordinated by Gothenburg Traffic and Public Transport Authority. The project is aimed at identifying environmentally and financially sustainable solutions for the last-mile distribution of freight and goods. The SMARTSET project is an important opportunity to focus on freight distribution activities within the city and, in particular, within the city centre.
- FIESTA (Family Intelligence Energy Saving Targeted Action) co-funded by the Intelligent Energy Europe Programme 2013 and coordinated by AREA Science Park. The project targets families with children focusing on how to improve their energy efficiency through a number of engagement, information and auditing measures.
- Renewal - best practices exchange among twinned cities financed by Europe for Citizens funded by Europe for Citizens.

# Today's reality: Smart buildings



## SMART BUILDINGS

Forlì is aiming to increase the energy efficiency and the use of renewable energy in public buildings through a programme of renovation and investments. The use of smart technologies could help to achieve these objectives by optimising the use of resources and reducing the need for energy. However the concept of 'smartness' for building also refers to the uses and opportunities. For example the renovation and/or change of use of historic buildings, taking into consideration their historical background and today's needs and users, can offer good examples for a modern and liveable city.

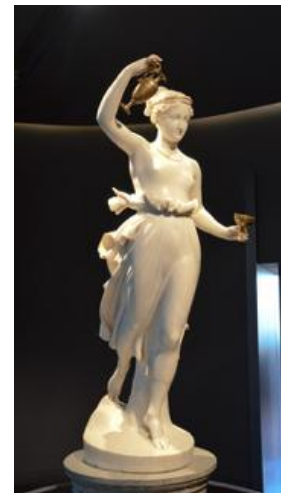
In recent years a number of renovation projects have been concluded in Forlì. These include historical buildings of cultural and historical value such as San Domenico and Campostrino, which have been renovated and made newly available for exhibitions and cultural events. The San Domenico complex is now the most important museum in Forlì, hosting national and international art exhibitions, thereby improving access to culture in Forlì for its citizens and visitors.



San Domenico Museum



Palazzo Romagnoli - Permanent exhibition "Il Novecento" (XXth Century)



Hebe by Antonio Canova (San Domenico Museum)

The Campostrino complex, which originally was the first school gym in Forlì will soon be opened to the public as a communal space for cultural events. The Campostrino complex has been renovated through a joint process which draws the attention of citizens and associations who together decided on the best use of the building.



Renovation project of "Campostrino" (first school gym in Forlì)



Energy efficiency work in Dante Alighieri School



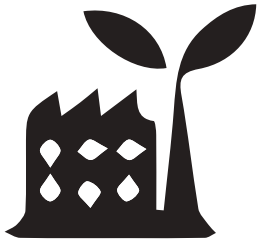


An important example of urban regeneration is also the new University Campus. It is located within the city centre and it saw the replacement and renovation of buildings that were part of the former city hospital.



The new University Campus Trigeneration plant (combined heat, power and cooling - CHPC) under construction.

## Today's reality: Smart urban spaces



### Smart urban spaces

Smart Urban Spaces are key elements of a thriving city. Forlì is committed to improving the quality of urban spaces and ensuring their sustainable use in relation to the needs of citizens. The pedestrian areas and recreational areas are two main focus areas in developing smart urban spaces. Key examples of smart urban spaces included places like Parco Urbano (Urban Park), Parco Repubblica (Republic Park) and Piazza Saffi (Saffi Square) with the availability of bicycle paths and public transport connections, bike sharing stations and wifi.

Urban space use is closely linked to urban mobility and cycling paths are of key importance. In Forlì there are 0.87 million users of cycling lanes with a total length of 82.850km.



Guido da Montefeltro Square in front of San Domenico Museum - Project to create a green area with pedestrian and bicycle paths



Bike Sharing Stations, Smart Card for Bike Sharing, the MI MUOVO (I move) integrated regional transport system and the Bike Sharing station next to the San Domenico Museum.



LED lamps in a new urbanisation and in the historic centre



## Results ambition workshop policy

# 2015

### High Lights

The top three aspects in the city the municipality is most proud of:

- Location of Forlì: near a national park, near the seaside, near green.
- Social structure of Forlì.
- Prestigious building projects, both new buildings like the university campus, as well as renovation projects like the old church and museum.

### Priority in Policy

The topics with the highest priority in the current policy:

- Compact city: making the city more dense and in this way attracting residents back into the city centre. Densify the city, not extend it, then we can concentrate our services to a smaller area. Not use too much soil. This is a longer term process: it took years for people to go out of the city, it will take also 10 years to finalize the inward flux.
- Renovation of school buildings on energy efficiency, also including safety measures for earthquake-proof school buildings. The focus on schools will also have to set an example for other buildings and private owners of buildings. Priority is public buildings with special focus on schools (energy and seismic). School to become the example for other buildings, also privately owned. Use the schools as a demonstrator. Start from what we can personally act from, but at the same time talk to private people that want to change or renovate their properties and help, support them (e.g. regulations). Program for renovating 70 school buildings, adopting safety measures, prioritizing them in order.
- Reuse of spaces and buildings. Some prestigious renovation projects have been done, still quite a few historical buildings remain. They will be given a new use. At the same time urban space will be redesigned for new use (like the new library), to make them more attractive to people (such as the museum parking space).

# 2050

### General Ambitions for the City

Sustainable economic growth is the key of the new politics. Realising economic and social wealth, including environmental awareness.. The key is to reuse, recycle and save.



## Specific ambitions for smart buildings

1

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.

### Aspirations

- Improve regulations for restoration
- In 2050 better energy efficient, but also reduce the use of new space
- In 2050 existing buildings and spaces are renovated with renewed energy efficient buildings that are also safer in terms of environmental hazards and working conditions
- High energy performances and safer buildings
- Safer school (earth quake proof)
- In 2050 beautiful private and public buildings respecting the environment
- In 2050 Forlì is as it is now, but surviving the climate change and floods
- In 2050 all buildings are energy efficient and all activities are efficient using resources: simple organisation, simple as possible mobility (few cars), no waste and zero-emission.

2

In 2050 Forlì is the example where people, spaces and new technologies are well connected. Technology is organised in a simple, yet effective way.

### Aspirations

- Focus on new technology and good implementations
- Hanging needs in a growing city; make better benefit from the changes
- A city that enhances technology to enable people to have a better life
- Introduction of new concepts and ideas, such as hanging gardens
- Encouraging innovative ideas and in 2050 harvest from this
- Develop real longer term plans and benefit from that
- Connecting technologies with people
- Connecting innovative technology, people and green areas, that is the key
- Address sensitivity of people and their emotions
- Implementing technology and the accessibility to technology to help people in good and healthy living

3

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.

### Aspirations

- The aggregation of 15 municipalities in the surrounding cannot form national policies, but can take the challenge to try and to lobby
- The challenge is to bring people closer together
- Find new business models to finance renovations
- Take into account the interest of private owners
- Work together with private parties to jointly find (EU) financing
- A smart interaction between: environment - region - city
- Realising a network in the city
- Connect stakeholders, concerning the use of resources (water, energy, waste, infrastructure)
- The Italian way is individually, but that is a waste of money. Ideal is more (regional) cooperation
- Common sense of being part of an identity

## Specific ambitions for smart urban spaces

1

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.

### Aspirations

- The key value of Forlì is the cultural and historical heritage
- Create an identity: people that are happy to belong to the city
- And respect the changing circumstances for safety
- Not only focus on public buildings, also squares and the historic centre
- Focus on existing buildings and spaces first, not only the creation of new ones
- Find the connection of public spaces and private spaces
- In 2050 Forlì is the same city, but completely different
- In 2050 Forlì is a dense city that attracts residents to the city centre

2

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.

### Aspirations

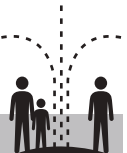
- Recover, renovate, not only for energy efficiency, but also re-use of spaces
- A greener city with more green spaces
- Long term planning for green spaces, e.g. number of trees and number of green spaces for people
- No more cars, pedestrian and cycle lanes
- Districts according to functionality (recreation, shopping, etc.)
- Recognize and respect the history of Forlì, and questioning what has happened so far, e.g. square in town, difficult to get lively
- In 2050 the city centre to be lively, not dead
- Have the courage to change and create spaces for people to meet and enjoy and participate in
- In 2017 the fortress (now a prison) back to its original aim
- Dealing with new buildings, e.g. university campus / kindergarten / new concept library
- Focus on historical city centre from public furniture to buildings, and all.

3

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.

### Aspirations

- Key are the people and interpersonal relationships. Smart citizens start at school at a young age.
- Raise awareness of people on sustainability and what the municipality can do
- People taking responsibility for the environment
- Closer social relationships
- To make this come true: changing behaviour
- School for digital natives & social natives
- Being able to interact in new system of social intervention
- Become environmental natives
- School project: capacity to interact with all these things simple, like how much water do you use brushing your teeth?
- Start now with working on this awareness and education



# Results ambition workshop strategy



## High Lights

The aspects in the city the strategy department, integral project managers and departmental managers are most proud of:

- Different interventions have been made, both to old buildings and new buildings.
- New buildings: the university campus and the aeronautic building.
- Historical buildings that are renovated supported by the local administration, e.g. the museum: example of a historical renovation with smart technology.
- The participatory process in the renovation projects.
- The solar field for business and industry to produce heating. An eco-friendly production area.
- 1500 m2 from offices to museum using easy technology (lighting)
- San Domenico museum: giving it back to the city, creating new use for people, increase prestige of the city, multifunctional use and open space.
- Hybrid building for the research centre of the university, opening up research for private people; a cheap and extremely flexible building with particular architectural features.
- Kindergarten with bio-construction.

## Strategic ambitions for smart buildings

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.

### Aspirations

#### Energy efficiency and self-sufficiency:

- Buildings not depending on fossil fuels
- Use renewable energy sources
- Enhance energy efficiency
- Enhancing energy performances thanks to new materials that are more technological advanced
- Higher (+ less soil consumption) and more self-sufficient buildings with more green area at least outside the town centre
- Buildings based on 'energy conservation technology (orientation, schemature, cool roofs, etc.)
- Wide broad band shared for smart services
- Setting new rules for bio-construction to comply with new buildings so that by 2050 30% of buildings will be self-sufficient



## 2

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.

### Aspirations

#### Respecting the buildings while making courageous improvements:

- Preservation in combination with renovation
- Ensure that history is not compromised with new solutions
- Rules to realise and share it
- Renovation and re-purposing former Eridania plant: music, conference room, concert hall, school
- Having the guts to heavily/radically change buildings built in the 90s and at the beginning of this century
- Ability to change historic buildings for fair and respectful re-purposing
- Greater possibility of working on 'bound' buildings and the chance to rebuild other, not particularly prestigious buildings in the town centre

#### Qualified and modern (schools & ) buildings:

- Functional, friendly, welcoming public buildings that are an example for the rest of the city to follow
- Refurbishment and upgrading of schools to meet the technological requirements of the youth
- Completely renovated schools, suitable to the needs of the students: energy savings and acoustic measures (no noise)
- Built on good examples for new areas
- Open public buildings, accessible for people and connecting equipped urban spaces

## 3

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.

### Aspirations

#### Disseminate awareness of citizens and administration

- Disseminate the idea of 'smart' architecture
- Raise awareness of citizens and increase participation
- Implementing GBC protocol of historic buildings in public buildings (- 30%)
- Developing neighbourhoods that encourage social activities and social cohesion and sustainability

#### Quality of life and quality of technologies

- Advanced buildings in terms of life quality and environmental protection

# 2050

### Other aspirations

#### Impact on historical buildings

- Costs for renovation of historical buildings
- Integrated and sustainable technologies to effectively reduce energy costs
- Harmonise the impact of (smart) technology to historical buildings (e.g. solar panels)
- Historical buildings, older than 70 years, with architectural standards requirements
- Reuse and restore historical buildings
- Technologies and smart buildings that won't compromise the historical city fabric
- Cutting on historical building protection requires to have a clear and simple framework for those working in this sector.

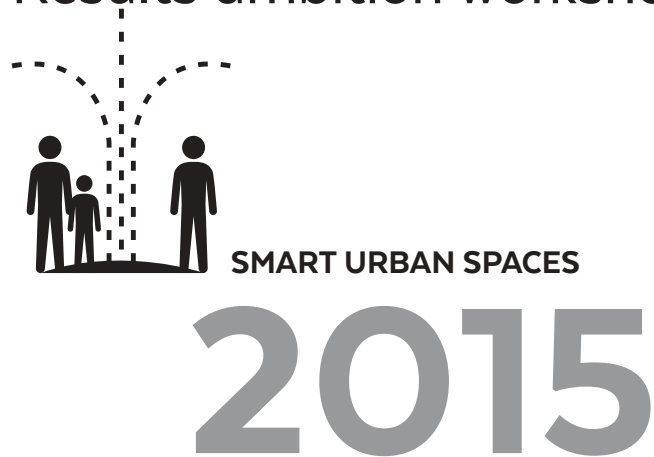
#### Economic aspects of implementation of technologies

- Industrial buildings based on 'pollution prevention' and 'cleaner production'; an industrial ecology
- Planned conservation as normal praxis supported by suitable resources
- More flexibility in interventions, making them more cost effective
- Economic aspects when renovation of industrial and commercial properties

#### Managing an integral planning

- Technological development in lighting, the use of colours and lights in the city
- Sustainable light and energy
- Include management-related aspects in projects since the very beginning
- TLC infrastructure for the whole town

# Results ambition workshop strategy



## High Lights

The aspects in the city the strategy department, integral project managers and departmental managers are most proud of:

- Parco Urbano - the Hyde Park of Forlì
- The cycling lane from Forlì to the castle
- The historical city centre
- The bike sharing service that is used more and more by citizens
- The availability of wifi in public spaces
- Controlled car access to the city centre & traffic control (enabled by wifi)
- New technologies (e.g. optical fibre) implemented in the public infrastructure
- Involvement of citizens in projects

## Strategic ambitions for smart urban spaces

# 1

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.

### Aspirations

- Spaces that enable people to interact and discuss - not only technologically but also freely
- Spaces that, technologically, can enhance interaction in the community
- Urban spaces that are interconnected and meet different needs - improving socialisation
- No physical and cultural barriers, to enhance dialogue
- No more barriers in public and private spaces
- Safe spaces where people often go and attend
- Community spaces, that are functional, suitable
- Improve quality of green public areas through agreements for managing them together with private stakeholders
- Open spaces for teaching, 'old' occupation land-crafts
- Public spaces used by people 24/7
- Disabled people friendly access - easy access from all city zones
- Spaces for projects focussing on the individual
- Interacting with nature in a more free way - focussing on 'spaces' vocations
- Smart services (public lighting, bike lanes) suitable to people's needs





## 2

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.

### Aspirations

- Educate citizens to use spaces while respecting them as well as other people
- Bigger car-free areas with alternative transport means
- No cars in wide urban areas
- Reduce traffic in the city & improve slow mobility
- Free parking lots for people residing in the city centre
- Recover spaces that were heavily and inconsistently changed in the past
- Re-think urban mobility
- Bicycle tracks
- 2050: guided transport means authorised parking lots
- Proximity services
- Providing urban spaces with the right tools & services for a 'beautiful' & efficient mobility
- Limited car access in wide areas and cycling lanes that connect those areas
- Urban spaces suitable for pedestrians and cyclists

## 3

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.

### Aspirations

- Increase density instead of empty spaces, live in existing spaces instead of building new ones
- Compact city with high environmental quality with a wide sustainable mobility network
- Urban spaces = connect areas that are more relevant in cultural terms & for monuments
- More value to urban areas with more functions to mobility
- More accessible, comfortable, interactive and safer urban spaces
- Green areas in the local environmental context
- Car-free area in the whole city centre (within the ring road)
- Historical and suburban areas that can be more inviting & welcoming top quality low sound pollution
- Urban spaces with no traffic (polluting) with modern systems (connection lighting)
- Maintaining local identities and specific features without nationalism - wide areas for homogeneous areas with no political barriers. Local interest and quick, sustainable connections between different areas

# 2050

### Other aspirations

- Involving citizens in the maintenance of urban & green spaces
- Maximise and optimise green areas: take care of them
- Caring for the aesthetic side and maintenance of urban spaces
- Having spaces for cultural events and open air meeting points
- Given public spaces to private owners (especially small green spaces) so that they carry out maintenance - not possible to build in those areas

# Results ambition workshop stakeholders - morning session



## High Lights

The top three aspects in the city the external stakeholders and strategic partners are most proud of:

- Renovation of San Domenico (the museum and church) and its surroundings for cultural events.
- Other palaces in the historical centre that become containers for commercial spaces that belong to the community.
- University as a culture container, which is also very energy efficient.

1

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.).

### Aspirations

**Renovate (historical) buildings for new use to make them attractive for citizens**

- Historical buildings to host new activities, e.g. hotel
- Renovate historical buildings to keep in good condition and involve people to make them aware of the beauty
- Attractive to citizens; attract people again to the historical centre
- The centre to be experienced again, not only a 'museum' ability set up but also residential in the centre

### Today's challenges

- Nowadays buildings are empty and the city centre is not lively
- Nowadays there are high costs for rental in the city centre
- Nowadays regulation is needed, for instance make ground floors available for commercial activities
- Nowadays strategic policies have to be made to create more shops
- Nowadays smaller areas need to be improved, and then extend from there



2

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.

#### Aspirations

Facilitate the start-up of business and commercial activities to increase liveliness in the city centre

- SME's to benefit from location
- Facilitate new start ups
- Foster liveliness of the centre
- Local crafts
- The importance of trading and commercial activities

#### Today's challenges

- Nowadays Forlì lacks vital infrastructures, such as internet

3

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.

#### Aspirations

Zero-emission, energy efficient and self-efficient buildings

- 50% buildings with 0-emission in 2050
- Energy efficient smart buildings
- Make it possible for owners of historical buildings to invest in energy efficiency

#### Today's challenges

- Nowadays incentives, policies and regulations are needed for stimulation
- Nowadays we have to face the economic challenge
- Nowadays we need to increase awareness; citizens need a mind shift to their way of living and working

2050

#### Other aspirations

- Involvement of citizens, students and entrepreneurs for sustainable development
- Involve university in getting new ideas
- Inviting for enterprises and new use
- Attractive for companies that are innovative and sustainable

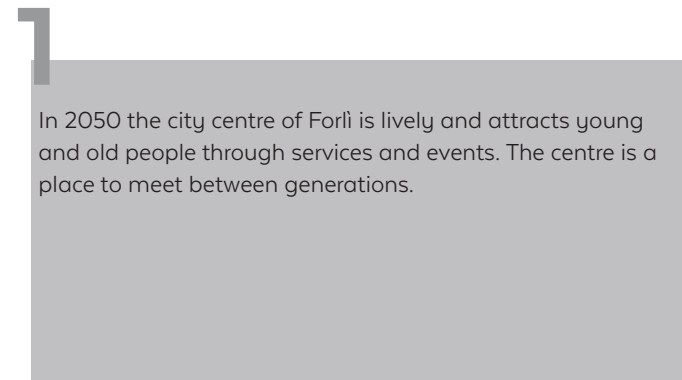
# Results ambition workshop stakeholders - morning session



## High Lights

The aspects in the city the external stakeholders and strategic partners are most proud of:

- The ring-road around Forlì
- More rational travel and short trips = cars spend less time on roads
- The lighting system of Piazza Saffi
- Parco Urbano



### Aspirations

#### Lively city centre that is attractive for people:

- More lively historical centre - easy to access and pleasurable
- Revitalise the centre with companies and enterprises
- The area around Forlì (including the centre) is balanced with services close to the population
- A small town - not too big scale to enable to meet the needs of people
- City that attracts people (already before 2050) for working
- Attractive for tourists, visitors and investors
- Public parks to be organised in a rational way and host events using technology.

#### Attractive centre and events for all people (young and elderly)

- Management and communication of all events in the city so everybody is reached
- Attractive for young people (brain & intelligence) that bring new skills
- Inviting for young people - meet & share ideas

#### Excellent services in the city centre:

- Excellent services in the city centre
- Parking lots (free) - improve payment system and smart use and management of parking



## 2

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.

### Aspirations

#### More and better green areas integrated in city (not separate):

- More green areas and more trees to provide a better environment for daily life
- Integrated green areas in the city - green 'furniture'
- Park Ronco: making the lake accessible (now an abandoned area)

### Today's challenges

- Use the example of Parco Urbano to spread to other areas of the city

## 3

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.

### Aspirations

#### Forlì as a show case for technological developments and collaboration:

- Smart things should facilitate our lives and systems
- Forlì to become an example for public-private collaboration

### Today's challenges

- Attractiveness for companies
- Low industrial level
- Opportunity for growing business and technology sector
- Use the example of the company that founds organic replacement for pesticides using insects and how has a global business
- The way the democratic system works today (top-down)

# 2050

### Other aspirations

#### Accessibility of the city with green mobility:

- Public transport means
- Better accessible with public transport - eliminate pollution up front by technologies
- 50% of people using alternative mobility = public transport (now it's less than 10%)
- Cycle lanes

#### Human scale urban spaces that invite to spend time together:

- Parks and green areas
- Public spaces (new and old) to have human size - not too big (huge spaces remain empty) and to be meeting points with furniture
- Smaller environments that are enjoyable to stay - with benches and playing grounds

#### Re-use of spaces for other purposes:

- Make spaces available and accessible for other purposes
- Renovate the airport

# Results ambition workshop stakeholders - afternoon session



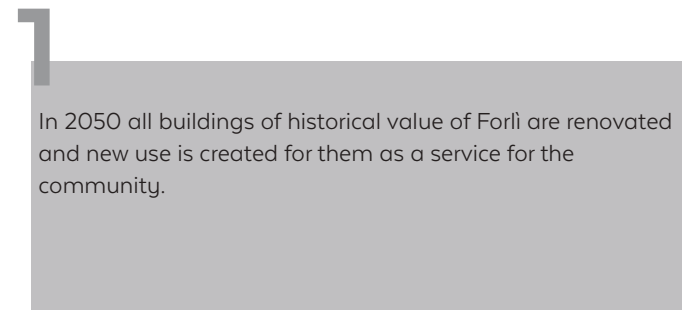
## SMART BUILDINGS

# 2015

### High Lights

The top three aspects in the city the external stakeholders and strategic partners are most proud of:

- The university campus
- Eataly, given prestige to the city and at tracing people to the centre
- San Domenico; a revitalised space for tourism, leisure, culture
- Opportunity for many more buildings with re-use purposes
- Forli is a good-sizes city
- The university campus and museum as demonstrators for what the city might be



In 2050 all buildings of historical value of Forli are renovated and new use is created for them as a service for the community.

### Aspirations

#### Renovation and reuse of all buildings of historical value

- A complete renovation of historical valuable buildings in Forli
- 2 buildings in the north off Forli: the former sugar factory and the animal market, in an area suffering: can be reused in new ways
- The main post office in the town square: convert and re-purpose

### Today's challenges

- Lack of a strategic vision, imagination and the will to share ideas
- Find the right decision process
- Financial problems
- Identify functions and sustainability of interventions
- Red tape and casus to complexity



2

In 2050 Forlì is a zero-risk city, concerning earthquakes and other nature disasters for all buildings.

#### Aspirations

##### Safe and earthquake proof

- 100% safe buildings
- Earthquake proof schools
- Safety measures

#### Today's challenges

- Find financial resources
- Lack of a strategic vision, imagination and the will to share ideas

3

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.

#### Aspirations

##### Schools and hospitals as leading examples

- Schools and hospitals are the primary means
- Schools and hospitals should be the first to be energy efficient

#### Today's challenges

- Find financial resources
- Lack of a strategic vision, imagination and the will to share ideas

2050

#### Other aspirations

##### Zero-energy consumption buildings

- 100% zero energy use

##### Involvement of owners

- Stimulate private owners to rethink use and
- Improve the energy efficiency of buildings

# Results ambition workshop stakeholders – afternoon session



## High Lights

The aspects in the city the external stakeholders and strategic partners are most proud of:

- Associations in the city that give spaces to citizens for temporary use
- Green spaces and good green lanes – e.g. Parco Urbano
- Smaller parks in the districts used by younger people
- Cycle lanes & public transport – more viable transport
- A quiet and safe city with social cohesion
- Good functions and urban planning
- New ring-roads & bypasses – guide cars outside the city
- Impact on the area around San Domenico
- Aeronautics institute

# 1

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.

### Aspirations

#### Living lab & regional cooperation:

- Create an area for innovation (living labs) where cooperation between companies, university and municipality is realised and demonstrated
- Campus available to all city & citizens
- Investment in university campus is stimulating multidisciplinary enhances
- In 2050 Forlì is part of a larger network involving other municipalities in effective cooperation for a strategic region

#### Redesign of 'old' systems and infrastructure:

- Reduction of 'old' systems for waste management, energy use etc.
- Create connection (wifi / broadband) in the city

### Today's challenges

- Lack of cultural vision
- Lack of networking collaboration
- Finding public/private cooperation tools
- Lack of cooperation between the partners / stakeholders
- Time
- Implementation costs and necessary investments
- Individualistic approach (selfishness)
- Technological boundaries / constraints





2

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.

#### Aspirations

##### Lively city centre with mixed activities and services all year round:

- The Wednesday event is very successful - more events during whole year
- Historical city centre to become more lively with mixed activities and services in the city centre

#### Today's challenges

- Strategic vision
- Time
- Implementation costs and necessary investments
- Individualistic approach (selfishness)
- Technological boundaries / constraints

3

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.

#### Aspirations

##### Self sufficient intelligent green spaces:

- Public urban furniture to be smart and connected
- Green areas should be energy self-sufficient. Use of wind, sun and water for energy of life and light
- Smart public lighting and renewable energy sources
- Citizens in Forlì will only need to work 40% of their time
- IT-connected trees indicate when they need water

#### Today's challenges

- Overcoming barriers (represented by cultural ideas)
- Time and resources
- Geographical constraints
- Time
- Implementation costs and necessary investments
- Individualistic approach (selfishness)
- Technological boundaries / constraints

2050

#### Other aspirations

##### Reduce use and ownership of private cars through efficient connections:

- Avoid the use of private cars
- Increase services for mobility
- In 2050 public transport replaces 70-80% of car possession
- In 2050 private cars use 100% renewable energy
- Public transport connects the outskirts of the city

##### Nature and environment as driver for tourism and economic development:

- Nature as economic drivers and vice versa
- Develop the potential for tourism on the hills around the city
- Connect tourism and environmental protection

##### Learn from nature:

- Back to nature - learn from how Aboriginals live
- Communication with feelings without technological means





# Contributions

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

- Silvano Allegretti                      Dirigente del Servizio Ambiente
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- Stefania Bartoletti                      Confesercenti
- Stefano Bazzocchi                      PO Comune di Forlì
- Alberto Bellini                      Comune di Forlì, Councillor
- Gian Piero Borghesi                      Dirigente Global Service
- Barbara Calzi                      Unindustria Forlì
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- Mirko Capuano                      Comune di Forlì -PO Informatica
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- Davide Drei                      Mayor of Forlì
- Francesca Gardini                      Comune di Forlì, Councillor
- Piero Ghetti                      Comune di Forlì - Esercizi Commerciali
- Riccardo Guardigli                      CNA
- Raffaella Lombardi                      Forlì Città Solare
- Claudio Maltoni                      FMI
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- Francesca Ravaioli                      Funzionario Comune di Forlì
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- Franco Rivola                      Associato dei Sistemi Informatici e delle Tecnologie dell'Informazione UCRF
- Mara Rubino                      Comune di Forlì- PO pianificazione
- Andrea Savorelli                      Gestione edifici pubblici
- Vittorio Severi                      Comune di Forlì, General Director
- Fabrizio Vimari                      Confcommercio Forlì
- Veronica Zanetti                      Comune di Forlì, Deputy Mayor
- Roberto Zoffoli                      Comune di Forlì - Turismo



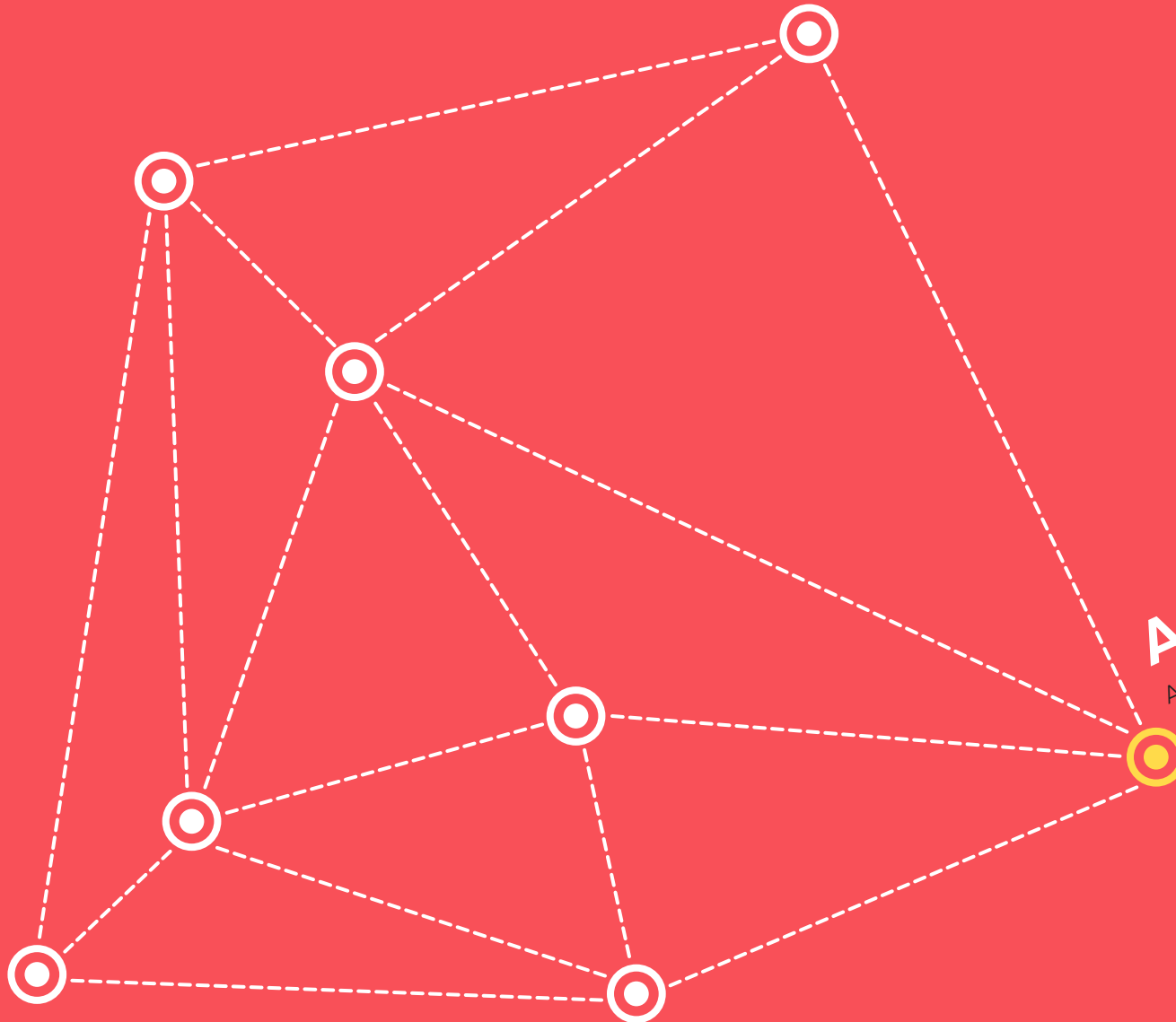
This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



ROADMAPS  
FOR  
ENERGY®



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# AMBITIONS OF ISTANBUL

Appendix C to D1.1 Report - Specific ambitions of the R4E partner cities

15 December 2015

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



ROADMAPS  
FOR  
ENERGY®

This appendix is part of the D1.1 Report - Specific ambitions of the R4E partner cities and contains all results of the ambition setting activities held in the city of Istanbul.




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

**Versions of this report:**

23 April 2015	Draft for internal check in the city (limited distribution)
26 May 2015	Concept for sharing with R4E partners (limited distribution)
6 November 2015	Version for final check
15 December 2015	Final version for public distribution



# Contents Appendix C

Introduction to Istanbul	C 5
Today's reality: smart public transport	C 16
Today's reality: smart traffic management	C 18
Results ambition workshop policy	C 20
Results ambition workshop strategy	C 22
Results ambition workshop stakeholders	C 24
Results ambition workshop stakeholders	C 26
Contributions	C 29





# Introduction to Istanbul

Istanbul is like a state on its own. With a population of almost 14 million, it is larger than 23 European countries. The metropolitan area falling under the responsibility of the Metropolitan Municipality is 5,389 km<sup>2</sup>, extending for 165 km from east to west, with a north-to-south distance of 45 km.

For centuries, Istanbul has always had a very strategic position along the historical Silk Road and naval routes between the Mediterranean and the Black Sea. This strategic location has helped the city to develop a cosmopolitan population.

Istanbul is the largest city in Turkey. The officially registered population is 13.8 million as of 2014, which is about 18% of Turkey's population. This means one in five Turkish citizens live in Istanbul. Istanbul is also the third-largest metropolitan area in Europe, after London and Moscow.

Istanbul Metropolitan Municipality has a massive budget, which is larger than those of 18 of the 29 Turkish ministries. The consolidated budget generally increases by 7.7% each year, and for 2013 it was around USD 12 billion. Of this figure, USD 8 billion is the investment budget, and around half of this budget is dedicated to transport.



So far, the municipality has succeeded in solving all its problems for the foreseeable future (i.e. water supply, pollution, housing etc.), except for transport: traffic congestion within the city is a growing problem, which is why the Metropolitan Municipality has dedicated almost half of its resources and energy to solve the transport problem.

Thanks to the recent excavations in Marmaray which had repercussions in many circles, we now know that the city's history goes back to the Neolithic Age. It has a history of eight thousand five hundred years.

There are 2.5 million vehicles throughout the metropolitan area and 1.8 million of these vehicles circulate on the roads every day.

The transportation network length has witnessed a sharp increase since 2004, and currently amounts to 25.000 km.

Average travel time in vehicles is now 45 minutes, while it was 53 minutes in 2004. This decrease basically owes to transport investments of the Metropolitan Municipality, and the Municipality aims to reduce this figure down to more tolerable levels.

Car ownership per 1.000 residents is 133 automobiles, which is growing as more and more people are better off in Turkey. This figure is a bit higher than Turkey's average (which is 96/1.000) but still quite low when compared to other OECD countries such as USA (812/1.000), Italy (656/1.000), Japan (599/1.000) France (576/1.000), Spain (564/1.000) Germany (586/1.000), UK (515/1.000) (figures for the year 2002). But here we should note that the figure was only 67 in the year 2000, so it is almost doubled in every decade.

So, this is the time to solve this traffic problem, and past experience as well as the case of huge metropolises show that, no matter how large and long are the roads you build, you'll not be able to solve the traffic congestion problem, unless you create a backbone transport network which is based on

railways. That's why the Municipality's strategy is to build high-capacity lines throughout the city and promise people guaranteed trip durations from one location to another.

Istanbul is the city of massive projects: The most famous one is probably Marmaray, known as the «project of the century».

This high-capacity rail transport project consists of the construction of an undersea rail tunnel under the Bosphorus strait as well as the modernization of suburban rail lines along the Sea of Marmara from Halkali on the European side to Gebze on the Asian side. The procurement of new rolling stock for suburban passenger traffic is also part of the project. Construction started in 2004, with an initial target opening date of April 2009. After multiple delays, the projected started revenue services in October 2013, and so far it's doing quite well, carrying about 130 thousand riders per day. However, Marmaray will have its real meaning when its overground section is opened in late 2015.



The Eurasia Tunnel Project, The Istanbul Strait Road Crossing Project will be constructed between Kazlıcesme and Goztepe districts along a 14.6-km route including a 5.4-km twin-deck tunnel that will cross the Bosphorus beneath the seabed, with the aim to ease the city's traffic pressure.



The Third Bosphorus Bridge is a planned suspension bridge located at the northern end of the Bosphorus, north of the other two bridges, in Istanbul. The tender was held in May 2013, and the bridge will be completed by the summer of 2015. It will have a total of 8 motor lanes, plus 2 tracks for high speed rail.

**The 3rd Airport:** The new airport will be built in a build-operate-transfer model and the winning bidder would have operating rights of the airport for 25 years. The new airport would have a total passenger capacity of 150 million per year. Once completed in 2017, it's going to be the biggest on earth with 6 runways.

Istanbul Canal is the name of the artificial sea-level waterway, which is proposed to be built by the government on the European side of the city. The new waterway would bypass the current Bosphorus. Istanbul Canal aims to minimise vessel traffic in the Istanbul Strait.

Statistical figures about transportation in Istanbul in general are as follows: The road system currently accounts for about 84 percent of overall transport in Istanbul.

This includes the elements of private cars, IETT public buses, privately-owned public buses, the BRT system, minibuses, taxis and company buses.

The share of rail-based transportation is about 13 percent, which was only 8 percent just a few years ago. All urban rail operators in Istanbul are public, and are performed by TCDD (i.e. the state railways) as the suburban commuter line, IETT (predominantly the bus operator but also provides railway transport in two historical, short-distance lines) and Istanbul Ulasim, which is affiliate company of Istanbul Metropolitan Municipality. Last but not least, Istanbul has also waterborne transport mode by almost 3.3 percent, which comprises the private operators IDO and private boats, and the public operator Sehir Hatlari (i.e. City Lines).

In line with Istanbul's Transport Master Plan designed in 2007, the future vision of the Municipality consists in changing the balance in favor of the second one—increasing the share of

rail-based modes up to more than 50 percent, in order to have a sustainable, liveable city.

Under normal circumstances, we have a 10 percent increase in the ridership every year. However, in extraordinary years when we open a new line, this figure could be higher, which was the case in 2013 with the opening of M3 and M4 lines.

Throughout the year 2013, we carried a total of more than 402 million passengers.

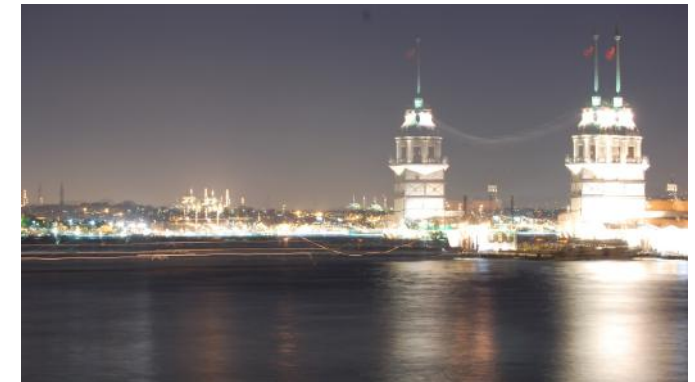
For the entire transport system of Istanbul, we have an integrated smart ticket called IstanbulCard. The card was developed and put into practice by Belbim which is the information technology company of the Istanbul Metropolitan Municipality. This is the last-generation ticketing system based on RFID technology. It's valid for all transport modes within the city and allows you transfer opportunity of five consecutive times within two hours. Plus, for the second, third, fourth and fifth validations you have discount, i.e. pay more or less half of the original price.



IstanbulCard was introduced on March 2009 and since then it has been doing quite well, even winning the most prestigious European award in the field.

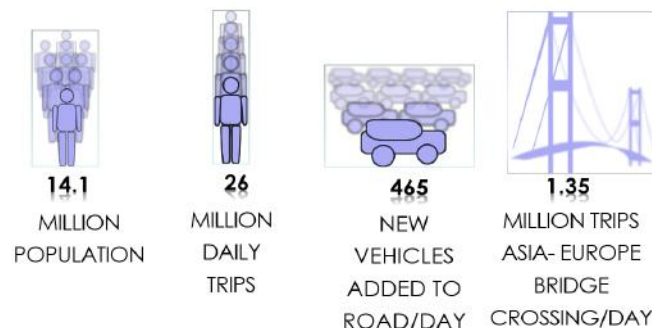


Currently, our IstanbulCard usage ratio is about 92 percent, while the remaining 8 percent represents the token usage—for single journeys within our network we use plastic RFID tokens.



### Istanbul Metropolitan Municipality (IMM)

Istanbul is one of the world's fastest-growing megacities, both with 14 million population and its strategic location. 27% of national GDP, 60% of Turkish trade and 40% of national tax revenues come from Istanbul. Besides being at the heart of the Turkish economy, Istanbul has many universities which make the city attractive for thousands of students from all over Turkey. Istanbul is located at the intersection of Asia, Europe and Africa, which makes it an international trade hub. In addition, thanks to its good accessibility from countries all over the world countries, many international organizations and exhibitions take place each year in Istanbul. As a result, there is a growing demand for all types of facilities in Istanbul especially for transportation.



The Istanbul Metropolitan Municipality:

- Serves as the municipal government centre for of Turkey’s thriving transcontinental hub
- Carries out local administrative tasks in Istanbul
- Provides public services for a population of around 14 million

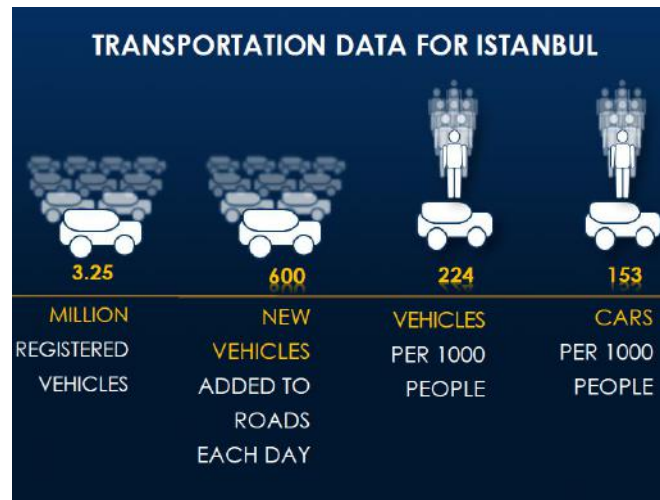
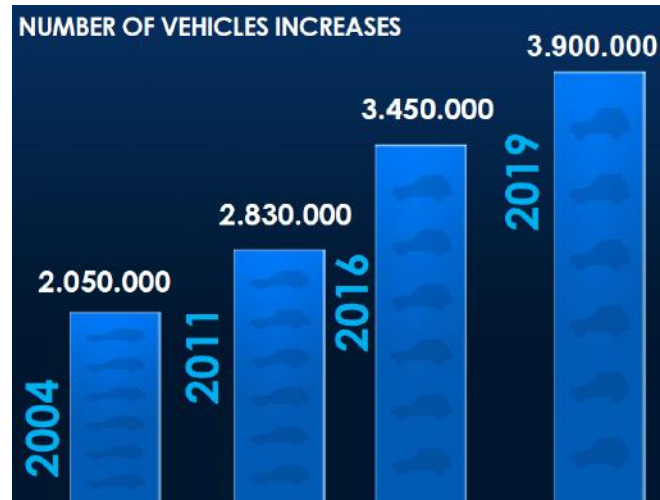
Has 25 municipal enterprises, 2 subsidiary public utility corporations and a total of 43,500 employees.

### Mobility and Transportation

Istanbul Metropolitan Municipality (IMM) allocates considerable amount of budget for transportation and effective traffic management projects every year. Even if new transportation facilities and projects are introduced, it doesn’t satisfy the mobility needs of inhabitants. For this reason, IMM supports the projects which will help manage traffic effectively and optimize the use of transport network and deliver a sustainable environment for next generations. Within the scope of IMM’s strategic plans, IMM gives importance to smart management and energy efficiency topics for its new projects and deployments in Istanbul.

### Goals by near future

Istanbul has defined a number of goals, as shown in the following images.






**Istanbul's share in Turkey's public investment**

# 26%

### Selection of focus areas

Istanbul has selected two focus areas for the R4E project:

- Smart mobility: smart public transport
- Smart mobility: smart traffic management

**Demographical aspects**

Number of inhabitants

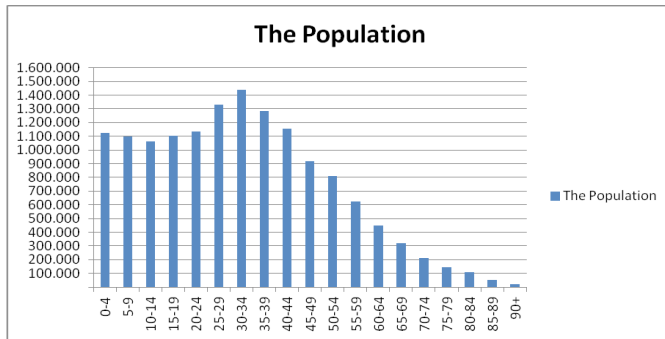
Total: 14.377.018

Men: 7.221.158

Women: 7.155.860

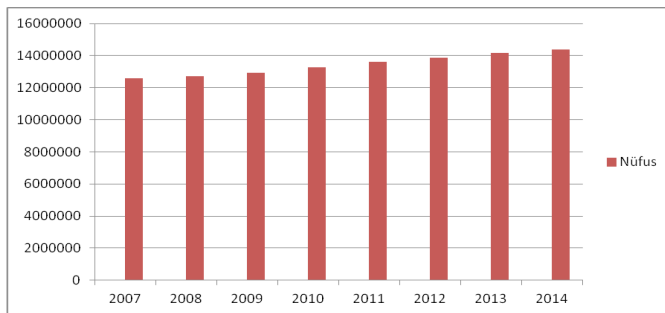
Graph: Age structure of the population

Source: Turkish Statistical Institute



Graph: Population trends

Source: Turkish Statistical Institute



**Social aspects**

Table: Level of education of citizens

	Primary Education	Secondary Education
Educational Year	Net schooling ratio (%)	Net schooling ratio (%)
1997-1998	84,74	37,87
1998-1999	89,26	38,87
1999-2000	93,54	40,38
2000-2001	95,28	43,95
2001-2002	92,40	48,11
2002-2003	90,98	50,57
2003-2004	90,21	53,37
2004-2005	89,66	54,87
2005-2006	89,77	56,63
2006-2007	90,13	56,51
2007-2008	97,37	58,56
2008-2009	96,49	58,52
2009-2010	98,17	64,95
2010-2011	98,41	66,07
2012-2013	98,86	93,09
2013-2014	99,57	94,52

Table: Connectivity level: penetration grade of smart phones, percentage of houses with broadband 1

Source: Turkish Statistical Institute

		Computer %			Internet %		
		Total	Men	Women	Total	Men	Women
Computer and Internet Usage	Turkey	49,9	60,2	39,8	48,9	59,3	38,7
	Cities	59,0	69,0	49,1	58,0	68,1	48,0
	Urban areas	29,5	40,1	19,3	28,6	39,2	18,4

Smart Phone Usage in Turkey: 19%

Source: Turkish Statistical Institute



Table: Unemployment rate

Year	Province name	Unemployment rate (%)
2013	Istanbul	11.2
2012	Istanbul	11.3
2011	Istanbul	11.8

There are 670.756 disabled people in Istanbul which means around 3% of population.

Table: Percentage of people that require special care/needs

Number of People Who Needed Care Between 2006 -2015	
Total Number of Care Request	<b>4.723</b>
Number of People Whose Request Accepted	<b>3.624</b>
Number of Patient Inspection Visits	<b>6.694</b>
Number of Medical Care Provided at Home	<b>12.394</b>
Number of Nursing Care/ Physical Therapy	<b>14.629</b>
Prescription	<b>16.599</b>
Medicine	<b>57.657</b>
Number of Medical Care Provided at Hospital	<b>1.959</b>

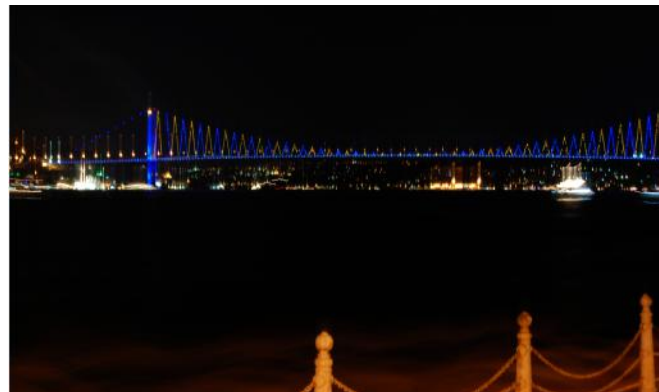
Source: Istanbul Family and Social Policies Provincial Directorate

### Economical aspects

Income per head in comparison to the national average income : Average yearly income per family in Turkey in 2013: 29.479 TL

Source: Turkish Statistical Institute

The most strong industry, business, transportation, advertisement and financial entities are located in Istanbul. 40% of national income is obtained from industry, 30% of it is obtained from business and the rest of it is available from other sectors. The part of agriculture is only 1%. Istanbul composes the main source of Turkish budget Approximately 37% of total taxes are collected from Istanbul. Other sectors are agriculture and stockbreeding, fishery industry, forestry, mining, transportation, highway, railway, seaway, airline and Bosphorus.



Source: IMM

Business sector has 27% share, transport and communication sector has 15% share and industry employment has 20% share in local economy.

MAIN SERVICE AREA	ACTIVITY/PROJECT NUMBER	PERCENTAGE (%)	EXPENSES in 2015 (THOUSAND TL)	PERCENTAGE (%)
DISASTER MANAGEMENT	22	2,9	246.590	2,7
ENVIRONMENTAL MANAGEMENT	100	13,3	1.385.352	15,3
RECONSTRUCTION MANAGEMENT	55	7,3	204.505	2,3
CITY AND SOCIETY ORDER MANAGEMENT	24	3,2	179.635	2,0
CULTURAL SERVICES MANAGEMENT	112	14,9	483.007	5,3
HEALTH ASSISTANCE MANAGEMENT	5	0,7	109.700	1,2
SOCIAL SUPPORT SERVICE MANAGEMENT	89	11,9	1.138.339	12,6
TRANSPORTATION SERVICES MANAGEMENT	188	25,1	3.620.153	40,0
GENERAL MANAGEMENT	155	20,7	1.681.888	18,6
<b>TOTAL</b>	<b>750</b>	<b>100</b>	<b>9.049.170</b>	<b>100</b>

Maintenance costs

### Historical/Cultural aspects

Istanbul has several associations.

ASSOCIATION (Istanbul)	Sayı
PREVENTION OF CRUELTY TO ANIMALS, ENVIRONMENT AND WILDLIFE ASSOCIATIONS	337
PEDIATRIC ASSOCIATIONS	3
TURKISH SOLIDARITY ASSOCIATIONS	134
DISABLED ASSOCIATIONS	171
EDUCATION RESEARCH ASSOCIATIONS	559
SUSTENTATION SOCIAL VALUES ASSOCIATIONS	267

Source: <http://www.dernekler.gov.tr/>

- Particular cultural matters for adoption of innovative solutions
- “Seker Otobüs” Children Events
- Summer Cinema
- Documentaries
- Documentary of Haliç
- Documentary of Companions of Prophet Muhammad
- Women of East/Istars at the Door Festival
- Woman and Sufism
- Meeting with Mevlana

- 4. Istanbul Meeting for freedom of thought
- Islamic Countries Culture Week
- Advertising Activities
- Book Fair
- Memorial Meetings
- Symposiums
- Feshane Activities
- Children's Film Days
- Oversea Istanbul Culture Days
- Istanbul Culture Days in Damascus
- Oversea Tourism Advertising Fairs

Source: www.ibb.gov.tr

**Environmental aspects**

**Green areas**



Metropolitan Surface Area	5.400.320.000 m <sup>2</sup>
Forested Land (Source: Regional Forest Directorate)	2.424.200.000 m <sup>2</sup>
Total Green Space cared by IMM	48.308.248m <sup>2</sup>
New Green Space done by IMM in last 6 years	18.198.315 m <sup>2</sup>
Total Green Space of District and Town Municipalities	29.152.880 m <sup>2</sup>
Total Green Space of IMM, District and Town Municipalities	77.461.128 m <sup>2</sup>
Green Space per capita ( Population of Istanbul 12.782.960 )	6.05 m <sup>2</sup>

Source: IMM

**Monthly maximum temperature, 2013 (°C)**

June	July	August	September	October	November	December
40,7	42,7	41,0	37,2	32,3	25,8	16,8
40,4	42,2	41,0	40,6	32,9	24,7	12,2
40,6	41,8	40,4	38,7	31,5	24,8	13,8
41,5	41,5	40,5	38,2	32,0	27,0	16,9
37,8	40,3	40,8	40,3	33,3	28,9	20,5
38,5	39,9	39,5	37,1	31,4	26,6	17,2
38,5	39,8	39,4	37,1	31,5	25,6	18,2
39,9	39,7	39,2	36,8	30,3	25,6	18,6
38,2	39,5	39,5	37,5	28,7	23,8	11,7
39,1	39,3	40,4	37,8	31,5	26,0	16,6

**Monthly minimum temperature, 2013 (°C)**

June	July	August	September	October	November	December
-0,2	2,6	3,5	-3,4	-9,0	-11,9	-27,1
1,0	3,1	4,2	-2,6	-6,8	-7,9	-22,5
1,7	7,5	7,7	2,2	-4,7	-8,4	-29,1
1,6	3,7	5,8	0,5	-5,7	-7,3	-23,5
6,5	12,2	11,9	5,5	-0,6	-1,6	-18,5
8,5	14,2	13,9	7,3	1,2	-0,1	-23,9
7,6	11,0	12,8	5,8	-0,1	-1,1	-12,3
9,8	16,7	16,2	9,8	3,7	1,7	-14,4
3,4	5,1	5,8	1,4	-4,0	-5,8	-18,3
8,6	13,9	13,5	4,9	-1,6	-4,8	-13,5

Source: Turkish State Meteorological Service

**Factors Affecting Climate**

- Mathematical position
- Geographical Formations (Level, direction of mountains, aspects)
- Position according to sea
- Direction of wind
- Centre pressure

Source : IMM Disaster Coordination Center

**Climate conditions**

Projects implemented by the Istanbul Metropolitan Municipality (IMM) to improve air quality and to reduce GHG



emissions :

1) To minimize the rate of solid waste going to landfill providing maximum material recovery by mechanical and biological treatment of municipal solid waste with high organic content and to reduce 171,000 tons of CO<sub>2</sub>-e/year GHG emissions generating alternative fuel (solid recovered fuel- SRF).

2) To reduce GHG emissions through waste transfer stations used for transfer of waste from garbage trucks into silos and semi-trailers of bigger volume for onward transportation to



landfill. Usage of transfer stations lowers amount of GHG emissions by reducing traffic towards landfill.

3) CO2 reduction from heat and power (CHP) generation in wastewater treatment and sludge dewatering units of Istanbul Water and Sewage Administration (ISKI).

4) The efforts on increasing green areas and reforestation.

5) The use of energy efficient equipments (thermostatic valve, solar collectors, lighting sensor etc.) in the houses produced by KIPTAS municipal company of IMM.

6) The establishment of 274 solar collectors in the facilities of IMM.

7) The establishment of healthy charging infrastructure for electric vehicles,

8) The efforts of IMM Art and Vocational Training Courses (ISMEK) to raise awareness of housewives about efficient consumption of energy in daily life,

9) The project of ISKI on the effects of climate change on some important water resources in Turkey including Istanbul as a pilot region,

10) The efforts on increasing the rail system,

11) The use of LED and solar energy for traffic signalization,

12) The use of online crossroad system in traffic signalization,

13) The efforts on intelligent transportation systems (ITS),

14) The efforts on promoting public transport,

15) Renewal of the bus fleet of IMM (buses working with compressed natural gas (CNG), buses with Euro 5 standards),

16) The efforts on changing transportation modes (increasing marine transportation, extending bike lanes).

17) The project "Development of a GIS Based Decision Support System for Urban Air Quality Management in the City of Istanbul" was performed within the frame of the LIFE Third Countries Programme for the term February 1, 2007-

January 31, 2009. A decision support system for urban air quality management was developed for the first time for a metropolitan city in Turkey within the scope of this study. According to the results of the study, Istanbul Metropolitan Municipality has prepared an action plan titled "Istanbul Air Quality Strategy".

18) In an effort to identify the largest sources of GHGs in Istanbul and to determine targeted initiatives that will achieve the greatest economic and carbon savings, the GHG inventory report, the first publicly available report for Istanbul, was prepared.

The reporting year selected for the inventory is 2010 as the data for this year the most complete at the time of developing the inventory. The inventory includes emissions from carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O).



#### Bicycle roads and pedestrian areas

According to Istanbul Transportation Master Plan Households Research Report, 50.72% of travels are performed with motor vehicles and 49.28% are performed on foot. It is necessary not to rule out pedestrian travels due to it has a huge ratio as

49.28%. The main sources of environmental and transportation problems are motor vehicles. Traffic problems can be solved if bicycle and pedestrian transport are supported in short distance travel. By this way, traffic congestion will decrease and at the same time people will have a chance to do sport. To extend and make it attractive this environment friendly system, IMM Transportation Planning Directorate has carried out a planning and designing project for bicycle and pedestrian roads in Istanbul.

"Rider and Pedestrian Transportation System" has created in Istanbul for 630 km long road. To provide route continuance, approach roads are added to 630 km and total road network will extend to 1004km. Within the scope of "Rider and Pedestrian Transportation System" routes are divided into 4 group as first, second, third and fourth priority bicycle roads as 2023 objectives. The concept projects of first and second priority roads are ready for implementation.

#### Rider and Pedestrian Transportation System Priority Table

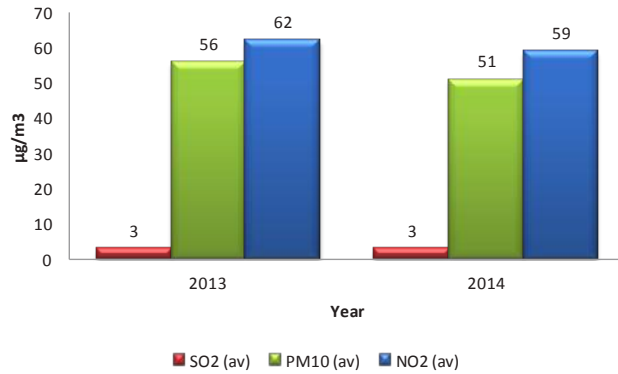
	ASIA (KM)	EUROPE (KM)	TOTAL(KM)
1. PRIORITY	27	40	67
2. PRIORITY	20	61	81
3. PRIORITY	40	98	138
4. PRIORITY	276	442	718
<b>TOTAL</b>	<b>363</b>	<b>641</b>	<b>1004</b>

24 km long road From Bakırköy IDO to Alibeyköy, 4.5km long road from Eminönü to Besiktas Square and 32.5km long road from Üsküdar to Kartal are decided to construct as first priority. UTK2008/24-23 (UTK: Transportation and Traffic Circulation Committee) numbered decision for aforementioned routes has been taken and transferred to put into practise to General Directorate of Public Works and Engineering.

Source: [www.ibb.gov.tr](http://www.ibb.gov.tr)

CO<sub>2</sub> emission per capita in 2010 has been estimated as 3.31 tCO<sub>2</sub>e.

## Air quality data



## Noise data

IMM Directorate of Environmental Protection has prepared road-related draft noise maps along routes used by more than 6 million vehicles per year in Istanbul since 2010. Road-related draft noise maps of Bayrampasa, Esenler, Gaziosmanpasa, Sultangazi, Eyüp, Kasıthane, Sisli, Beyoslu, Besiktas Sariyer, Fatih, Zeytinburnu, Bakırköy, Üsküdar, Atasehir were completed. The noise maps for the remaining districts are being prepared. According to the data of prepared maps:

378.800 of 5.224.554 people are exposed to total noise values of above 55 and 90.400 people are exposed to total noise values of above 65 dBA\*.

246.600 of 5.224.554 people are exposed to total noise values of above 50 dBA and 119.400 people are exposed to total noise values of above 55 dBA\*.

## Particular cultural matters for adoption of innovative solutions

- “Seker Otobüs” Children Events
- Summer Cinema
- Documentaries
- Documentary of Haliç

GHG Inventory of Istanbul - 2010						
Source Category	GHG Emission tCO <sub>2e</sub>	% contribution to total carbon footprint	Emissions Source	GHG Emission tCO <sub>2e</sub>	% contribution to source category	% contribution to total carbon footprint
Stationary Units	26,781,623	61.1%	Residential Buildings	15,282,654	57%	34.9%
			Commercial/ Institutional Facilities	4,872,008	18%	11.1%
			Energy Generation	0	0%	0.0%
			Industrial Energy Use	6,626,962	25%	15.1%
			Other Emissions	0	0%	0.0%
			Fugitive Emissions	0	0%	0.0%
Mobile Units	13,309,358	30.4%	On-Road Transportation	10,008,732	75%	22.8%
			Railways	76,248	1%	0.2%
			Water-Borne Navigation	2,130,383	16%	4.9%
			Aviations	1,093,994	8%	2.5%
			Off-Road	0	0%	0%
			Waste	2,371,376	5.4%	Solid Waste Disposal
Biological Treatment of Waste	0	0%				0.0%
Incineration and Open Burning	4,357	0.2%				0.0%
Wastewater Treatment and Discharge	768,283	32.4%				1.8%
Industrial Processes and Product Use (IPPU)	1,363,741	3.1%	Industrial Processes and Product Use (IPPU)	1,363,741	100%	3.1%
<b>TOTAL</b>	<b>43,826,098</b>					

- Documentary of Companions of Prophet Muhammad

- Symposiums

- Women of East/Istars at the Door Festival
- Woman and Sufism
- Meeting with Mevlana
- 4. Istanbul Meeting for freedom of thought
- Islamic Countries Culture Week
- Advertising Activities
- Book Fair
- Memorial Meetings

- Feshane Activities
- Children’s Film Days
- Oversea Istanbul Culture Days
- Istanbul Culture Days in Damascus
- Oversea Tourism Advertising Fairs

Source: [www.ibb.gov.tr](http://www.ibb.gov.tr)

## Way of working

Departments in the municipality:

MAIN SERVICE AREAS
DISASTER MANAGEMENT
ENVIRONMENTAL MANAGEMENT
RECONSTRUCTION MANAGEMENT
CITY AND SOCIETY ORDER MANAGEMENT
CULTURAL SERVICES MANAGEMENT
HEALTH ASSISTANCE MANAGEMENT
SOCIAL SUPPORT SERVICE MANAGEMENT
TRANSPORTATION SERVICES MANAGEMENT
GENERAL MANAGEMENT

This integrated project is important for sustainable and uninterrupted transportation. By this way, comfortable travel for riders is aimed. They may use their own bicycles or may rent from ISPARK- Bicycle Rent System.

- Increasing low commissioned public transport vehicles
- Extending rail system network
- Decreasing private cars by supporting public transportation
- Supporting the use of electric vehicles

## Recent projects

### 1. Pedestrian roads

(To extend Carbon free zone ) Pedestrianization projects are increased. Bicycle paths has been planned and put into practice.

- Total Current Bicycle Roads in Istanbul : 88,3 km
- Completed Construction Project / Planned to Construct : 106,1 km
- Ongoing Construction Project : 67,7 km
- Target Bicycle Road of Istanbul Metropolitan Municipality : 1.050 km

### 2. SARIYER HACIOSMAN - BELGRAD FOREST BICYCLE ROAD

This road has been planned to construct in 2015 and is 6,5 km long. It reaches out from Sarıyer Haciosman Metro Station and follows Büyükdere Bahçeköy - Maresal Fevzi Çakmak Street-Valide Sultan Street-Bahçeköy Forest Faculty route to Belgrad Forest entrance. It is planned to connect this new road to current bicycle path which is located in the forest.

# Today's reality: smart public transport



IETT, a general directorate of IMM, is in charge of delivering public transport services in Istanbul. IETT provides only public transportation by bus, Bus Rapid Transit (Metrobus) and Tunnel Operations and is also responsible for management and inspection of Private Bus Transit Services.

IETT equipped all its buses and Metrobuses with a smart payment system, which is the quickest and most preferred way of payment system for all public transport modes in Istanbul. IETT's buses and Metrobuses are equipped with smart monitoring and surveillance systems, which gives confidence to the public in terms of security. IETT buses continuously transfer their GPS coordinates to IETT's data centre which helps to monitor the buses and provides estimated arrival times to passengers at bus stops to avoid long waiting times. To provide the best-quality, high-tech solutions to its passengers, IETT has changed and renewed its bus fleet, which is now environment-friendly with lower gas emissions. IETT also takes advantage of hybrid systems in its buses, which use both oil and electrical energy.

Table: Mobility modal share: % use of different modes of transportation (bicycle, car, taxi, bus, train, trolley, ...)  
Source: IETT

ROADS	Average Passengers Per day	SHARE (%)
Metrobus	800.000	8,27
IETT	927.546	9,59
OHO	1.441.334	14,90
OAŞ	795.504	8,22
Minibus	2.100.000	21,71
Shared Taxi	110.000	1,14
Taxi	1.100.000	11,37
Employee Shuttle	2.400.000	24,81
<b>TOTAL</b>	<b>9.674.384</b>	<b>100</b>

RAILWAY SYSTEMS	Average Passengers Per day	SHARE (%)
Metro	613.062	8,27
Light Metro	308.420	9,59
Tram	497.230	14,9
Tunnel - Funicular	48.837	8,22
Nostalgic Tram	1.983	21,71
Telpher	5.966	1,14
TCDD (Marmaray)	129.895	11,37
<b>TOTAL</b>	<b>1.605.393</b>	<b>100</b>

SEA LINES	Average Passengers Per day	SHARE (%)
IDO	20.610	7,8
City Lines	106.357	40,2
Private Ferries	137.285	52,0
<b>TOTAL</b>	<b>264.252</b>	<b>100</b>

## Smart Bus Stop



## Fair collection system System



- Contactless SmartCard**  
RFID Technology
- Integrated Ticketing System**  
Istanbul's transportation modes
- for all transportation modes**  
Buses, tram, metro, commuter rail, ferries
- Allows passenger transfer**  
5 times within 2 hours
- MasterCard Transport Awards**  
Europe's most prestigious transportation award (2013)

## Estimated Travel Times at the Bus Stop

YOLCU BİLGİLENDİRME SİSTEMİ				
18.04.2011 - Pazartesi		09:40:46		
DİKİLİTAŞ				
TÜR	HAT NO	GÜZERGAH	KALAN DURAK	VARİŞ SÜRESİ
IETT	93	ZEYTINGURNU EMİNÖNÜ		1 Dk
ÖHO	93M	ZEYTINGURNU MECİDİYEKÖY		3 Dk
ÖHO	93C	ZEYTINGURNU BEYAZIT		10 Dk
ÖHO	93T	ZEYTINGURNU TAKSİM		10 Dk
ÖHO	93M	ZEYTINGURNU MECİDİYEKÖY		13 Dk
ÖHO	93	ZEYTINGURNU EMİNÖNÜ		15 Dk
IETT	93C	ZEYTINGURNU BEYAZIT		21 Dk
				Dk
				Dk
				Dk

## Bus Rapid Transit



## Level of infrastructure maintenance

Licences Given for Maintenance Work in Istanbul				
Year	Licences for Excavation		Licences Given to Fix Failures	
	Number	Length (m)	Number	Length (m)
2009	5,801	1,529,741	8,216	67,472
2010	8,028	1,692,995	6,725	50,408
2011	11,884	2,072,849	6,321	49,210
2012	12,199	1,972,389	7800	59,993
2013	23,156	3,651,183	23,425	285,689

Source: IMM

## Sources of income for investments in transport

## GENERAL BUDGET TAX REVENUES

- 1-Finance share
- 2-Provincial bank share

## MUNICIPAL TAX, FEE and SHARE

- 1- Announcement and Advertisement Tax
- 2- Entertainment Tax
- 3- Electricity Gas Consumption Tax
- 4- Fire Insurance Tax
- 5- Fees
- 6- Estate Tax Share
- 7- Sanitation Tax
- 8- Museum Income Share
- 9- Bosphorus Share

## MUNICIPAL GOODS and ATTEMPTS INCOME

- 1- Rent- Adequate Pay
- 2-Marketplace
- 3-Cemeteries

## OTHER INCOMES

- 1-Penalty Income
- 2-Subsidies

Source: IMM



# Today's reality: smart traffic management



IMM has a Traffic Control Centre (TCC) operating since 2003 to provide 24/7 online traffic information to the public. TCC Call Centre staff directs drivers to less crowded routes so they do not get stuck in traffic jam and waste time and energy while releasing harmful gases. By deploying Variable Message Signs that provide both congestion status and estimated travel times, IMM aims to optimise the use of its road network and direct drivers to alternative routes. Moreover, IMM has both web and mobile traffic applications that provide online traffic camera streams, estimated travel times, online parking information, weather information, road works announcements etc. which affect traffic in Istanbul.

Traffic Control Centre



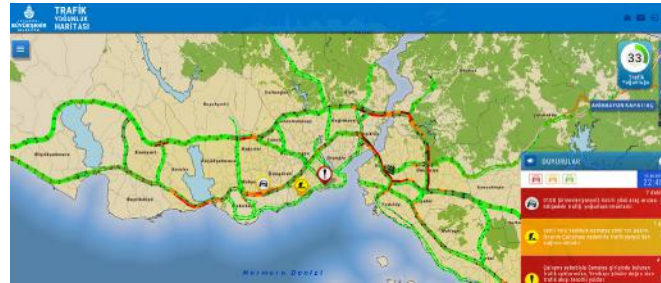
Tunnel Control Centre



Variable Message Signs



IMM Traffic Density Map



Traffic Sensor Powered by Solar Energy



"İBB CepTrafik" Mobile Traffic App

## Results ambition workshop policy

# 2015

### High Lights

The aspects in the city the municipality is most proud of:

- Developing a new para-transit system without driver

### Priority in Policy

Which topics have the highest priority in the current policy:

- All the rail systems must be integrated to provide uninterrupted trips
- There should be a local central management
- To create demand for all the things we provide

# 2050

### General Ambitions for the City

In 2050:we have an accessible system which considers the cultural heritage and makes it visible with respect for the environment

### General aspirations

- HavaRay

### Other aspirations

- Develop another public transport system - other than railway



## Specific ambitions for smart public transport

1

In 2050 we have increased the share of rail systems to beyond 50%

### Aspirations

- Raise the rail system to more than 50%
- The municipality really owns the targeted rail system network
- The target of 750km rail system is actually achieved
- Public transport system with tube system

2

In 2050 we use renewable sources for energy in public transport

### Aspirations

- To maximise the use of renewable energy sources (e-vision 2050)
- Primarily use of solar energy for public transport to ensure clean air
- Green buses with green roof

3

In 2050 we use less cars and more public transport and bikes

### Aspirations

- Smart districts in the city without automobiles but with bikes



## Specific ambitions for smart traffic management

1

In 2050 traffic congestions is not among the primary 10 problems in Istanbul

### Aspirations

- Improve connectivity of east and west from 2015 with the bridge and the North Marmara car route project to 2050 with flying vehicles that have come into our lives

2

In 2050 we have individual signalisation so that communication with vehicles and drivers is possible

### Aspirations

- Individual signalisation so that communication with vehicles and drivers is possible

3

In 2050 Istanbul will be in the world's top 5 regarding traffic safety statistics.

### Aspirations

- To be in the top 5 in the world regarding traffic safety statistics



# Results ambition workshop strategy



# 2050

# 2015

## Strategic ambitions for smart public transport

### High Lights

The aspects in the city the strategy department, integral project managers and departmental managers are most proud of:

- Using newest technologies on railway systems
- EFQM excellence model
- All buses accessible for disabled people
- Smart bus stops
- Simulation centre with simulated bus and metrobus vehicles used for driver training
- 13 quality certificates for service improvement (ISO, Ottsas, EN - standards)
- International know-how sharing: we are member of many international platforms: IBBG, UITP, APTA
- Intelligent transport system devices: WiFi, USB charging units, passenger counting system
- Marmaray
- Mobile application for mobility and journey planning
- Using clean energy on railway systems
- Europe largest bus fleet with 4,2 average fleet age.
- We have photovoltaic roofs for garages
- 360 CNG buses: 240 new purchased and 120 converted from diesel
- We have a clear vision for % of fleet for alternative energy: 20% in 2020
- Europe second largest CNG fuelling station
- We have a clear strategy for 2019 - 2023.

# 1

In 2050 we have a fully integrated, accessible and sustainable mobility system.

### Aspirations

- 100% natural based energy used in railway systems
- Zero emission fleet
- Congestion charging schemes and emission free zones
- Fully integrated mobility system
- No need for shuttles, minibuses or taxi's
- All central places connected via rail modes
- One public authority for all Istanbul's mobility management
- No private car in historical peninsula and no CO2 emission

# 2

In 2050 all mobility elements will be smart, using all effective Intelligent Transportation Systems (ITS)- solutions.

### Aspirations

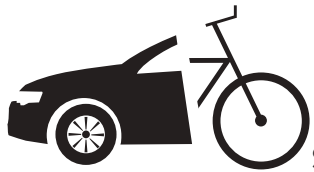
- Ride sharing and car sharing above 25% of modal shift
- Increase of 10% sea transport; all coastlines connected via sea modes through frequent schedules
- Integration of time tables of public transportation
- all payment in public transport done by online means
- (Electric) bike sharing facilities everywhere
- Heli-taxi and Heli-bus for air transport
- Mobility coaching via mobile applications
- Demand based dynamic mobility routes via online booking
- Usage percentage of railway systems more than cars and buses
- No parking lot problem
- Bike usage in commuting more than 25% of modal share

# 3

In 2050 we achieved a 100% social inclusion in terms of mobility.

### Aspirations

- Accessible transportation system; more connected
- Car-bus project: "10 cars together" in the bus
- Accessibility in all terms but especially in transport
- Every point in Istanbul accessible by railways
- 100% inclusion achieved in mobility
- Female drivers for public transport



Traffic management

SMART MOBILITY

2050

2015

## High Lights

The aspects in the city the strategy department, integral project managers and departmental managers are most proud of:

- Data gathering methods, installed systems and hardware
- Adaptive traffic signal control
- Providing real life traffic info via mobile apps
- More reliable travel time even with traffic congestion
- Integrated transportation systems
- Smart card
- We are able to manage our 2000 traffic lights/ signals
- Smart traffic management using mobility applications
- Smart parking system
- Online travel time info
- Monitor real time traffic status
- Guide drivers, passengers via different channels such as web, mobile, smart TVs, etc.
- 4444154 call centre
- Shortest route directing in TKM (traffic control centre) website

## Strategic ambitions for smart traffic management

1

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.

### Aspirations

- C2C technology for more effective, real time traffic management
- Congestion free roads
- More roads instead of more buildings
- Connected and integrated transportation systems
- Cars and vehicles with clean energy
- There is no air pollution or children with asthma
- All vehicles are powered by electricity and with high efficiency power decks

2

In 2050 people move faster and fluently through the city, experiencing no congestion and using new transport modes (pedestrians, cyclists, etc.). There is better air quality to stimulate healthier living and more walking and cycling.

### Aspirations

- Having advanced and rapid public transport infrastructure to reach sustainable transport
- Less signalised intersections to avoid stop-and-go vehicle movement
- We hope we have a better traffic management with less stop and go, less pollution.

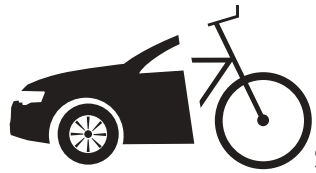
3

In 2050 we have safe traffic management by communication between vehicles and infrastructure. Vehicles are equipped with smart safety measures to avoid accidents.

### Aspirations

- Zero traffic violation of rules

# Results ambition workshop stakeholders



Public transport  
**SMART MOBILITY**

# 2015

## High Lights

The aspects in the city the external stakeholders and strategic partners are most proud of:

- Smart stations ≈ 1000 items
- The youngest vehicle fleet in Europe
- IMM transportation master plan
- Subway Levent - R Hisarvistü & subway Kodiköy - Kartal
- Fair integration among transport modes (Istanbul Card)
- 53% of investment budget of IMM is for rail systems
- Bosphorus pass by maritime is pleasant, fast and comfortable
- Application of different transport systems
- Route planning
- Park & Go
- Marmaray project
- R&D projects about energy transportation developed by us
- Development of nationalised tram and mass production
- Increased importance for railway transportation

## 1a

In 2050 we have energy-efficient, sustainable and green transportation

### Aspirations

- Hybrid vehicles promoted
- Historical peninsula carbon free zone - zero emission
- Zero emission fleet
- Pedestrian friendly accessories and green zones
- Renewable energy efficient public transport vehicles
- Modernisation of vehicles: taxi, minibus etc.
- Green stations and depots for railways
- Developing codes and standards for environment effects
- Environmental friendly technology used in public transportation

### Today's challenges

- Political resistance
- Regulations related problems
- Policy adaptation
- Public lack of participation

## 1b

In 2050 we have attractive bicycle and pedestrian areas

### Aspirations

- Forming a walk-able, pedestrian city
- Going to school or work by foot or bike
- Increasing pedestrian areas
- At least 1 bike per household
- Increasing cycling lanes

### Today's challenges

- Financial support mechanisms

# 2050

## 2

In 2050 we have accessibility of all modes of transportation through integration

### Aspirations

- Shortening time between connections of different transportation modes
- Shortening distances between connection stations
- Make easier for people with disabilities
- Increase cycling & pedestrian areas
- Full integration between transport modes
- Only one control centre for public transport
- Achievable public transport within 300m, cheap and fast

### Today's challenges

- Widespread sprawl of urbanisation
- Long-term planning perspective
- Spatial planning (current)
- Coordination of all relevant stakeholders

## 4

In 2050 we have better information in information systems

### Aspirations

- Easy charging for public transport fare cards
- Free wifi and charging instruments in transport vehicles
- Dynamic request management on public transport systems
- Tele-porting system for business in 2050
- Car park information system
- New project developing for new public transport systems
- Integrated systems between transport modes
- Determining feasible route by online system

### Today's challenges

- Unplanned urbanisation, population, unawareness
- Coordination problems between different institutions
- Adoption with different / new strategies

### Other aspirations

City planning: land-use and transport planning integration

- Logging for all employees: cheap houses, cheap transport, cheap life
- Removal of dorm-like cities: liveable cities
- Home office
- Reduce work-home-school distance to 30 min travel
- Personalised maps for people for routes to work
- Aligning work times & jobs

More and better parking

- Building multi-storey parking lots in neighbourhood to prevent parking in the street

### Affordable / free public transport

- Free of charge transportation
- Free of charge public transport and cheaper price of private cars

Security for school children

- Pre-school and primary school students can make journey alone in the city

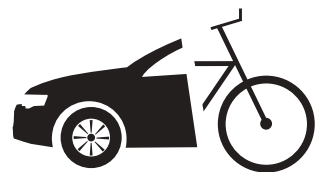
Public transport marketing & promotion

- Preparing informative transport advertorials
- Conduct campaigns to develop ideas for projects and award ideas
- Conduct surveys to learn about expectations and readjust project

New transportation modes

- Urban air transportation
- Skyline (mono-rail) realisation
- Heli-bus & Arag-bus vehicle
- Maritime transportation realisation & integration
- Cable-car everywhere
- Using sea transport more in public transport
- Finishing the railway projects
- Increasing network of railway systems

# Results ambition workshop stakeholders



Traffic management

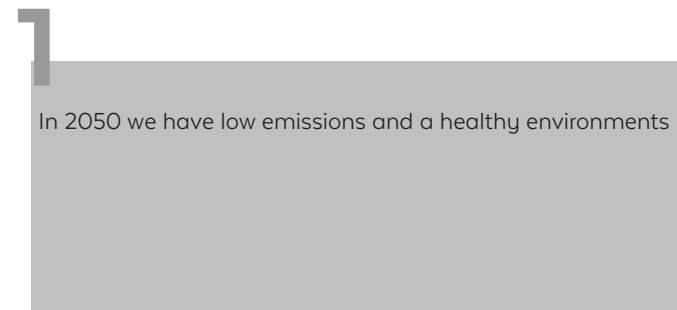
SMART MOBILITY

# 2015

## High Lights

The aspects in the city the external stakeholders and strategic partners are most proud of:

- The IMM traffic control centre applications, mobile traffic apps and route planning apps
- Saving of energy and reduction of queue lengths by different traffic signalisation plans (adaptive signalised intersections, green light applications and signalisation systems)
- Use of renewable resources (e.g. on intersection management through LED signals)
- Intelligent transport systems: traffic monitoring, re-routing facilities, adaptive junction system and variable message signs



In 2050 we have low emissions and a healthy environments

## Aspirations

- Changeable 'low emission zone' according to air pollution levels
- Route planning based on emission levels
- Congestion charge applications
- Effective use of congestion charging in the most congested areas
- Zero traffic
- Roads move instead of vehicles to save fuel and less gas emissions

## Today's challenges

- Excessive & increasing population
- Insufficient budget to carry out aspirations
- Lack of enough energy resources
- Istanbul still being an attractive centre for immigration

# 2050

## 2

In 2050 green behaviour is stimulated

### Aspirations

- Policies to encourage people to live closer to their work
- Widely use of car sharing systems in the city road network
- Flexible working hours for people, public services
- High occupancy of vehicles: encouraging people to use car sharing

### Today's challenges

- Lack of local management & financial support

## 3

In 2050 there is no congestion due to the use of automation and automated solutions

### Aspirations

- Having adaptive traffic lanes based on traffic congestions
- Fully automated highway transportation - without any driver
- Instead of traffic signals drivers yield to themselves to proceed in traffic
- Vehicle-2-vehicle and vehicle-2-infrastructure communication
- Use of integrated and integral sensors
- Coverage of traffic data exists in all main and secondary roads with high accuracy

### Other aspirations

#### Security & crash management

- Warning of drivers by smart cars about traffic violations, mistakes made in traffic
- Creation of road safety management capacity
- Efficient handling of emergency cases

#### More biking

More bike paths created so that everyone may have a healthy life

- Being able to easily use bikes

#### Dense public transport system

- Train system which will take off and take in passengers without any duration





# Contributions

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

- |                             |   |                                   |   |
|-----------------------------|---|-----------------------------------|---|
| • Hamza AYDIN               | IETT  | • Nizamettin MANGIR               | IMM Assistant Environmental Protection Manager      |
| • Yunus Emre AYÖZEN         | IMM Traffic Department Manager  | • Mehmet MERT                     | ISBAK INC. Engineer                                 |
| • Dursun BALCIOGLU          | IMM Head of Rail Systems  | • Prof.Dr. Sema OKTUG             | Istanbul Technical University Dean                  |
| • Ali BAYINDIR              | R4E Communication and Finance Manager - IMM<br>EU Relations Project Chief | • Seray OKAN                      | Translator  |
| • Kübra BAYRAKTAR SISMAN    | IMM EU Relations Department Manager                                       | • Aybike ÖNGEL                    | Bahçeşehir University                               |
| • Baris BERBER              | Technician  | • Özgür Özalp                     | Hitachi Business Development Manager                |
| • Büsra BOYSAN              | IETT  | • Dr. Seda ÖZDEMİR                | IMM Engineer  |
| • Fatih Kerem BOZ           | ISBAK INC. Engineer   | • Doç.Dr Halit ÖZEN               | Yıldız Technical University                         |
| • Berna ÇALISKAN            | IMM Engineer  | • Hasan PEZÜK                     | IMM European Side Rail Systems Manager              |
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| • Belkıs DISBUDAK           | Translator  | • Hayati UYSAL                    | Energy Manager                                      |
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| • Fatma Betül GÜNEY AKBIYIK | IMM Engineer  | •                                 |   |
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| • Prof.Dr. Mustafa ILICALI  | Bahçeşehir University   |                                   |   |
| • Taha Taner INAL           | Ulaşım Corp.  |                                   |   |
| • Seyma İstengir            | ISBAK INC. Engineer   |                                   |   |
| • AYSE KAPUCU               | IMM EU Relations Department Administrative Affairs Chief                  |                                   |   |
| • Nesim KARACA              | Administrative Assistant of Head of Transportation                        |                                   |   |
| • Ugur KIZILOK              | R4E Public Transportation Intelligent Mobility Expert                     |                                   |   |
| • Enes KOÇ                  | Istanbul Energy INC.  |                                   |   |
| • Atilla KULAK              | Istanbul Energy INC.  |                                   |   |



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ROADMAPS  
FOR  
ENERGY®



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Appendix D to D1.1 Report - Specific ambitions of the R4E partner cities

15 December 2015

Jaime RUIZ HUESCAR & María Cruz FERREIRA COSTA, Ayuntamiento de Murcia  
Elke DEN OUDEN & Rianne VALKENBURG, TU/e LightHouse



**ROADMAPS  
FOR  
ENERGY®**

This appendix is part of the D1.1 Report - Specific ambitions of the R4E partner cities and contains all results of the ambition setting 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 does not necessarily reflect the official European Commission's view on the subject.

**Versions of this report:**

2 October 2015	Draft for internal check in the city (limited distribution)
14 October 2015	Concept for sharing with R4E partners (limited distribution)
6 November 2015	Version for final check
15 December 2015	Final version for public distribution



# Contents Appendix D

- Introduction to Murcia
- Today's reality: Smart buildings
- Today's reality: Smart mobility
- Results ambition workshop strategy
- Results ambition workshop strategy
- Results ambition workshop stakeholders
- Results ambition workshop stakeholders
- Contributions

- D 5
- D 14
- D 16
- D 18
- D 20
- D 22
- D 24
- D 27







# Introduction to Murcia

## Introduction to the city

Murcia is the major city in south-eastern Spain, and the capital and most populous city of the autonomous community of the region (with the same name, Murcia). It is Spain's seventh-largest city, with a population of 439,712 inhabitants (about one-third of the total population of the region). Murcia has a mild climate with hot summers, mild winters and relatively low rainfall. In global terms, the region's climate can be described as 'an eternal spring'.

Murcia is a municipality of 890 km<sup>2</sup>, at 43 metres above sea level, covering the city and 52 parishes in the surrounding 40 km. The region has 2,800 hours of sunshine each year, and the average rainfall in the Segura basin is one of the lowest in Spain (only 301 l/m<sup>2</sup>).

The average temperature is 17.8 °C. Yearly average relative humidity is 59%. Irrigation uses the 85% of the 240 Hm<sup>3</sup> consumed in the basin, whilst domestic, industrial and other uses represent only the 15% of the water consumption, 50% of it will soon be supplied with desalinated water.





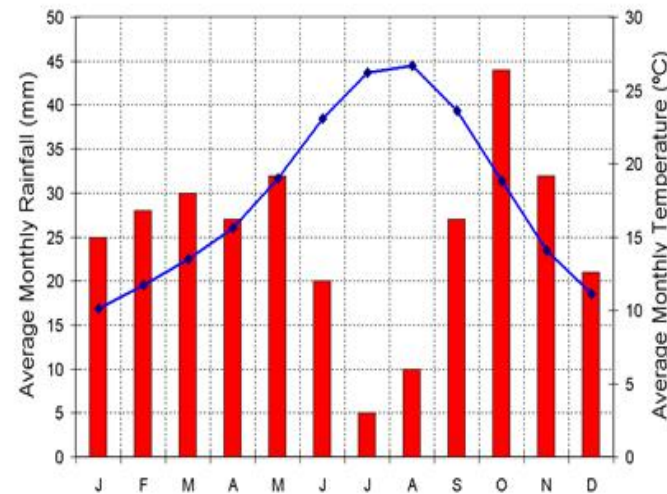




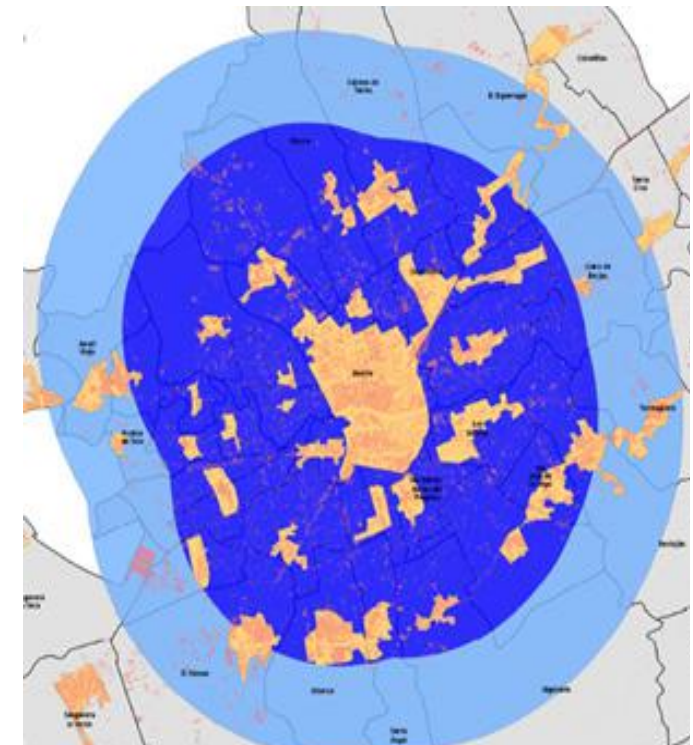
Due to its location, Murcia has high levels of solar radiation during the whole year. Specifically, it has a yearly average of 5 kWh/m<sup>2</sup>/day, one of the highest in Spain. The Municipality of Murcia owns 27 roof-mounted PV installations on a number of buildings to generate electricity, producing 362 kWp. The income from the sale of this energy is used to improve the energy efficiency of the installations in these buildings.



On the other hand there is little rain, which is why Murcia has developed very advanced irrigation system to make efficient use of the available water. Traditionally Murcia has been known for its agriculture, and at present it exports fruits and vegetables to the whole of Europe. The shortage of water and its importance for crops has forced farmers to invest in high-tech systems to get the most out of the available water.



The Municipality of Murcia has a complex land planning system. 83% of the population live within a 5 km radius, and within a radius of 7 km the figure is 89%. The city centre attracts most commuters each day, and this is also the area with the most severe congestion problems.



### Selection of focus areas

The city has selected two focus areas for the R4E project:

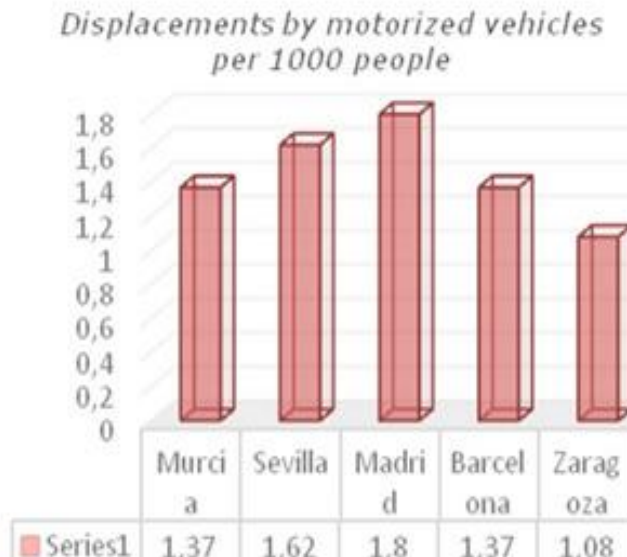
- Smart buildings
- Smart mobility

Mobility and transport

MOBILITY KEY DATA OF MURCIA			
	TOTAL	%	Per person
Total moves	915.770	100,00%	2,21
Public transport	94.549	10,33%	0,23
Private trasnport	463.075	50,57%	1,12
Other	10.200	1,11%	0,02
By foot	337.786	36,89%	0,81
Bycicle	10.115	1,10%	0,02

To make a good diagnosis of Urban Mobility in Murcia, it is necessary to analyse the social and demographic situation in detail. Regarding mobility, the chart of “MOBILITY KEY DATA OF MURCIA” shows the essential mobility data of Murcia Municipality, based on ourSUMP (Sept. 2009). This shows that the use of public transport remains relatively low compared to other large cities (10.33%).

In terms of comparativeness with the rest of Spain, the following chart shows that Murcia has similar levels to Barcelona regarding motorised travel:



Walking

The City of Murcia has over 252.000m2 of pedestrian zones – just in the city center- and 100.000m2 in the surroundings districts. Murcia City Council has built and marked an urban route, so-called “Walk 10.000steps”, which covers a distance of 10.000 steps and connects 8 urbandistricts within the center of Murcia.(see pedestrian areas in orange color).

Our Council continues to highlightstreets and pathways to further expand the pedestrian zones and enlarge the traffic-restricted areas in order to encourage people to walk on daily basis. So far, we do have in Murcia over 338,000 daily trips made by foot. This accounts for 37% of total daily trips, being equivalent to 0.87 trips per person per day.

The following graph shows the distribution of journeys by foot in Murcia:





### Bicycle

The bicycle in Murcia is under a high process of transformation. The City has over 162 km of cycle paths, bike friendly routes and streets with limited speed. The City has 10,100 daily trips by bicycle, which represented 1.1% of total daily trips, (Sept, 2009), nevertheless we are updating the statistics, that are rather closed to 3% nowadays). Of all these trips, 66% may be considered "needed" trips due to different causes. In addition, 60% of bicycle users take the bike daily from Monday to Friday in their displacements.

### Public transport

The use of Public transport represents the 10% of all journeys in Murcia, meaning the 17% of all motorised journeys. Regarding the City Bus System, the City has a good set of accessibility to travelers and several bus stops. It offers a good system of bus information and an adequate cover: 300 meters within the Murcia City Center. The tram has very positively benefited public transport in Murcia. Over the last two years has improved the rate of use of public transport. Murcia's tram has served in those 2 years to 7,047,475 passengers.

### Electric mobility

Murcia City has a considerable fleet of electric vehicles. Nevertheless, our public electric network of chargers must be expanded. This would Foster the demand of electric vehicles and would gradually grow the number of registered electric vehicles. Great efforts are being made by our Municipality in order to spread out the needs of changing mobility habits. We do incorporate electric vehicles to our usual means of transport, always in detriment of fossil fuels. Murcia City Council is currently looking for strong financing schemes in order to support the development of a proper e-mobility infrastructure, to better facilitate the introduction of electric mobility in Murcia.

### Traffic and circulation

Traffic in Murcia indicates that there is a high use of private vehicles for commuting, which accounts for 51% of all trips and 81 % of all motorised trips, (Sept, 2009). Roundabouts are our main Traffic hotspots in the City, where there is the higher volume of traffic. In addition, also make it a place where unfortunately there is the higher level of conflicts, casuistic and accidents. The average speed is quite high in Murcia (22km/h) and there are no significant variations between peak and valley period. Furthermore we cannot address significant traffic congestion in Murcia, though it is a big city. From further analysis, it has been concluded that the global system used for traffic management in Murcia should give more priority to public transport rather than private one. Nevertheless, Murcia offers a massive use of private vehicles, which mainly causes heavy traffic in the roundabouts of the City (here below Murcia road's distribution).

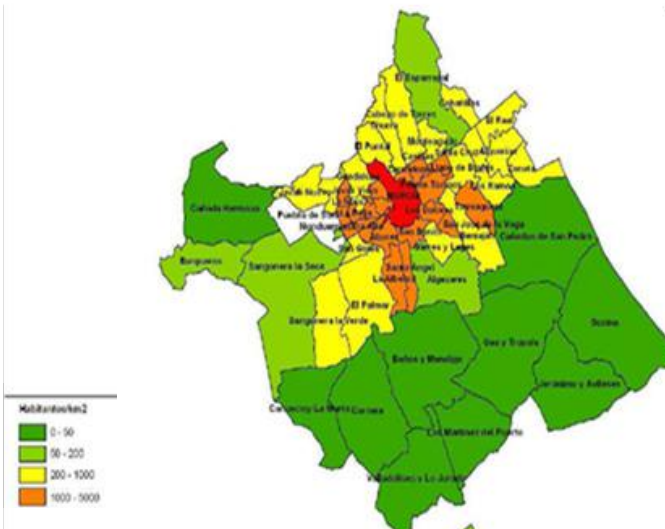
Existing studies and surveys show a great interest by citizens to change their usual means of transport, as for a more efficient one. Citizens in Murcia give great importance - as mainly everywhere else - to saving opportunities, towards mobility alternatives.



### Demographical aspects

Number of inhabitants in 2014: 439.712

Population density 497 inhab./km<sup>2</sup>. Due to the extension of Murcia Municipality, percentage of people living outside the city is bigger (61,33%) than percentage living in the urban center (38,67%). The highest density of population (in red) occurs in the urban center.



In Murcia the population increased to 50.000 people from 2003 to 2011. A soft decrease of population has been registered in the last years.

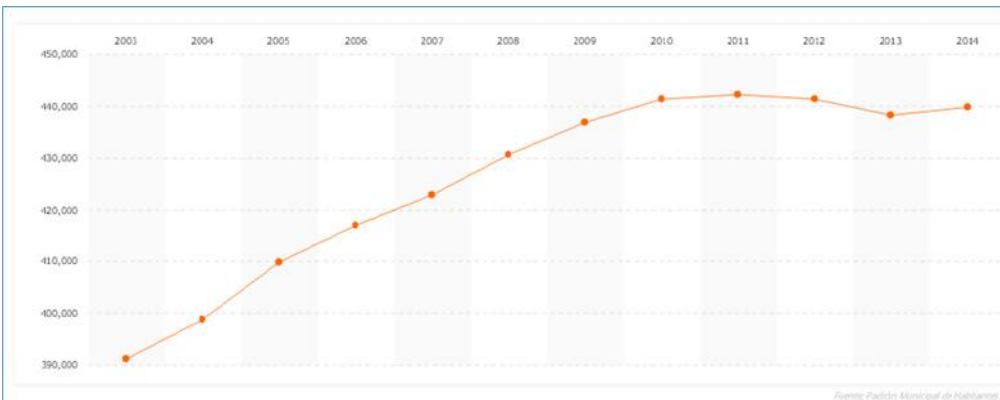


### Social aspects

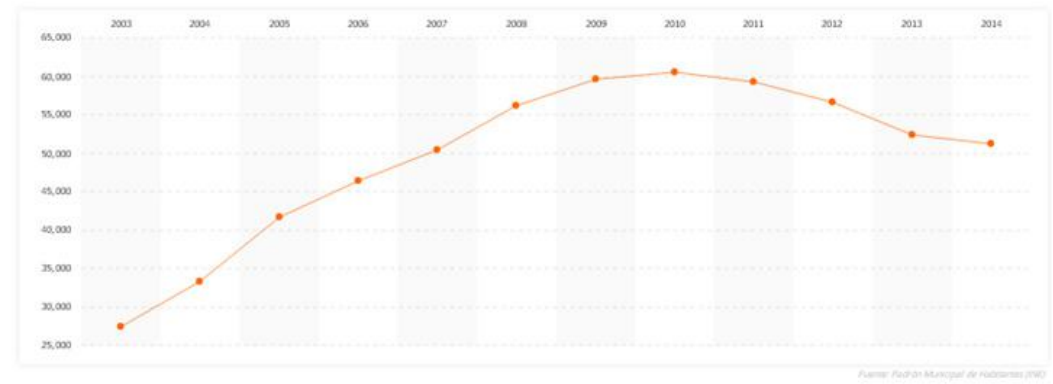
Percentage and evolution of people from foreign origin:

Inhabitants (2014)percentage		
Spanish origin	388.510	88,36%
African origin	18.121	4,12%
American origin	17.420	3,96%
European origin	13.387	3,04%
Asian origin	2.258	0,51%
others	16	0,00%

Evolution of the population in Murcia 2003-2014:



Murcia foreign population 2003-2014:



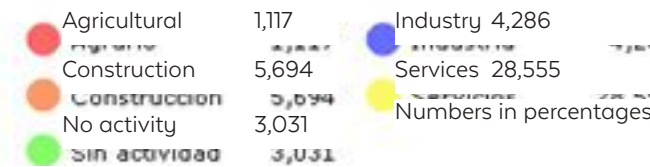


**Economical aspects**

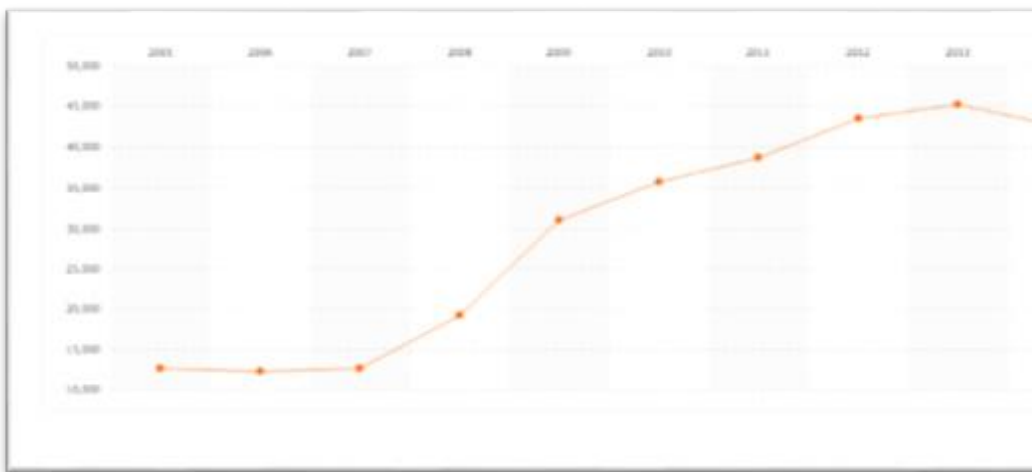
Income per head in comparison to the national average income in 2014: Murcia €18.529, Spain €22.780.

Due to financial and economic global crisis which extremely affected Spain and its regions, the number of unemployed in Murcia increased in 32.600 people since 2007 to 2013. In 2014 a downward evolution can be seen, and number of unemployed was reduced in 2600 people.

According to sector, unemployment in Murcia (2014) mainly affects Services.



Registered unemployment. Murcia. 2005-2014:



<http://www.murciaencifras.com/datos-basicos>

**Environmental aspects**

In 2008 Murcia was the first Spanish city to join the Covenant of Mayors initiative, in order to take action to reduce 20% of CO2 emissions in 2020. Within this context, Murcia also launched in 2008 the 'Local Climate Change Strategy'. recently, in 2015, Murcia joined the European initiative to fight the climate change, Mayors Adapt.

The total area of the city is 890km2. The extension of with green space making up 67.72km, or 55%.

Total surface of public parks and gardens in the municipality: 4,2 km2

Water consumption per head 143 lit/day. Cost of water in Murcia is the higher in Spain 2,5 €/m3

SMART Real Time Water Management Center - smart meter infrastructure

Drinking Water Network is 2,187 km long. 164 km are main pipes of up to 1,000 mm diameter.

Biogas production in the Waste Water Treatment Processes (WWTP), which ensures a large part of its energy consumption of the by this renewable energy source.

Climate conditions: average temperature 18,4 °C, rain-fall 215 mm in 2013 .

Evolution of air quality (in number of days):

	2010	2011	2012	2013	2014
Good	172	123	84	111	92
Admisible	186	229	280	246	273
Bad	4	13	1	6	3
Very bad	3	1	0	0	0

## Recent projects

### 1. MOBISEC – Mobility Initiatives for Sustainable European Communities

Grant DG MOVE (Transport and mobility) of the EU.

Current

Coordinator of the project.

Main topics: Promotion of the use of the bicycle as usual transport; Guarantee the safety of users of public roads and especially cyclists and pedestrians; strategies to promote the intermodality of bicycle with other transport and Citizen participation

### 2. MUTRANS (Murcia-Transport).

Grant DG MOVE (Transport and mobility) of the EU.

Current

Coordinator of the project.

Mutrans is the integrated urban mobility platform of the City of Murcia. The web and App include all the information needed to move around Murcia tram, bus and bicycle, and can set routes combined. Also available in english to encourage a sustainable tourism

### 3. R4E: Roadmaps for Energy

H2020-EE-2014-3-MarketUptake

Current

Topics: Enhancing the capacity of public authorities to plan and implement sustainable energy policies and measures

### 4. SMARTSPACES – Saving Energy in Europe’s Public Buildings Using ICT

CIP ICT Policy Support Programme.

Current

The project started on 1 January 2012 and will last for three years. It will set up 11 pilot sites in 11 cities in 8 countries and be operated by 26 partners with an overall budget of almost 7 million Euros.

### 5. SMARTPA – Smarter Public Administrations in the EU

Life Long Learning Programme

Current

This project aims to improve the use of ICT, particularly cloud computing and required competences, in European public administrations

### 6. SURE. Sustainable Urban Energy in the ENPI Region.

Program CIUDAD of the EuropeAid Office of the European Commission.

The aim of the project is exchanging experiences in energy planning, promotion of the Covenant of Mayors and technical advice for achieving the targets of the Covenant (20-20-20), meaning: decrease of CO2 emissions 20%, increase of energy efficiency 20% and renewable share 20% for the year 2020.

### 7. « ENPCOM project- European network for the promotion of the Covenant of Mayors »

“Europe for Citizens”. DG Culture

ENPCOM is a network of local governments, citizens, industry organizations and associations aimed at strengthening the involvement of European citizens in the fight against climate.

### 8. Creation of Local Energy Agencies in Bordeaux, Latina, Murcia, Riga and Porto

Intelligent Energy for Europe Programme

### 9. Partnership Energy Planning as a tool for realising European Sustainable Energy Communities (PEPESEC)

Intelligent Energy for Europe Programme

PEPESEC supports the development of sustainable energy communities by increasing the role of local community planning in developing a more efficient supply, distribution and use of renewal energy sources (RES) and conventional energy, demand-side management and associated mobility.

### 10. ProSto project

Intelligent Energy for Europe Programme

The overall objective of ProSTO is to support European local authorities in planning, developing, introducing and managing efficient solar thermal ordinances (STOs).

### 11. Pro-EE: improve energy efficiency through sustainable public procurement.

Intelligent Energy for Europe Programme

Pro-EE brought together producers and consumers, implemented energy-efficient green public procurement (GPP) procedures in local administrations, and organised training sessions for municipalities’ procurement staff. At the same time, five pilot cities set up integrated energy efficiency action plans, which included the involvement of stakeholders and awareness-raising campaigns for citizens.



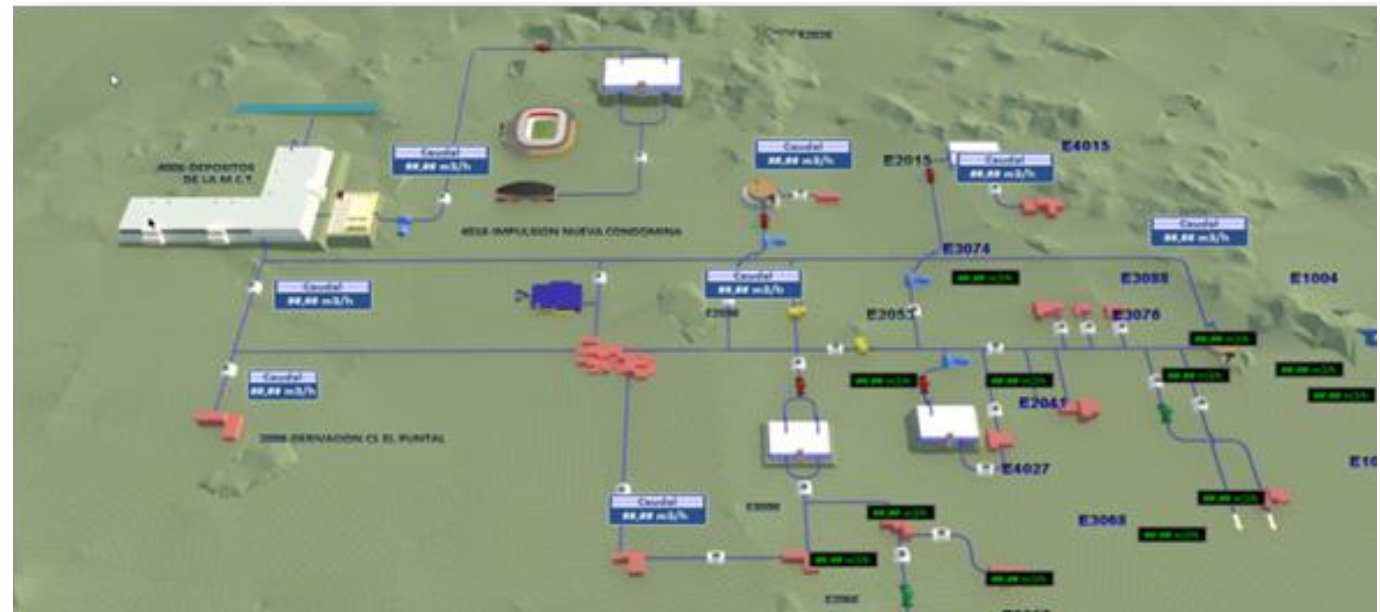
## 12. NICE Project (Networking Intelligent Cities for Energy Efficiency)

FP7 funded project

The NiCE project aimed to support the fulfilment of the Green Digital Charter commitments.

## 13. Networks:

- Signature in 2008 of the Covenant of Mayors
- Member of Mayors Adapt, launched in the context of the EU Adaptation Strategy and is implemented within the Covenant of Mayors
- Vice president of the CIVITAS network in Spain and Portugal
- Member of Eurocities.
- Member of Eneragen, Spanish network of Energy Agencies
- Signature in 2009 of the Green Digital Charter. European Innovation Partnership on Smart Cities and Communities (EIP-SCC)
- Members of EnerAgen, the Spanish Association of Energy Agencies
- Members of RECI, the Spanish network of Smart cities
- Vice-Chair of the Technical Committee of Standardization AENOR CTN 178 on Energy in Smart Cities
- Presidents of the Spanish Network of Cities for the Bicycle (RCxB)
- Municipal Observatory of bicycle. It is a consultative body of the City of Murcia composed of representatives of all political groups of the municipal corporation, municipal technicians, representatives of associations of bicycle users, citizens' associations in defense of sustainable mobility and companies that regularly work with the City Council in advocacy and promotion of cycling.



Murcia Drinking Water Network

# Today's reality: Smart buildings



The city of Murcia has seen a strong construction sector during the period 2000 - 2007. From that time, the property bubble meant that the city has not had many examples of private smart building projects. With respect to Municipal Buildings, the Murcia City Council has built some remarkable buildings like the 'Edificio Municipal multiusos de Abenarabi', which is a good example of monitored and integrated systems. It uses the latest advances in communications, and can be considered as a reference in energy efficiency at regional level.

Apart from these examples, the Murcia City Council has been involved in the European 'Smart Spaces' project to reduce energy consumption in municipal buildings using ICT and by raising awareness. Murcia City Council achieved a reduction of the energy bill by 16% in five of its more representative buildings. The use of metering equipment in such buildings, combined with recruitment and dissemination activities, helped to make this possible.

The pictures show the starting point in every building involved in the "Smart Spaces" project:

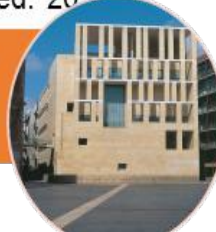
- Surface (m<sup>2</sup>): 5543
- Number of users: 223
- Visitors/month: 6000
- Electricity: 1,173,669 kWh
- Cost (€): 214,674
- Savings Planned: 20%

MURCIA CITY COUNCIL



- Surface (m<sup>2</sup>): 2000
- Number of users: 135
- Visitors/month: 6000
- Electricity: 431,665 kWh
- Cost (€) 82,525
- Savings Planned: 20%

ANNEXE BUILDING



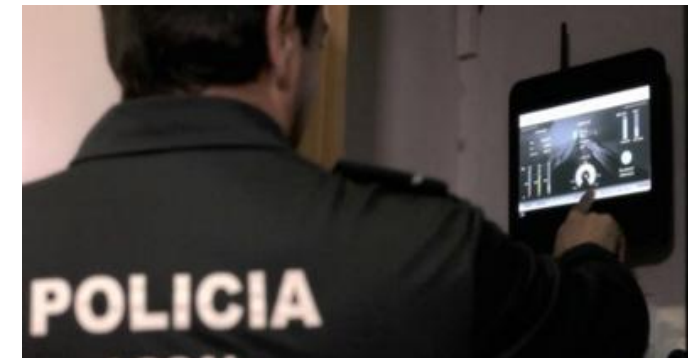
- Surface (m<sup>2</sup>): 4399
- Number of users: 85
- Visitors/month: 6000
- Electricity: 1,265,436 kWh
- Cost (€) 221,007
- Savings Planned: 20%

POLICE STATION COMPLEX

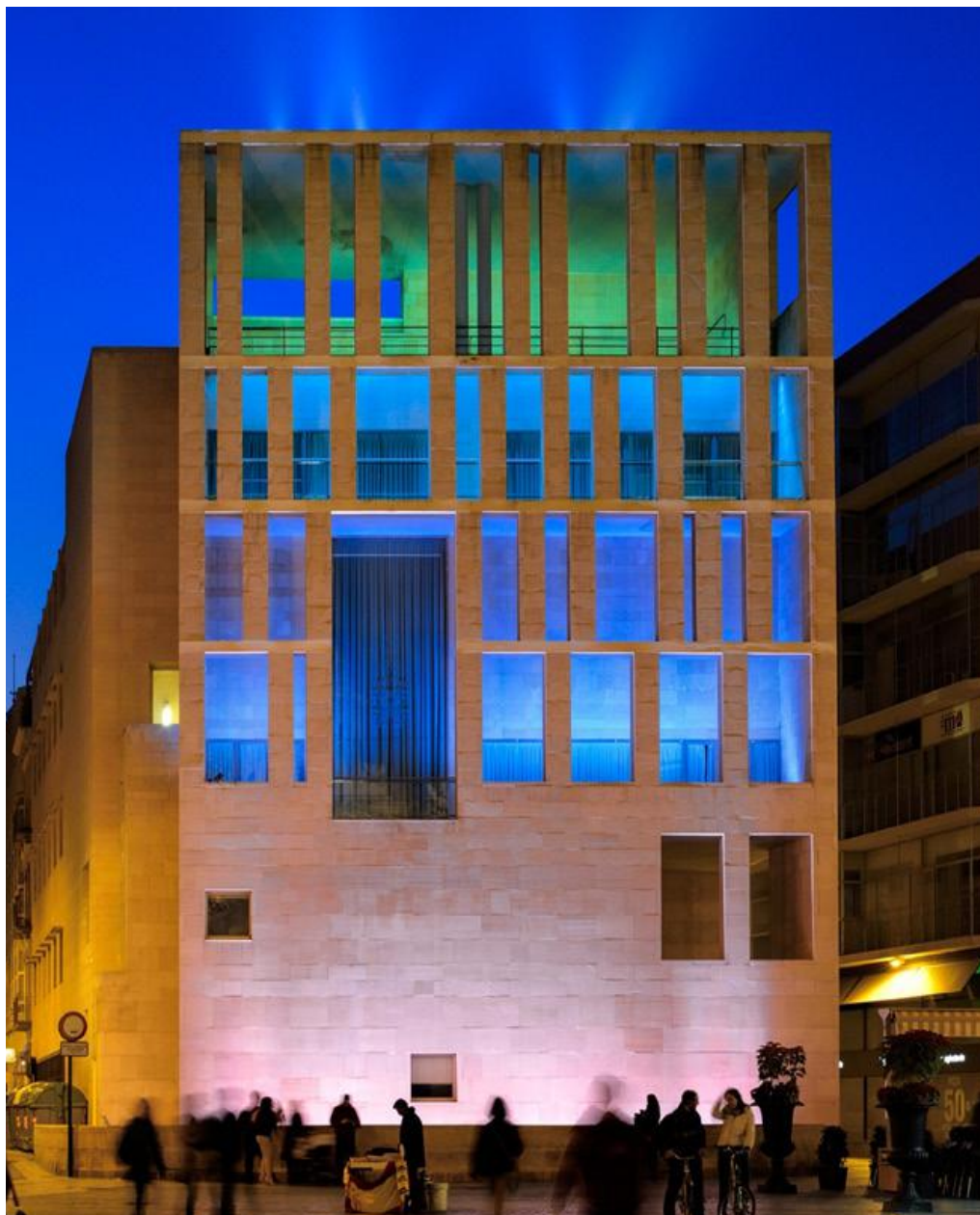


Thanks to this project, the municipal staff can monitor the energy consumption of their building in real time with just a few clicks. This 'Free Access' to energy consumption data has been very helpful in raising staff awareness about energy saving. The online platform, allows them to view the specific energy consumption of each department and to check how the behaviour of people in the offices affect energy use.

There is a lot of work to be done yet in the field of monitoring and improving energy efficiency in Murcia's municipal buildings. There are a total of 500 buildings with different characteristics and uses, so the big challenge is how to install a precise and affordable monitoring system meets all the requirements and provide useful data to take decisions and act accordingly.





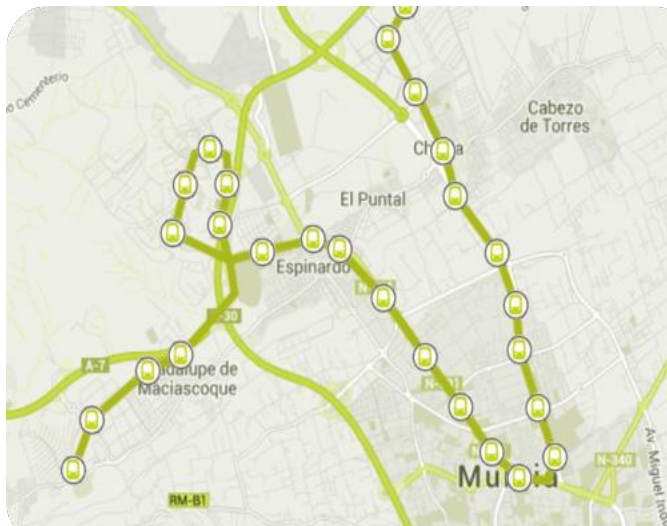


## Today's reality: Smart mobility



Murcia has taken important steps towards becoming a reference in Smart Mobility in the past decade.

One of the major projects has been the construction on line 1 of the Murcia's Tram, which has very positively benefited public transport in Murcia. Over the last two years this service has increased the use of public transport. Murcia's tram has served 7,047,475 passengers in those 2 years.



MUyBICI is another recent and successful project that has been working since March 2015. MUyBICI is a public bicycle-sharing system that aims to increase the use of bicycles in Murcia. The system has 60 sharing stations and 600 bicycles, and it has a Smartphone App that informs users in real time about the availability of bicycles at each station. MUyBICI has been devised to provide a smart service for citizens and support them in their daily journeys.



MUTRANS is an online platform created to help citizens to plan their journeys using public transport in Murcia. Through MUTRANS, users can set their starting points and destinations, then they can see the most efficient route using public transport. The system combines the tram, the public buses and bicycles to make optimised route suggestions for the user. The platform also offers real-time video of 13 different points in the city, chosen to show the traffic in the main streets of Murcia. The MUTRANS project is complemented by a Smartphone App to facilitate access to information regardless of location. The goal is to facilitate intermodal transport use for Murcia citizens. Supporting this concept, an integrated transport card has been created to give access to the tram and both the urban and interurban bus services.



# Results ambition workshop strategy



# 2015

## High Lights

The aspects in the city the strategy department, integral project managers and departmental managers are most proud of:

- Murcia municipality has an active policy on smart building: the local energy agency is operable
- Regardless the crisis and the lack of money energy efficient activities have been initiated
- La Venerati: a new building where energy use and efficiency are measured
- Citizens can check their own energy use online
- There is a good natural coding for the design of buildings and systems in the Murcia climate
- There is a national program by the ministry of energy to set the parameters for 0-energy buildings that have to be realised by 2015.
- The monitoring system installed by the agency is operating very well.
- Many municipality buildings have PVs installed. We are now already good at analysing and spotting the problems in energy use. The next step is to solve the problems and create awareness amongst citizens
- A semi-public data-processing building is optimised for energy efficiency

1  
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.

## Aspirations

### Zero-energy use and the use of renewables

- All buildings with solar panel systems of thermal
- All municipality buildings with PV for heating and lighting
- 100% of the buildings to be energy sustainable
- Thermostatic monitoring systems (switching lights off when no-one is there)
- Self-adjusting buildings for use at that time (e.g. night or day)
- Buildings that provide for electrical cars etc.
- Self-sufficient buildings generating renewable energy (solar, wind)
- Use all means for 0-energy
- 0-energy consumption 2.0: buildings that produce energy
- All swimming pools to use biomass or other green energy
- Self-sufficient buildings
- Biomass production from garbage can be cost-efficient in a building
- Self-generating energy and 0-energy use
- Reduce both the energy use and the cost for habitats



## 2

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.

### Aspirations

#### Intelligent buildings adjusting automatically to comfortable use and users

- Intelligent buildings that do not waste energy in places where it isn't needed at the moment
- Computer and ICT devices are disconnected outside working hours
- Self-management buildings
- Immediate action taking buildings
- Offices that adjust to their use (light, heating, etc.)
- Flexible buildings that can easily adopt to other use
- Smart buildings that react and adapt to external factors: wind, sun, rain, temperature, ...
- Buildings that help and support working at home
- Comfortable buildings that adjust to internal factors: people living and using them

## 3

In 2050 Murcia is amongst the top 10 green, eco-friendly cities in Europe. Urban planning creates enough green to minimize local CO<sub>2</sub>-emission and local heat stress. The citizens are aware of their energy consumption and reduce their use.

### Aspirations

#### "Green design"; urban planning and passive buildings

- Green urban planning and putting buildings in these plans
- Green walls and making use of the shadows the buildings generate
- Smart green design
- Passive systems and materials: use glass that lets through the light, but not the heat
- Automated systems in buildings that adjust to the seasons

# 2050

### Other aspirations

#### Energy producing buildings (profit)

- Higher performing buildings, not only efficient, but also producing
- Small shops and businesses that are energy efficient
- Building that make a profit

#### Conscious people (staff & citizens)

- All staff is aware of the cost of energy and water. No unnecessary consumption
- Users that are aware of the cost of their comfort

#### Integrated systems (one platform)

- Good measuring management to save energy
- Integration of all systems into 1 platform

#### Recycling = no waste

- No paper
- Eliminate paper
- Sustainability is also water and water usage
- Recycling of all resources in the building: paper, glass, etc.
- No paper used

# Results ambition workshop strategy



# 2015

## High Lights

The aspects in the city the strategy department, integral project management and departmental managers are most proud of:

- Pedestrian area in the historical centre (realised as part of a bigger project that started in 1997)
- The city is sensitive to people with disabilities and made adjustments in the city to allow them to get a normal life on daily basis (parking, accessibility of public transport)
- Basic network of specific bicycle lanes. Urban planning schemes link to basic network of bikes/non-powered vehicles.
- More and more people are using non-powered vehicles
- The shared bicycle system is used by people of all ages. 60 stations are located around the city, linked to a smart IT system for registration, collection and payments.
- App to get proper knowledge on public transport (routes, timing, reliability).
- Tram, city bus and intercity bus all use the same card. 54 different areas of Murcia all connected and using the card.
- Public transport vehicles use the latest technology, e.g. hybrid, to reduce CO2 emissions.

- Tram network connects the city centre and university, as well as shopping malls outside the city. Plan to extend down south to the railway station.
- Users of public transportation benefit from the economic efficiency and user friendliness
- Citizens are proud of being aware of mobility, e.g. the European Mobility Week in Murcia. In 2014 Murcia reached the top 3 in Europe and achieved a national award for the European Mobility Week.
- Murcia is located well to enable e.g. a good biking system (the city is build in a flat area).
- The hard work of the last 35 years paid off!

# 1

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.

## Aspirations

### Stimulating walking & biking:

- Stronger citizens awareness of the benefits of rationalising public transport and bike and pedestrian areas
- Bike network and parking areas like in Amsterdam
- Global/general bike lane interlinked throughout the city
- Bikes are not stolen!
- Create specific parking areas to hop onto public transport or use pedestrian areas in the city
- Promoting and encouraging those people using bikes in stead of the car - show more respect and recognition
- Expand the pedestrian areas across the city
- Expand the bike lanes.



2

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.

#### Aspirations

##### Less and cleaner cars:

- End of private cars in the city
- All municipal vehicles to have low carbon emission
- Electrical vehicles only in the city
- Very low % of private cars and car sharing of remaining cars
- Car economy to be replaced by economy on public transport and walking/biking.
- Make the automotive industry sector less powerful, with less impact on decisions and economy. The sector cannot be a key sector anymore.
- Nuclear fusion energy at private (individual) level and public level. People can generate their own power in a small unit (respecting safety measures etc.)

3

In 2050 the transport system of vehicles and goods will be optimised through smart and integrated platforms.

#### Aspirations

##### Alternatives for goods delivery:

- Loading and unloading goods in the city centre by bikes
- Pedestrian area: organise delivery of goods at certain times
- Transport and delivery of goods optimised to reduce the number of vehicles that have to go into the city

##### Smart integrated mobility management system:

- Smart car parking areas indicating available slots
- Geo-localisation for taxis to know where they are and which ones are free
- Smart traffic management system achieving zero traffic jams in the city
- Achieve reduction of private cars to improve flow of other traffic
- Recharging points for electrical vehicles all over the city
- More extensive public charging facilities, and also private facilities for home owners
- Car loan system for intercity transport - to get rid of parking areas and make use of the space differently

2050

#### Other aspirations

##### Dense network and high quality of links in the city and to national and international destinations

- Link suburbs and outskirts to the city centre in faster, frequent and more efficient manner
- Expands trams to all areas of the city
- Intercity transport system to link Murcia to other Mediterranean cities by high speed train
- Fixed transport elements (like conveyor belts) for people and goods transportation, to replace tram and bus
- Fast/speedy systems to link to (international) airport

##### Murcia recognised as frontrunner in smart mobility:

- Murcia is internationally recognised for its smart mobility solutions for close range, national and international mobility. The system is cost efficient, agile, practical, frequent, fast and modern.
- Create exposure for Murcia on national and international level.

# Results ambition workshop stakeholders



# 2015

## High Lights

The top three aspects in the city the external stakeholders and strategic partners are most proud of:

- The municipality is currently monitoring several buildings on energy use
- The cathedral and other historical buildings in the centre of the city
- The Casino as an example of modern renovation of an historical building, including an automation system
- Experience in many projects in energy efficiency in European context in and outside Murcia
- Example project where monitoring and active influencing energy efficiency in a company Porta Sporia. Savings were realised through the detection of faults and insights in use.
- Example of the Theatre in Madrid where the monitoring system had a return on investment of 2 months, due to energy savings
- The data centre has received an international award: 17 data centres were integrated into 1, also virtual, and major energy savings were realised
- Have started with monitoring neighbourhoods and lighting to do savings and adjust to time and season
- The implementation of projects in schools

# 1

In 2050 buildings in Murcia inter-communicate, think and act in order to provide comfort and user-centered services with energetic autonomy.

## Aspirations

### Proactive intelligent buildings based on data and profiles

- Use sensors to collect more data on actual use, CO2, air quality, etc.
- Adapt to the agenda of the use and the users and adjust the energy demand to that
- Profiles to direct energy use instead of monitoring yesterday's use
- Adapt buildings to demand response programmes
- Prevent the demand of the building: know what it has and what it will cost
- Buildings become alive, self-controlling, self-heating, self-lighting, etc.
- Automated systems in buildings and in the city
- Buildings are smart, produce their own energy and direct the energy use

### Today's challenges

- Companies interests
- Consolidated networks
- Money, financial resistance
- Lack of investment in automated systems and the monitoring of buildings
- Lack of resources to create smart infrastructure for buildings
- Efficient communication channels, such as fibre glass
- Privacy of the data
- Normalisation
- Lack of investments





## 2

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.

### Aspirations

#### Renewable energy producing buildings

- 100% self-production buildings based on renewable energy
- 0-consumption
- Renewable energy production through systems and materials
- Self-sufficient buildings producing their own energy

#### New technologies for generating and storing energy

- No energy problem through the implementation of nuclear power and batteries
- Data centres without mechanical cooling systems (which is 50% of the energy use)
- Improve time to recharge batteries for electric cars
- Use special PV materials (paint, foil) to maximise the use of the sun
- Buildings as a heat pump: use their skin to transfer heat between inside and outside

#### Today's challenges

- Current legislation is against renewable energy Legislation
- Mentality of politicians, business men and citizens
- Lack of political awareness on the importance of energy savings and efficiency
- The town and buildings already build: how to cope with them
- We need new methods and systems for an efficient, habitual, non-polluting renovation
- European regulation for energy production companies so that increased energy efficiency is returned as savings for the user
- Negative legal framework for local self-producing of renewable energies
- European law is needed

## 3

In 2050 in Murcia tele-management will allow buildings to inter-operate in order to optimise resources.

### Aspirations

#### Tele-management of integrated systems connecting buildings

- Interconnect buildings to share energy resources and use
- The big companies facilitate the use of all these small solutions into one big system or platform
- Register PV performance, more than only savings parameters
- Connect to wifi and in 1 system
- Tele-management from everywhere, not the office or control centre

#### Today's challenges

- Open and common communication protocols
- Social awareness that generates demand for optimization
- Awareness of benefits against the costs
- Opposition of electrical companies to allow the use of electrical networks
- Individualism
- Privacy of the data
- Smart grid concept is not developed and costly
- An entity that manages the data network
- The way or system to create connected to all actions
- Lack of investments

# 2050

### Other aspirations

#### User-centred comfortable buildings (individualised, personalised and ease-of-use)

- Focus on the use and comfort of buildings (sensors, etc.)
- Buildings that adapt to external and internal factors
- Providing users with simple apps to adjust and be aware
- All monitoring, reporting and adjusting through a simple device, like a pen
- Smart buildings will be around use and comfort

#### Modulair, flexible systems enabling flexible buildings

- Flexible modulair systems

#### Circular use of building & surroundings

- Recycling waste water
- Integrate the building in the surroundings
- Small scale urban farming on water and recycling the waste into biomass

#### Teleworking becomes reality

- Multi-purpose buildings; now residential buildings are only used in morning and evening, offices only during the day, why not combine
- Digital offices: no paper use
- Raise awareness that decisions now will influence the entire life-cycle of the building

# Results ambition workshop stakeholders



# 2015

## High Lights

The aspects in the city the external stakeholders and strategic partners are most proud of:

- The fact that there is a clear contact in the city that is interested in smart and sustainable mobility solutions.
- Already on regional and local level new technologies are promoted: greener cars, mobility etc.
- New technologies are introduced for integration of transport means.
- Introduction of loan bikes to promote sustainable transport and reduce the use of cars.
- Initiative to install 50 points to charge electric vehicles.
- Investments in R&D to promote smart mobility
- Change in mentality: 'the right of citizens for mobility'. Awareness at citizens as well as politicians.
- Availability of facilities in town to promote smart mobility.
- The tram network is well used by citizens.
- The availability of the tri-card for tram, bus and intercity bus and plans to extend the use to shared bicycles.
- Implementation of new technologies, e.g. geo-localisation and payment methods (since 2001), to improve efficiency, ease of use and performance of transport.

- Started 6 years ago with transition of the municipal fleet to electrical and low emission vehicles.
- Willingness and good intentions to use electric motor bikes: trial runs done.

## Today's challenges in general

- Projections are based on the demand now, in stead of creating a new demand
- Financial means
- Political willingness
- Teamwork
- Citizen awareness

# 1

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.

## Aspirations

### Sustainable public transport: that is really user-friendly:

- Sustainable ways of public transport: clean, non-polluting, cheap vehicles
- Autonomous vehicle applied to public transport (technically safe)
- Transport modality of public transport to reach above 80%
- Use of smart phones for all public means of transport (apps)
- Free public transport
- Public transport to all areas
- Efficient use of new technology to facilitate use of public transport and its coordination

## Today's challenges

- Investments in R&D
- To improve and expand on public transport requires investments. Maintenance is expensive and economic profitability is not guaranteed
- Lack of fast and safe connection to the airport of Murcia
- Citizens are reluctant to leave their car and use public transport (awareness!)
- Lack of communication among the different agents/stakeholders
- Transport by bus is affected by traffic jams and is not fast and practical
- Mentality of the user in Murcia is to use the private cars - habits are difficult to change
- It is difficult to offer night mobility as an efficient public service



## 2

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.

### Aspirations

#### Policies to promote clean vehicles:

- Include special lanes for vehicles depending on their degree of pollution
- No private cars in the city: car sharing and proper regulation of goods delivery
- Taxes to go in relation with safety, pollution and energy consumption of vehicles
- Independent means of transport: all electric
- All people with influence & power (teachers, politicians etc) set an example with using bikes, electrical vehicles etc.
- Avoid the use of private cars as much as possible - promote car sharing
- Storage facilities for good to facilitate greener distribution to city
- Delivery of goods via integrated logistics to optimise delivery
- Access to city centre by electrical vehicles only

#### Safe & clean:

- Energy used in transport is coming from local renewable sources
- Emission and pollution down to zero
- Zero accidents
- Collective means of transport using clean energies
- Zero emissions in all transport means = no pollution

#### Today's challenges

- Interests of the big corporations
- Necessary change in social and political mentality to accept that not going by car to the city centre is positive
- Public transport with clean energy requires investments
- Political strategies to take into account pollution and accidents

## 3

In 2050 extensive pedestrian areas will predominate in Murcia, and in these pedestrians and other safe and clean mobility means will live in harmony.

### Aspirations

#### Priority for pedestrians and cyclists: a city for citizens:

- City centre for pedestrians, bikes and public transport only.
- Extensive pedestrian areas for citizens, not for cars
- User friendly city with pedestrian areas and public transport to urban areas
- Extensive and efficient bike lines, availability of bikes and management of new routes
- (Historical) city centre 100% for pedestrians and social use
- Pedestrians and bikes are respected and have priority
- Promote sustainable and safe mobility: enhancing going by foot/bike/public transport
- Cycling to be more than 50% of modality

#### Today's challenges

- Master plan coming from the administrations (on different levels)
- An improvement on mobility planning
- Short term visions (lack of long term vision)
- Lack of support from the government to introduce e-motorbikes and generate trust and safety
- Cars are convinced that the city belongs to them, and the pedestrians and cyclists are the problem
- It is difficult to extend pedestrian areas because this affects the traffic and restrains the existing flow
- Private cars still take the lead (they are the main characters in this play)
- The population of Murcia is dispersed: neighbourhoods belonging to the city are far from the centre

# 2050

### Other aspirations

#### Accessibility of areas in the city and beyond:

- Inter-modality to facilitate better connection
- Public transport service more efficient, and better matching to the demand
- Expand tram lines to all areas of the city
- Bicycle lanes all over the city and to everywhere
- International airport within reach, and accessible with high speed train

#### Integral view on planning of mobility (including new/future options):

- Smart traffic management system - including parking
- Smart phone apps with integral service and information on e.g. events, mobility etc.
- Urban design is following Mediterranean style and is combined with collective public transport
- Decreasing the demand for transport and reduce length of trips by introduction teleworking etc.
- Personal transport by drones
- Facilitate coordination of all public transport at lower cost for users

#### Develop business with batteries and charging facilities:

- Points to recharge electrical vehicles to be everywhere
- Recharging points for electrical cars are common in the city
- National manufacturing of batteries
- To develop technologies for faster recharging of batteries (needed for public transport)





# Contributions

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

- Mercedes Albacete Murcia Municipality, Education
- Elena Alday Association of Architects-COAMU
- Enrique Alvarez Murcia Municipality, Urban Plan
- Carmen Blanco Murcia Municipality, Traffic&Transport
- Andres Brugarolas LATBUS
- Antonio Caballero Murcia Municipality, industrial engineer
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- Jose María Cervera Hernandez Murcia Municipality, Urban Cleaning
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- David de Diego Villarrubia KIO Networks España
- Jara Feliu Gómez-Salcedo Regenera Levante
- Álvaro García Montoro Murcia Municipality, Sports
- Jose Gambin Orenes Murcia Municipality, Urban Cleaning
- Virginia Jerez DGT
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- Silvia Lopez Belmar Telefónica
- Tomas Lopes Garcia El Corte Inglés
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- Pedro Tomas DGT
- Antonio Valdelvira Murcia Municipality, industrial engineer
- Patricia Zambudio Emisiones 00



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ROADMAPS  
FOR  
ENERGY®



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

# AMBITIONS OF NEWCASTLE

Appendix E to D1.1 Report - Specific ambitions of the R4E partner cities



15 December 2015

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

**R4E**

ROADMAPS  
FOR  
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This appendix is part of the D1.1 Report - Specific ambitions of the R4E partner cities and contains all results of the ambition setting 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 does not necessarily reflect the official European Commission's view on the subject.

**Versions of this report:**

19 June 2015	Concept for internal check in the city (limited distribution)
17 July 2015	Concept for sharing with R4E partners (limited distribution)
6 November 2015	Version for final check
15 December 2015	Final version for public distribution





- Introduction to the city of Newcastle
- Today's reality: Smart domestic buildings
- Today's reality: Smart non-domestic buildings
- Results ambition workshop policy
- Results ambition workshop strategy
- Results ambition workshop stakeholders
- Results ambition workshop stakeholders
- Contributions

- E 5
- E 10
- E 11
- E 12
- E 14
- E 16
- E 18
- E 21

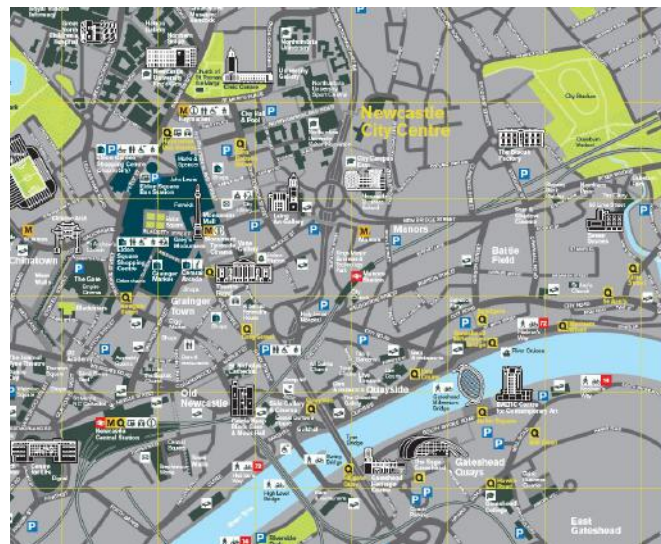
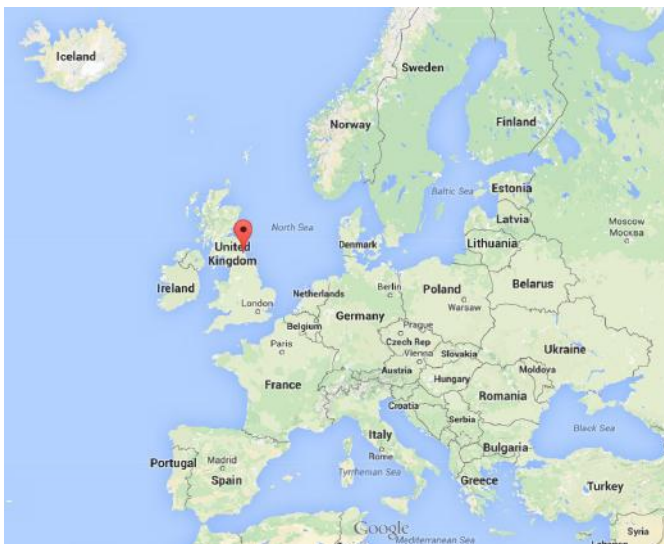


## Introduction to the city of Newcastle

### The City

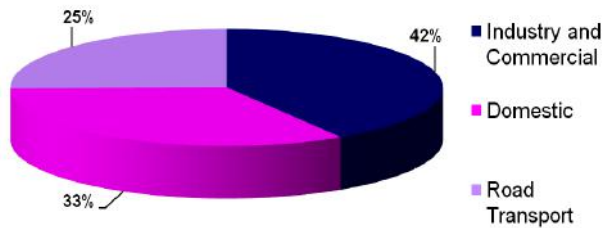
Newcastle upon Tyne, commonly known as Newcastle, is a city in the metropolitan county of Tyne and Wear in North East England. Located 120 miles (193 km) south of Edinburgh and 280 miles (450 km) north of London, it is situated on the north-western bank of the River Tyne estuary and is 8.5 miles (13.7 km) from the North Sea. Newcastle is the most populous city in the North East region, and lies at the urban core of Tyneside, the seventh most populous conurbation in the United Kingdom and the most populous in the North East. Newcastle is a member of the English Core Cities Group and, together with nearby Gateshead, is part of the Eurocities network. Newcastle was part of the county of Northumberland until 1400, when it became a county in its own right, a status it retained until becoming part of the Tyne and Wear metropolitan county in 1974. The regional nickname and dialect for people from Newcastle and the surrounding area is 'Geordie'.

The city developed in the location of the Roman settlement called Pons Aelius. It was named after the castle built in 1080, by Robert Curthose, William the Conqueror's eldest son. The city grew as an important centre for the wool trade in the 14<sup>th</sup> century, and it later became a major coal mining area. The port developed in the 16<sup>th</sup> century and, along with the shipyards lower down the river, was among the world's largest shipbuilding and ship-repair centres. Newcastle's economy includes corporate headquarters, learning, digital technology, retail, tourism and cultural centres, from which the city contributes £13 billion towards the economy of the United Kingdom. Among its main icons are Newcastle Brown Ale, a leading beer brand; Newcastle United F.C., a Premier League football team; and the iconic Tyne Bridge. It has hosted the world's most popular half marathon, the Great North Run, since it began in 1981.





Breakdown of Newcastle Carbon Footprint (2005)



Newcastle upon Tyne local authority carbon emissions

Year	A	B	C	Total
2005	2.9	2.5	1.7	7.1
2006	3.0	2.4	1.6	7.0
2007	2.8	2.3	1.6	6.8
2008	2.9	2.3	1.6	6.7
2009	2.6	2.1	1.5	6.1
2010	2.8	2.2	1.5	6.4
2011	2.4	1.9	1.4	5.7
2012	2.6	2.0	1.4	6.0
2013	2.5	1.9	1.3	5.8

Units t CO2 per person

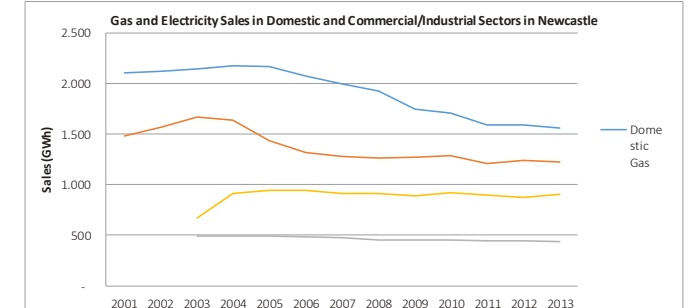
A = Industry and Commercial

B = Domestic

C = Transport

Source: <https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-2013>

Trend data, Newcastle upon Tyne for gas and electricity in domestic and commercial



Source: <https://www.gov.uk/government/statistical-data-sets/regional-and-local-authority-electricity-consumption-statistics-2005-to-2011>

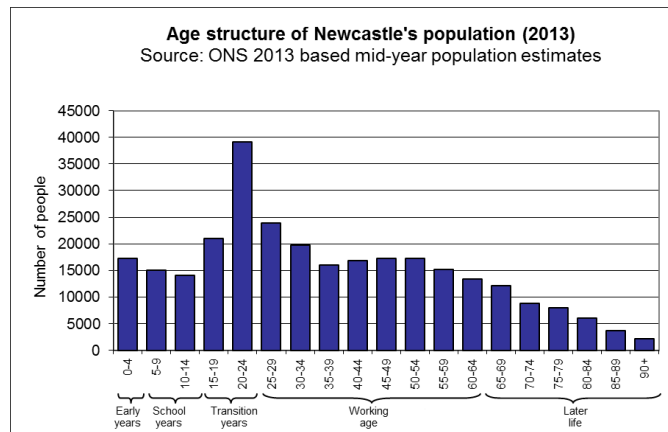
## Demographical aspects

### Number of inhabitants

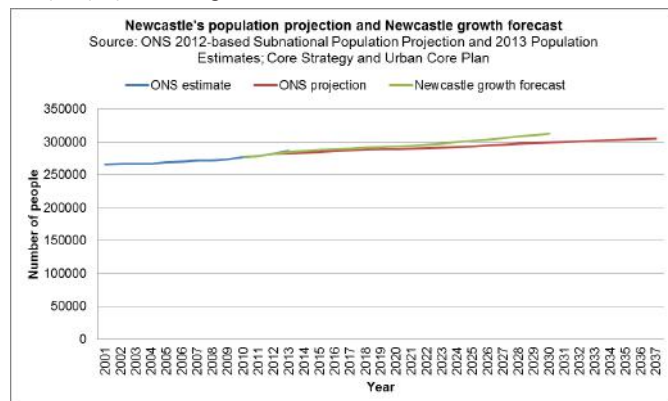
The latest ONS population estimates (2013) suggest there are approximately 286,800 people currently living in Newcastle.

Census 2011 and ONS 2012-based Sub-national Population Projections. Source: Population Projections Unit, ONS. Crown copyright 2014.

### Graph: age structure of the population

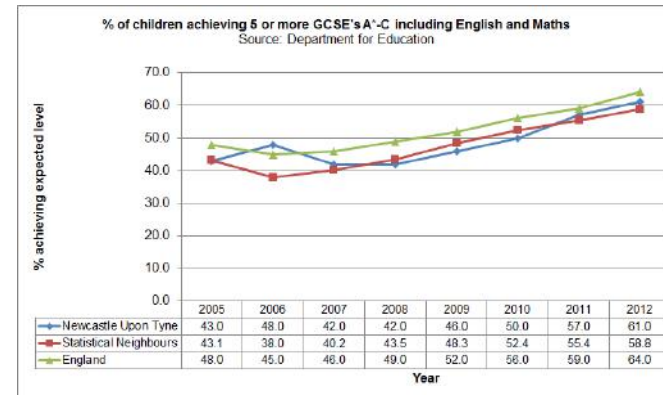


### Graph: population growth forecast

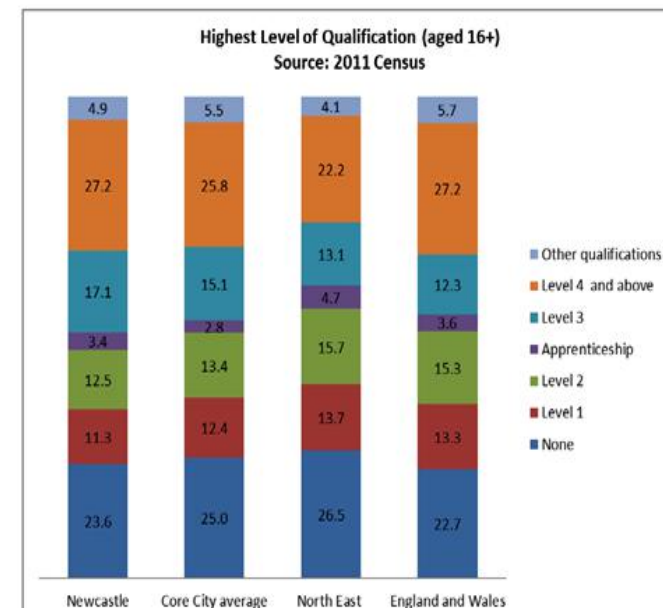


## Social aspects

### Graph: Children educational achievements



### Graph: Highest level of qualification



In the year to June 2013, the Newcastle unemployment rate was 11.1%.

Source: <http://www.wellbeingforlife.org.uk/sites/default/files/2.5%20Activities.pdf>

The estimated proportion of households on fuel poverty is 13%. That is 15,344 households out of the total number of 118,362 in Newcastle upon Tyne.

Source: <https://www.gov.uk/government/statistics/2013-sub-regional-fuel-poverty-data-low-income-high-costs-indicator>

Census 2011 suggests 18.7% of people in Newcastle have a long-term health problem or disability that limits their day-to-day activity to some degree, a reduction from 21.6% in 2001. Of the 18.7%, just over half are limited 'a lot' (26,661 people) and the rest 'a little' (25,916).

Source: <http://www.wellbeingforlife.org.uk/sites/default/files/People%20living%20in%20Newcastle%20-%20B.pdf>

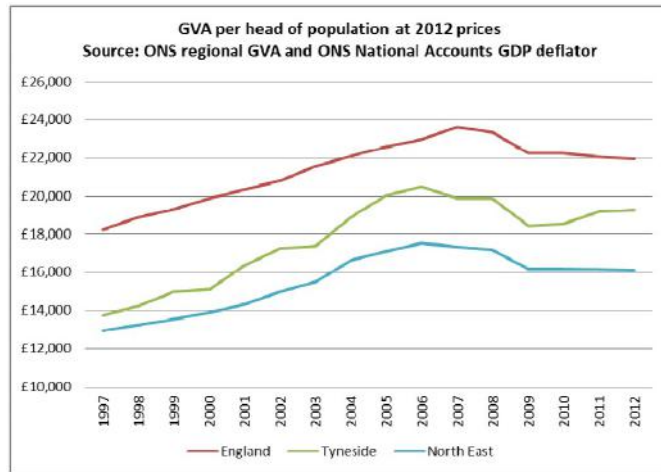
In 2010, Newcastle conducted a Private Sector House Condition Survey against the Decent Homes Standard. The Survey identified that:

- 23.4% of private dwellings (including owner occupied and private rented) were not in the condition to achieve the standard.
- 32.5% of private rented properties were not in the condition to achieve the standard. Within this group one quarter were properties where the occupiers were classed as vulnerable, such as people on low incomes, people with disability and people in later life. These people can all be particularly affected by the state of their home.

**Economical aspects**

Gross Disposable Household Income (GDHI) for Tyneside is 81% of the UK average GDHI, which is similar to other large urban areas (Figure 2.6-8). Low income is consistent with the economic challenges discussed elsewhere in Know Your City, such as high unemployment rates and a shortage of highly paid jobs. Figure 2.6-8: Gross Disposable Household Income as a percentage of UK average.

Source: ONS Regional GDHI (2012) <http://www.wellbeingforlife.org.uk/sites/default/files/2.6%20Local%20economy.pdf>



The graph shows that over time, GVA for the North East as a whole is lower than the England average, however Tyneside is higher than the North East average. This low rate of GVA in part reflects low employment rates, relatively low skills, and comparatively few higher-paid jobs.

<http://www.wellbeingforlife.org.uk/sites/default/files/2.6%20Local%20economy.pdf>

Graph: Jobs per 100 residents (aged 16-64) by sector. It shows that Newcastle has a particularly high concentration of employment in service sectors and comparatively few manufacturing jobs. The service sectors and successful higher education institutions are particular strengths. Weaknesses include a relatively small number of private sector businesses and higher public sector employment in a period of ongoing spending cuts.

<http://www.wellbeingforlife.org.uk/sites/default/files/2.6%20Local%20economy.pdf>

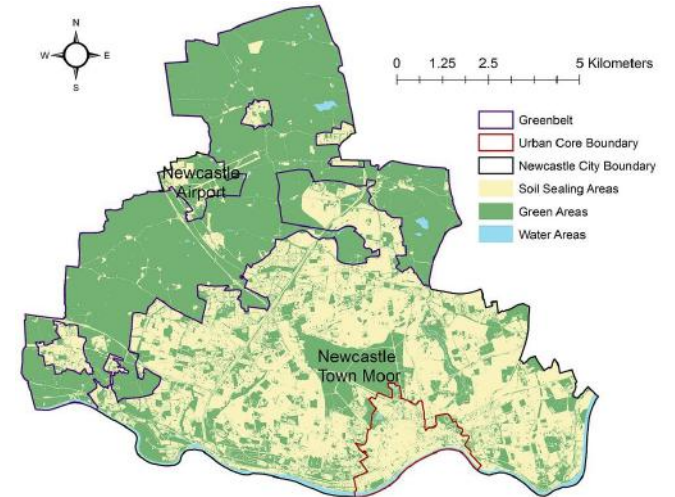
Broad Industrial Group	Newcastle	NELEP	England
Agriculture, forestry & fishing	0.0	0.0	1.0
Mining, quarrying & utilities	0.1	0.9	0.8
Manufacturing	4.4	6.9	5.9
Construction	2.3	3.1	3.2
Motor trades	1.0	0.9	1.3
Wholesale	1.0	1.2	2.9
Retail	8.8	6.7	7.2
Transport & storage	3.2	2.1	3.2
Accommodation & food services	7.2	4.4	4.8
Information & communication	3.8	1.7	2.8
Financial & insurance	3.2	1.4	2.7
Property	2.0	1.1	1.3
Professional, scientific & technical	6.8	2.7	5.6
Business administration & support services	7.7	4.5	5.9
Public administration & defence	9.2	5.0	3.2
Education	10.5	6.1	6.5
Health	15.6	9.5	9.0
Arts, entertainment, recreation & other services	5.4	2.9	3.1

**Environmental aspects**

The total area of the city is 122.85km<sup>2</sup>, with green space making up 67.72km, or 55%. This space is reasonably evenly distributed across the city, with the town moor at its heart.

Publicly accessible green space:

Type of green space	Area (km <sup>2</sup> )	Percentage coverage of all publicly accessible green spaces
Allotments, community gardens and urban farms	1	5.87
Amenity green space	4.22	24.75
Cemetery or churchyard	0.68	3.99
Green corridor	0.16	0.94
Natural and semi natural green spaces	5.49	32.20
Outdoor sports facility (inc. schools)	2.94	17.24
Parks and gardens	2.54	14.90
Provision for children and young people	0.02	0.12



## Way of Working

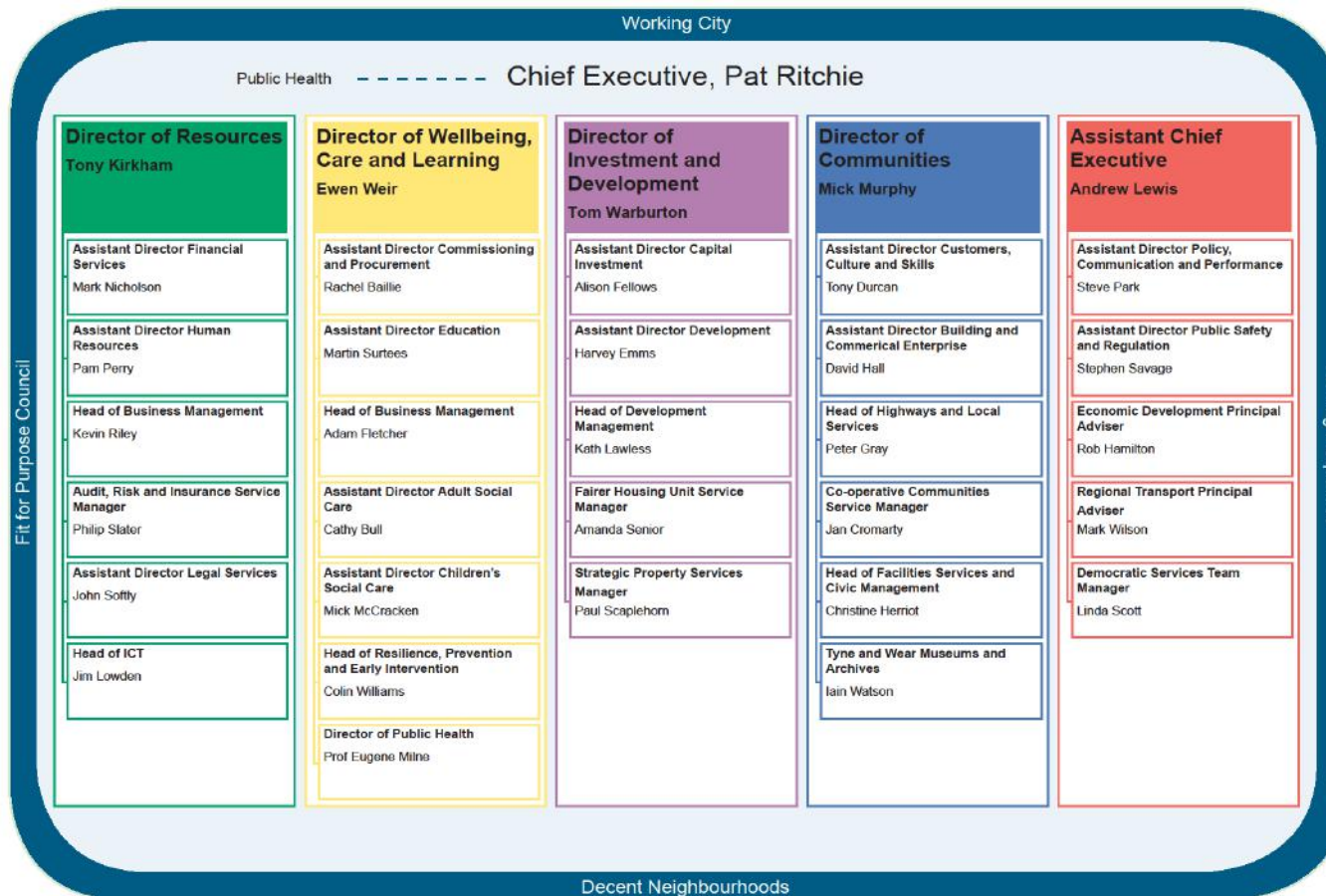
Organisational chart of the relevant departments in the municipality

<http://www.newcastle.gov.uk/your-council-and-democracy/policies-plans-and-performance/our-policies-and-plans/council-plan/vision-values-and-priorities>

## Selection of focus areas

The city has selected two focus areas for the R4E project:

- Smart domestic buildings
- Smart non-domestic buildings



# Today's reality: Smart domestic buildings



The domestic buildings includes 122,000 properties in Newcastle, which contribute 33% of the CO<sub>2</sub> generated by the city. Reducing the CO<sub>2</sub> generated in the domestic sector not only makes a substantial contribution to the overall targets, but will also contribute to improving living standards by helping to reduce 'fuel poverty' and improving the physical condition of the property.

A residents' survey gives some insights into respondents' satisfaction with their homes and their local areas as a place to live. The survey is carried out every one or two years — most recently in 2012.

How satisfied are you with your home as a place to live?

	2008/9*	2009	2010	2012
	%		%	
Satisfied	86	88	88	86
Neither	6	5	7	8
Dissatisfied	7	7	6	6
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

How satisfied are you with your local area as a place to live?

	2007	2008/9*	2009	2010	2012
	%	%	%	%	%
Satisfied	75	79	79	80	77
Neither	10	12	10	11	9
Dissatisfied	15	9	12	9	14
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>



Source: <http://www.wellbeingforlife.org.uk/sites/default/files/2.4%20Built%20environment2.pdf>



# Today's reality: Smart non-domestic buildings



## SMART BUILDINGS

Newcastle has a primarily service-based economy, with very few 'heavy' producers of CO<sub>2</sub>. Within the private sector, this is distributed across the provision of professional services, financial services and a dominant retail and leisure sector. In this regional capital, the public sector is a significant operator with two universities, several major hospitals and central government agencies located in the city. The total number of non-domestic buildings in Newcastle is 7,283.



## Results ambition workshop policy

# 2015

### High Lights

The top three aspects in the city the municipality is most proud of:

- The example of the new Scotswood development. There used to be much cynicism at the start, but new technology proved right and now that it is working people are enthusiastic and have trust.
- The cycling transition. Cycling is not a cultural habit in Newcastle. To stimulate healthy behaviour Newcastle anyway created bicycle paths and infrastructure. People were sceptical about it, but now that they see the result, they like it and embrace it. It is a growing area now, in physical space, in peoples mentality, and also in new businesses around the subject.
- The planning of a new heating system for the city centre, which is now being procured (Re-Generate Newcastle), generating a sustainable heat source in the city centre and connect people to a district heating system.

### Priority in Policy

Which topics have the highest priority in the current policy:

- 4 priorities in policy:
  - A working city - creating good quality jobs and helping local people develop the skills to do them.
  - Decent neighbourhoods - working with local communities to look after each other and the environment.
  - Tackling inequalities - tackling discrimination and inequalities which prevent people from fulfilling their true potential.
  - A fit for purpose council - a council which leads by enabling others to achieve.
- Become a good working city and an environmentally friendly city at the same time. By 2030 we will have realised 21.000 new homes and 40.000 new jobs in a sustainable way.
- We have to put the infrastructure in place too; how to get people to their jobs. Railways, cycling paths, but also sustainable mobility: solutions fit for the next generation.
- We have to set the regulations and requirements to investments.

# 2050

### General Ambitions for the City

In 2050 Newcastle is an environmentally friendly, fit for purpose and accessible city for people to live in. Environmentally friendly deals with a healthier growing population as well as a healthier environment, providing sound sources of energy and energy distribution. All city facilities are fit, accessible and used, both by residents and industry partners.

### General aspirations

- Newcastle policy should be integral and visionary, combining all challenges, and ensure that all benefit from this planning for the future (fit for the next generation).
- The Newcastle city council has to show visionary leadership, embracing change and spread the news of change by examples, showing people the possibilities of new solutions.



## Specific ambitions for smart domestic buildings

1

In 2050 Newcastle City Council considers the local authority footprint, looking beyond the boundaries of a house, of a property, of land ownership and creating shared responsibility.

2

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.

3

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,

### Aspirations

- Retrofit (funding issue), energy efficient, comfortable, de-carbonised heating domestic
- Housing stock retrofitting
- Free heating, everybody happy.

### Aspirations

- Water source
- Heat-pump in the river
- Jobs in the green economy (off-shore wind) to replace current gas/oil industry
- Effective use of geothermal opportunities in 2050
- More reliance on locally supplied electric power and locally generated heat

## Specific ambitions for smart non-domestic buildings

1

In 2050 the city of Newcastle is a catalyst for job creation and industry investments for ethical and environmental developments.

2

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.

3

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.

### Aspirations

- New economy: attracting younger people (on longer term less aging issues)
- Heritage of a trading city: use it to attract new industries, like software
- Investment in environment (café's, cycling, walking etc) to create a growing economy that is attractive for people



# Results ambition workshop strategy



## SMART BUILDINGS

domestic

# 2015

### High Lights

- Securing position to work with the Energy Technologies Institutes (ETI), Smart Systems and Heating programme
- The new build 'Science Central'; a smart grid installed is a successful example of knowledge transfer.
- The approach and the partnering in the project 'Warm up North'
- The focus on how to retrofit existing housing and not just built new houses.
- Many small projects have succeeded in e.g. getting installations in old buildings, upgrading private houses, retrofitting social housing and other one-off projects, where we learned a lot on complications, costs, and people behaviour.
- Early roll out of electrical vehicle infrastructure and plug in places
- Urban monitoring by collecting data on movement of people
- Strong understanding of climate change risks
- Successes in enhancing local businesses; 'warm zone' was implemented with local installers. The solutions in 'warm zone' really helped people to increase their household income.
- Taking people on to the central heating systems/ greater individual controls and giving them control over their own environment.

## Strategic ambitions for smart domestic buildings

# 1

In 2050 Newcastle City Council benefits from their clear message, strong leadership and leadership by example.

### Aspirations

- Lead by example
- Strong municipality capacity to plan, implement and consider sustainable energy
- All sites served by renewable energy
- New devts meet highest sustainability criteria
- All housing (heating) zero carbon
- Quality or quantity measures?
- More local energy generation
- The city council plays an active role in global fossil fuel diversity
- One message on technology and solutions
- Long term thinking part of day to day operations
- Developers and planners understand the benefit of high sustainability and the city councillors are clear on how to achieve this role.
- By 2050 all people are applying green choices
- All city services and regulations support sustainability. Business as usual
- Collective responsibility of the community to meet the carbon targets
- The whole city has a smart grid to most effectively control demand (national, regional, local)

# 2

In 2050 the energy system is affordable, accessible, sustainable and fair.

### Aspirations

- A booming green job sector (energy efficiency, renewables, any!)
- A fairer, more progressive pricing system for energy
- Life cycle costing factored into services
- People can afford their energy bills
- Residents want better control over their homes
- Local / regional / communities buy in

# 3

In 2050 the residents of Newcastle have the means and desire to control their energy environment and make responsible choices.

### Aspirations

- Robust energy security
- Easy control of the property environment
- Accurate, accessible, comparable real time data
- People are aware of how best to use energy and heat their homes
- Sustainable energy systems are resilient to shocks and stresses. e.g. extreme weather, climate change,
- Behaviour of residents
- Means and desire to exploit it
- Everybody cares and knows
- Easy controllable heating

# 2050



## SMART BUILDINGS

non-domestic

# 2015

### High Lights

The top three aspects in the city the strategy department, integral project managers and departmental managers are most proud of:

- Significant investments in schools (biomass boilers, LED, PV)
- Byker Wall: largest system for heating, based on biomass energy centre & connecting non-domestic buildings (swimming pools)
- 'Warm-up North' for non-domestic public sector
- 'Re-generate Newcastle' project: procurement process
- Good relationships with local stakeholders on networks/infrastructure established: the universities, hospital trust, carbon energy centre
- Centralised approach in the region

### Strategic ambitions for smart non-domestic buildings

# 1

In 2050 the Newcastle buildings are affordable and fit for purpose. Occupants have the necessary technology to flexibly adapt the spaces to their needs.

#### Aspirations

- All council commercial properties are being (or have been) invested in using life-cycle costing
- Transitional technologies are implemented to re-use gas infrastructure for new opportunities
- Smart energy storage
- Greater use of demand side response measures
- Increased local generation
- Maximising use of assets (buildings and land)
- All council assets maximised energy generation opportunities
- Use 'Re-generate Newcastle' to drive provision of low-carbon energy to non-domestic buildings
- Sustainable buildings
- Zero carbon exemplar public buildings as case studies (a Newcastle Crystal, like London Siemens)
- Upgrade and improve own portfolio, owned occupied and owned managed
- Flexible, fit for purpose, adaptable

# 2

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.

#### Aspirations

- Green jobs
- Ongoing investments through new revenue models
- The city attracts longer-term finance to secure low-carbon developments
- New business models taking into account stakeholder values
- New revenue(s) found in buildings and business models
- Use existing stakeholder groups to drive forward 'smart cities' agenda - catalyst project
- Revolving
- Critical mass
- Global investments

# 3

In 2050 Newcastle is a leader in a smart cities approach and an exemplar in sustainable energy efficient buildings. This approach is adopted across the city by all stakeholders. The City Council is a national leader in driving business participation through policy making and by getting things done.

#### Aspirations

- We inform, support & cooperate in sustainability
- EPC rating: impact of hardening targets - improve efficiency dramatically
- Regional collaboration
- Stakeholder collaboration
- Zero carbon
- Having knowledge, able to inspire + lead
- The council is showing leadership in planning and in resources to implement robust policy framework
- Use of City Deal to drive business participation in energy
- The good examples are used to real progression in the city
- Operational meaningful zero carbon measurement scales
- Market leader: advise and expertise
- Newcastle is seen as best practice in commercial property handling
- Good landlord ship
- Home working practices reflect in council: asset + accommodation provision

# 2050

# Results ambition workshop stakeholders



## SMART BUILDINGS

domestic

# 2015

### High Lights

The top three aspects in the city the external stakeholders and strategic partners are most proud of:

- ETI: Newcastle as a demonstrator for future domestic buildings and in the lead on Energy Path network tool
- New residential buildings in the town centre
- Project Warm zone
- Redevelopment of Scotswood: 1800 houses in the next years, central heating system
- Behavioural change management: the use of the health system service for learning people
- Local energy planning
- Decent homes programme for heating upgrade and isolation
- We have a good, comprehensible data set on domestic buildings
- Just started a project to understand social practices and behaviour on energy use in a multi-storey tower block
- Future Energies: the cooperation with a local energy supplier
- Partnership and cooperation with other local authorities and the universities, combining a wealth of expertise
- Available knowledge, i.g. on collective intelligence, modelling, PVs, heat pumps, customer led network revolution (CLNR)
- Byker Wall: the architectural heritage

- Social sustainability: how we kept communities together, created gardens, during renovation.
- Realisation of 2 passive houses on Pottery Bank
- New projects with local architects
- Code 6 homes
- The cooperation in a joint project for sustainable multi-story communities in an existing building.



In 2050 Newcastle domestic buildings have zero energy import from the grid.

### Aspirations

- Zero carbon housing
- Negative energy housing realised
- Zero import from the grid
- Smart and efficient energy domestic buildings
- Every home insulated
- Zero carbon net
- Data supporting the ambition
- Every home with adequate heating
- Retrofitted private houses
- Municipal energy supply Co.
- Low carbon, affordable, secure energy
- New houses 100% passive or equivalent

### Today's challenges

- Local energy plans
- Data and from data to modelling
- Evidence based: longitudinal studies
- Delivering business models
- Matching political ambitions, legislation and regulations, and a viable delivery model.

# 2050

## 2

In 2050 fuel poverty in the city is zero.

### Aspirations

- Zero fuel poverty through a unique basic subsidiary system, providing basic comfort need
- Unique for Newcastle is the buying of comfort instead of energy
- Smart data to support a fair system that supports people for their specific home
- Business models with a notion of comfort: comfort as a value
- Smart control for citizens
- No one in fuel poverty
- Fuel poverty to be zero in the city
- No excess winter deaths

### Today's challenges

- Data and from data to modelling
- Evidence based: longitudinal studies
- Delivering business models
- Matching political ambitions, legislation and regulations, and a viable delivery model.

## 3

In 2050 Newcastle is low-carbon energy secure and self-sufficient.

### Aspirations

- Renewal energy secure
- Self-sufficient as a region
- (Regional) combined authority level
- Looking beyond the boundaries of the city
- Local and connecting generation
- Deploy district energy
- City wide carbon budget from individual dwelling to whole city level
- Smart grid & smart storage & enough local renewable energy generation to make city net zero energy

### Other aspirations

#### Data smart

- Open data
- Access to data
- Individual monitoring and measuring performance
- Smart meter and smart data for all homes
- Actual data with sufficient level of detail
- Ability to use smart meter data to improve where people do not use enough energy
- Local smart data for all homes: gas, electricity, water

#### Policy/planning

- Local energy planning further development
- Local energy planning total
- Mechanisms for landowners to manage their own budget effectively-strong local partnerships between health service, local authority energy
- Strong local energy regulations to mandate net zero energy use from all new buildings
- SAP rate 86 minimum for all housing should help meet climate change and fuel poverty objections

#### People/behaviour change

- Smart energy consumers
- Informed and interested consumers

#### Objective studies to support plans

- Longitudinal studies

#### Quality of life

- For Newcastle to have the highest UK life expectancy
- For Newcastle to be THE place for sustainable living
- Better schools

#### Financial schemes and business models

- Economic infrastructure that incentivises low carbon
- Develop business models and influence policy

# Results ambition workshop stakeholders



## High Lights

The top aspects in the city the external stakeholders and strategic partners are most proud of:

- Willingness to learn and experiment: early embarkation on sustainable solutions and capturing the lessons learned in the various examples of buildings that have been fitted with sustainable solutions:
  - Devonshire (2004): good design, good installations, some new solutions installed: at that time the best building in UK
  - In projects good discussions are being held, because we acknowledge the challenges explicitly.
  - Experience in evidence-based policy making and research strategies.
  - There is a growing amount of data available that provides understanding of how the technology is used in practice, but there is also still an appetite to further try and develop sustainable solutions. Tools are becoming available to deal with (big) data.
- University as frontrunner & demanding client for over 10 years, leading the turnaround to utilise new technologies in their own buildings (heat pump etc). In 2017 the first truly smart building will open in Science Central (USP building).
  - Building on 10 years of experience and learnings from earlier developments & being able to take the next steps anticipating on future options

- The own buildings of the university are used as own labs for academic research as well as operational use of innovative solutions
- There is capacity and expertise of interlinking technical solutions and human behaviour and cooperation on how to implement new technologies in real practice
- There is a good link with industrial capacities
- Many people and organisations are involved and aware of energy efficiency. There is growing recognition with industry that there is potential business (not just cost-driven). Even the construction industry (architects, builders) are now expecting to be asked for sustainable solutions. There is a good ecosystem / framework to get more energy efficient. There is good cooperation and enough people willing to make it work on short term. A changing mindset in the council (policy and facilitating role), the university (asking for innovative solutions) and industry (business).
- Resources for renewable energy are available in the region (water, wind, sea, sun) as part of a bigger movement
- There is a story, a narrative of the region of an industrial history that creates a culture and mental state that can put us forward into exploiting energy.

## Discussion

What do we mean by 'smart':

- Giving and receiving data in a network that adapts to the situation
- With an element of flexibility: adaptability

### Today's challenges - general

- Changing the mindset of the development of new smart and sustainable buildings with key external parties
- Managing public negativity when spending money on heat networks etc, rather than other more perceived important issues
- Costs (£££)
- Collaboration between stakeholders, i.e. working towards a common aim
- Understanding the real business case: life cycle costs

1  
In 2050 a collective approach to smart buildings is realised that enables joint smart 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.

### Aspirations

- Smart drainage
- Smart buildings linked by smart infrastructure (grid, roads, transport etc.)
- Heat networks across the city + wider
- Local generation
- A collective approach with partners in the city
- Enabler for other ambitions: providing a social benefit
- Systems architecture perspective: physical infrastructure of all kinds of networks (heat, electricity, data, ...)
- Linking smart buildings into smart grids: receiving and transmitting information
- Planning of a wider infrastructure for how a sustainable city will work

### Today's challenges

- Silos: in planning, construction, design, academia, facilities mgt etc.
- Lack of policy and regulation to enable one organisation to invest (chicken or egg)
- Costs, short term approach, not joined up, lack of data and lack of information
- No business model to enable one organisation to lead development
- Silos and limited local powers
- Time-scales of realising change compared to political cycles
- Funding regulations and availability
- Access to data and capacity to work with it
- Institutional drivers + business models not aligned
- Time-scales with clash between different projects (leads to abortive spend)



## 2

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.

### Aspirations

- Buildings are adapted to the climate change
- Sustainable buildings
- City wide integration of smart grids + building energy demands
- Green roofs, PV, solar thermal etc.: looks and feels different - roof space across the city visually shows our sustainability criteria
- Key & visible buildings demonstrations & exemplars of smart buildings within smart places
- Vibrant building sector design exporting consulting services
- Life cycle of continuous innovation (building is no fixed thing)
- Fit for purpose, flexible, adaptive to changing demand
- Expertise and exemplars retro-fit & new
- Thermally efficient buildings - highest levels
- Zero carbon / low carbon buildings: i.e. planning etc.
- Build in an on-going retrofit: continuously flexible
- Visibility: showing the next solutions
- Support occupancy and user requirements
- Efficient = supporting the occupant and flexible use
- Low impact, optimised, adaptable, changed occupancy needs

### Today's challenges

- Popular buy in and recognition of value
- Recognition technology with change and ongoing process
- Lack of access for long-term cheap capital
- Funding often spend-led not outcome
- Challenge of failure and emergence of new technology, i.e. outcome of doing nothing is safe!
- Managing policy for existing building retrofit, i.e. when do you quit and build new? Costs?

## 3

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, communities and business. People are happy because of the support citizens and communities experience. The economy is vibrant, with green jobs maximising the potential of the city.

### Aspirations

- More and better jobs - varied sectors - key need to grow economy to increase employment & skills level (output & pay)
- Green jobs - reliance on local industry
- Improved process of planning
- Establish local cooperation - all sectors having skills of sustainability. A construction industry that changes processes. Bridging silo's / disciplines
- Reputation to provide practical solutions
- NE known for practical solutions to smart energy - full life cycle, thriving businesses and supply chain
- Greater investment opportunities & incentives
- Hotbed of exemplar sustainable buildings
- To be carbon-negative at uni/city/region scale
- At regional scale: exploit resources to become net provider of renewable energy
- Balancing priorities
- Lower energy costs? Local tariffs etc.
- Energy security & greater reliance of locally generated energy
- Newcastle is known for offering excellent building accommodation - this attracts in ward investments
- Happy people, support to citizens and communities

### Today's challenges

- Challenge of achieving social change
- Ensuring economic opportunities not lost to other areas during transition
- Unknown outcomes
- Long term impacts
- Cynicism: of people towards... science, politics, the future

### Other aspirations

#### Smart data

- Smart building data and control
- Low energy use per business / per person currently relatively high, especially businesses which hold back growth
- Data and sharing of data
- Using the data to really change behaviour

#### Smart citizens

- Being sustainable & using green choices is normal
- Positive vibe around sustainability
- It is cultural accepted that you look beyond the physically footprint: taking a wider systems perspective
- Awareness of citizens and users = creating a positive vibe
- Taking into account the practical use and users of the buildings
- Achieving this and not loose the good other things in society
- Citizens who make sustainable choices
- Links between cutting edge research, business & people/ organisations made - buy-in and understanding of benefits



# Contributions

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

- Graeme Armstrong Newcastle City Council
- Paula Bashforth Newcastle City Council
- Ged Bell Cabinet Member for Investment & Development (with Thematic lead for: Climate Change)
- Carlos Calderon Newcastle University
- Kate Coulthard Newcastle City Council
- James Davies North East Local Enterprise Partnership
- Matt Dunlop Newcastle University
- Kit England Newcastle City Council
- Kelly Graham Newcastle City Council
- David Henry Your Homes Newcastle
- Simon Johnson Newcastle City Council
- Allen Jones Newcastle City Council
- Padraig Lyons Newcastle University
- Adrian McLoughlin Newcastle City Council
- David Orr Newcastle City Council
- Tom Warburton Director of Investment & Development, Newcastle City Council
- Colin White Newcastle City Council



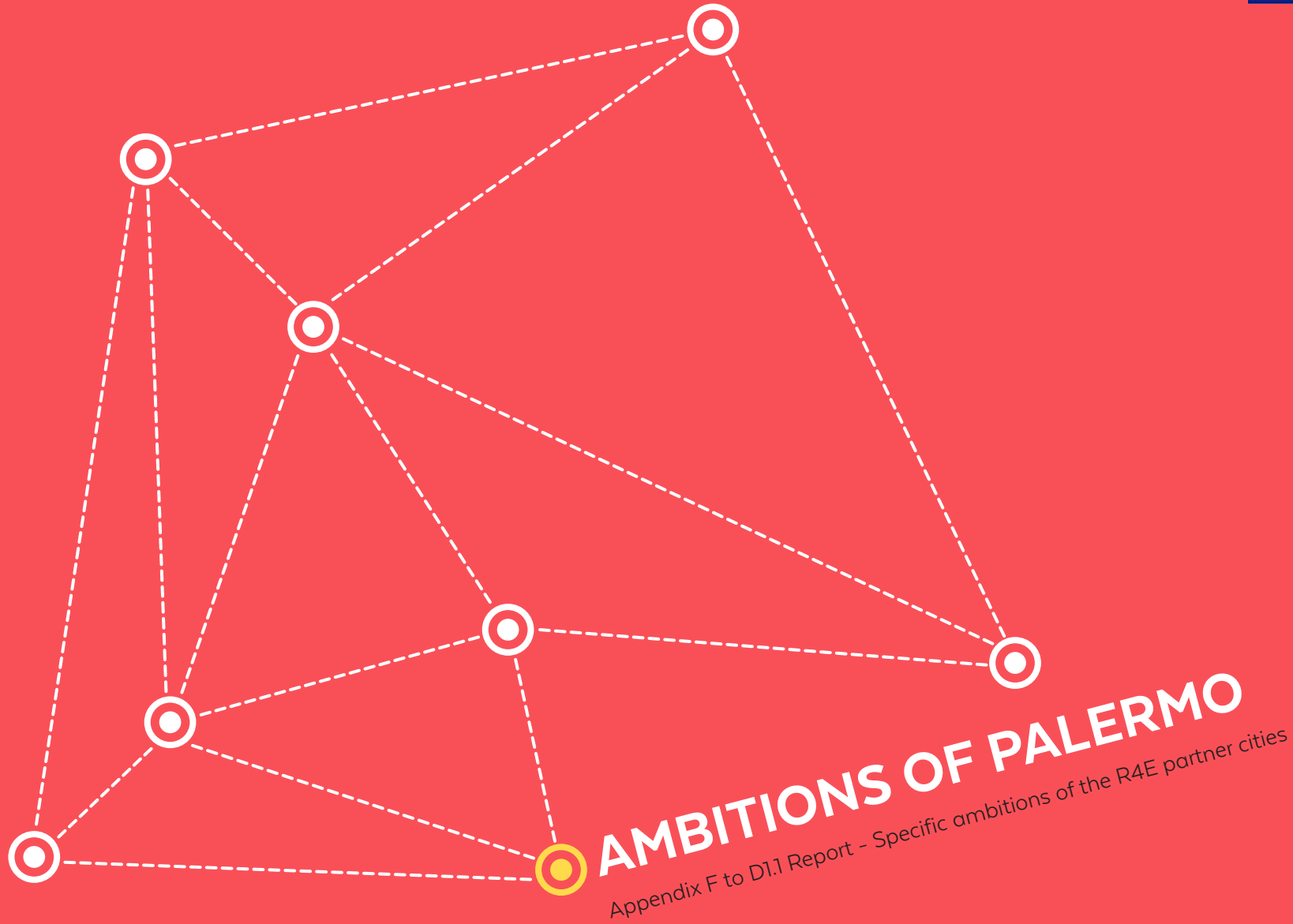
This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



ROADMAPS  
FOR  
ENERGY®



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



15 December 2015

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



**ROADMAPS  
FOR  
ENERGY®**

This appendix is part of the D1.1 Report - Specific ambitions of the R4E partner cities and contains all results of the ambition setting activities held in the city of Palermo.



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 does not necessarily reflect the official European Commission's view on the subject.

**Versions of this report:**

28 July 2015	Concept for internal check in the city (limited distribution)
14 October 2015	Concept for sharing with R4E partners (limited distribution)
6 November 2015	Version for final check
15 December 2015	Final version for public distribution



# Contents Appendix F

- Introduction to Palermo
- Today's reality: smart buildings
- Today's reality: Smart mobility
- Results ambition workshop policy
- Results ambition workshop strategy
- Results ambition workshop stakeholders
- Results ambition workshop stakeholders
- Contributions

- F 5
- F 14
- F 18
- F 20
- F 22
- F 24
- F 26
- F 29







# Introduction to Palermo

## Introduction to the city

Palermo is a city of the Insular Italy, the capital of both the autonomous region of Sicily and the Province of Palermo. The city is well-known for its history, culture, architecture and gastronomy, playing an important role throughout much of its existence. It was founded as a port town by the Phoenicians around 734 BC

Palermo is located in the north-west of the island of Sicily, right by the Gulf of Palermo in the Tyrrhenian Sea. Palermo is the fifth-largest Italian city by population after Rome, Milan, Naples and Turin.

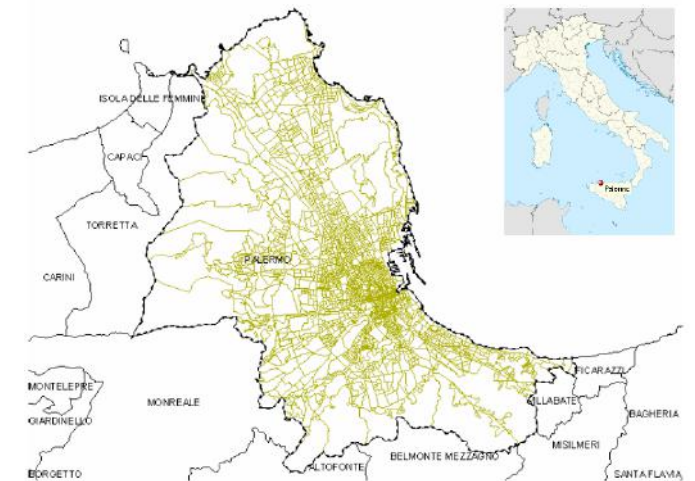
Many monuments, churches and palaces in Palermo have been recognised for years as national monuments and in 2015 the Arab-Norman buildings were included in the UNESCO's

'World Heritage List'.

For cultural, artistic and economic reasons Palermo is the main city of the Euro-Mediterranean region, and today is one of the top tourist destinations in Southern Italy also for Mediterranean cruise ships.

The city is the main centre of the Sicilian Region, it has the oldest parliament in the world, and it is also the home of the University of Palermo and of the regional archdiocese.

It was established as city-port by the Phoenicians around 734 BC. It has always been a trading and cultural cooperation centre between West and East. It has been conquered by several populations at different times. Its long history has given rise to a remarkable and unique artistic and architectural heritage.





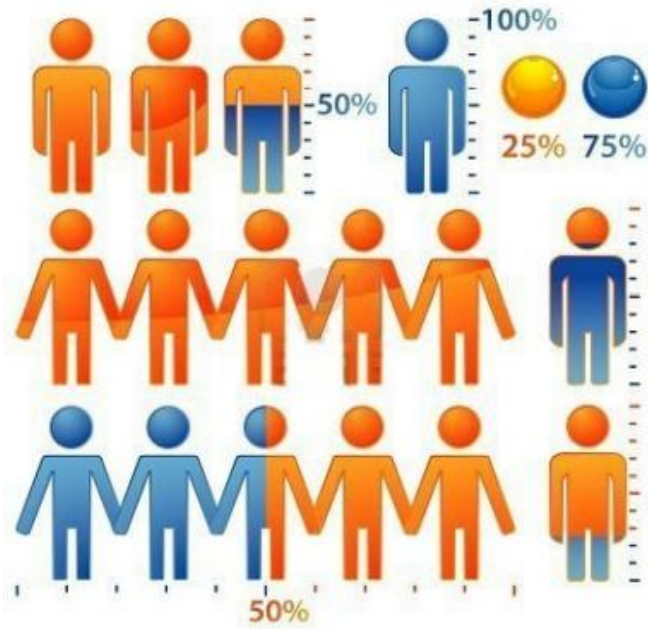


## Selection of focus areas

The analyses performed on the greenhouse gases emissions of the city of Palermo show that the sectoral distribution of consumptions is characterized by a clear predominance of the building sector (both housing and service industries) and transport one.

The main objectives of the 'Sustainable Energy Action Plan (SEAP) are, therefore, the reduction of CO<sub>2</sub> emissions in these sectors, by reducing the energy consumption of buildings and improving the efficiency of public and private transport.

As a consequence, it was decided to focus the activities of the local project R4E on the issues of "Smart Buildings" and "Smart Mobility".



**Demographical aspects**

Size in km<sup>2</sup> : 158,88 km<sup>2</sup>

Number of inhabitants: 678.492 ab

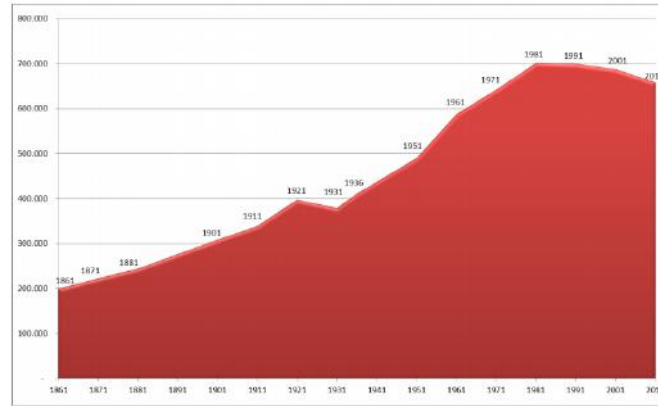
**Population trends**

Palermo, like many cities of southern Italy, is characterized by a significant activity rate (active population to resident one ratio) of 37.6%, is far below national average, which is 42.2%.

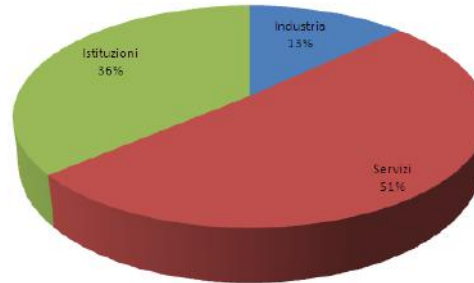
2.2% of the employed people are distributed in agriculture, fishing and breeding sectors, 20.8% are in the industrial sector while the remaining 77.0% are in services, where an important role is played by tourism services.

This distribution is very different from the national average, which is characterized by a lesser incidence in the service sector (55.7%) and, on the contrary, by a much larger one in the first two sectors (agriculture and fishing: 7.6%; industry: 35.6%).

As for education, 33.3% of the population has a good level of education (university degree and diploma), 53.9% have a middle school or elementary certificate, while 12.8% have no qualification, however, only 2.1% are illiterate.



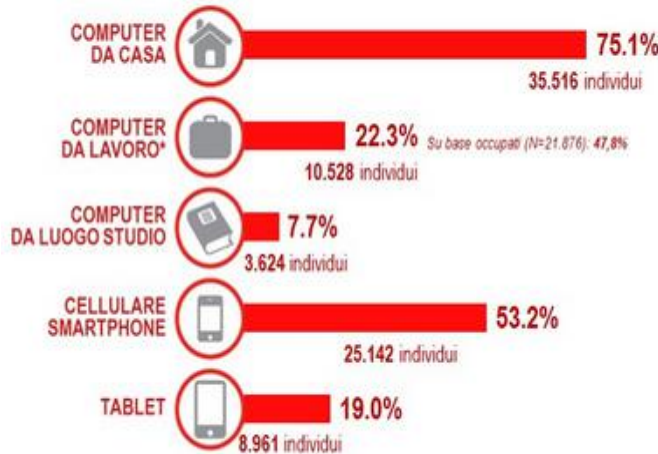
Resident population in Palermo 1861 – 2011



Number of employees for the productive sector

**Gli italiani e l'accesso a internet**

Base: totale individui 11-74 anni – Valori % e Stime in '000



Audiweb Trends - Giugno 2014

In Italy, 39.7 million of citizens, aged 11 and 74, can access the Internet from fixed locations (home, office, or a place of study) or from the mobile, 83, 9% of the population in the age group concerned. Studies show that:

35.5 million of individuals, aged 11 and 74 years, accounting for 75.1% of cases, access the Internet from home via computer;

25 million people say they access the Internet from a mobile phone / smart-phone (53.2% of the Italians concerned), an increase of 13.7% in the last half of 2014;

9 million people say they access the Internet from the tablet, with an annual growth of 88% (June 2014 VS June 2013).

The internet access has similar values in all segments of the Italian population, confirming the high spreading rate of online in Italy. Some segments of the population, also have concentration ratios almost equal to 100%:

over 96% of young people aged between 11 and 34 years.-  
98.5% of graduates,

95.8% of high school graduates,

93.8% of workers and, more specifically, 99.6% of managers, executives and academics, 98.2% of entrepreneurs and self-employed and employees, and 98.4% of teachers.

There are very high rates among students: 100% of university students and 97.8% of middle and high schools students.



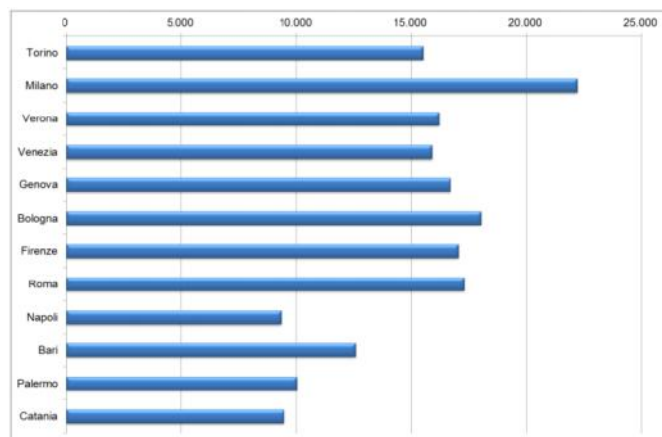


The latest report of the European Commission, “Quality of life in European cities - Italy” of 2014, contains the results of the survey on the perception of quality of life in 79 European cities. This report reveals a general dissatisfaction expressed by the citizens of the cities of southern Italy in relation to the chances of finding employment, to public transport services and garbage collection, as well as the wish that the local administration will improve all the services for the use of urban areas, sports facilities and, in general, services to citizens. However, according to the people living in Palermo who were interviewed, there are some positive exceptions, which would consist in the possibility of finding a cheap accommodation and in the rate of integration of foreigners in the city. These aspects place Palermo in the top half of the rankings on European cities.

#### Economical aspects

The per capita income of the Sicilians is about 10,000 euro per inhabitant, but if we consider only the number of people who register their income to the State, the per capita income amounts to about EUR 25,600.00 per registrant.

The data on per capita income of the inhabitants of the city of Palermo, capital of Sicily Region, are in line with national ones, but higher for about 20% if compared to the regional average.



Per capita income in Italy

The actions proposed in the PUT (Urban Traffic Plan), in general, are linked to improving pedestrian mobility, the establishment of Limited Traffic Zones (ZTL), the introduction of measures to improve the mobility of collective public transport, the reorganization of the movement and parking of private motor vehicles, the improvement of road safety, the introduction of measures to reduce traffic, the use of ITS technologies, strengthening services of urban supervision and the activities of Urban Mobility Management.

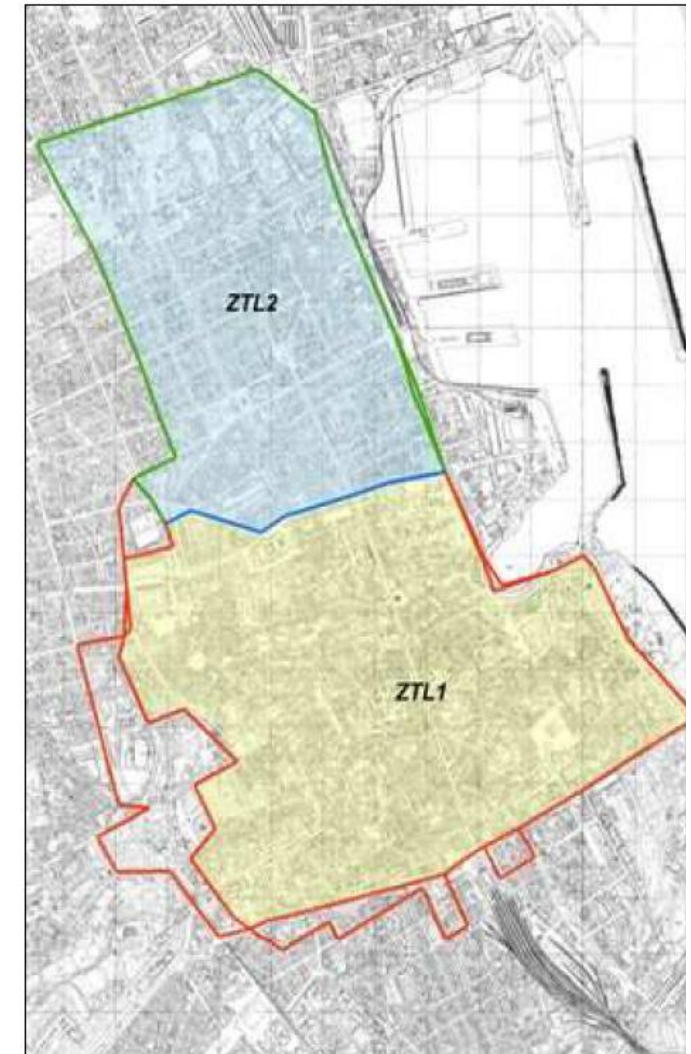
In particular, the Plan of Palermo involves some important measures:

- The creation of a network of the streets and pedestrian areas, especially in the Old Town, which is the most important urban area from the historical, urban, and monumental point of view. The extension of the pedestrian area will increase from 41 hectares to more than 83 hectares; if we add to these ones the areas affected by the presence of historical markets, the surface of the pedestrian areas of the Old Town will reach about 120 hectares.
- The establishment of Limited Traffic Zone, where only public transport and private transport to zero or low emissions will be allowed to pass;
- Improving public transport through the establishment of tram networks, metro networks, cycle paths, the doubling of the railway line linking Palermo to the villages nearby;



Traffic in the city centre

- The replacement of old buses with low-emission vehicles (natural gas and diesel € 6, hybrids);
- Strengthening the car sharing service and promoting carpooling and shared taxis.



**Environmental aspects**

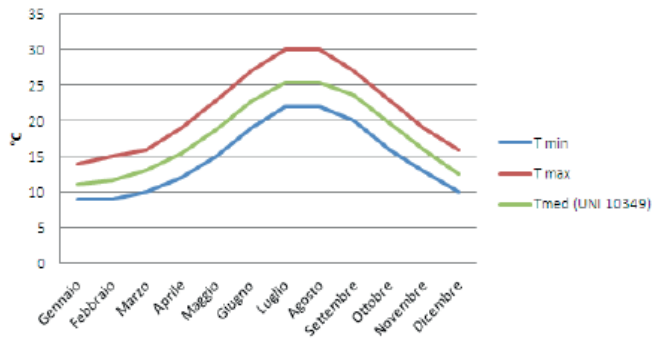
The city of Palermo is characterized by a Mediterranean climate, with low temperatures slightly below 10 ° C and maximum temperatures that can exceed 30 ° C (in August 1999 it was recorded a maximum temperature of 45.2 ° C). Average annual rainfall amounted to 855 mm, an average spread of 81 days of rain, with minimum in summer, peaking in the winter and secondary maximum in the fall for accumulations. The annual average of relative humidity recorded the value of 62.3% with a minimum of 57% in July and maximum of 67% in December and January; on average, there are zero days of fog a year.

The city of Palermo is located in a region with very favourable sunlight conditions throughout the year and, consequently, with a high potential for the exploitation of solar energy for the production of thermal and electric energy.

The following table shows the mean values of solar radiation for different exposed and oriented surfaces; values greater than 1900 kWh / M2 year can be reached.

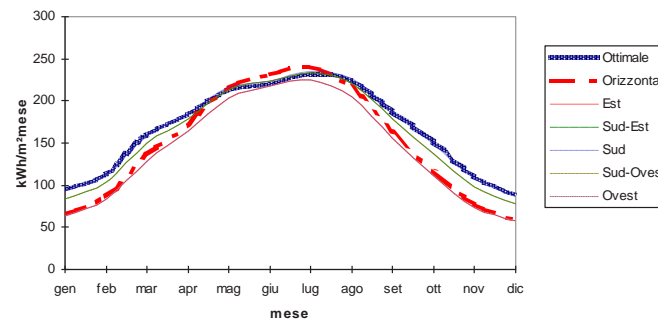


**Temperature medie**  
Palermo



Monthly average temperature in Palermo

**Radiazione media mensile su superfici inclinate a 25°**



Monthly average solar radiation on inclined surfaces in Palermo

The beach of Palermo (Mondello)

Horizontal	Optimal	Eastward oriented	South - eastward oriented	Southward oriented	South-westward oriented	Westward oriented	25° east incl.	25° south-east incl.	25° south incl.	25° south-west incl.	25° west incl.
kWh/m² year	kWh/m² year	kWh/m² year	kWh/m² year	kWh/m² year	kWh/m² year	kWh/m² year	kWh/m² year	kWh/m² year	kWh/m² year	kWh/m² year	kWh/m² year
1784	1985	975	1191	1230	1191	975	1689	1898	1980	1898	1689



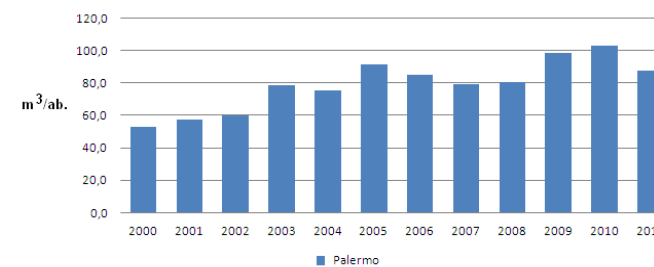
The city of Palermo approved the Sustainable Energy Action Plan in 2015, calculating CO<sub>2</sub> emissions [1] in the city, for the reference year 1990 (IBE year), equal to 1,864,142 tons (2.7 tons CO<sub>2</sub> per capita).

In order to meet the target for 2020 (20% less emissions than in 1990), the Administration has committed to reducing the emissions by an amount 400,000 tons of CO<sub>2</sub>/ year, ie by 21.5% compared to the year 1990.

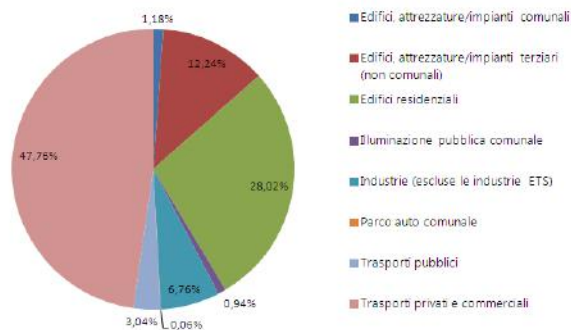
The data provided by the SEAP on final energy consumption show that the sectors having the greatest impact are transport (60% for Palermo and about 45% for Sicily), followed by the civil sector (34,9,2% for Palermo 23.8% for Sicily), while agriculture and fishing account for only 0.4% of Palermo consumptions and 3.9% of the region ones. It should be noticed, even today, a predominant consumption of petroleum products and energy, although in the last years the share of natural gas consumptions has increased substantially, together with the production of electricity from renewable sources (photovoltaic and wind systems).

As for the residential sector, there is a large gap between the southern cities of Italy, which are located in coast areas with a mild climate, such as Palermo, and the centre-northern cities. By way of example, it should be noticed how the average per capita consumption of natural gas for domestic use and for heating concerning Palermo is about 15% (90 ÷ 100 m<sup>3</sup> / inh) of that one of Turin (700 m<sup>3</sup> / ab approximately). As for the consumption of electricity, however, there are no substantial differences among per capita consumption of Italian cities, which are about 1,200 kWh / inhabitant.

Consumo di gas metano pro capite per uso domestico e riscaldamento



Emissioni di CO<sub>2</sub>



Percentage breakdown of CO<sub>2</sub> emissions between different sectors, except industry

# MEDCLIMA

## GUIDE FOR LOCAL CLIMATE PROTECTION

Easy Steps for Reducing CO<sub>2</sub> Emissions



## Historical / cultural aspects

Today Palermo is working for defining its role as a city of art and a place of culture, valuing the past and the historical evidence, on one hand, but also looking to the future, turning to new developments in contemporary art and multimedia research on cultural heritage.

The policies of the Administration aim to define stable structures and organizations for cultural heritage management in the belief that, we can build the future development of the city, including the economic one, over them.

It 'a long path, whose action is expected to continue over time, placing short, medium and long range goals. A path that is identified with the activities of museums, libraries, archives, foundations that have increasingly taken a leading role in the cultural, social and economic life of the city.



## Way of working

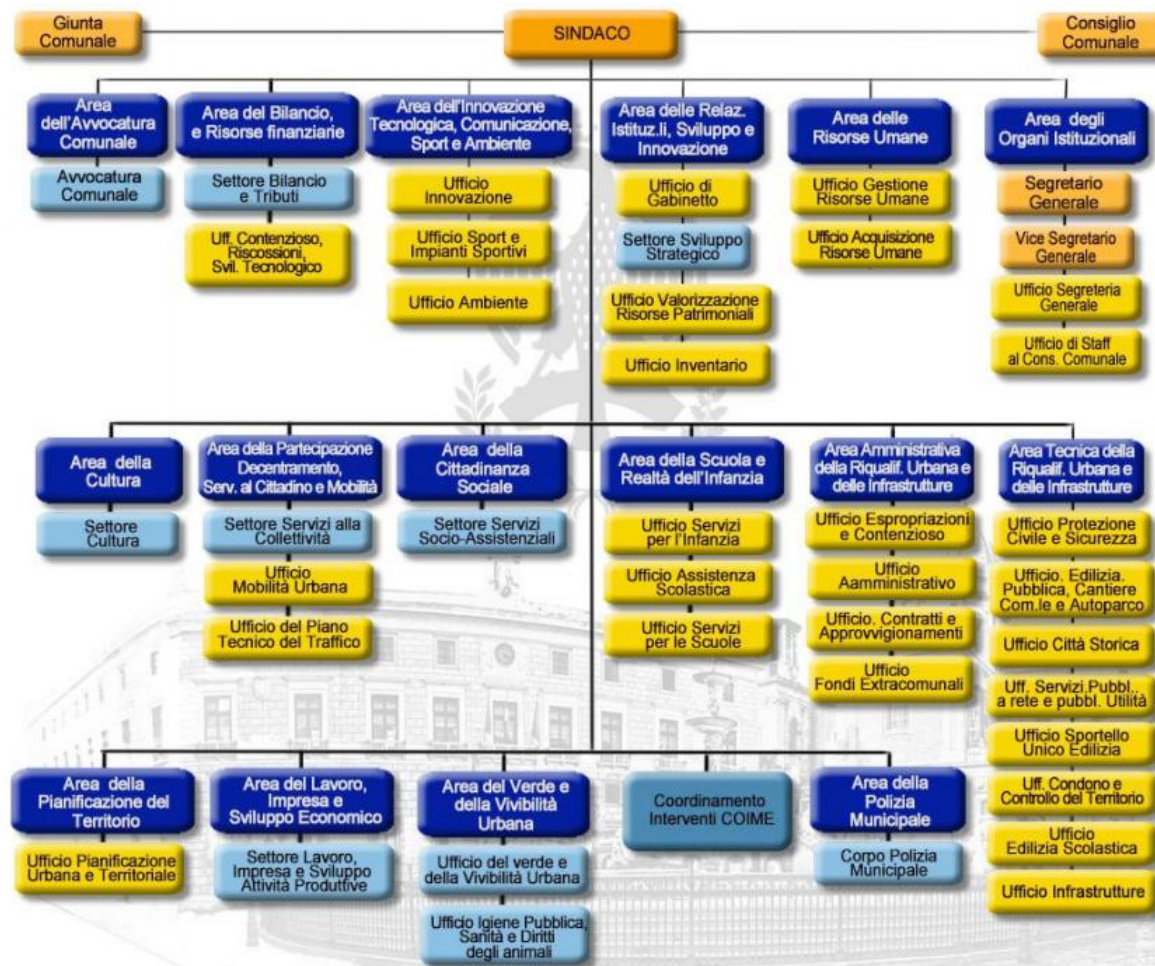
The organizational structure of the Administration of Palermo is divided into several macro-structural levels defined Areas, Sectors, Autonomous Offices, Services, Project Unit, Staff Unit. In order to ensure more streamlined and efficient administration, within the Services and Autonomous Offices, there are micro structures defined as organizational units of different levels.

At the end of 2014, the employees of the sector amounted to 9,838 units, n. 75 of which were executives; n. 6940 of the employees had Local Authorities sector contracts (of which n. 666 had temporary contracts); n. 916 had Construction Companies contracts, n. 1907 belonged to "precariat". Over 51% of all employees in the sector are men.

In order to manage the necessary resources to provide services to the community of citizens, like all organizations, the Municipality has its own budget. This one has a part including any business and revenue, and a part concerning the liabilities and expenses. To give an idea of the importance of the municipal budget of the city of Palermo, just think that the total amount of funds for the year 2013 amounted to over one billion and one hundred million Euros. The Municipality of Palermo, moreover, reached the budgetary objectives with particular attention to the respect of the "Stability Pact".

The Municipality manages public services through some subsidiaries such as:

- AMAP S.p.A. manages the integrated water service in the city of Palermo. It is responsible for the infrastructures for the supply, delivery and conversion of seawater into drinkable water, which provide, mainly, Palermo and the various coast municipalities of all the Province;
- AMAT Palermo S.p.A. is responsible for the organization and management of public transport systems, including the management of fleets (car-sharing, car pooling, shared taxis, global service of vehicles made by any means), for the installation and maintenance of road signs, for the



management of public car parks and tariffed parking areas; it also controls the parking along the urban road network, the removal of illegally parked vehicles and of those ones for reasons of public order and safety;

- RAP S.p.A. is responsible for the waste management service, the environmental hygiene service and the road maintenance;
- AMG S.p.A. is in charge of the practice and management of the activities in the fields of research, production, supply, transportation, processing, distribution, sale, use and recovery of energy in any form, promoting rational use and enhancing renewable energy sources;

- SISPI S.p.A. is responsible for the management of all systems and IT services of the Municipal Administration.

Since 2002, the Administration has enabled participatory processes with stakeholders through the Agenda 21 and the Sustainable Energy Action Plan, in order to develop environmental sustainability policies.



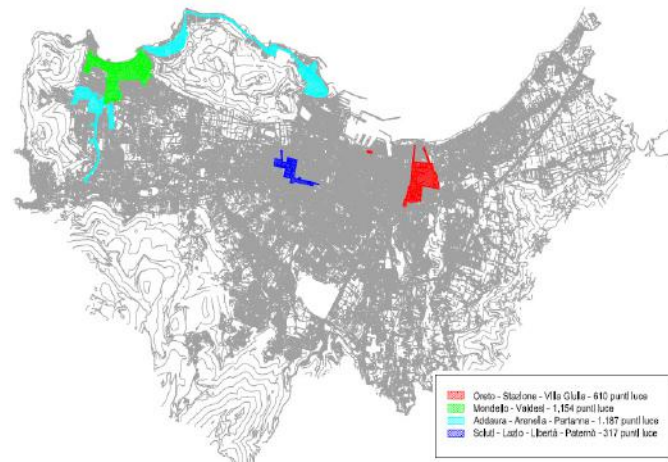


### Actions to improve energy efficiency in public lighting systems

In the Municipality of Palermo there are 47,022 light centres for public lighting (updated to the 31st of December 2012). The street lighting system consists of 25,388 light points powered in series (medium and low voltage) and 21,634 light points powered in shunt. The light centres are powered by an electrical network that extends for about 1,200 kilometres, with an electric rated output installed of 9.0 MW. The Municipal Administration has approved a program of replacement of old plants, which were built between “the 1960s and the 1970s”, with others, characterized by cutting-edge technology, which will produce a higher quality light, granting a saving of energy consumption and a reduction of polluting CO2 emission of about 60% compared to the original values. The project will cost 26,525,000.00.

### P.O. N. METROPOLITAN CITIES 2014/2020

National Operational Programme Metropolitan Cities 2014/2020: Palermo is expected to receive from 80 million to 100 million euro to be used for the redevelopment of the Southern Coast, actions to improve sustainable mobility, the reduction of energy consumption and pollutant emissions, for the social inclusion of the most fragile segments of the population and for disadvantaged areas and neighbourhoods.



### Promotion of car sharing and bike sharing

The Municipal Administration, through its public transport company, and also through private operators, will start policies to increase sustainable transfers of citizens and tourists, enhancing the existing car sharing service and activating a new bike sharing service. As regards the car-sharing, the action will involve the increase of the parking lots from 45 to more than 80, of methane cars from 36 to 92 and the introduction of over 20 new electric vehicles. At the beginning, the car sharing service will be integrated with the bike sharing, that will be composed of more than 23 cycle-parking places, some of which are equipped with photovoltaic shelters, and more than 400 bicycles, both traditional and with pedal assistance.

### Construction of the underground rail circuit

It's already under completion the construction of the circular route, about 6.5 km long, almost entirely in the underground, which will encompass the main urban attraction poles, networked by a system of “metro-railway”. The plan provides, in two distinct phases, the “closing” of the circuit with the realization of the missing section (about 3 km: 1.7 km with the first section from Giachery to Politeama; 1.3 km with the second functional part from Politeama to Notarbartolo) and the creation of four new stops.



### Realization of the tram system

The new tram system in the city of Palermo is under construction. The tramlines are double track to connect some peripheral areas of the city with the central ones. The tramway will be reserved along all paths, except the intersections that will be managed by traffic lights with the traffic light subservience to the tram. The stops, in total about 40, will be 35 m long in order to allow the insertion of a complete vehicle to its maximum intended composition. The service will be provided by 17 bidirectional convoys, with an availability of 250 places, including 62 seats. The total route of the tram system will extend for about 15.2 Km.

### The doubling of the railway bypass Palermo-Punta Raisi

The doubling of the railway bypass Palermo-Punta Raisi is already under construction. It realizes a high-capacity connection between the airport of Punta Raisi, Palermo Central Station and the Brancaccio area, along a highly urbanized corridor, about 26 Km long. Through 18 stops, the suburbs are welded together, extending the city to the whole urban area. The construction of new stops, the burial of other ones, the elimination of level crossings through the burying of the future double-track line, will allow to create a metropolitan area without interference with the surrounding roads and urban traffic.



# Today's reality: smart buildings



## Smart buildings in Palermo 2015

The building and transport sectors can be considered to have the main responsibility for energy consumptions, and therefore also for greenhouse gas emissions in the city of Palermo.

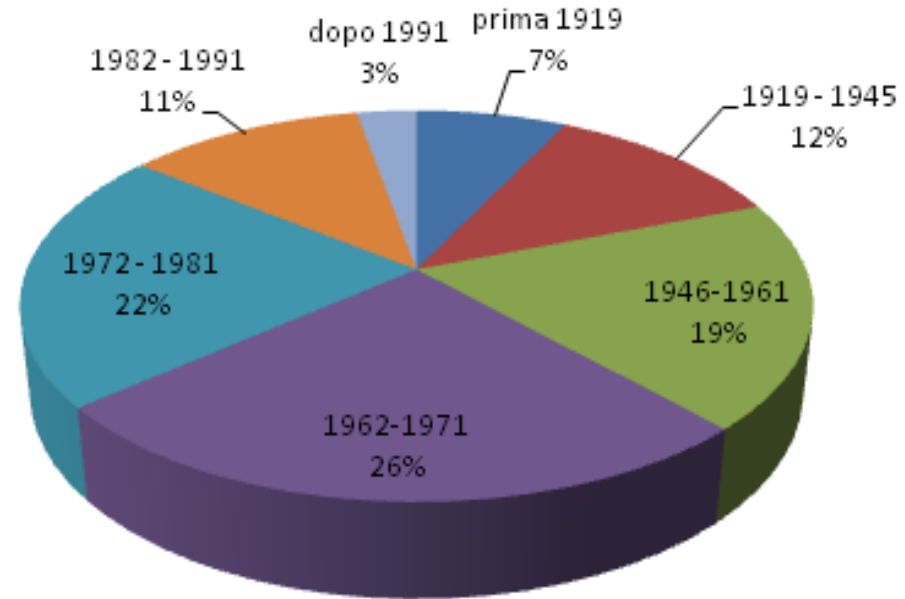
The building volume in the municipal area is about 201.5 million m<sup>3</sup>, with an average density of 12,588 m<sup>3</sup>/ha. Approximately 134 million m<sup>3</sup> (67% of the total) are intended for housing, 50 million m<sup>3</sup> (25%) for the services industry, and 16 million m<sup>3</sup> (8%) for other industrial activities.

Over 47% of the total volume is within the Old Town and the urban area built up in the early 1900s. As regards the distribution of assets in different age classes, only 19% was built before 1945, 19% was built between the post-war period and the 1960s, and the remaining 59% of the total buildings were built between 1961 and 1991. The year 1991 is important because in Italy because of new rules on energy consumption in buildings that apply since then, and these have had a positive effect on the building sector. However, it was only in 2005 that the European directive on energy certification of buildings was implemented in Italian law.

Moreover, the data contained in the Register of Energy Certifications for the Sicilian Region shows that over 85% of housing units belongs to the classes G and F, which are characterised by high energy consumption.

Dealing with the theme of 'Smart Buildings' is therefore vital for the reduction of greenhouse gas emissions in the city of Palermo.

Comune di Palermo  
Edifici per epoca di costruzione



Buildings by period of construction in Palermo

Classe	2009	2010	2011 <sup>129</sup>	somma	Percentuale sul totale
A+	4	1	13	18	0,11%
A	2	11	47	60	0,37%
B	17	36	222	275	1,69%
C	68	154	450	672	4,14%
D	56	26	605	687	4,23%
E	28	34	524	586	3,61%
F	19	57	807	883	5,44%
G <sup>130</sup>	408	2.169	10.474	13.051	80,40%
<b>Totale</b>	<b>602</b>	<b>2.488</b>	<b>13.142</b>	<b>16.232</b>	<b>100,00%</b>

Energy performance of buildings in Sicily



Palermo will use a tool web-based for managing and monitoring energy consumptions and CO2 emissions of public buildings.

ID	FOTO	MAPPA	INDIRIZZO UNITÀ
1822			PALERMO (PA) - Italia Via Bramante n.6 Asilo Nido Tornatore PROPRIETÀ: Pubbico Reg. da Marco Sceflo
1821			PALERMO (PA) - Italia Via Eugenio L'emiro n.152 Asilo Nido Topolino PROPRIETÀ: Pubbico Reg. da Marco Sceflo
1820			PALERMO (PA) - Italia Via Leonardo Da Vinci n.36 Asilo Nido Tom & Jerry PROPRIETÀ: Pubbico Reg. da Marco Sceflo
1819			PALERMO (PA) - Italia Via Barisano De Trani n.5 Asilo Nido Peter Pan PROPRIETÀ: Pubbico Reg. da Marco Sceflo
1818			PALERMO (PA) - Italia Via Guido Rossa n.35 Asilo Nido Pedrono PROPRIETÀ: Pubbico Reg. da Marco Sceflo
1817			PALERMO (PA) - Italia Via Certigiani n.43 Asilo Nido Ferraria Rosa PROPRIETÀ: Pubbico Reg. da Marco Sceflo
1815			PALERMO (PA) - Italia Via Pegano n.29 Asilo Nido "Moriello Franciosa" PROPRIETÀ: Pubbico Reg. da Marco Sceflo
1814			PALERMO (PA) - Italia Via S. Saverio n.45 Asilo Nido Maschi Inghil PROPRIETÀ: Pubbico Reg. da Marco Sceflo
1813			PALERMO (PA) - Italia Via Salvatore Petriga n.4 Asilo Nido Manco PROPRIETÀ: Pubbico Reg. da Marco Sceflo

The Energy Cadastre will contain the catalogue of administrative, geometric, thermo-physical and energetic data about municipal buildings and street lighting.

Then the Energy Manager will be able to determine the foreseen electrical and thermal energy consumptions .

**ATTESTATO DI PRESTAZIONE ENERGETICA DEGLI EDIFICI**  
CODICE IDENTIFICATIVO: VALIDO FINO AL 31/12/2025 **APE**

**DATI GENERALI**

**Destinazione d'uso**

Residenziale  
 Non residenziale

Classificazione D.P.R. 412/93:  
E.1(1) esclusi collegi, case di pens. convenite caserme

**Oggetto dell'attestato**

Intero Edificio  
 Unità immobiliare  
 Gruppo di unità immobiliari

Numero di unità immobiliari di cui è composto l'edificio: 1

Nuova costruzione  
 Passaggio di proprietà  
 Locazione  
 Ristrutturazione importante  
 Riquadrificazione energetica  
 Altro:

**Dati identificativi**

Regione: Sicilia  
Comune: Palermo  
Indirizzo: Via F. Crispi 72  
Piano:  
Interno:  
Coordinate GIS: 0,000,0,000

Zona climatica: B  
Anno di costruzione: 1000  
Superficie utile riscaldata (m²): 279,20  
Superficie utile raffrescata (m²):  
Volume lordo riscaldato (m³): 1123,30  
Volume lordo raffrescato (m³):

Comune catastale	Palermo	Sezione		Foglio	19	Particella	24
Subaltemi	2						

**Servizi energetici presenti**

Climatizzazione invernale  Ventilazione meccanica  Illuminazione  
 Climatizzazione estiva  Prod. acqua calda sanitaria  Trasporto di persone o cose

**PRESTAZIONE ENERGETICA GLOBALE E DEL FABBRICATO**

La sezione riporta l'indice di prestazione energetica globale non rinnovabile in funzione del fabbricato e dei servizi energetici presenti, nonché la prestazione energetica del fabbricato, al netto del rendimento degli impianti presenti.

**Prestazione energetica del fabbricato**

INVERNO	ESTATE

**Prestazione energetica globale**

+ Più efficiente

A+, A, B, C, D, E, F, G

D

EPgI,nren

116,8

kWh/m² anno

— Meno efficiente

**Riferimenti**

Gli immobili simili avrebbero in media la seguente classificazione:

Se nuovi: A+

Se esistenti: D

**ARCHIVIO APPARECCHI LUMINOSI**

Torna all'elenco

Modello:

Costruttore: **OSRAM**

Tipo apparecchio: Plafondiera 4 x 18 W

Tipo lampada: Tubi neon

Numero lampade: 4

Flusso luminoso: 2900 lm

Distanza elettrica lampada: 18 m

Potenza elettrica totale apparecchio: 80 W

Numero apparecchi dello stesso tipo: 313

Numero ore accensione all'anno: 4000 h

Nota:

Salva le modifiche

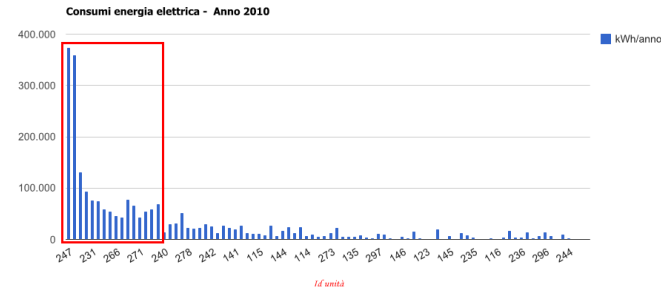
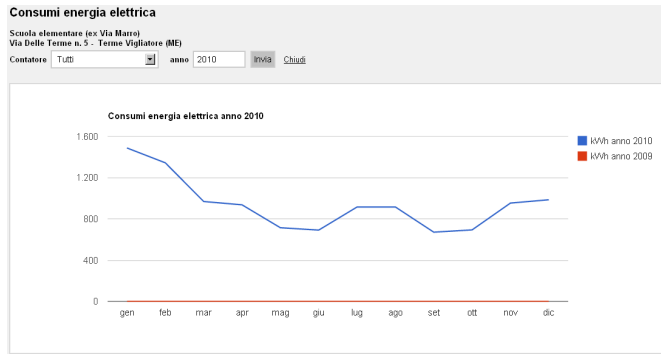
**Altri generatori**

Anno:  Visualizza

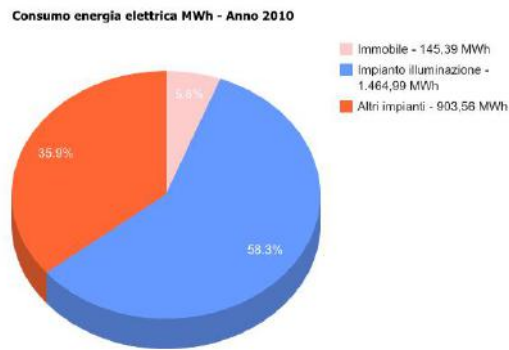
**NUOVO GENERATORE**

ID	INTERNO FUNZIONAMENTO	IRIG	GENERATORI INSTALLATI
	7	1000	<p>Modello caldaia: Ferrol - Super Flex 9K-9K</p> <p>Combustibile: Elettricità</p> <p>Tipo: Pompa di calore</p> <p>Tipo uso: Solo riscaldamento</p> <p>Locale installazione: Interno</p> <p>Matricola: 02222</p> <p>Anno costruzione: 2013</p> <p>Data installazione: 01/1/2021 3</p>
	3	2000	<p>Modello caldaia: Rebur - G04P-AR</p> <p>Combustibile: Gas naturale</p> <p>Tipo:</p> <p>Tipo uso: Riscaldamento + acqua calda sanitaria</p> <p>Locale installazione: Locale tecnico</p> <p>Matricola: 0101 01 0</p> <p>Anno costruzione: 2006</p> <p>Data installazione:</p>

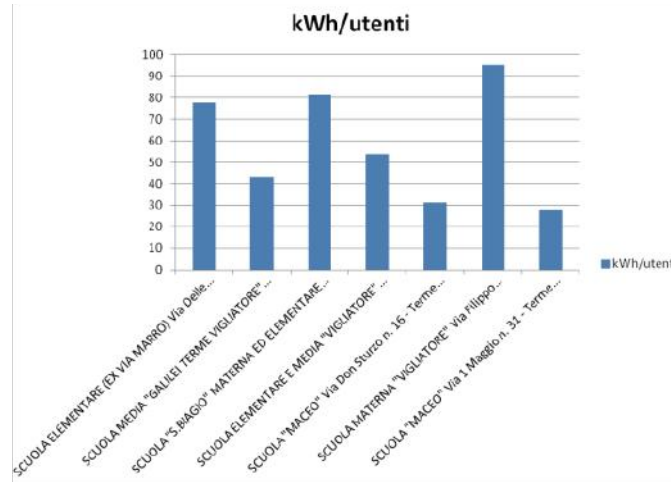
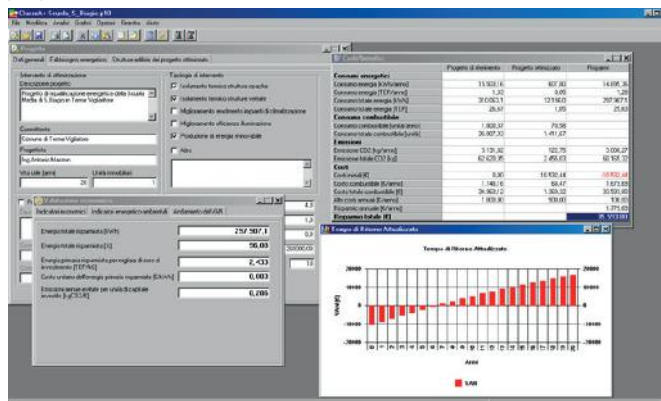
**PRESTAZIONE ENERGETICA DEGLI IMPIANTI E CONSUMI STIMATI**



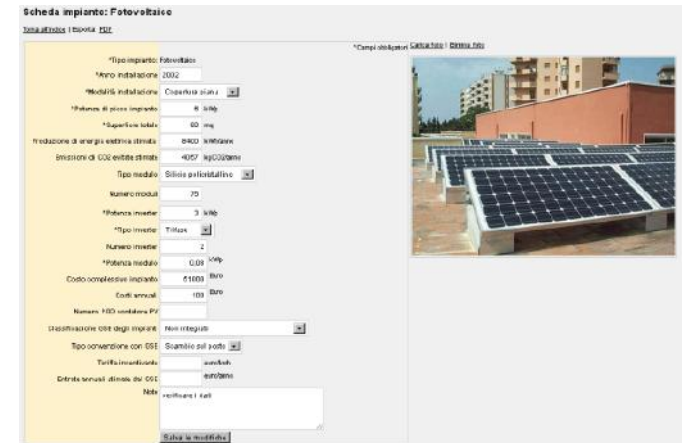
Annual consumption of electricity of individual users, identified by its own POD number. It is possible to identify the greater electrical energy consumption.



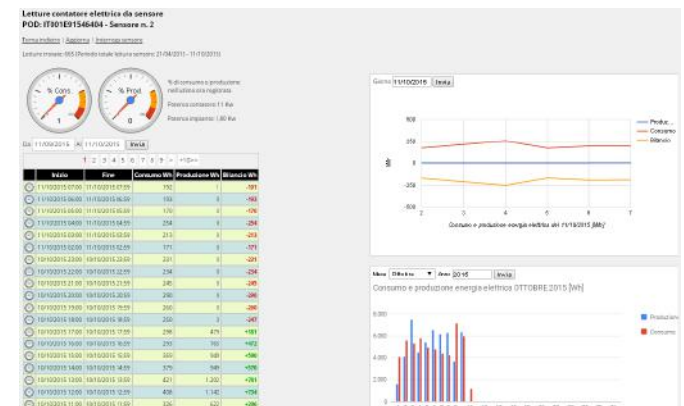
Other tools are used to calculate the NPV (Net Present Value) and Payback Time of the investment for energy saving projects.



The graph shows that three schools have a specific consumption kWh per user (80-95 kWh / user) approximately double that of other (30-50 kWh / user) and therefore it would be appropriate to assess the possible energy saving measures to be taken.



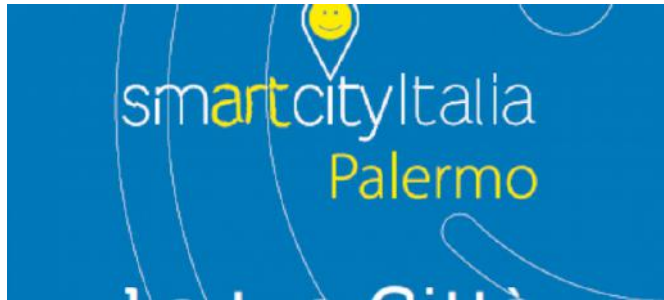
Geometric and electrical data of the photovoltaic system.



Web-based tool for monitoring energy consumption and CO2 emissions of public buildings and photovoltaic energy production.

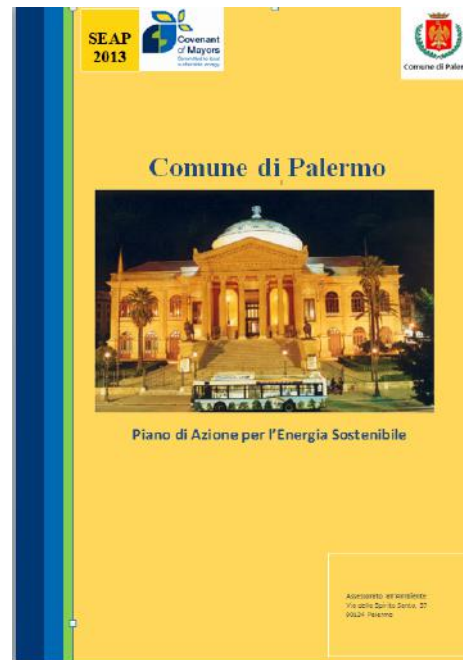
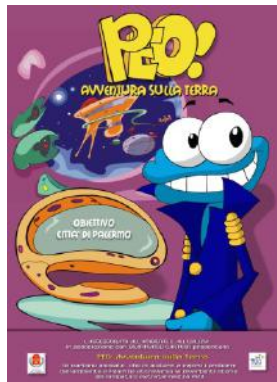
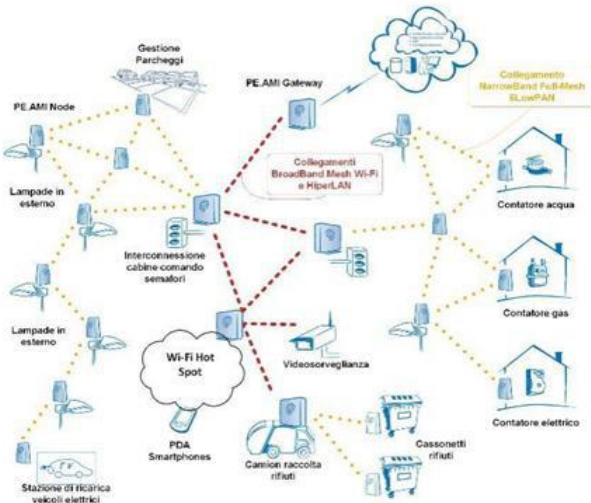
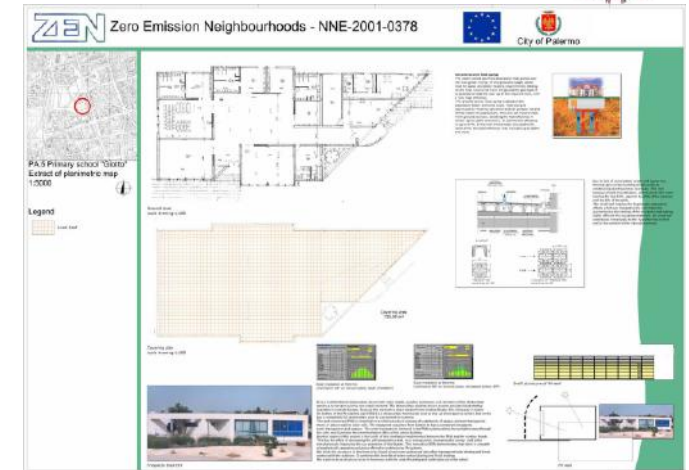
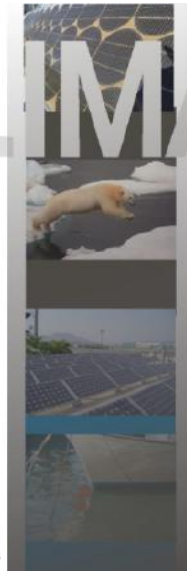


Projects, events, dissemination



# MEDCLIMA

GUIDE FOR LOCAL CLIMATE PROTECTION  
Easy Steps for Reducing CO<sub>2</sub> Emissions



# Today's reality: Smart mobility



## Smart mobility in Palermo 2015

In 2007 the Municipality of Palermo drew up the Strategic Plan for Sustainable Mobility (PSMS) followed in 2010 by the Urban Traffic Plan (PUT). The overall aims were to improve traffic conditions and road safety, reduce air and noise pollution and achieve savings in energy consumption and a reduction of CO<sub>2</sub> emissions by the transport sector.

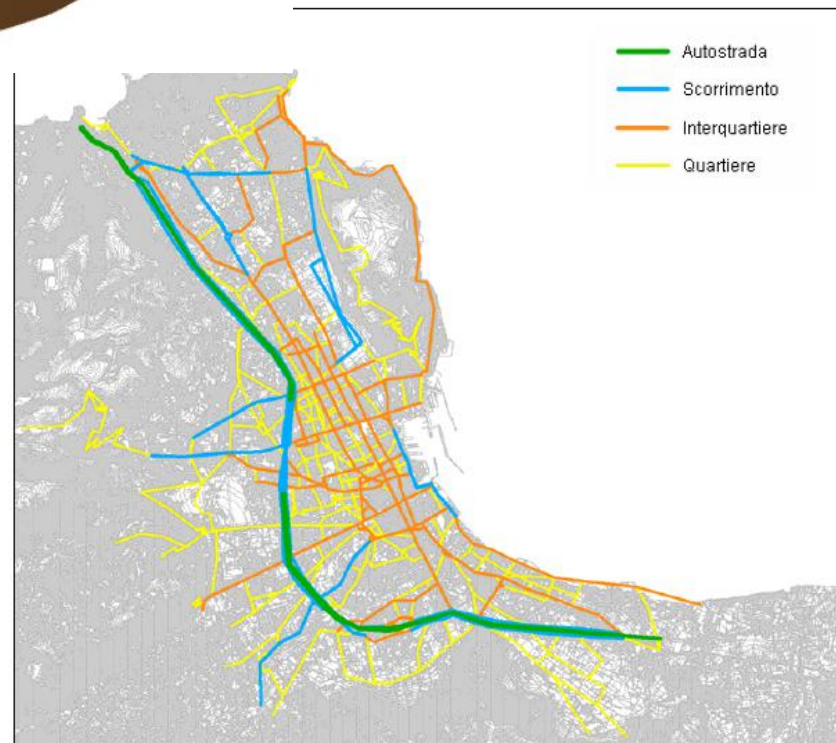
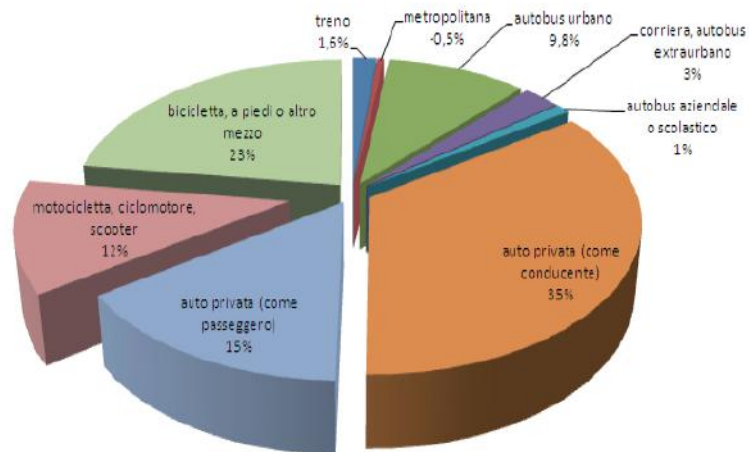
Analysing transfers data for both the Municipality of Palermo and the entire urban area, it is clear that the most commonly used means of transport is the private car, which is used for about 35% of journeys. A significant percentage of travellers are (regular) passengers in private cars (15% of the total). As a result, almost half of the cars travel with 1 or 2 persons on board. The percentage of the use of public transport is low (it does not exceed 15%), but it can positively be observed that travel by bike and on foot represent almost a quarter of the overall commuter mobility.

Reasons for travelling are divided more or less equally between study and work.

Peak time is between 7.15 and 8.15.

The time spent travelling, in nearly half of cases, does not exceed 15 minutes.

Mezzo utilizzato nel Comune di Palermo





**-70%**  
**PER GLI STUDENTI UNIVERSITARI**



Guarda le offerte

CATEGORIA	FRUITORI	Sconto abbonamento
Annuale	Studenti (tessera nominale non cedibile)	- 70%

CATEGORIA	MODELLO	399 e 200 Km inclusi	costo km oltre 200 Km
CITY	Up!, Panda	€ 94,00	0,35
UTILITARIE	Polo	€ 104,00	0,35
MEDIE	500L, Golf, Golf Plus,	€ 120,00	0,35
MONOVOLUME	Touran, Zafira	€ 135,00	0,35



# Results ambition workshop policy

# 2015

## High Lights

The top three aspects in the city the municipality is most proud of:

- The re-qualification of the south coast. Capo Gallo is a reserved area without buildings along the coast and a high number of species. This natural environment is used for the development of an aquarium; a protected area for sea protection, where research, innovation and policy are organised in cooperation.
- The implementation of new public transport and smart mobility systems (cycling, buses, car sharing)
- The Arab/Norman roots of the culture, and the way they serve tourism.
- The protection of green areas in the city (centre), where building is avoid to save green areas.

## Priority in Policy

Which topics have the highest priority in the current policy:

- Urban action plan: social innovation interventions for special people (Roma's, blind people, etcetera), with many projects, covering 90 million euro's in total. E.g. the separate waste collection for households, which will increase to 50% of the population.
- Sustainable action plan: 27 kilometres of coast are preserved for nature and tourism. And the preservation of cultural and historical buildings.
- Metropolitan plan: the development of new infrastructure for mobility, including 3 trains and a subway.

# 2050

## General Ambitions for the City

In 2050 all buildings in Palermo are smart & ecological, including energy and waste management.

In 2050 the coast and nature are preserved and more green areas in the city are realised.

In 2050 cultural and historical tourism will be a showcase for other cities.

### General aspirations

- The natural assets of the area, such as the mild climate all year round: per m<sup>2</sup> the solar power production is 5 kWh, which is 1 barrel of oil per m<sup>2</sup>.
- Value and the care of the buildings history.

### Other aspirations

- The natural assets of the area, such as the mild climate all year round: per m<sup>2</sup> the solar power production is 5 kWh, which is 1 barrel of oil per m<sup>2</sup>.
- Take care of the buildings history.





## Specific ambitions for smart buildings

# 1

In 2050 there is regulation for the use of renewable energy systems in the historical centre.

### Aspirations

- New regulations are being made
- Historical buildings to be developed
- Regulations for use of renewable energy in the historical centre

# 2

In 2050 new buildings are zero-emission compliant.

### Aspirations

- 0-emission for new buildings

# 3

In 2050 services for citizens, such as schools, health care, etceteras, are located along public transport lines to decrease mobility.

### Aspirations

- Schools are re-located along public transport lines
- Less traffic in a lot of area
- Aim: more people to school by public transport
- Decrease traffic
- Relocate public services

## Specific ambitions for smart mobility

# 1

In 2050 smart mobility is an obvious choice: such as bike- and car sharing and walking.

### Aspirations

- Implementation of smart mobility
- Sustainable mobility
- Bike- and car sharing services are developed
- Development of cycle- and walking paths

# 2

In 2050 Palermo provides green areas and restricted areas for mobility to stimulate walking.

### Aspirations

- Pedestrian area
- Restricted mobility area
- Better green area
- Preservation of green in the city centre

# 3

In 2050 a profound public transport system is realised (rail & subway).

### Aspirations

- Develop public transport system
- Railway and subway infrastructure



# Results ambition workshop strategy



## SMART BUILDINGS

# 2015

### High Lights

The top three aspects in the city the strategy department, integral project managers and departmental managers are most proud of:

- There are already many active citizens and cultural activities, it only needs more structure.
- Projects have started to reduce energy consumption and to create 0-emission buildings. E.g. schools using heat-pumps and photovoltaic systems, public lighting is being replaced and new buildings are designed to reduce energy consumption.
- New regulation and funding needed for further reduction of emission in public and private buildings.

## Strategic ambitions for smart buildings

# 1

In 2050 Palermo is a cultural hub: a harbour for cultural exchange where people meet and bring in their own culture.

### Aspirations

- Ambition to become a cultural platform that connects European and Mediterranean culture.
- Build on Manifesta 2018 (held in Palermo) to further develop cultural behaviour.
- Use the position as cultural hub to open up.
- Exploit the position of Sicily in the centre of the Mediterranean.
- Further improve the city that has suffered from the fight against the Mafia, but is now getting better because the much of the power is lost.

# 2

In 2050 Palermo uses culture and art in education to improve the quality of life by stimulating behavioural change.

### Aspirations

- Creating cultural interventions in different areas of the city as start for culture projects that involve all people in Palermo.
- Building on three directions: educational, social and event/exhibition.
- Educational: artists group to work with kids at school, to provide musical education for children (orchestra) in most problematic areas of the city. Educating kids in classical music language, but also to learn all sorts of social aspects, obeying rules, and creating beautiful things together (that is otherwise ignored).
- Develop "laboratories" as pilots for change
- Starting sports facilities for disadvantaged children.
- Integrating three pedagogical thoughts to change the culture of the citizens of Palermo: Paolo Freire (the pedagogy of oppressed people), Ivan Illich (the lack of scholarisation of society - education without rules, not impose by institutions) and Antonio Gramsci (cultural supremacy).

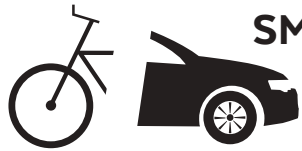
# 3

Before 2050 public buildings in Palermo are sustainable & energy efficient. Both historical, monumental buildings, as well as the buildings from the 80's and 90's are treated in a respectful way with retrofit solutions.

### Aspirations

- Investments in infrastructure and using funds to become a smart and sustainable city.
- Improve the energy efficiency of public and private buildings
- Realise policy and regulations for energy efficiencies in public buildings.
- Create more space for buildings to become smarter.
- Increase the volume of energy efficient private buildings by 20% on shorter term and plan for further reduction to 30-50% in 2016.
- Redefining the development of spaces (museum, church) and connect the buildings in terms of functions for the public.
- Create a better/logical infrastructure for citizens.

# 2050



## SMART MOBILITY

# 2050

# 2015

### High Lights

The top three aspects in the city the strategy department, integral project managers and departmental managers are most proud of:

- The square Piazza San Domenico is now a car-free zone. This used to be packed with cars. At first people objected, but now everyone is proud of the space.
- Sicily and its location in the middle between Europe and the Mediterranean.

### Strategic ambitions for smart mobility

## 1

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.

#### Aspirations

- A big network of tram ways that connect all parts of town
- A new subway
- Once the infrastructure is realised, people will change their mobility behaviour.
- a network of trams and railways
- Diminishing car use and ownership
- invest in infrastructure

## 2

In 2050 energy consumption will be reduced for mobility, buildings and public lighting.

#### Aspirations

- Lighting to provide a network for smarter solutions
- Traffic lights with remote control
- The first town to have a public lighting network and therefore a dated system and lamps
- Energy consumption in lighting now 12 million/year. An investment of 15 million will lead to a reduction of 75%. The goal is to replace 30% in the next 5 years.
- increase the use of public transport and reduce the use of private cars

## 3

In 2050 the citizens of Palermo value walking and cycling as obvious part of life and mobility.

#### Aspirations

- Cultural change
- Investments in changing behaviour
- Change the citizens mentality
- Respect for bikers and walkers
- Improve pedestrian walks
- Develop 100 km of bike-lanes.

# Results ambition workshop stakeholders



# 2015

## High Lights

The top three aspects in the city the external stakeholders and strategic partners are most proud of:

- Il centro storico: Good roots in the past with historical buildings, that have good thermal and energetic qualities
  - built for the climate in Palermo (e.g. noble palaces), using good and high quality materials, and good use of natural light. The older buildings are safer and more efficient than the ones build in the 70's.
- Use of (a few) EU projects to restore the old tradition in building and natural lighting.
- Mild climate, close to the sea, providing a good location for natural sustainable solutions.
- The 'astuto' reward. 'Astuto' having two meanings:
  - 'clever/smart' in Italian
  - 'switch off' in Sicilian slang.



1

In 2050 Palermo uses its historical strength to built comfortable and energy efficient houses and neighbourhoods.

#### Aspirations

- Restoring with respect for history: maintaining the historical quality of old buildings, while improving efficiency: apply new technology with respect.
- Evaluate the quality of buildings to assess if it is worth to invest: consider demolition of 'bad' buildings from the 70's (ugly and inefficient), instead of investing in improvement.
- Common spaces and shared spaces in buildings.

#### Today's challenges

- New technologies are not affordable by everybody.

2

In 2050 all buildings in Palermo use smart technology, including technology for the full re-use of waste.

#### Aspirations

- Greener neighbourhoods and wider streets.
- Greener buildings: use of green roofs and walls and natural ventilation.
- Energy independent public buildings.
- Energy efficient historical buildings.
- Smart monitoring for different buildings.
- New buildings to have rooms for waste recycling and waste management systems to ensure independent waste management and full re-use of waste.
- Transform buildings into smart & ecological buildings.
- Regulations to ensure demolition waste is re-used.
- Improvement of recent buildings to class A energy-efficiency label.
- Change the functionality of buildings.
- Social buildings and social relations.
- Funding for upgrading and innovation.

#### Today's challenges

- Participatory decision process and involvement of citizens to create synergy.
- Common ambitions and targets, but a lack of communication between different departments, organisations and citizens.
- Not enough involvement in EU projects.
- Innovation: integration of research and implementation.
- Long term strategy can change when people change in the municipality.
- How to manage household waste is a big issue.

3

In 2050 the mild climate of Palermo is used to its full extend for sustainable buildings & energy production.

#### Aspirations

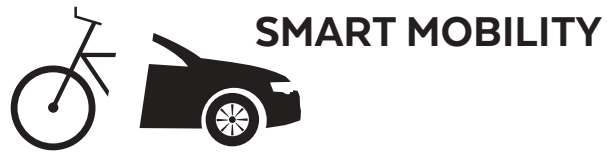
- Master plan and new regulations for new efficient buildings.
- Use the climate to improve sustainability.
- Create an economical gain out of reduced energy consumption.
- Making modern buildings smarter with wireless technology and domotica.
- New buildings (commercial) can have building and electrical restrictions to provide value with renewable energy (e.g. photovoltaic).
- Experimentation with new buildings and solutions on a large scale.
- Matching the energy needs of citizens with sustainable solutions (e.g. photovoltaic, using glass to obtain energy from the sun)
- Information systems are available for citizens to know the possibilities.
- Bureaucracy is simplified for energy measures.

#### Today's challenges

- Building regulations for efficiency.

2050

# Results ambition workshop stakeholders



# 2015

## High Lights

The top three aspects in the city the external stakeholders and strategic partners are most proud of:

- The provision, by the administration to the citizens, of bicycle lanes and the removal of physical obstacles to improve them.
- The changing mindset and engagement of the citizens and stakeholders of Palermo
- The balance between what is offered and what is used.



1

In 2050 the people of Palermo will use biking, because the foundation and infrastructure is available and accessible.

#### Aspirations

- Street path to be homogeneous, continuous, well-considered and well-defined for walking and biking
- Stimulate walking for health
- Improve public transport in the far part of the town and improve the connection to the city centre
- Faster links for the city periphery
- Revaluation of periphery
- Bus links to connect the sea and Montepelligrino and piazza forte
- A cycle lane along the sea to appreciate it
- Bike sharing
- Create green areas as corridors for butterflies
- Bring physical infrastructure closer to citizens (participation)

#### Today's challenges

- Lacking infrastructure for full implementation
- Insufficient parking areas for bikes
- It is not allowed to take bikes into public transport
- Lack of green areas

2

In 2050 Palermo will use education as a foundation for good citizenship and sustainable behaviour.

#### Aspirations

- Greener areas in town and more respect for green
- Put down Mediterranean trees and plants
- Green areas that are maintained and clean
- The pedi-bus: safe walking for children, involving the community and creating a sense of responsibility
- Stimulate green transportation
- Create interest in the communities of families and people
- Involve families in the mobility team
- Proud of Palermo as a town of art
- Centres in district of town to promote green mobility
- Defeat school dispersion from 30 to 50%
- Validation of monumental and good places
- Real citizen participation where citizens are aware and responsible
- People know the value of historical heritage
- Education in safe walking and good citizenship for children
- Use schools and education to change people's minds
- Start awareness with the children
- Social activities with citizens to choose new solutions
- Communicate clear goals to increase participation

#### Today's challenges

- People leave bikes and motors on the pavement
- Lack of respect for green areas
- Dispersion of schools
- Children should be taught not to throw things in the streets or green area

3

In 2050 Palermo provides safe mobility for all people: families, children, elderly, disabled, pedestrians and cyclists.

#### Aspirations

- A vision for a safe town, starting from simple things, like the pedi-bus
- Safe town for families
- School buses to replace car driving of all parents
- Improve safety for cyclists
- Texture of the city that allows more moving
- Accessibility
- Mobility for disabled people; space for everybody
- A cleaner town, encountering the need of citizens to tailored needs
- The city is more accessible and green areas are accessible for cyclist

#### Today's challenges

- Not enough attention or mediation from the administration
- The current projects are too few and too small in scale

2050







# Contributions

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

- Dario Allegra                      Direttore, AMG Energia
- Emilio Arcuri                      Vice Sindaco, Comune di Palermo
- Bohuslav Basile                      Capo Area amministrativa della riqualificazione urbana e delle infrastrutture, Comune di Palermo
- Eliana Calandra                      Capo Area Cultura, Comune di Palermo
- Paolo Caracausi                      Presidente 2° Commissione Consiliare, Comune di Palermo
- Giusto Catania                      Assessore alla Mobilità, Comune di Palermo
- Andrea Cusumano                      Assessore alla Cultura, Comune di Palermo
- Nicola Di Bartolomeo                      Capo Area tecnica della riqualificazione urbana e delle infrastrutture, Comune di Palermo
- Antonio Gristina                      Presidente, Amat
- Luisa La Colla                      Presidente 3° Commissione Consiliare, Comune di Palermo
- Cesare Lapiana                      Assessore innovazione tecnologica, comunicazione sport e ambiente
- Maria Mandalà                      Capo Area del lavoro, impresa e sviluppo economico, Comune di Palermo
- Sergio Maneri                      Capo Area della partecipazione, decentramento, servizi al cittadino e mobilità, Comune di Palermo
- Alberto Mangano                      Presidente 6° Commissione Consiliare, Comune di Palermo
- Leoluca Orlando                      Sindaco, Comune di Palermo
- Salvatore Orlando                      Presidente del Consiglio, Comune di Palermo
- Mario Pagliaro                      Presidente AMG Energia spa
- Sergio Pollicita                      Capo Area delle relazioni istituzionali sviluppo e innovazione, Comune di Palermo
- Daniela Rimedio                      Capo Area dell'innovazione tecnologica comunicazione sport e ambiente, Comune di Palermo
- Licia Romano                      Capo Area della scuola e realtà dell'infanzia, Comune di Palermo
- Mimmo Russo                      Presidente 7° Commissione Consiliare, Comune di Palermo
- Giusy Scafidi                      Presidente 4° Commissione Consiliare, Comune di Palermo
- Fausto Torta                      Presidente 5° Commissione Consiliare, Comune di Palermo
- Juan Diego Catalano Ugdulena                      Presidente 1° Commissione Consiliare, Comune di Palermo
- Angelo Zito                      Alta Forma



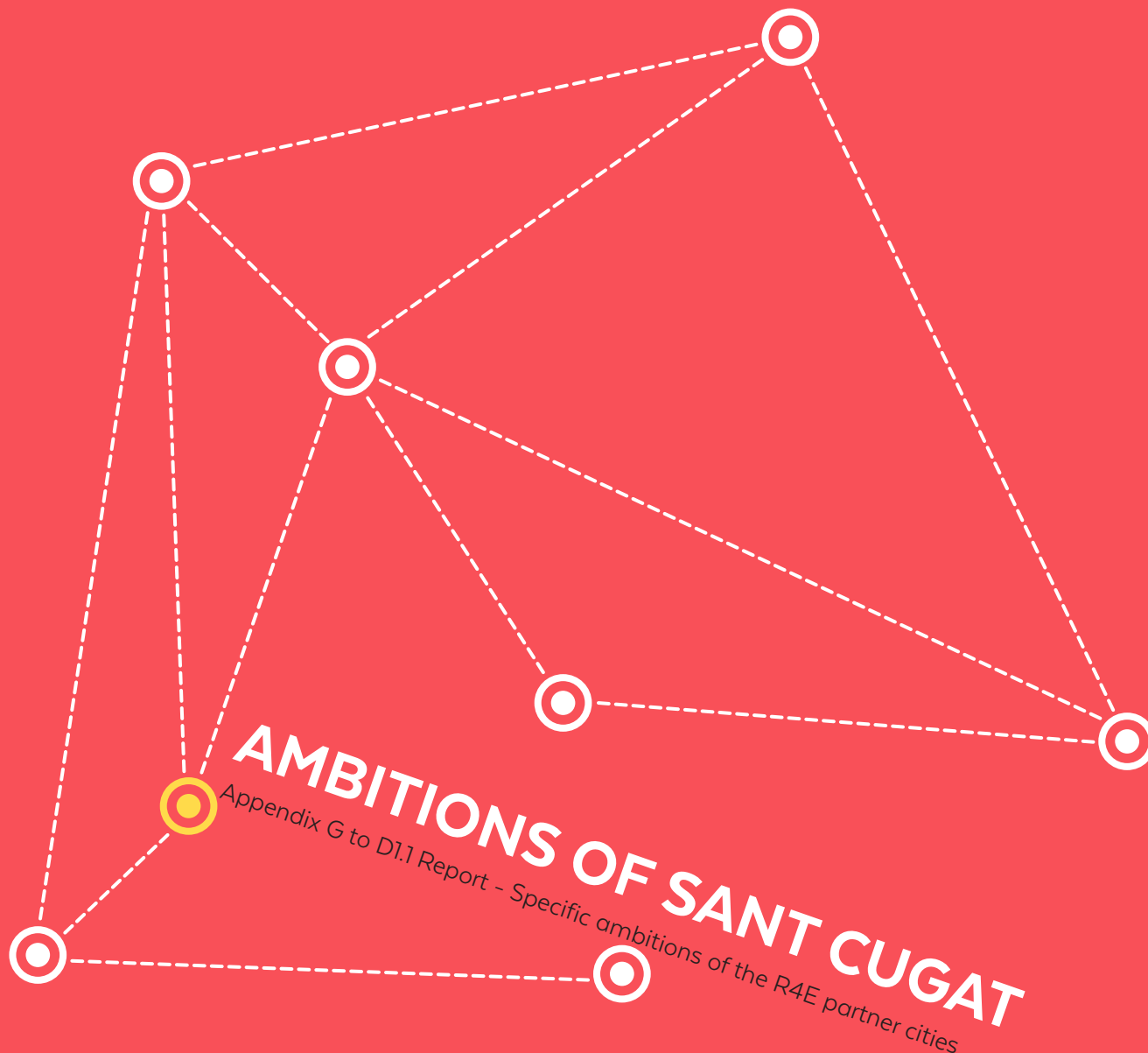
This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397



ROADMAPS  
FOR  
ENERGY®



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



15 December 2015

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



**ROADMAPS  
FOR  
ENERGY®**

This appendix is part of the D1.1 Report - Specific ambitions of the R4E partner cities and contains all results of the ambition setting activities held in the city of Sant Cugat.



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 does not necessarily reflect the official European Commission's view on the subject.

**Versions of this report:**

17 July 2015	Draft for internal check in the city (limited distribution)
16 September 2015	Concept for sharing with R4E partners (limited distribution)
6 November 2015	Version for final check
15 December 2015	Final version for public distribution



## Contents Appendix G

Introduction to Sant Cugat del Vallès	G 5
Today's reality: smart buildings	G 24
Today's reality: smart urban spaces	G 26
Results ambition workshop policy	G 28
Results ambition workshop strategy	G 30
Results ambition workshop stakeholders	G 34
Results ambition workshop stakeholders	G 36
Contributions	G 41

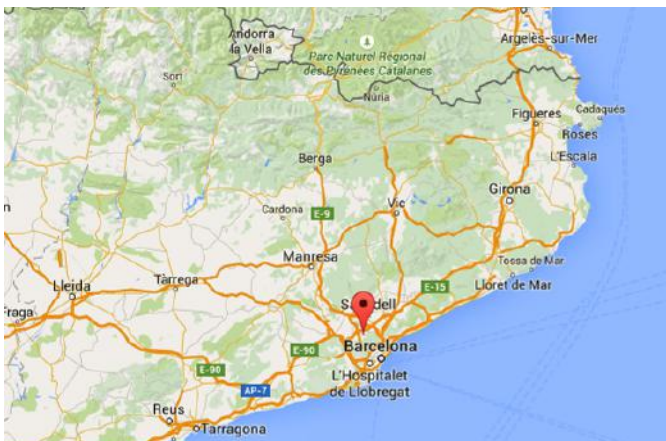




# Introduction to Sant Cugat del Vallès

## Introduction to the city

The city of Sant Cugat del Vallès is located in the region of Catalonia, Spain, approximately 20 km from Barcelona. The city of Sant Cugat del Vallès is a municipality with a population of around 85.000, and enjoys a privileged natural environment and urban green landscape with a strong commitment to sustainability. It is the central hub of the communication network of highways, railways and public transport systems, linking Sant Cugat with the rest of the region.









Faced with a complex economic situation, Sant Cugat needs a strategy for an environmentally sustainable economic future. The government wants the city has to provide more efficient public services, but to achieve this the city is asking the public to be active participants in the strategy. This requires a strong and innovative strategy for the future economy. And it also calls for a social and environmental strategy to promote economic, social and environmental sustainability for individuals, organisations and companies. These strategies aim to improve the quality of life, spread the values and encouraging innovation, talent and creativity. Rapidly changing technology calls for models that can be updated quickly, the integration of systems and their adaptation to end-uses that meet the needs of society. The Smart City is not a 'Gadget City', but a city that creates value by intelligent data collection from daily activity in the surrounding area. The information must support improving the efficiency of services and boost the economic competitiveness of the region. Reduction of energy consumption is achieved by intelligent management of buildings, public space, and lighting; intelligent and advanced waste management systems; multi-modal transport and the implementation of sustainable vehicles, accessibility, management centres and traffic control. Secure, integrated telecommunications use open data to create the conditions for competitiveness and innovation. These



connect people and talent in an environment of co-creation and social development, transparency and citizen participation in an inclusive and committed city. All this takes place with the focus on democratic solutions for citizens and improving the quality of life.

Since the city has updated its SEAP, it realises that the major goal seems to be to reduce the energy consumption of buildings, not only public but also private.

## Selection of focus areas

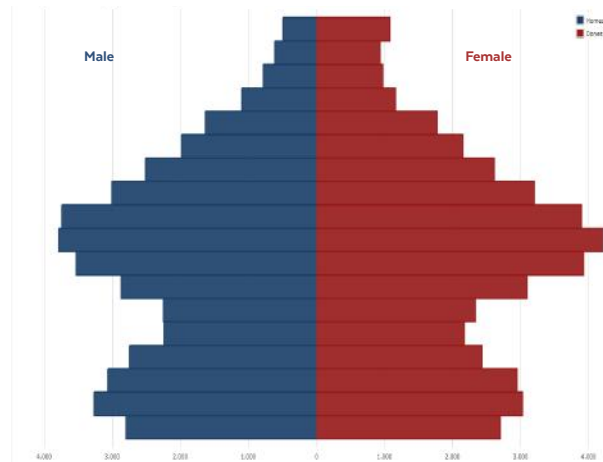
The city has selected two focus areas for the R4E project:

- Smart buildings
- Smart urban spaces

### Demographical aspects

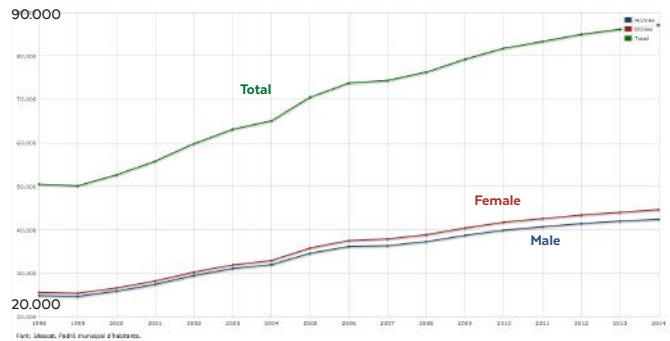
- Size in km2 48,32 km2
- Number of inhabitants: 87.118 inhabitants - 1.807 hab/ km2
- Age structure of the population (see graph below)

Graph: Demographic pyramid by sex and age (five-year)



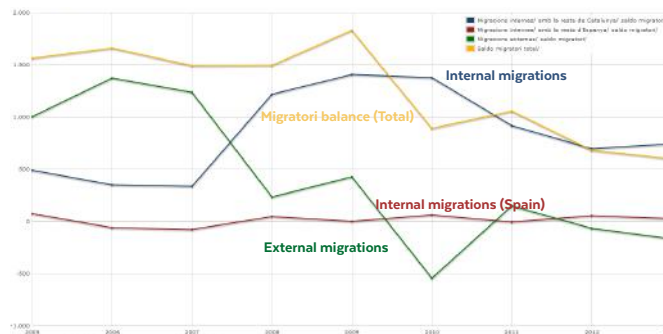
Source: Institut d'Estadística de Catalunya (IDESCAT)

Graph: Evolution of population (1998 - 2014)



Source: Institut d'Estadística de Catalunya (IDESCAT)

Graph: Migratory balance (2005-2013)



Source: Institut d'Estadística de Catalunya (IDESCAT)

The age structure of the population shows a tendency to progressive aging of the population. After a period of about 20 years in which there has been a widening of the base, it has returned to a period constricting. The report dynamics of the municipality of Sant Cugat del Vallès ( 2012 ), prepared by the Department of Care for People of the City Council stresses that:

- The percentage of foreigners increased continuously between 2000 and 2009 and since then the percentage decreased slightly to 12.2 % in 2010.
- The growth of the population is due primarily to the recording of positive migratory balances , mainly in Barcelona and the rest of the province.

### Social aspects

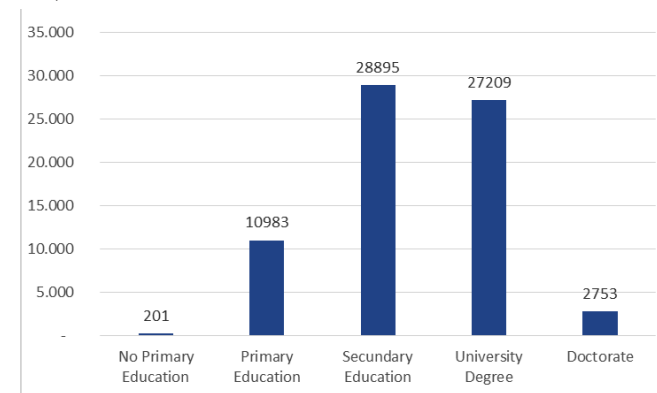
Table: Level of education of citizens

	Male	rate (%)	Female	rate (%)	Total	rate (%)
No Primary Education	71	35,3%	130	64,7%	201	0,29%
Primary Education	4.912	47,6%	6.071	52,4%	10.983	15,68%
Secondary Education	14.255	43,7%	14.640	56,3%	28.895	41,25%
University Degree	13.054	49,6%	14.155	50,4%	27.209	38,85%
Doctorate	1.282	50,3%	1.471	49,7%	2.753	3,93%
<b>Total<sup>(1)</sup></b>	<b>33.574</b>		<b>36.467</b>		<b>70.041</b>	<b>100,00%</b>

<sup>(1)</sup> Older than 16 years

Source: Sant Cugat del Vallès City Council

Graph: Level of education of citizens



Source: Sant Cugat del Vallès City Council

Connectivity level: In December 2012, the percentage of houses with broadband reached a 75,2%. In the other hand, a 74,3% of the citizens had a smartphone in december 2013. Source: Sociological Observatory of Sant Cugat.

Table: Average unemployment in Sant Cugat del Vallès 2014

Age	Male	Female	Total
<b>From 16 to 19 years</b>	19,9	12,4	32,3
<b>From 20 to 24 years</b>	71,8	63,9	135,8
<b>From 25 to 29 years</b>	143	139,4	282,4
<b>From 30 to 34 years</b>	198,8	221,8	420,6
<b>From 35 to 39 years</b>	216,8	291,4	508,3
<b>From 40 to 44 years</b>	244,5	326	570,5
<b>From 45 to 49 years</b>	265,1	299,1	564,2
<b>From 50 to 54 years</b>	252,5	267,3	519,8
<b>From 55 to 59 years</b>	265,3	252,8	518,1
<b>older than 60 years</b>	170,5	214,6	385,1

**Total: 1.848,20 2.088,70 3.936,90**

Source: Institut d'Estadística de Catalunya (IDESCAT)



Graph: Unemployment rate by distribution of age in Sant Cugat del Vallès

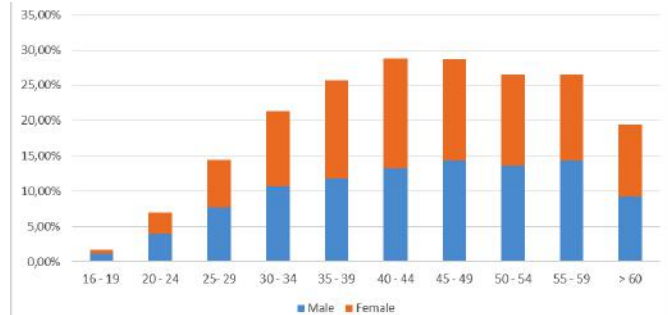
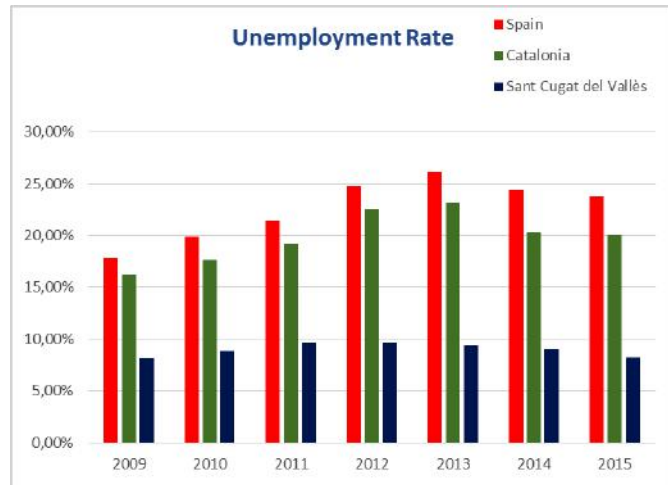


Table: Unemployment rate

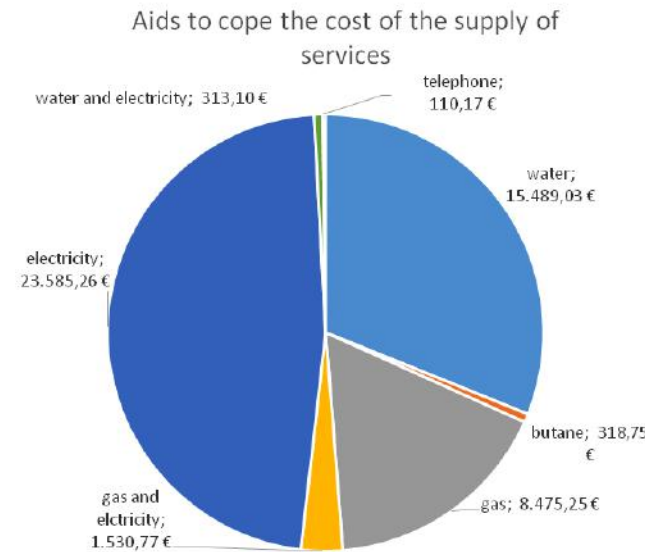
	2015	2014	2013	2012	2011	2010	2009
<b>Spain</b>	23,78%	24,44%	26,10%	24,79%	21,39%	19,86%	17,86%
<b>Catalonia</b>	20,05%	20,33%	23,12%	22,52%	19,16%	17,66%	16,22%
<b>Sant Cugat</b>	8,26%	8,97%	9,41%	9,72%	9,70%	8,79%	8,13%

Source: Sant Cugat del Vallès City Council and Instituto Nacional de Estadística (INE)



Share of population with energy poverty: According to information from the City Council of Sant Cugat, a total of 351 inhabitants that represents 125 families have received aids to cope the cost of the supply of services (water, gas, electricity,

butane and telephone). These families represent 0.4% of the total population of Sant Cugat. The amount designated to the aids are 49.822,33 € in the following concepts.

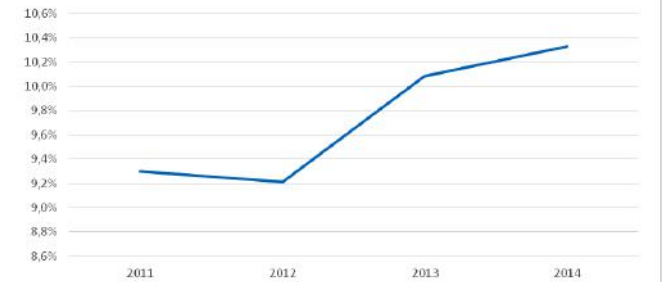


While these values (0.4%) seem a very small percentage, remember that 2011 was allocated a total of € 7,256.40 on the same concept. Thus, this concept aid has increased 586% in just four years.

The percentage population requiring special needs have increased only 1 point compared to the value in 2011 (9.3% in 2011 to 10.3% in 2014). But this value does not represent the reality, because these people are poorest. It is easy to see how people handled increased by 14.8%, while subsidies have risen 166.44%. Aid to supplies energy is the concept that has more increased.

	2011	2012	2013	2014	variation 2011/14
<b>People attended</b>	7897	7.951	8.786	9.065	1.168 14,8%
<b>Percentage of population</b>	9,3%	9,2%	10,1%	10,3%	
<b>Families attended</b>	3524	3.561	3.913	3.949	425 12,1%
<b>Inhabitants</b>	84941	86.325	87.118	87.788	2.847 3,4%

Graph: Percentage of population that require special care



	2011	2012	2013	2014	Variation 2011/14
<b>Extracurricular activities aid</b>	32.407,62 €	33.314,97 €	33.110,49 €	39.792,92 €	22,79%
<b>Housing aid</b>	80.509,57 €	101.091,03 €	149.534,41 €	218.836,10 €	171,81%
<b>Food aid</b>	42.064,60 €	74.134,54 €	100.796,53 €	117.251,46 €	178,74%
<b>Transport aid</b>	4.916,34 €	7.007,35 €	9.659,97 €	15.471,65 €	214,70%
<b>Aid in energy supplies</b>	7.256,40 €	17.554,73 €	24.925,40 €	49.822,33 €	586,60%
<b>Aid health</b>	8.057,26 €	3.337,40 €	6.066,78 €	10.618,11 €	31,78%
<b>Other</b>	3.449,51 €	7.853,37 €	9.106,67 €	24.232,53 €	602,49%
<b>TOTAL:</b>	<b>178.661,30 €</b>	<b>244.293,39 €</b>	<b>333.200,25 €</b>	<b>476.025,10 €</b>	<b>166,44%</b>

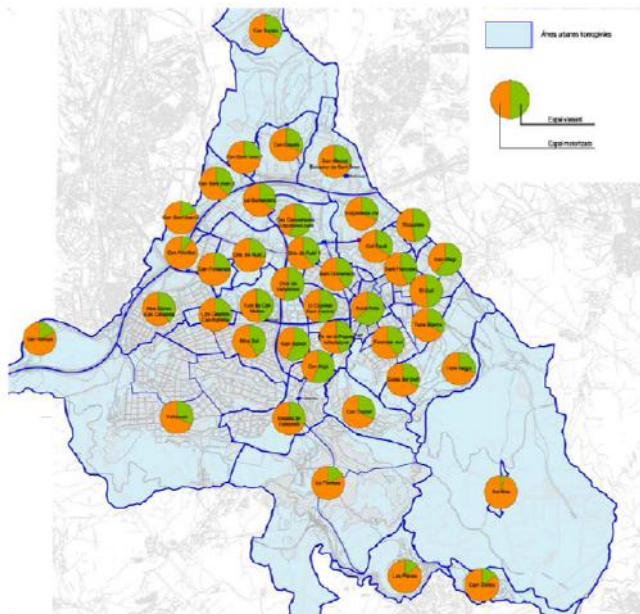
Municipal Aids



Road space the whole city is divided as follows: 67.1% is for the motorized traffic and pedestrians remaining 38.3% (sidewalks and streets with pedestrian priority)

The Centre is by far the largest district with road space designated to pedestrians with 63% of the total space. This is an area where motorized traffic is restricted except for residents, emergency or loading and unloading operations.

Graph: Sharing road space areas



Source: Urban Mobility Master Plan

In accordance with the Urban Mobility Mater Plan, 93% of pedestrian crossings are currently accessible. However, it would be necessary to double the current amount.

Table: Pedestrian crossings

	Accesible	No Accesible	lack of pedestrian crossings
Total	2.068	156	1.941

Source: Urban Mobility Master Plan

Other data from the Urban Mobility Plan in terms of accessibility is that the coverage of public transport (stop less than 500 m) is 90% and 100% of the vehicles and stations are accessible.

Satisfaction level of citizens regarding buildings, mobility, urban spaces: According to data form the Sociological Observatory of Sant Cugat, 92 % of the citizens of Sant Cugat

del Vallès are satisfied o very satisfied with life in the municipality.

Other interesting questions included in the Sociological Observatory are:

- Average satisfaction of living in Sant Cugat 8,1 (October 2014)
- Average rating of Sant Cugat as a city designed for all 6,7 (June 2012)
- Average rating of Sant Cugat as a creative and educating city 7,1 (June 2013)
- Average rating of spaces and cultural activities: 7,0 (June 2013)
- Percentage of citizens who believe that Sant Cugat has enough sports facilities 68.8 % (July 2012)
- Percentage of citizens use the sports facilities of the town 27,8 % (June 2012)
- Percentage of people attending cultural activities carried out in Sant Cugat 43,2 % (November 2011)
- Percentage of citizens who know the range of sports activities offered by City 54,7 % (July 2012)
- Percentage of citizens who use the cultural facilities of the town 61,1 % (April 2008)
- Average Rating Municipal Library 7,8 (June 2013)
- Average Rating Museum of Sant Cugat 7,8 (June 2013)
- Average Rating Theatre Auditorium 7,8 (May 2011)
- Average rating of the Government in the area of social services 6,0 (November 2005)

- Average assessment of the government's actions in the area of culture 7,1 (July 2012)

### Economical aspects

Income:

- Because of Sant Cugat is not a very big city, local information is not published on the per capita income in a year. The final value was calculated in 2010. The value of the per capita income in 2010 was 30.100 € Sant Cugat. In the same year, per capita income was 27.700 € in Catalonia Community IDESCAT seconds.
- Today (2014) 26.996 € is the average of the Catalonia region of 22.780 € and the average for Spain according to the INE. The value of Sant Cugat should respect a similar variation as in 2010.

The most strong sectors:

- The population middle age is around 35 years old. The city

has a vibrant, knowledge-intensive economy and is the home of several world-class universities. The ratio of new technologies penetration and use is significantly above the average value for the country. Availability of multilingual, cosmopolitan staff combines with ability to attract multinational talent. Despite its relatively small size, Sant Cugat has been selected the prime location for a number of high-tech companies, competing in the global marketplace.

- Sant Cugat is also an active player in the regional government's strategic development plan which involves 36 municipalities with altogether 3 million inhabitants, the business community, financial institutions, professional associations, trade unions, cultural associations and other stakeholders committed to the shaping of one of Europe's most creative, innovative science-based city-regions.
- Sant Cugat has pledged its commitment to become a smart community since 2010. The City Hall, in cooperation with the business sector and the civil society, is driving a strategic plan since 2011 in order to pursue a society based



on knowledge, talent and innovation, in line with the current sustainable growth strategy promoted by the European Union.

- More than 2,700 business providing more than 50,000 jobs, is one of the most important economy of the Barcelona Metropolitan Area. The areas where they are located commercial buildings and services, business parks, etc. areas are powerful attraction for journeys, as are the major shopping areas. The old part of the city as a commercial centre and also civic centre, is one of the main areas of attraction of the town trips, as that brings together most of the commercial, administrative, urban services, or simply as an area where you can walk without traffic.
- The city has a vibrant, knowledge-intensive economy and is the home of several world-class universities. The ratio of new technologies penetration and use is significantly above the average value for the country. Availability of multilingual, cosmopolitan staff combines with ability to attract multinational talent. Despite its relatively small size, Sant Cugat has been selected the prime location for a number of high-tech companies, competing in the global marketplace. Companies like Sharp, Hewlett Packard, Deutsch Bank or Iguzzini are an example how important is the municipality in the local region.
- Sant Cugat has as well four campuses and more than 17,000 students. The city of Sant Cugat del Vallès collaborates since years actively with UPC-BarcelonaTech University, and specifically with its School of Architecture ETSAV, located within its municipality, and the KIC InnoEnergy Iberia co-location centre, represented through the KIC InnoEnergy members ESADE Creapolis.

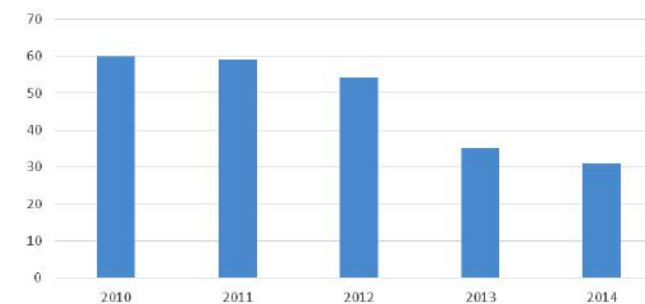
Map: Tertiary sector



Buildings and new building construction:

- The housing Sant Cugat del Vallès, according to the latest census data AMB 2011 is 33 359 houses. The new building construction for the last 5 years shows how it has decreased along this period. The added value in those years represents only a 0,7% of the whole houses in the municipality.

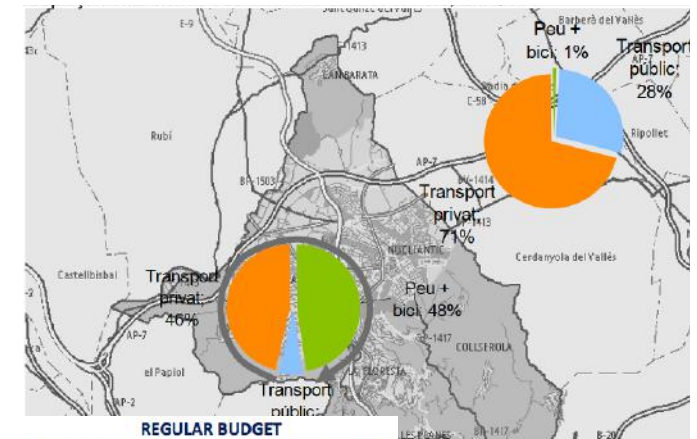
Graph: New building construction sites for the last 5 years



Mobility modal share:

- According to the 2006 municipal survey, every day in St. Cugat there are 330.505 trips (average daily Monday to Friday) and 235.826 trips on Saturday and Sunday (daily average of Saturdays, Sundays and holidays) is in other words, a week there are 2.124.177 trips.
- The 330.505 trips made with origins and/or destination Sant Cugat on a weekday, the mode of transport most used is the private car (61%), 20% of journeys are made by public transport and 19% walking or biking .

- Saturday and Sunday, the proportion of journeys made in private vehicles is even higher (63%) as well as the proportion held by public transport (29%) while walking decreased significantly (8%).
- Furthermore, If we separate the total displacements in internal displacements and inter-municipality displacements, we can see that the proportion of walking and cycling represent 48% of internal displacement, being the most used mode.
- Moreover, inter journeys on foot or by bicycle is practically negligible (1%)



REGULAR BUDGET	
Mobility	513.495,03 €
Public roads	456.039,77 €
Green Areas	3.531.189,52 €
Waste collection	8.968.679,08 €
Buildings	4.338.350,63 €
Street Lighting	2.768.173,30 €
Sewer System	464.021,58 €
<b>Total</b>	<b>21.039.948,91 €</b>

INVESTMENT BUDGET	
Mobility	372.478,13 €
Public roads	1.742.522,09 €
Green Areas	1.063.710,99 €
Buildings	520.709,02 €
Street Lighting	998.591,28 €
Sewer System	497.984,38 €
<b>Total</b>	<b>5.195.995,89 €</b>

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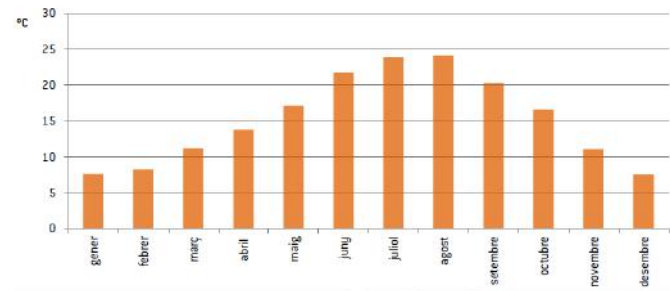
### Environmental aspects

2.929.425 m2 of green areas (see map) with more than one urban tree per inhabitant. Sant Cugat is part of Collserola Natural Park.

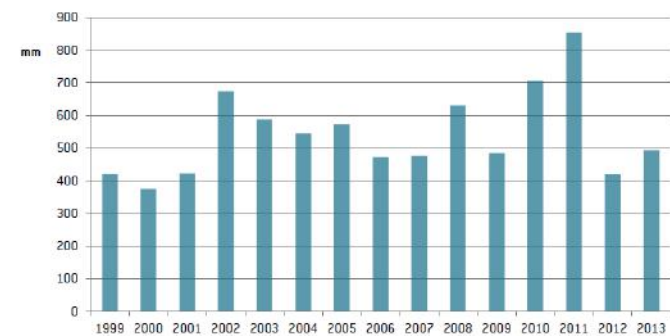
Climate conditions:

- Sant Cugat is within the domain Mediterranean coast climate. Located south of Vallès Occidental is characterized by having a moderate temperature range with mild winters ( average minimum temperature 6–8°C ) and absence of cold periods , although they are occasionally recorded episodes of major frost ( -16°C in February 1956 -12°C in January 1985).
- Regarding precipitation, the average is around 650 mm annual rainfall irregular seasonal, concentrated in equinoctial periods.

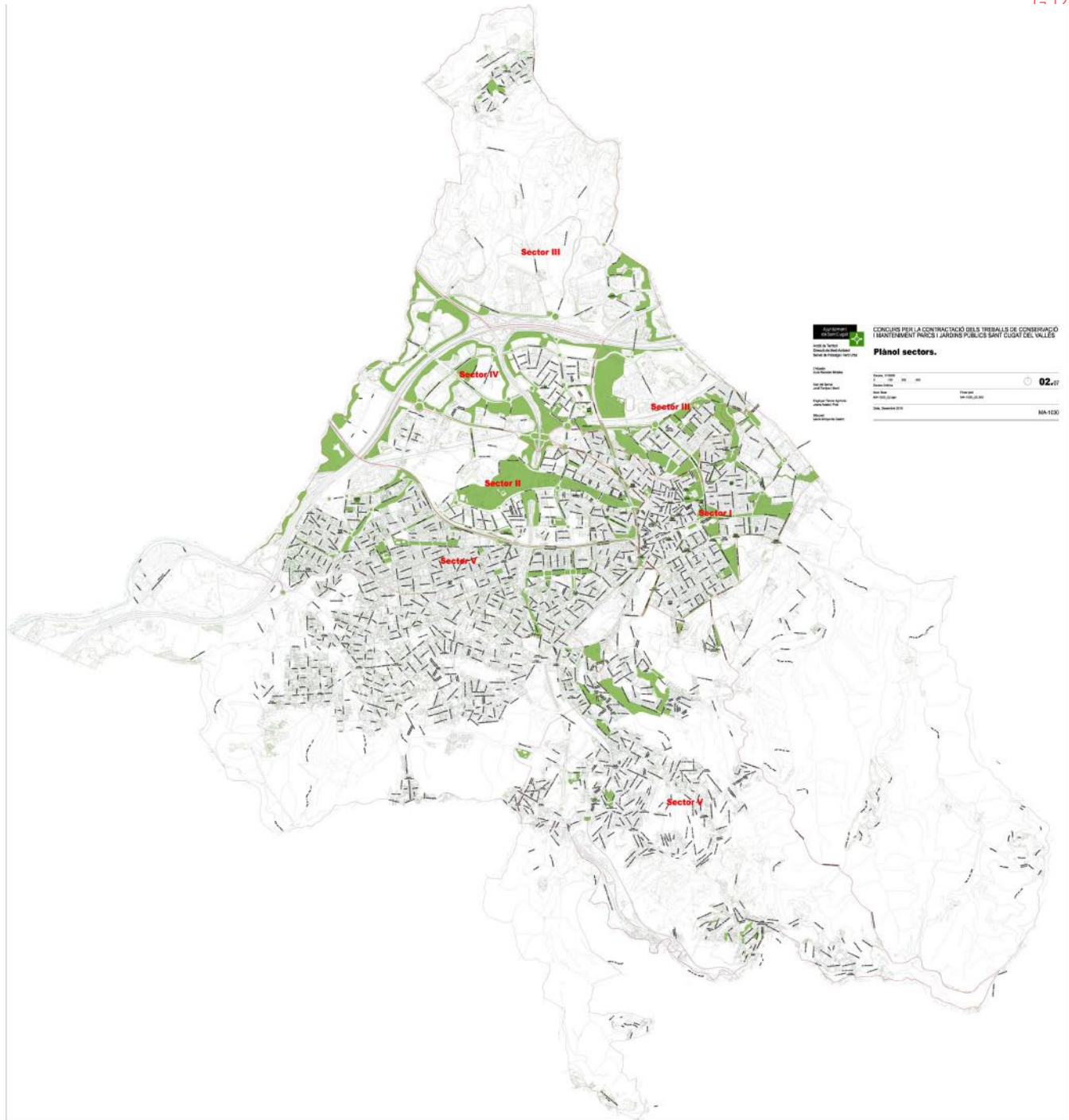
Graph: Annual temperatures 1999 - 2013



Graph: Annual precipitation 1999 - 2013



Source: Servei de Meteorològic de Catalunya





## Impact of climate change:

- Extreme temperatures, water scarcity, droughts and forest fires. The evolution projected average annual temperature anomalies for Coastal and Prelitoral of Catalonia calculated from regionalised simulation of MM5 15 km from 1971 to 2100 shows:

ÍNDEX	2011-2040	2041-2070	2071-2100
Increment mitjà de temperatura [°C]	+0,7 / +0,9 °C	+1,4 / +2,0 °C	+2,5 / +3,5 °C
Increment màxim de temperatura [°C]	+0,9 / +1,0 °C	+1,5 / +2,2 °C	+2,7 / +3,9 °C
Increment mínim de la temperatura [°C]	+0,2 / +0,5 °C	+1,2 / +1,6 °C	+2,3 / +3,3 °C
Precipitació mitjana [%]	-6,5 / -1,7	-5,3 / -3,0	-14,3 / -9,5
Humitat relativa [%]	0,5 / 0,7	0,2 / 0,7	-0,1 / 0,0
Velocitat del vent mitjana [m/s]	-2,2 / -2,1	-3,3 / -2,1	-4,9 / -4,0

Source: Els climes de Catalunya. Present i tendències recents. 2010

- Vulnerable sectors: Agriculture and forest, Biodiversity, Financial, Infrastructure and Water management.
- Increased temperatures: hot and dry summers, increased heat waves, increased episodes of intense cold . This would result in the following risks:
  - Major fire hazard drying / processing wetlands
  - Increasing desertification and aridity
  - Negative effects of heat effects on livestock infrastructure
  - Changes in patterns of energy demand
  - Increased mortality / morbidity associated
  - Increased heat island effect
  - Risk of increased heat scents for major fermentation residues
- Changes to the cycles of the seasons: The climate projections set by the Catalan coastal and pre-show for the following climatic variations stations:
  - Summer. At the end of the century the increase in air temperature could increase by 4°C in the worst scenario. Also, summer is expected a considerable reduction in average rainfall.
  - Spring. At the end of the century is expected to decrease in average rainfall of between 11 and 18% and an increase in temperature.
  - Fall. Temperature increases are planned, but the biggest uncertainties in precipitation.

- Winter. We anticipate increases in both temperature and precipitation
- This would result in the following risks:
  - Forest species vulnerability to disease and pests.
  - Changes in arable areas
  - Vulnerability of crop to pests and diseases
  - Increased allergies appearance of new diseases
  - Loss tourist attraction
  - Changes in the pattern of tourism demand
  - Greater vulnerability of urban green
  - Changes in the patterns of urban species
- Changes in rainfall and wind: decreasing the average annual increase of drought, increasing the possibility of torrential rains and strong winds episodes .
  - Increased risk of flooding
  - Increased droughts (duration, frequency and intensity)
  - Allocation to water resources available (from studies)
  - Increased risk of floods
  - Longer dry periods of rivers and streams
  - Major intensity of storms
  - Increased episodes of strong winds
  - Damage to infrastructure for floods
- Measures taken to handle climate change:
  - Adhesion to Covenant of Mayors (15/09/2008): signatories represent cities that vary in size from small villages to major metropolitan areas such as London or Paris. Within a year following their signature, Covenant signatories commit to implement Sustainable Energy Action Plans SEAP on their territory, with the aim of cutting CO2 emissions by at least 20% by 2020.
  - Mayors Adapt (21/07/2014): cities signing up to the initiative commit to contributing to the overall aim of the EU Adaptation Strategy by developing a comprehensive local adaptation strategy or integrating adaptation to climate change into relevant existing plans. These local plans for climate change adaptation, whose main aim municipality adapt to the impacts of climate change and become more resilient Municipality.

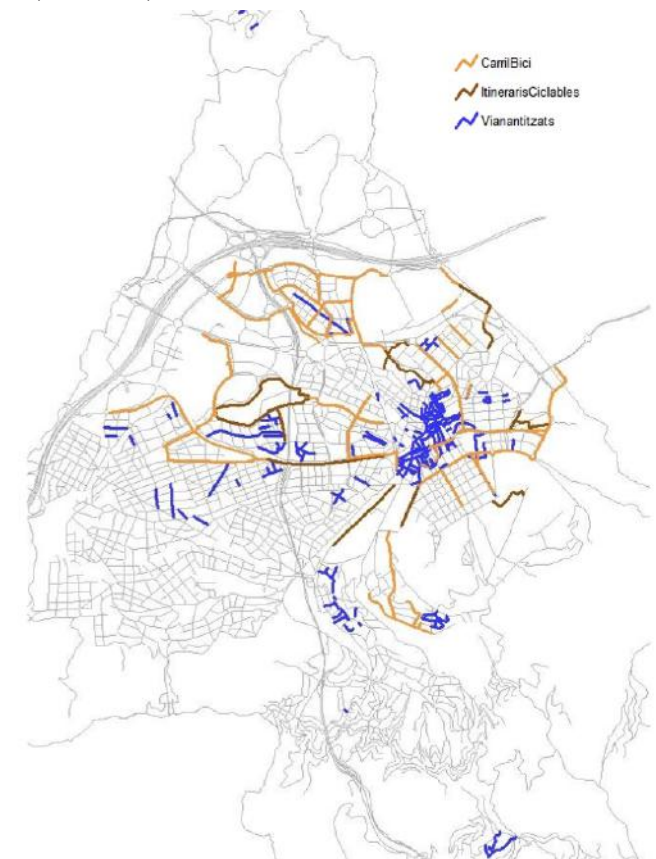
## Type of urban space

- There is no information about the urban area divided by

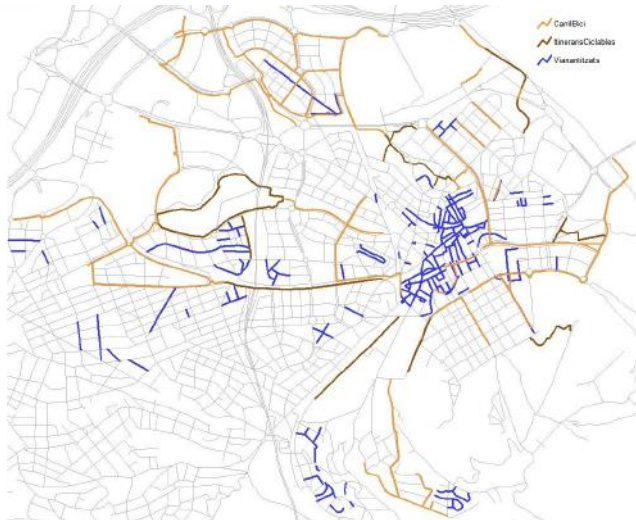
type of road. But on the other hand, knows how long are the roads by type.

- Pedestrian paths: 22 603 linear meters
- Bike Trails: 33 790 linear meters
- Roads: 361 889 linear meters
- Unpaved roads: 89 755 linear meters

Map: Bike trail paths



Map: Bike trails in the centre

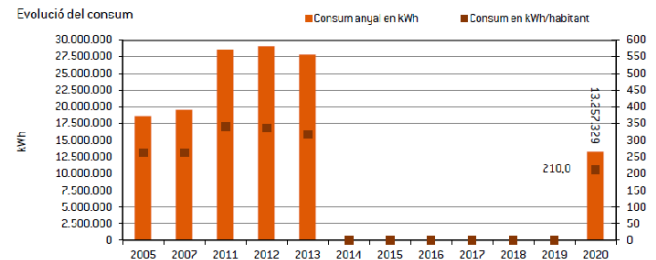


- Ownership of urban space: % public/private:  
The size of the urban space is 6,91 square kilometre. 1,05 square kilometre (15%) belongs to private and the rest of the 5,86 (85%) square kilometre belongs to the municipality.
- Total housing in Sant Cugat del Vallès (AMB-2011): 33 359
- Energy performance of buildings in the city:  
The housing Sant Cugat del Vallès, according to the latest census data AMB 2011 is 33 359 houses. Of these households 13% have be energy certified to date.  
3450 Energy certified buildings up to 2015:
  - 3009 Homes: 2,219 flats / 790 houses
  - 441 Tertiary buildings
- Most housing has been certified with the old rules before 1979
- More than half of the homes are certified letter E, then D
- The average consumption / m<sup>2</sup> increase as increases in energy classification

HOUSING RULES 1900-2013					
	Up to 1979	Up to 1987	Up to 2006	Up to 2013	TOTALS
Nº energy certified homes	2236	435	333	5	3009
Nº flats	1619	310	287	3	2219
Nº houses	617	125	46	2	790
A Energy performance	0	0	3	0	3
B Energy performance	5	3	11	0	19
C Energy performance	52	15	59	2	128
D Energy performance	277	99	106	1	483
E Energy performance	1243	262	132	1	1638
F Energy performance	228	23	9	0	260
G Energy performance	431	33	13	1	478

Data medium according total energy classification								
	A	B	C	D	E	F	G	TOTALS
Nº Tertiary buildings	17	19	66	138	77	60	54	431
Nº Homes	3	19	128	483	1638	260	478	3009
% of HOMES energy performance	0,10%	0,63%	4,25%	16,05%	54,44%	8,64%	15,89%	
% of Energy Certified Buildings	0,09%	0,55%	3,71%	14,00%	47,48%	7,54%	13,86%	3450
Average Consumption (kWh/ m <sup>2</sup> -year)	14,51	39,03	55,24	84,46	145,78	217,00	312,56	
m <sup>2</sup> average area	139,35	144,62	127,20	121,99	114,48	112,47	98,147	

Graph: Energy consumption per head



Graph: CO2 emission per head

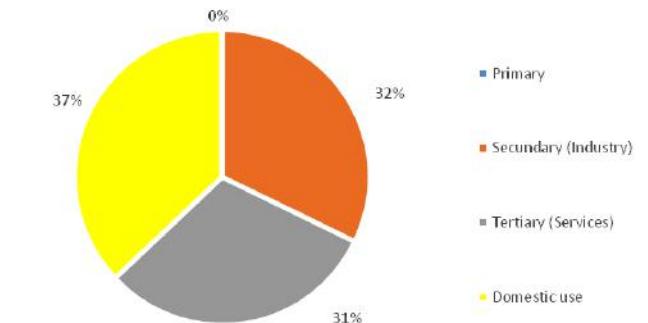


- Total energy consumption in the local industry
  - According to information ICAEN, all energy consumption in the city is 534 621 MWh annually. Segregation of these values by sector, as shown below, can be noticed that the industry accounts for 24% of total energy consumed. An important value, but not much if compared with the tertiary sector (services), which represents 49% of total energy consumed.
  - The domestic use is also not far from insignificant since it represents 27% of the total. Moreover, the primary sector accounts for less than 1%.

Table: Consumption segregated by sector

Sector	Average (2009-2013) MWh
Primary	199
Secondary (Industry)	345.519
Tertiary (Services)	330.224
Domestic use	397.752
<b>TOTAL</b>	<b>1.073.693</b>

Graph: Consumption segregated by sector



- Energy performance of public transport systems
  - The energy consumption of public transport systems represents only a 1% of the global consumption. Work on private and commercial transport is almost the totally consumption (97 %).
  - Diesel is the energy source more used in transport (73%)
  - The performance of municipal public transport is around 0,38 litres per km.





Table: Gasoil public transport consumption

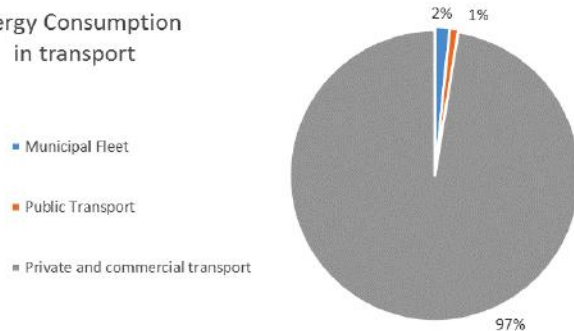
	2011	2012	2013	2014
<b>Vehicles</b>	20	20	19	19
<b>Total Km</b>	1.112.033	1.052.361	1.039.818	1.076.048
<b>Gasoil consumption (l)</b>	446.173,00	391.328,00	395.130,84	403.265,12
<b>Performance (l/km)</b>	0,40	0,37	0,38	0,37

Table: Energy consumption & source in transport

Tranport	MWh	Energy source	MWh
Municipal Fleet	6.519	Diesel	106.339
Public Transport	3.921	Gasoline	295.747
Private and commercial transport	394.387	Biofuel	2.741
<b>Total:</b>	<b>404.827</b>	<b>Total:</b>	<b>404.827</b>

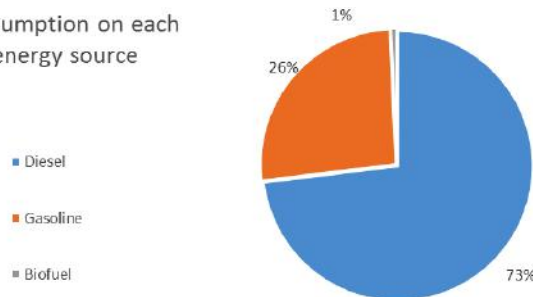
Graph: Energy consumption in transport

Energy Consumption in transport



Graph: Consumption on each energy source

Consumption on each energy source



Municipal buildings energy consumption:

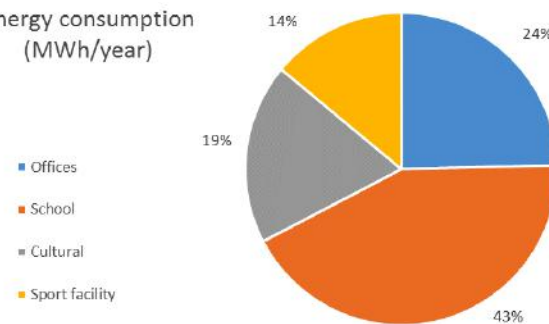
- The total annual energy consumption in municipal buildings is around 10 MWh. Schools and offices are the main consumers. Both types represent 67% of the accumulated consumption. They also have the worst indicator per square meter.
- However, the difference in the indicator between these buildings and cultural and sports facilities does not mean that the second set is more efficient. There are many factors that explain why, for example, the needs of offices and schools are larger and use of the building is more intensive.

Table: Municipal buildings energy consumption

	Energy consumption (MWh/year)	Floor space (m2)	Energy consumption (kWh/m2yr)	Solar thermal production (kWh/buildingyr)	Solar PV production (kWh)	Average year of construction
Offices (17)	2.454,42	14.500	169,27	-	105.264,00	1.985
School (16)	4.257,76	26.500	160,67	24.511,56	-	1.995
Cultural (11)	1.861,80	21.400	87,00	-	-	1.990
Sport facility (9)	1.393,84	13.572	102,7	15.184,76	-	2.000
<b>Total</b>	<b>9.967,81</b>	<b>75.972</b>		<b>39.696,32</b>	<b>105.264,00</b>	

Graph: Municipal buildings energy consumption

Energy consumption (MWh/year)



- As shown in the following table, the weight of consumption of the municipal building is not very significant (only 1%) in front of residential and commercial buildings.

Table: Buildings energy consumption

Energy consumption (MWh/year)	
Municipal Buildings	9.968
Tertiary Buildings	313.240
Residential Building	433.486
<b>Total</b>	<b>756.694</b>

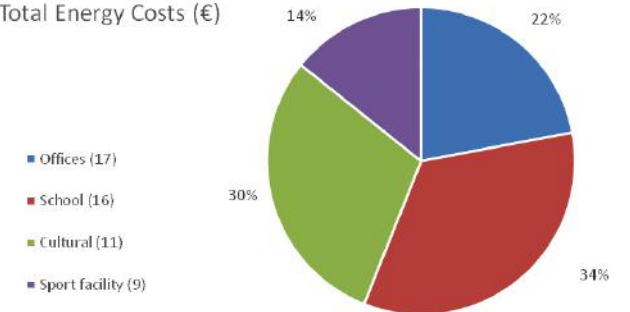
- An analysis of the energy costs of municipal buildings, confirmed that the electric energy cost is three times the energy cost of natural gas. Schools are the type of municipal buildings that use natural gas as an energy source and this allows for a lower price for kWh.
- On the other hand, cultural buildings and sports facilities get the worst ratio of energy cost. This is especially true in the cultural buildings, where the ratio is twice the ratio of schools.

Table: Municipal buildings energy costs

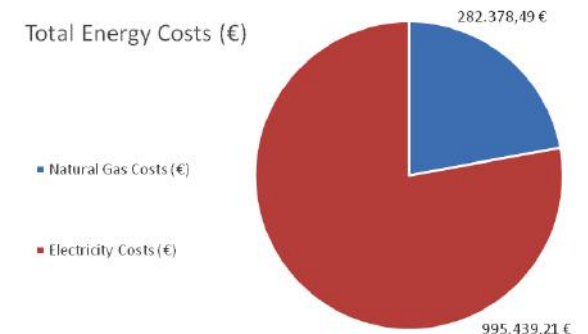
	Energy consumption (MWh/year)	Floor space (m2)	Natural Gas Costs (€)	Electricity Costs (€)	Total Energy Costs (€)	Rate €/kWh
Offices (17)	2.454,42	14.500	3.211,57 €	278.190,50 €	281.402,07 €	0,1147
School (16)	4.257,76	26.500	192.209,55 €	242.458,75 €	434.668,30 €	0,1021
Cultural (11)	1.861,80	21.400	41.527,35 €	338.232,38 €	379.759,73 €	0,2040
Sport facility (9)	1.393,84	13.572	45.430,02 €	136.557,58 €	181.987,60 €	0,1306
<b>Total</b>	<b>9.967,81</b>	<b>75.972</b>	<b>282.378,49 €</b>	<b>995.439,21 €</b>	<b>1.277.817,70 €</b>	<b>0,1282</b>

Graph: Municipal buildings energy costs

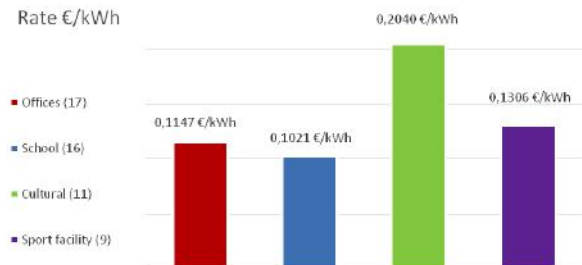
Total Energy Costs (€)



Total Energy Costs (€)



Rate €/kWh

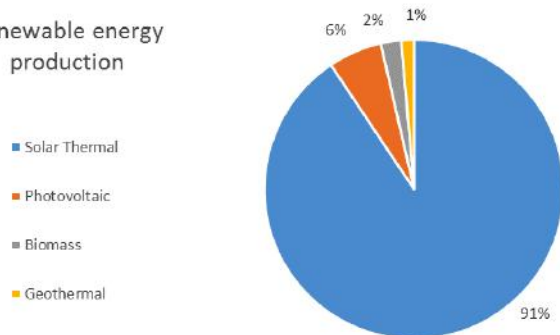


- Renewable energy production in the city: In 2013, renewable energy produced was 7.5 MWh. Most of them were solar energy (91% of total). This is not enough, too low compared to the energy needs of buildings (757 MWh). Only 1% could be covered

Table: Renewable energy production

Renewable energy production	kWh 2013
Solar Thermal	6.782.961,60
Photovoltaic	434.210,00
Biomass	164.984,00
Geothermal	102.881,40
<b>Total:</b>	<b>7.485.037,00</b>

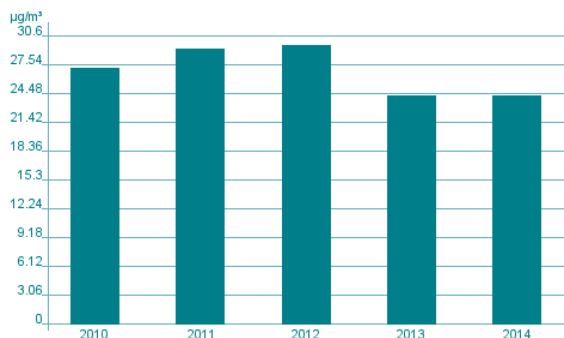
Renewable energy production



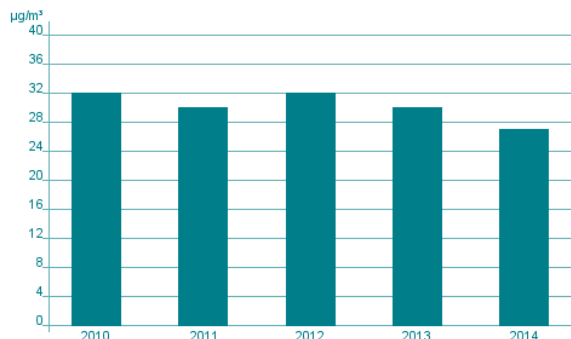
• Air Quality:

- The town of Sant Cugat del Valles has joined the program of voluntary agreements and reaffirmed the Government’s commitment to reduce greenhouse gases.
- This council will also join the EU strategy to combat climate change which is focused on three targets for 2020: cutting greenhouse gas emissions by 20%, make the 20% of energy from renewable sources and reduce energy use by 20%.
- Please note that the town of Sant Cugat is included in Decree 226/2006 of 23 May, which declared special protection areas of atmospheric several municipalities in the regions of Barcelona, Vallès Oriental Vallès Occidental and Baix Llobregat for the pollutant nitrogen dioxide and particles in suspension. Specifically in the case of Sant Cugat has not exceeded the limit value of 40 µgr / m3 as an annual average for the past few years, as can be seen in the following charts.

Graph: Suspended particles (PM10)



Graph: Nitrogen dioxide (NO2)



• Noise:

- The town of Sant Cugat del Valles has a map of acoustic capacity of the municipality to comply with regulatory requirements, European, national and regional regulations. This map identifies unwanted noise quality objectives, and it classifies land in areas of acoustic sensitivity according to land use. The map capacity acoustics should be reviewed every 5 years.
- The autonomous legislation establishes emission limits for each zone and three time periods (day, evening and night).

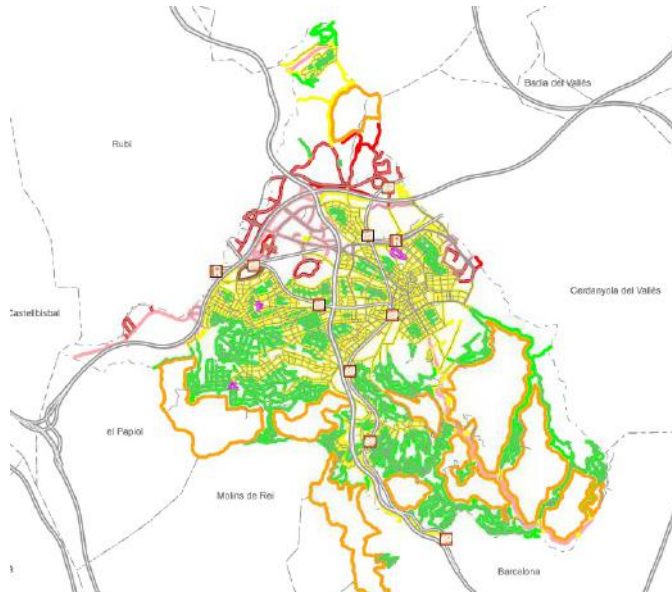
Zones acoustic sensitivity and land use	Limit value		
	L <sub>d</sub> (7h-21h)	L <sub>n</sub> (23h-23h)	L <sub>n</sub> (23h-7h)
<b>ZONE HIGH ACOUSTIC SENSITIVITY (A)</b>			
(A1) Espais d'interès natural i alters	-	-	-
(A2) Predomini del sòl d'ús sanitari, docent i cultural	55	55	45
(A3) Habitatges situats al medi rural	57	57	47
(A4) Predomini del sòl d'ús residencial	60	60	50
<b>ZONE MODERATE ACOUSTIC SENSITIVITY (B)</b>			
(B1) Coexistència de sòl d'ús residencial amb activitats i/o infraestructures de transport	65	65	55
(B2) Predomini del sòl d'ús terciari diferent a (C1)	65	65	55
(B2) Àrees urbanitzades existents afectades per sòl d'ús industrial	65	65	55
<b>ZONE LOW ACOUSTIC SENSITIVITY (C)</b>			
(C1) Usos recreatius i d'espectacles	68	68	58
(C2) Predomini de sòl d'ús industrial	70	70	60
(C3) Àrees del territori afectades per sistemes generals d'infraestructures de transport o altres equipaments públics	-	-	-

L<sub>d</sub>, L<sub>e</sub> i L<sub>n</sub> : Noise emission levels in the periods day, evening and night respectively.

- Controlling noise levels of activities and neighbourly relations corresponds to the City Council. In the last two years have opened nearly 80 complaint files that have been processed and resolved by the municipal technical services. Most cases missed sonometric measurements to assess the level of noise and determine whether or not there was a breach regulations.
- This 2015 planned acquisition of two noise measuring equipment that can be installed in public lighting, in order to resolve complaints or evaluate noise levels in different parts of the city. These teams will move according to the needs and will be very useful for the realization of the new map capacity acoustics, 2017.



Map capacity acoustics Sant Cugat approved on 23 April 2012 (each zone is identified with stripes of different colours).



- Water consumption per head, % of underground water:
  - Water consumption in the town of Sant Cugat del Vallès stands at 6.404 million m<sup>3</sup> (2013), of which 68.06 % is domestic consumption, a 26.39 % non- domestic consumption and 5.55 % municipal consumption.

Graph: water consumption per head



Source: Area Metropolitana de Barcelona

- This measure has been complemented by the proposed use of groundwater and rainwater for watering parks and gardens and for cleaning. This measure has been made through the legalization and use of wells municipality.
- The amount of groundwater used in 2014 (22.019 m<sup>3</sup>) increased by 214% compared to 2012 (7.018 m<sup>3</sup>). The use of this water has been for the maintenance of green areas service and the waste collection and street cleaning service. But this value is insignificant when compared to the total consumption of that year in the city (6,4 million m<sup>3</sup>), representing only 6,2% of municipal needs in 2013 (356.000 m<sup>3</sup>)

• Water conservation initiatives:

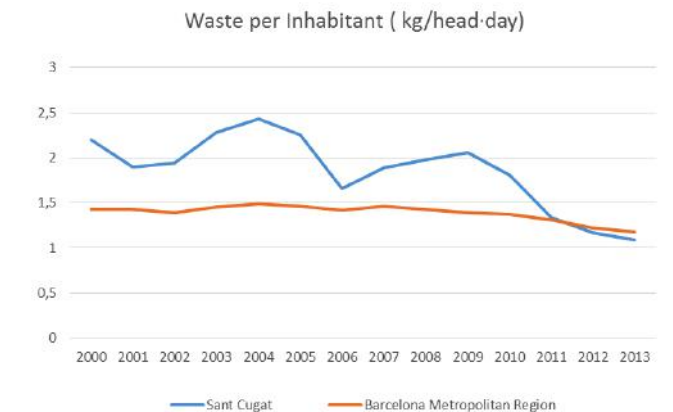
- Because Sant Cugat del Vallés is in a drought-prone region, water conservation is becoming increasingly important. In 2008, the city council approved a Water Conservation Bill, the first of its kind in Catalonia. This piece of legislation requires the incorporation of water-saving devices and installations in buildings.
- In recent years, the city has also started collecting ground and rainwater to clean and water parks and gardens. Currently, the Sant Cugat, Barcelona, and SOREA (the Sant Cugat's water utility company) are drafting a Master Plan for Water.

• Residual waste:

- The waste collection service has worked in the last decade to reduce the amount of municipal waste. The result is more than satisfactory as shown in the following tables and graphs. The recyclable rate has been another of the objectives have been improved. a new contract awarded in 2010 with continuous improvement and communication campaigns aimed at citizens have been the main tools used.
- In recent years the generation of waste in the town of Sant Cugat has fallen very important, from being one of the municipalities in the Metropolitan Region of Barcelona (RMB) with a ratio higher to stand for below the average value of the field.

Table and graphs: Residual waste

YEAR	TOTAL WASTE (Tn)	NON RECYCLABLE WASTE (Tn)	RECYCLABLE WASTE (Tn)	RECYCLING RATE	SANT CUGAT Kg/head-day	BARCELONA METROPOLITAN AREA Kg/head-day
2.000	37.864	35.094	2.770	7%	2,20	1,43
2.001	32.670	28.139	4.532	14%	1,90	1,43
2.002	42.728	38.122	4.606	11%	1,94	1,39
2.003	52.506	44.891	7.615	15%	2,28	1,45
2.004	57.627	50.849	6.778	12%	2,43	1,49
2.005	57.800	50.818	6.982	12%	2,25	1,46
2.006	44.818	36.797	8.021	18%	1,66	1,42
2.007	51.364	39.640	11.725	23%	1,89	1,46
2.008	55.002	38.581	16.421	30%	1,98	1,43
2.009	59.483	43.329	16.154	27%	2,06	1,39
2.010	53.888	35.834	18.054	34%	1,81	1,37
2.011	40.841	23.363	17.479	43%	1,34	1,31
2.012	36.351	19.948	16.403	45%	1,17	1,22
2.013	34.391	18.867	15.524	45%	1,09	1,18

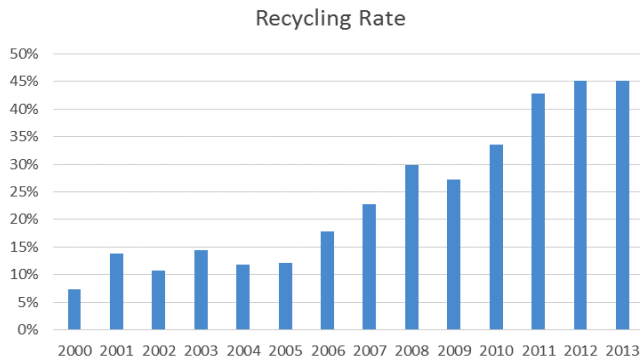


• Type of waste collection:

- Sant Cugat use trucks for waste collection. The vast majority of them have lateral load up system and collect five fractions in different containers. The number of containers installed are:
  - Paper: 319 containers of capacity 3.200l
  - Glass: 311 containers of capacity 2.200l
  - Packing: 339 containers of capacity 3.200l
  - Organic: 722 containers of capacity 2.200l
  - Do not recyclable: 794 containers of capacity 3.200l
- In addition to these containers, there are 60 mini dumps distributed to the public, as well as both fixed and mobile collection points around the town. The collection centres are many more fractions, apart from the five previous (special waste, furniture, pruning ...).
- 100% of the containers have position sensors and GPS, as well as trucks that weigh know how much you weigh each container when the investment of the taxpayer.

• Recycling rate (% of total waste)

- From 2003 to 2013, the percentage of recycling has risen from 13% to just 45% today.



• Kind of sewer system, type of sewage plant (waste water cleaning, resources)

- The sewerage network is approximately 450km long.
- The network is a separate sewer system in the 60% of the town (Centre and new urbanizations). The rest of the network collects rainwater and wastewater in the same sewer.
- The sewer system is directly managed by de city hall through a contract with a private company in charge of cleaning and

corrective maintenance of the network. This contract is directly supervised by the municipal technical services.

- Most of the Sant Cugat's waste water goes to two different sewage plants that are manage by supramunicipal administrations (Agència Catalana de l'Aigua and Àrea Metropolitana de Barcelona). Both of them receive wastewater from several municipalities of the region as well. These Plants are:
  - The WWTP in Montcada I Reixach is a biological plant that is design for 423.500 equivalent inhabitants and 72.600m<sup>3</sup>/day. This plant treats 80% of Sant Cugat's wastewater.
  - The WWTP located at Rubí is a biological plant with a nitrogen removal treatment, that is design for 135.000 equivalent inhabitants and 27.000m<sup>3</sup>/day.
- Because the geographical features of Sant Cugat, we need to use pumping wastewater plants (4 ut) and municipal treatment plants (3 ut), smaller than the other ones we have described above (see attached files contains further information).
  - WWTP Can Barata. Compact system, with a biological air flow-decanter tank reactor. Design for 1.000hab.eq and 150m<sup>3</sup>/day
  - WWTP Can Cortès. Biofilter design for 135 equivalent inhabitants and 27m<sup>3</sup>/day.
  - WWTP Costa del Golf. Air flow Biological treatment design for 250 equivalent inhabitants and 62,5m<sup>3</sup>/day.

• Buildings

**CO<sub>2</sub> building emissions by source (Tn)**

Electricity	131.471
Natural Gas	64.462
Liquid Gas	2.976
Heating Oil	5.574

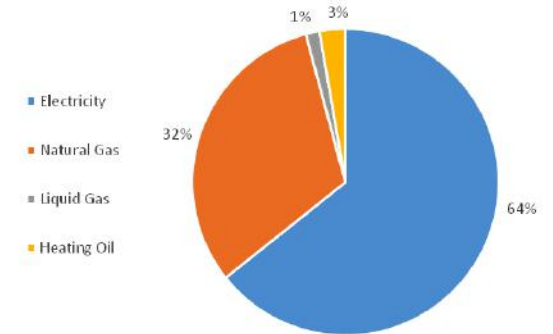
**Total: 204.483**

**CO<sub>2</sub> Emissions in buildings by building (Tn)**

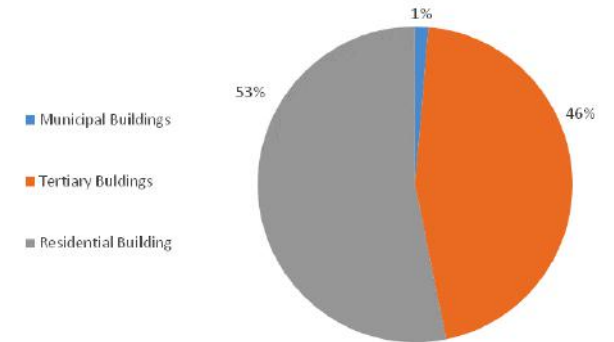
Municipal Buildings	2.785,00
Tertiary Buldings	93.002,00
Residential Building	108.696,00

**Total: 204.483,00**

CO<sub>2</sub> Emissions in buildings by source (Tn)



CO<sub>2</sub> Emissions in buildings by building (Tn)





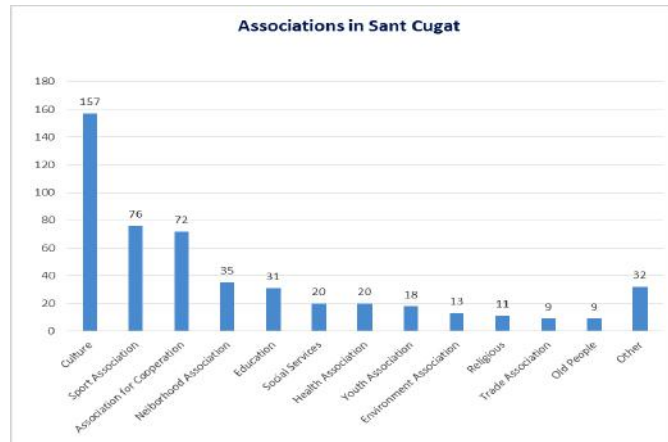
**Historical / cultural aspects:**

- The size of the historic centre are 401.060 square meters. It represents a 1,8% of the total developable.
- The total number of listed historic buildings is 376. In the historic centre are locate 120 buildings.

Table: % of foreign people living in the city (last 5 years)

	European Union	Rest of Europe	Africa	North and Center America	South America	Asia and Oceania	Total
2014	4,78%	0,55%	0,79%	1,24%	3,61%	1,03%	12,00%
2013	4,78%	0,51%	0,82%	1,34%	4,23%	1,03%	12,73%
2012	4,80%	0,42%	0,84%	1,32%	4,68%	0,98%	13,03%
2011	4,75%	0,43%	0,84%	1,24%	5,19%	0,96%	13,42%
2010	5,47%	0,42%	0,87%	1,20%	5,41%	0,89%	14,27%

- Lifestyle aspects: The rate of motorization in 2013 was 602,3 vehicles per 1000 inhabitants. Importantly, this value was reduced over the previous five years a 3,2%
- The total number of associations in Sant Cugat is 471
- As an interesting information, the Social Observatory shows that an 18,6% of the citizens belongs to a cultural association and a 15,9% belongs to a sport association.



**Awards & achievements**

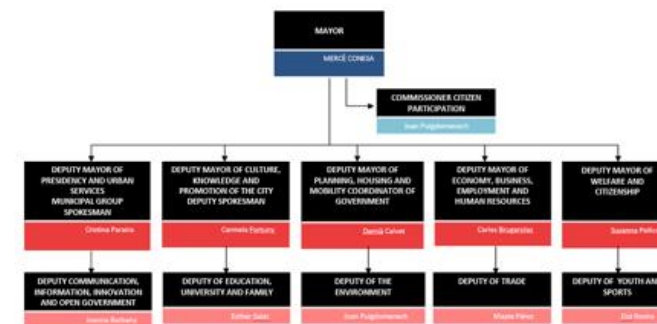
The city thrives to give first-rate responses citizen's demands. It has influenced public leadership and stimulated the city administration to pioneer with new ways and means for effectively providing public services, based on the idea of a flexible, transparent and accountable governance structure. These advanced community services are widely recognized. Sant Cugat has in the past 2 years won several international awards for innovation, transparency and management. In 2009, the City was awarded the European Public Sector Award (EPSA) for Leadership and Innovation and was listed by Transparency International as the most transparent local government in Spain. In 2010, Sant Cugat was again awarded the highest ranking by Transparency International, as well as the Living Labs Global Award by the City of Eindhoven for its Local Innovation Plan.

**Organisation**

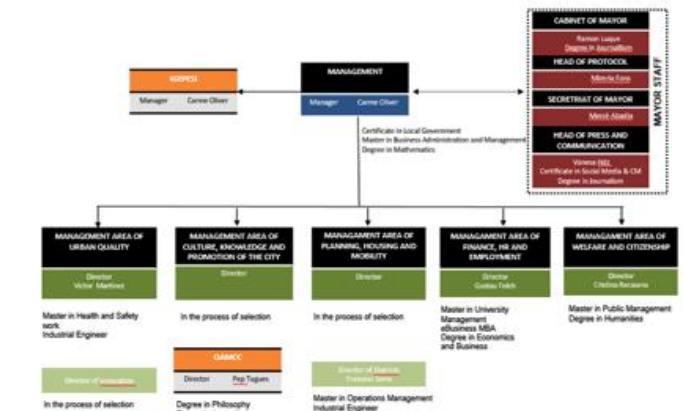
After the election last May, the internal organization of the council is changing and there is not the definitive organization.

However, the political and management organization are already approved.

**POLITICAL ORGANISATION 2015 - 2019**



**MANAGEMENT ORGANISATION 2015 - 2019**



Nowadays Sant Cugat has a service of management of the Management Centre comprises the following functions in the field of traffic control systems:

- The surveillance and supervision of the 25 access bollards in the pedestrian area and cameras controlling 7 of these entrances through a computer program managed by an operator.
- Control of the traffic state by 5 cameras situated around the city centre.
- The exploitation help service (SAE) that allows to obtaining information in real time of the urban buses fleet and allows a direct control of the routes and communication with the users through the stops management.

The main goal of the Sant Cugat Management Centre is to monitor and manage all these municipal services in a centralized way to take transversal decisions that allow us to optimize and improve all the services keeping the minimum impact for the citizens. Each of the services are offered by concession companies with an own system of service management [GPS for positioning the vehicles, information database collected by the sensors, broadcast of indicators, ...] Generally, the access to these services for part of the responsible municipal technicians of the city council is done via web service.

A unique platform to access all these different services data will allow the city to realize a data-crossing in order to have greater information for each of the services and carry out a development in decision-making capacities.

At present, each of the services can be seen on the video wall so unique operators of the management centre have an overview of all the services state.

The services the city can incorporate to the existent services in the management centre are:

- Public lighting: control of incidences, efficient management of the energetic consumption, control of the on/off switch.
- Garbage collection and road cleaning: equipment control panel with position data, speed and state of work, incidences control, routes control and containers identification.
- Parks and gardens: integration of the irrigation software control. This software allows giving orders on the irrigation activation based on the meteorological data.
- Environment: data control of pollution in real time.

## Regulations

In 2015, the City of Sant Cugat del Vallès has 23 tax regulations. Some of these tax advantages as aspects of mitigation and adaptation to climate change. Below is a summary of the most important aspects, as shown in the

ORDENANÇA	OBJECTE DE BONIFICACIÓ
ORDENANÇA FISCAL NÚM. 1. IMPOST SOBRE BENS IMMOBLES	<ul style="list-style-type: none"> <li>• [Punt 4.2.4.] Bonificació del 70% d'aquells immobles ubicats en àrees del municipi que corresponen a assentaments de la població caracteritzats pel predomini d'activitats primàries de caràcter agrícola, ramader o forestal i que disposin d'una sèrie d'infraestructures de competència municipal inferior a l'existent a altres àrees del municipi.</li> <li>• [Punt 4.2.5.a] Bonificació del 50% els immobles que hagin instal·lat sistemes per a l'aprofitament tèrmic o elèctric de l'energia provinent del sol per autoconsum, així com els béns immobles en els que es realitzin per part del subjecte passiu instal·lacions d'adaptació o millora d'aquests sistemes, durant el període impositiu immediatament anterior a aquell en que hagi de tenir efectes la bonificació.</li> <li>• [Punt 4.2.5.b] Bonificació del 70% les instal·lacions d'energia eòlica per autoconsum.</li> <li>• [Punt 4.2.5.c] Bonificació del 70% les instal·lacions de biomassa i geotèrmia</li> </ul>
ORDENANÇA FISCAL NÚM. 2. IMPOST SOBRE	<ul style="list-style-type: none"> <li>• [Art. 4.4] Bonificació del 75% pels vehicles de propulsió elèctrica pura i de propulsió híbrida endollables amb capacitat de tracció elèctrica al 100% mitjançant bateries i</li> </ul>

ORDENANÇA	OBJECTE DE BONIFICACIÓ
VEHICLES DE TRACCIÓ MECÀNICA	<p>amb emissions inferiors a 110g de CO<sub>2</sub>/km i una autonomia mínima en mode elèctric de 20km.</p> <ul style="list-style-type: none"> <li>• [Art. 4.4] Bonificació del 50% pels vehicles de propulsió híbrida que tinguin capacitat de tracció elèctrica mitjançant bateries, i unes emissions inferiors a 110g de CO<sub>2</sub>/km, així com els tots els vehicles que utilitzin com a combustible el gas natural, GLP i unes emissions inferiors a 160g de CO<sub>2</sub>/km.</li> <li>• [Art. 4.4] Bonificació del 25% pels vehicles de gasoil amb emissions inferiors a 108 g de CO<sub>2</sub>/km i vehicles de benzina amb unes emissions inferiors a 120 g de CO<sub>2</sub>/km.</li> </ul>
ORDENANÇA FISCAL NÚM. 03. IMPOST SOBRE ACTIVITATS ECONÒMIQUES	<ul style="list-style-type: none"> <li>• [Art. 4.4] Bonificació del 20% pels subjectes passius que tributin per quota municipal i que utilitzin o produeixin energia a partir d'instal·lacions per l'aprofitament d'energies renovables o sistemes de cogeneració (definides com a tals en el Pla de Foment de les Energies Renovables).</li> <li>• [Art. 4.7] Bonificació del 20% pels subjectes passius que estableixin un Pla de Transport pels Treballadors que tingui per objecte reduir el consum d'energia i emissions. Aquest pla s'ajustarà al que estableix el decret 152/2007 i aquest Pla ha d'estar aprovat per l'Autoritat Territorial de la Mobilitat.</li> </ul>
ORDENANÇA FISCAL NÚM. 05. IMPOST SOBRE CONSTRUCCIONS, INSTAL·LACIONS I OBRES	<ul style="list-style-type: none"> <li>• [Art. 4.2.] La quota de l'impost corresponent a construccions, instal·lacions o obres que incorporin mesures innovadores i potestatives de construcció sostenible, es reduiran per aplicació del coeficient següent: <ul style="list-style-type: none"> <li>○ Fins al 95% en obres d'ampliació o instal·lació en edificacions existents destinades a incorporar elements de construcció sostenible basats en sistemes actius d'aprofitament de l'energia solar, biomassa, geotèrmic, i/o sistemes per a l'estalvi d'aigua 95 %</li> <li>○ Fins al 60% en la incorporació potestativa d'altres elements de construcció sostenible no inclosos en l'anterior apartat (disseny bioclimàtic dels edificis, mesures addicionals d'estalvi energètic, selecció de materials constructius ecològics, entre d'altres).</li> </ul> </li> </ul>
ORDENANÇA FISCAL NÚM. 12. TAXA PER SERVEIS URBANÍSTICS, LICÈNCIES O PER LA COMPROVACIÓ D'ACTIVITATS COMUNICADES EN MATÈRIA D'URBANISME	<ul style="list-style-type: none"> <li>• [Art. 4.] No estaran subjectes a la taxa: les obres de reparació i/o pintat de façanes a excepció dels edificis situats en tipus d'ordenació en edificació aïllada o volumètrica específica, les edificacions existents destinades a incorporar elements de construcció sostenible basats en sistemes actius d'aprofitament d'energies renovables i/o sistemes per estalvi d'aigua quan siguin de caràcter potestatiu,</li> <li>• [Art. 4.] Es bonificarà en un 50% de la taxa de llicències d'obra major aquells immobles que disposin de certificació energètica registrada a l'Institut Català de l'Energia (ICAEN) de valor A.</li> <li>• [Art. 4.] Estaran exempts del pagament de la taxa els immobles que executin rehabilitacions integrals d'edificis d'antiguitat superior a 50 anys amb la finalitat de millorar l'eficiència energètica de l'edifici. També estaran exempts de pagaments de la taxa aquelles llicències d'obra destinades exclusivament a la instal·lació en edificacions existents d'elements de construcció sostenible basats en sistemes actius d'aprofitament d'energies renovables i/o sistemes per a l'estalvi d'aigua, i que siguin de caràcter potestatiu.</li> </ul>
ORDENANÇA FISCAL NÚM. 18. TAXA PER LA UTILITZACIÓ PRIVATIVA O L'APROFITAMENT ESPECIAL DE LA VIA PÚBLICA I DE TERRENYS D'ÚS PÚBLIC	<ul style="list-style-type: none"> <li>• [Art. 4.1.] Estaran exempts del pagament de la zona blava d'aparcament de vehicles i futures zones verdes tots els vehicles 100% elèctric i híbrids endollables.</li> </ul>

following table.

## Recent projects

According to Smart City plan, the city put into operation a pilot project to test some of the existing innovative urban management systems. The City Hall delimited a sustainable high-tech zone (smart street) where to implement a series of innovative measures. First results are the implementation of a guided vehicle parking, an intelligent garbage collection point, a street lighting sensitive to presence, an irrigation system dependent of the humidity levels and a pedestrian crossing equipped with lighted sensors, amongst others.

Monitoring systems are also in place to help businesses with loading and delivery management.

After a one-year trial period, the smart street lighting initiative has been applied in the whole city, allowing a reduction in the economic and environmental bill equivalent to 30%.

According with its smart city strategy, Sant Cugat has also been one of the pioneer cities in Spain promoting the City Protocol Society. The City Protocol Society is an international forum that invites the city councils, industry, research organisations and other agencies involved in city transformation to work together in order to share knowledge and experiences in the sustainable transformation of urban spaces. This cross-sector partnership focuses on the establishment of international standards and politics that should drive the sustainable development of cities.

The city of Sant Cugat del Vallès has defined the goal of becoming a "Smart City" by 2020 and therefore strengthens its focus on innovation based on public-private partnerships, with a strong commitment to testing and deploying forward-thinking solutions, together with private companies.

The city has broad experience in successfully implementation of full-scale pilots in the city of the winning solutions, in order to evaluate the impact and to lead to broader implementation.

Sant Cugat is developing many projects related to the plan,



as the Public Lighting Master Plan, the Mobility Plan, the Energy Management Plan for buildings, etc. The city has already achieved first improvements regarding the efficient management of its public spaces and is saving significant costs for energy use, lighting and water. A local automobile club study estimates that if the vehicles driving in Sant Cugat's centre in search of parking spaces could reduce their search time by just two minutes each, 776,000 tonnes of carbon emissions could be reduced annually.

One of the most important goals for Sant Cugat is achieve the most efficient buildings it can be, so we took part of the 3e-Houses project, which aims to improve the housing energy efficiency through information technology (ICT) and home automation systems. Specifically, Sant Cugat promoted the retrofit of two buildings through Promusa, the municipal housing company of 118 renting apartments.

The city of Sant Cugat del Vallès develops its environmental politics backed up by the SEAP as developed in the context of the Covenant of Mayors, the local strategy against climate change.

Recently it has renovated and improved its compromise with the SEAP through a new resolution "Step forward of the Covenant of Mayors and agreement for local sustainable energy" and also the City has recently received certification bronze registration EMAS, which recognizes five years of commitment to ecomanagement municipal equipment

Contract with an energy service company (ESCO) Maintenance Heating and cooling them in municipal buildings. They have achieved energy savings of 30%, a cost savings of € 1,090,064 and non-emission of 3,138 t of CO2 compared to the situation baseline (2007-2013). It has applied to 62 buildings in the city: Schools and Children Schools, sports facilities, civic and cultural centres, and libraries (including the Auditorium Theatre), Museums (Monastery and House Aymat) and more than 14 Municipal offices.

Company street cleaning and waste collection contract. They have achieved a saving of € 1,840,000 / year (20%) with the

economic improvement of the solicitation and the introduction of continuous improvement and part of the price with the variable billing. We paid for services actually rendered and well made.

Improvement of street lighting contract. By efficient management and implementation of new technologies they are getting a 30% energy savings worth around € 400,000 / year approx. Minimizing light pollution and avoid the emission of some 1,000 tonnes of CO2.d

Sant Cugat has the First Smart Street of Catalonia, applying different ICT solutions for energy efficient urban management. Implemented in 2011 the smart street project explored the potential of an intelligent parking system, intelligent public lighting and an efficient garbage collection system amongst other technological innovations, with an overall energy saving potential of up to 30%.<http://smartcity.santcugat.cat/?lang=en>;

Sant Cugat implemented an ambitious local regulation, going beyond the existing Spanish building code, in order to improve the amount of thermal solar energy systems installed within the municipality. Beside technical consultancy and tax reduction incentives for citizens a special focus has been since set on the installation of solar thermal systems in public buildings.

## Involvement in EU projects

The City of Sant Cugat has, an ambitious development plan, which based its philosophy of innovation and cooperation has opened participation in strategic projects at European level by sharing their experience with others cities and regions across Europe, as well as to take advantage of the knowledge of experts from all over to ensure the development of actions and measures to assist and facilitate the implementation of its own plan of action. At the same time this investment is an openness to change, continuous improvement, which will allow sustainable development and committed to society and the environment over time.

In this sense here you are an example of the participations of The City of Sant Cugat in European Founded Projects aligned with the own objectives included in it's Smart City strategy:

- Projects covered by the EU framework programs:
  - 3e-Houses (CIP-ICT-PSP-2009-3): improve the energy efficiency of homes, through the installation of energy control and automation equipment for the use of information technologies (ICTs)
  - BiTiBi (bitibi.eu), which aims to promote inter-modal rail-bike-bike, following the examples of the Dutch rail operator NS and FGC (as is the case Biciestació Sarria, etc. ).
  - Optimus (FP7-SMARTCITIES-2013): carry out actions to achieve energy efficient neighbourhoods
  - R4E (H2020-EE-2014-3-MarketUptake): develop a vision and roadmap corresponding to initiate joint activities to stimulate the development and implementation of innovative energy solutions in cities.
  - NewTREND (H2020-EeB-2015): monitoring and optimization of energy consumption
- Projects pending assessment by the European Union:
  - CHES-SETUP (H2020-EE-2015-1-PPP): implement different storage systems from thermal power plants
  - Solar thermal installation in order to use it in periods of less production, finding the best solution for storage under any circumstances
  - Refurbee (H2020-EE-2015-3): validate and develop a platform that allows the creation of urban energy models that



integrate multiple data sources. Tools platform to evaluate the performance of buildings in an urban area, and improve the existing conditions.

- Switch (IEE program): help reduce urban traffic boosting change (switch) short-haul journeys by car or bicycle to walk.
- CitOS (H2020-INSO-2015): open city government to citizens through open data and enable the development of innovative services / mobile tools to meet the objectives of the principles of open government: transparency, participation and co-operation.
- CLOSE CARE (H2020-PHC-25-2015): the implementation of patient-centred and integrated care pathways supported by a novel ICT infrastructure that will be blended with existing systems. This will result into a major revamping of current health delivery processes, involving the integration of health and social services to extend the concept of Smart Cities to Smart Wellbeing Cities
- SsIMPLE (H2020-MG-2015): A new form of public transport, including bus and taxi fleet of cars circulating with fixed lines (like the bus), offering cruising speed and coverage similar to a taxi.
- Sport (Erasmus+ KA1): implement innovative instruments to support good governance in sport basis, by improving the skills and abilities of the sports bodies to respond more effectively to the risks that threaten the integrity of sport.

Sant Cugat also participates in many forums like the Smart City World Congress in Barcelona, we participated in the Smart City Congress that was held in Amsterdam in May 2014 and 2015, moreover Sant Cugat participated in de ICN SUMMIT 2014 that was held in Copenhagen in May 2014. Sant Cugat participates in different congress presenting talks related to Smart City, energy management, mobility, waste collection and many other issues, explaining its experience.





### Relevant learnings from earlier experiences

We have participated in various conferences and events such as the meeting of Living Labs Global (2010), the International EPSA 2009 Knowledge-Transfer Workshop (European Public Administration Institute, EIPA, 2010), BDigital Global Congress (2011), the meeting of Eurocities (2011), the World Green Design Forum (2012), the Europe in my Region (2012), the Smart City Expo World Congress in Barcelona (2012-14), the meeting of the Covenant of Mayors (2013), a seminar the EIPA (2013), the Open Days week (2013), a talk at EIPA (2014), the Amsterdam Smart City Hall (2014), ICN and the EU SUMMIT 2014 Core Genoa Clean Cities Congress (2014).

Moreover, Sant Cugat receives delegations of states (Sweden, Norway, Russia, China, Japan, Brazil, Portugal) while visiting other countries to learn about other city models.



# Today's reality: smart buildings



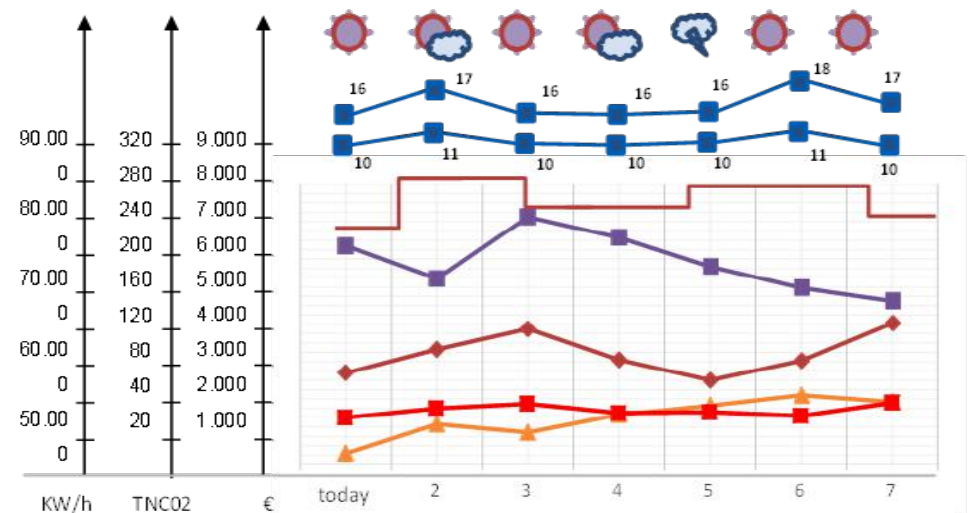
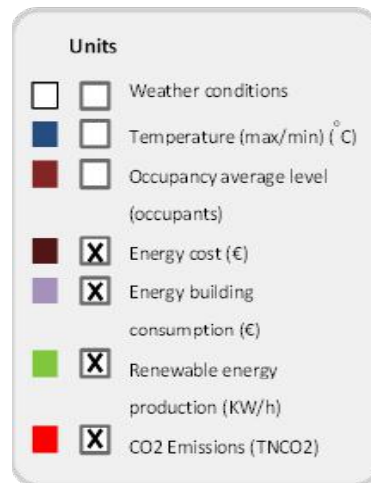
One of the most important goals for Sant Cugat is buildings as efficient as possible. To achieve this the city took part in the '3e-Houses' project, which aims to improve housing energy efficiency by using information technology (ICT) and home automation systems. Specifically, Sant Cugat promoted the retrofitting of two buildings through Promusa, the municipal housing company with 118 rented apartments.

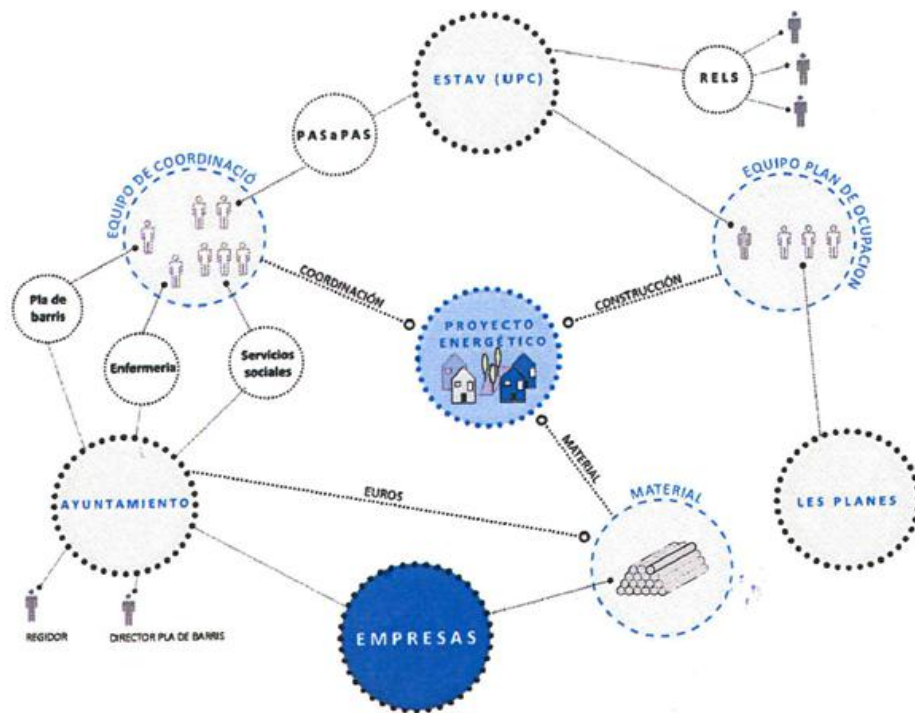
There is a contract with an energy service company (ESCO) for maintenance, heating and cooling of municipal buildings. Energy savings of 30% have been achieved, with cost savings of € 1,090,064 and non-emission of 3,138 tonnes of CO<sub>2</sub> compared with the baseline figure (2007-2013). This applies to 62 buildings in the city: schools and children schools, sports facilities, civic and cultural centres and libraries (including the Auditorium Theatre), museums (Monastery and House Aymat) and more than 14 municipal offices.

Sant Cugat implemented an ambitious local regulation, going beyond the existing Spanish building code, in order to improve the number of thermal solar energy systems installed within the municipality. As well as technical consultancy and tax reduction incentives for citizens, there is a special focus on the installation of solar thermal systems in public buildings;

Sant Cugat participates in an FP7 project, OPTIMUS, which aims to create a platform that will allow cities to predict their energy demand and consumption based on weather forecast, occupancy of the building and the energy cost. OPTIMUS will provide an integrated ICT platform that will collect and structure the multidisciplinary open data sets and use semantic, intelligent technologies and inference rules to combine the data and propose energy optimisation plans. Within the OPTIMUS scope, a Smart City Energy Assessment

Framework (SCEAF) has been developed. The SCEAF is structured under three main pillars of evaluation, namely 'Political field of action', 'Energy and environmental profile' and 'Related infrastructures and ICT'. Each of these includes 7 indicators to provide the assessment in a coherent, transparent and integrated way.

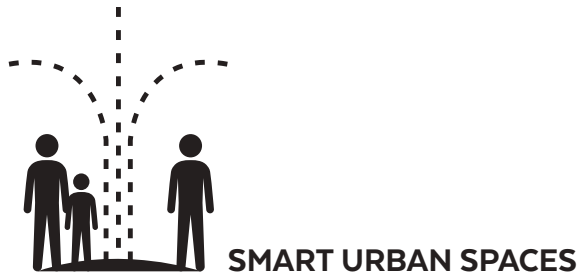




Sant Cugat has developed a pilot project which aims to improve well-being of citizens who cannot afford the costs of energy. The project involves energy refurbishment of inefficient houses by unemployed people from the neighbourhood, so it is both sustainable and socially smart. The project includes not only the improvement of houses, but also monitoring health indicators. For example respondents have been blood-tested several times; before, during and after the refurbishment.

Sant Cugat has signed an agreement with the University of Technology with the goal of defining and developing the local plan for energy refurbishment of Sant Cugat's buildings, both public and private.

# Today's reality: smart urban spaces



The City of Sant Cugat has a firm and consistent commitment to transparency, with the aim of informing and accountability of all the action of government and the municipal administration. For years, the city has been a leader in governance through the Alignment and Strategic Competitiveness Plan (PACTE). With this tool, the city plans and manages its government action, while facilitating accountability and evaluation of public policies. PACTE is also key to the rationalisation of public resources and the reorientation of activities in a complex and changing environment. It is a management model based on budgetary strategy maps and scorecards for use by managers at all levels of the organisation, and defined the strategic objectives of management and functional indicators and values each year, both planned and real.

The vision of Sant Cugat in 2015 is a creative city, a meeting place for people and businesses, knowledge institutions and universities to create synergies that will allow the generation of new ideas that inspire experimentation and innovation. These can be transformed into reality, with the most daring ideas being transformed into value for the city and country.

Entrepreneurship, a magnet for people, organisations and companies that promote innovation and research without fear of the effects of change on citizens while businesses can prosper with a global approach to services, a highly skilled and qualified labour force and optimum territorial infrastructure. This creates socially responsibility, an accessible city that is inclusive, safe and has an attractive environment. A city in



which people regardless of age, origin and social status find their space for participation and coexistence. The urban quality leader active in maintaining public spaces and providing services for citizens by reducing their carbon footprint in line with its commitment to the sustainability of the planet. Projection International will be recognised internationally for its contribution as a model for quality of life and wealth generation.



## Results ambition workshop policy

# 2015

### High Lights

The aspects in the city the municipality is most proud of:

- Many open spaces in the cities, compared to the cities around us
- Current update of the building engineering services (more energy efficient)
- Good working ESCO's (energy supply cooperation organisation) for public buildings
- Environment education in primary school, realising energy conscious children
- Behaviour change and investment, split savings between organisations and municipality
- The natural parks in the city are an asset
- The fuel poverty project with the school of architecture UPC, that made an analysis of buildings and investments, respecting both social and sustainability
- Strong relation with the university that also creates new ways to tackle problem
- The reduction of water consumption through the re-use of grey water and rain water for the city public parks
- The perception of the people towards efficiency and sustainability is already very good

# 2050

### Priority in Policy

Which topics have the highest priority in the current policy:

- Sustainability: how to manage the forest and parks as energy resource (biomass)
- The maintenance of urban space, such as the high number of trees, park sewage and reduction of maintenance.
- Reduction of fuel poverty
- Water: how to retain water from underground or rain,
- Taken the first step in an resilience service project with external enterprises .

## Specific ambitions for smart buildings

1

In 2050 In 2050 Sant Cugat is self-producing all energy resources needed for smart buildings.

### Aspirations

- Balance zero in energy city
- Self sustaining
- Self-sufficient
- No use of carbon fossils
- Get rid of natural gas use for heating. Instead use biomass
- First city to have a 0-energy balance

2

In 2050 In 2050 the newest technology will be used (e.g. the internet of things) to reduce energy use in buildings.

### Aspirations

- Sustainable public and private buildings
- No loss of energy
- Reduce energy use in each building



3

In 2050 the citizens of Sant Cugat are 100% smart citizens



## Specific ambitions for smart urban spaces

1

In 2050 all mobility in Sant Cugat (in general sense) is low-carbon.

### Aspirations

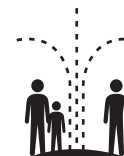
- Mobility without negative energy input, e.g. human powered, low-carbon, renewable energy
- No cars in the city
- Mobility and energy
- Municipality as e-administration, where citizens can connect digitally and teleworking for employees. This will lead to less mobility

2

In 2050 the citizens of Sant Cugat feel responsible for the open urban space, in the sense of sharing, water use and maintenance of the green.

### Aspirations

- Water use of urban space by re-used sources and from underground
- Create space for small-scale city farming
- Changed mentality of people to see urban space as a place for everybody and a place to work together
- Teach citizens to share energy (and other goods)
- Less division in public and private areas (e.g. the school buildings open in the holidays)
- Using opportunities in areas and districts



### Aspirations

- Urban spaces open
- Create spaces for people to spend time
- Spaces where open-innovation with them can take place
- The citizens are virtual and physical well connected
- Create awareness of energy use with people
- The social aspects of behaviour change

# Results ambition workshop strategy



## High Lights

The aspects in the city the strategy department, integral project managers and departmental managers are most proud of:

- We implemented new policies and systems on water savings and energy efficiency that are even more restrictive than Spanish national law.
- We are monitoring and telemetring all public buildings on climate and energy.
- One project on sustainable public buildings won an award.
- We achieved water savings through new solutions on using rain- and grey water.
- In a district heating project on bio-mass 30% savings are achieved.
- The number of Photovoltaic panels realised, even though the Spanish national laws do not support citizens in installation.
- Since 2009 8 out of 10 actions of the SEA plan are already achieved, as well as 25% of the ambitions for implementation of green energy in public buildings.

## Strategic ambitions for smart buildings

1

In 2050 the buildings in Sant Cugat are designed (by materials, production and construction) to consume less energy and use mostly renewable energy.

### Aspirations

#### NZEB in all new and existing buildings

- NZEB (Nearly Zero Energy Buildings) in all new buildings
- 0-emission buildings
- Existing buildings connected to district heating for 100%
- Best isolation constructions (NZEB)
- Buildings that energetic consume nearly zero
- Produce more than you use and provide a smart grid

#### Materials, production and construction

- Green roofs and walls
- Integrated into the environment
- The construction of the building
- Less/no pesticides and chemical products
- New building materials with energy captivation
- A city with green walls and roofs in most of the buildings



# 2050



## 2

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.

### Aspirations

#### Local energy production and storage

- Smart network for energy in districts
- Liquid hydrogen to produce electricity
- Local energy production
- PV roofs in all buildings
- All buildings using PV production for self consumption
- All buildings connected to smart grid of PV energy supply for e-vehicles
- Eliminate fossil energy dependency

## 3

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.

### Aspirations

#### Digital

- Adaptive lighting and functionality in buildings
- Exact (tele-) measure of energy consumption
- Efficiency and share the use of buildings
- Connected to the internet network
- Smart buildings to switch on/off automatically the installations

### Other aspirations

#### Behaviour

- Incentives in regulation to change behaviour
- Improve energy consumption in houses (heating/cooling)

#### Accessible buildings

- 100% accessibility in all buildings
- To achieve a total accessibility for all private buildings with a public use (schools, services, etcetera)
- Building related sustainable transport
- Buildings with shared spaces for (e-)bikes; safe and at street level
- Charging for e-vehicles
- Sharing of vehicles to reduce the impact on parking space needed

#### Comfortable buildings

- Buildings with all parameters (CO<sub>2</sub>, H<sub>2</sub>, °C) in good range of comfort

#### Water

- 100% water re-use: rain, grey, black
- Less water consumption during irrigation

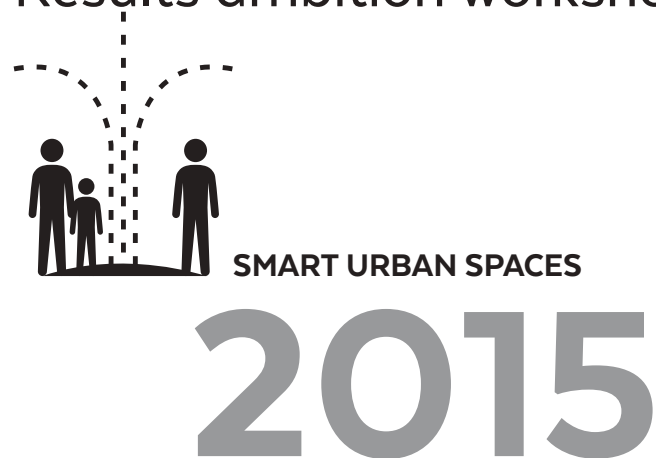
#### Recycling

- Organic rubbish treatment and collection in buildings
- Automatic rubbish collection classified for recycle
- Mini biomass centres

#### Law and subsidies

- Normative and rules and law for existing buildings

# Results ambition workshop strategy



## High Lights

The aspects in the city the strategy department, integral project managers and departmental managers are most proud of:

- Expansion of the urbanisation, while respecting the park
- Connected green areas into the city
- No big (high rise) buildings - more houses
- Pedestrian areas in the city centre
- Clean air
- Close to Barcelona, and good train connection
- Good and many children areas
- Improving technologies in civic services for people
- Many rivers and water storage possibilities (to accommodate rain)
- Transition lands between city and natural park
- LED lights (>10% now) and detection sensors
- New way of collecting waste
- High level of culture
- High level of security and feeling of safety
- Monitoring system services according to real need (waste, sewage etc).

## Strategic ambitions for smart urban spaces

1  
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.

### Aspirations

#### Environmental factors

- Reduce environmental noise
- No noise
- Fresh air
- A city which air quality achieves high rates
- Zero pollution / Zero air pollution
- Free zones of electro-magnetic waves

#### Mobility

- Electric machines for parks and garden maintenance
- A city without cars
- Streets for walking and riding bicycles - no cars
- Electric cars and bus
- 100% electric buses
- Pacified city: no cars, good public transports
- More space dedicated to the pedestrian and less to motor vehicles.

# 2050



## 2

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.

### Aspirations

- Free access to broad band net
- 100% council services accessible from home
- The possibility to switch off the lights when nobody is there
- Sensors installed in whole territory
- Telecontrol sewage network
- More efficient services
- Development of synergies and operational savings
- Public services adapted to the real needs of citizens
- Optimisation and service adapted to the real needs of the town
- Efficiency and quality
- Integrated view of all areas of the city.

## 3

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).

### Aspirations

#### Bio-/eco-city

- Strategic distribution of masses of trees in the city by improving urban bio-comfort
- Proximity commerce
- Increase farmer markets
- Urban farms

#### Re-use

- Increase re-use of waste products
- Increase the use of water from treatment-plants for watering
- Re-use waste water for urban spaces
- Energy for street lighting from renewable production system
- Run of gestioneted by sustainable drainage systems
- Re-use water for green areas (district system)
- Community composting facilities.

### Other aspirations

#### Attractive green areas

- Green areas adapted to the new services that citizens require
- Genetic modification tree - fluorescence at night

#### Sewage system

- Age of sewage networks less than 25 years

# Results ambition workshop stakeholders



## SMART BUILDINGS

# 2015

### High Lights

The aspects in the city the external stakeholders and strategic partners are most proud of:

- Knowledge on energy technology in buildings within the engineers network
- The number of PV installations in Sant Cugat
- We have fostered a challenge on open data, which resulted in 10 apps
- We established a good knowledge community with different stakeholders in the region
- Implemented a good and relevant intelligent lighting plan
- A social innovation plan for building refurbishment, where a lot of attention is paid to fuel poverty and the system ability of users
- We have realised energy efficient buildings, not only general buildings, but also residential
- We are realising energy efficiency in schools (project will be finished in 2 years)
- Already realised energy use reduction of 30%
- Realised bio-mass generation (for boilers) and central district heating
- Participating a EU project on realising renovations, where insights are gained into how people use public buildings

# 1

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.

#### Citizen awareness and skills

- Energy literacy: the ability to understand
- Recover our grandparents skills: Granny's App
- Education in schools to ignite behaviour change
- Interactivity of people and buildings through mobile app
- Empowering citizens
- Citizens have awareness and knowledge to manage consumption
- High awareness and engagement
- Achieve the social perception of energy as limited good
- Sustainable citizen culture
- More saving energy behaviour (dry the clothes outside, not drying)
- Upgrade citizens skills on intelligent monitoring and energy management solutions
- Open platform for community (citizens, organisations, commercial, ...) with data on energy and sustainability
- Fully implemented awareness education participation

#### Today's challenges

- Education
- Citizens apps
- Smart systems dependency
- Citizens "energy culture"
- Citizens are not consumers but users
- Lack of standards
- To overcome the lack of sustainability knowledge and energy literacy

#### Monitoring and management

- Renewable energy systems in almost all buildings, connected to smart grid
- Monitor and communicate results
- Find a way to measure the outcomes and scope correctly
- How to make accountable, how to measure?
- To use just the energy that is needed; sensors to detect the energy necessity of the people
- Better awareness, measuring and management of energy consumption
- Citizens knowledge about the energy sector (technical, legislation, ...)
- Money for paying smart monitoring
- Grant access to home do-it-yourself solutions
- Enable an open platform and foster solution development
- Training
- Education
- Basis knowledge on energy for 12-year olds at school

# 2050



## 2

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.

### District scale and integrated view

- Urban metabolism
- Community grid in neighbourhoods
- Citizen control and network
- Reinvent the profit that citizens get
- Large scale (BIN) community
- Consolidate impact (global scale)
- Sharing energy resources
- Scope of indicators
- Look at it from larger scale and more integrated view
- Energy model + social model + technological model
- Context is larger than buildings, for instance also mobility
- District dimension as a context should be done properly
- Neighbourhoods improvement of energy supply, increasing competition amongst suppliers (price)

### Today's challenges

- Development of holistic city simulation tools: user-friendly and open
- Business models ESCO-promotion
- Market awareness
- BIM grids
- Money
- Involve the whole district community
- Who pays the party? Who is willing to invest?

## 3

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.

### 0-emission building and self-production

- Average n city level
- Central heating systems in big buildings
- Make buildings future proof for climate and consumer needs
- To produce energy close to the buildings (if possible)
- Energy generation and auto-consumption
- Renewable energy generation in buildings
- All buildings 100% self-sustainable energy
- Closed circle "cradle to cradle"-approach implemented for all building materials and energy systems
- All building stock deeply renovated to NZEB standard and beyond

### Certification and audit

- Certification on energy/sustainability for products and services (like CE certification)
- Develop the certification process further
- Energy audit on each building compulsory
- Certification for high energy users to really realise energy reduction
- Energy accountability present energy every year

### Today's challenges

- Financing
- Fight with the law men of utilities
- Measure first, save then
- Speed up and rapid implementation of solutions
- Regulation
- Law enforcement
- Smart regulation
- Adapt the design to the environment of the building

### Other aspirations

#### Values of Sant Cugat and the quality of life

- Translation of indicators into value for citizens
- Maintain the high level of value in Sant Cugat (both quality of life as well as value for property)
- Private/commercial refurbishing including energy efficiency to maintain value of the local houses

#### Smart buildings and technology

- Quick implementation of ideas that are proven useful and suitable
- Passive elements in design; shadows, green facade, ventilation
- Be aware and quick about energy storage implementation
- Empower citizen's home control from smart phones (lighting, devices, cooling, applications)
- Smart grid connection (buildings and districts)
- Interactivity person and building to seamlessly find his way and regulate functionality

#### Management of energy mix

- Management of energy mix/use through distributed generation/connection to the grid

#### Laws and regulations

- Oppose RD self-consume
- Technical debate
- Political incentive

#### Poverty

- 0 fuel poverty
- Energy poverty zero

#### Rethink / back to natural values

- Right level of light, in the right place, at the right time = energy savings
- Same quality of light inside as outside
- Rethink human activity in natural settings again
- Effective use of (free) natural light in buildings
- Smart means less

#### Be nr 1

- Competition of the smartest building in town
- EU targets
- Decrease 85% CO2 emissions

# Results ambition workshop stakeholders



## High Lights

The aspects in the city the external stakeholders and strategic partners are most proud of:

- Lots of non-paved areas to collect rain water & re-use of rainwater (sustainable and cheap)
- Integration of water and green in urban space design
- Re-use of traditional systems - like water canals (heritage)
- Saving energy in private property through urban sprawl
- Good streets for walking and good mobility through public transport (9 train stations)
- Design of streets and urban planning at human scale
- Lighting master plan (made 3 years ago) has already resulted in 35% energy saving through LED and sensor controlled lighting (presence detection)
- Good telecom network: fiber, wifi and service operators
- People like Sant Cugat because of lots of green areas (parks, trees) and a good network of greenery through the city
- Inviting parks for people to meet
- Lots of public space in the city - low density (compared to other cities)
- Good underground structure for water
- Mediterranean compact city : social economic and low carbon
- Social cohesion projects to build community gardens
- Sant Cugat citizens are early adopters, e.g. of local & healthy food

# 1

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).

### Sustainable energy production:

- 100% of renewable energy generation
- Decrease carbon footprint with suitable strategies
- Allocation of energy production spaces (renewables, ...)
- Reduce (2050) carbon footprint from 10 to 2 T CO<sub>2</sub>/yr, usability, low cost, citizen appropriate (real) - re-use of ringo-rango
- To get energy using public and private roofs to achieve at least 20% of energy consumption
- District heating in Sant Cugat
- Increase production in the city, not only services - planning and monitoring
- Promote low emission fuels not based on diesel fuels - in 2050 no diesel please!
- To get photovoltaic energy in the green areas not used by anyone - energy kmo = smart energy - at least public consumption
- Green urban spaces will be a productive space - not consuming

### Re-use of waste and water:

- Extend use of circular water management to all areas
- Balanced water cycle (separate network)
- Optimize waste collection reducing CO<sub>2</sub> emissions and noises
- No waste containers on the streets
- Rainwater runoff re-use for parks irrigation
- Increasing use of rain water and ground water sources
- Organic matter recycling for compost for public parks
- Rain water as a resource - not waste
- Energy production on public parks (water, biogas, biomass)
- 100% efficient water distribution
- S.U.D.S urban drainage systems to opportunity to make a best human urban space

### Today's challenges

- Utilities open market
- Economic interest of utilities
- Ban energetically inefficient elements
- No incentive sustainable energy
- New public-private partnership to enable solutions deployment
- New service models and contracts
- New technology
- Lack of dissemination
- Conflictive regulations and laws for sustainability implementation / economically not attractive
- No money to invest in infrastructure



2

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.

#### High quality living environment:

- No cars that make noise nor produce bad smelling air in the streets
- Change space for cars to space for green & water
- Sant Cugat to be a noise-free city: info to prevent, info to act
- Green urban spaces connect the parks
- All the children parks under shadow from trees
- Optimised urban micro-climate: water, air, vegetation, surfaces
- Green belt - interconnect green spaces of Sant Cugat with other municipalities for leisure, sports in nature
- Green areas net for a really urban ecosystem
- Adapt/optimize public space in view of climate change
- Productive but no stress city - back to natural way of life

#### Today's challenges

- No money to invest in infrastructure
- Education
- Ecologist and biologists become more important
- History and mix and heterogeneous structures / buildings not prepared / not equipped not in conditions to achieve goals
- Guarantee high quality urban planning: knowledge, higher education, university - city collaborations
- Legal framework change
- Legal changes
- Automated systems allowing a local efficient management of resources

#### Design of urban space (co-location):

- Urban space and infrastructure to be prepared to bounce back effect of crisis (positive = festival, or negative = storm)
- Develop public space use
- Improve 'sleeping' residential areas by combing work/live/school etc. through co-location to reduce car use
- Define and implement land use rules
- No fences in private gardens (security)
- Limit residential areas
- Improve public space by opening private spaces
- Mixed use lively city quarters with 'middle-density'
- Transversal interrelated infrastructure in urban spaces
- Mixed use of urban spaces
- Citizens interact with urban elements (twitter, social networks, apps)
- Community management of urban green stakes
- Neighbourhoods at human scale, including co-working spaces, open air collaborative areas
- More urban complexity (mixed use)

2050  
3

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.

#### Social participation & co-creation in community projects:

- Promote corporate social responsibility policies on city maintenance (name not only streets but urban elements, e.g. trees)
- Collaboration to solve crisis situation with stakeholders
- Urban scale challenges to be solved without budget (previous projects in the university have shown this is an opportunity)
- Senior citizens will become the advisors and supervisors of EE to use their experience
- Opportunities in community projects to reduce carbon footprint
- Use of innovation mindset of inhabitants and students
- Self-reliant communities
- Design urban areas with community (participation)
- Set clear goals for self-reliance
- Local agents participation in urban planning from the beginning

#### Today's challenges

- The crisis gave power to the citizens
- Overcome lack of social participation mechanisms
- No leadership
- Political leadership and citizen link
- Conflicts of personal interest with interest for the community
- Better and more educated people
- Citizens are not ready

## Other aspirations

### Food production & community gardening:

- Community gardens on each park and neighbourhood
- Introduce vegetable garden in public areas
- Organic food self-efficiency (at least for public buildings and schools)
- Food production parks around the build areas
- Private roofs become gardens and solar generators
- Vegetable garden in public spaces to increase social cohesion

### Holistic urban design for resilience:

- Develop a resilient city / urban spaces
- Operators of Sant Cugat work together in front crisis situations (positive and negative)
- A new general urban plan (PDU) that considers energy issues in a holistic way
- Manage city as a whole - understanding relation between services in urban spaces (system of systems)
- A more resilient city

### Smart (lighting) grid:

- Public lighting self-sufficient
- 100% smart public lighting LED system with presence detection
- Use of public lighting grid for smart use (wifi, communications, electrical car charging)
- Full automation of infrastructure to be able to monitor, measure and improve quality of urban services and open data
- Extend use of public lighting grid for new services

### Shift from car-reliance to clean mobility (incl. pedestrian):

- Switch to a multi-modal mobility based on provision of time-cost-comparison
- No full streets of parked cars
- Local transportation that is efficient and that is always an alternative for the car in time and cost
- More bike lanes, less cars
- Pedestrian commercial areas in districts (out of centre)
- Electro-mobility on other solution than car
- City centre with exclusively 'clean' mobility: pedestrian, bike, electrical vehicles

### Humanised technology:

- Human touch in technology
- Smart city / service / citizen communication and information systems (info, bus, parking, e-governance)
- Good indication where to go when you go from A to B
- Reduce the time to park, hence reduce congestion and related

### Business / economic development:

- Beome the 'easiest' place to start-up by enabling space, speed up administrative issues, accelerate cluster collaboration
- High speed connected city to attract companies and talent
- Become the energy cluster region in Europe and the Innolab to test solutions (early adopters)
- Smart city = social + economical + ecological = balance productivity and quality of life

### Flexible mindset towards workplaces:

- Mindset in companies to change to allow work outside office
- Telleworking options for talent in the city
- Change mindset in community and employers to work from 'home' to reduce transportation



Ajuntament  
de SantCugat







# Contributions

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

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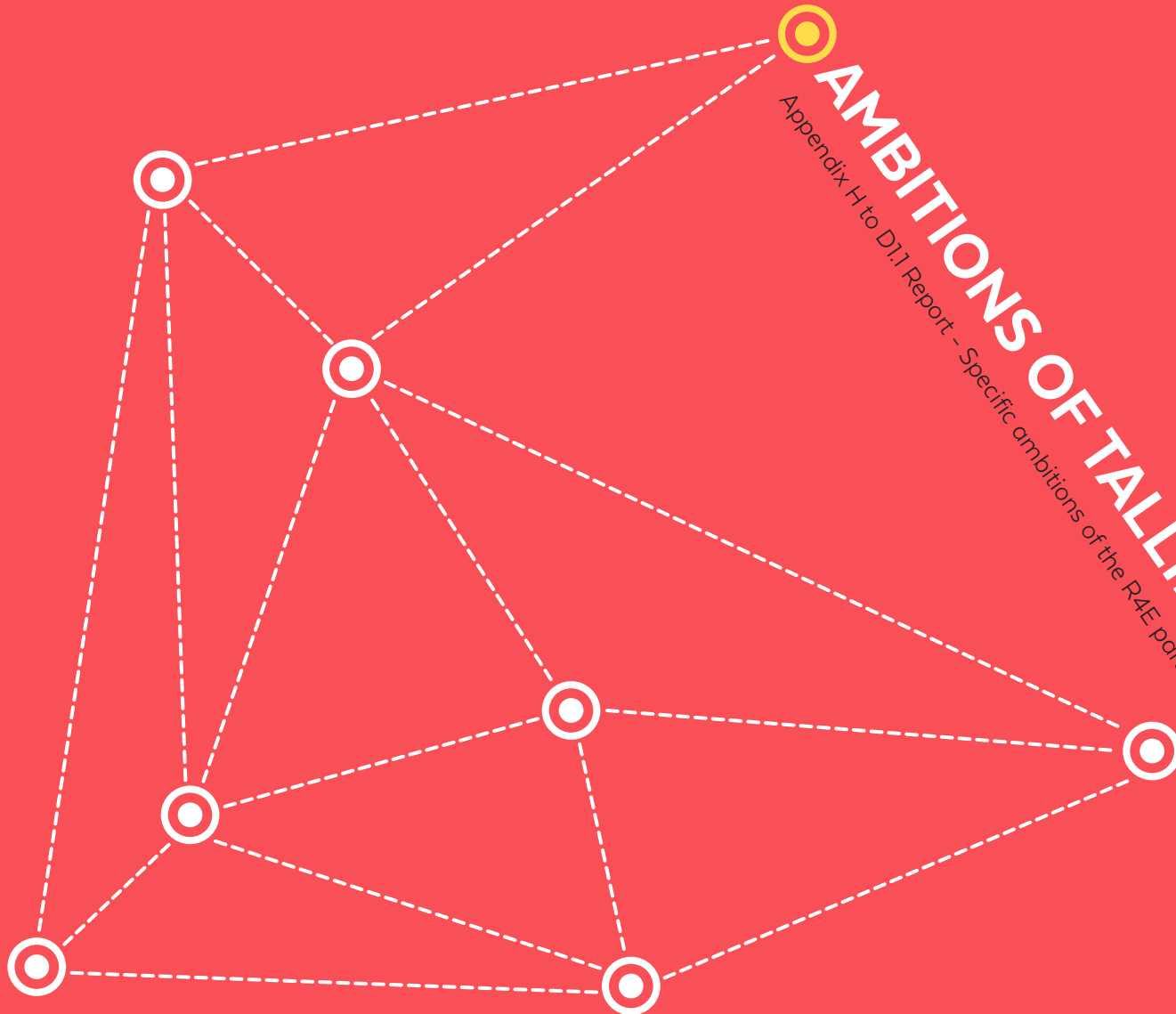
ROADMAPS  
FOR  
ENERGY®



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

# AMBITIONS OF TALLINN

Appendix H to D.I.I Report - Specific ambitions of the R4E partner cities



16 December 2015

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



ROADMAPS  
FOR  
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This appendix is part of the D1.1 Report - Specific ambitions of the R4E partner cities and contains all results of the ambition setting 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 does not necessarily reflect the official European Commission's view on the subject.

**Versions of this report:**

11 September 2015	Draft for internal check in the city (limited distribution)
22 September 2015	Concept for sharing with R4E partners (limited distribution)
6 November 2015	Version for final check
15 December 2015	Final version for public distribution



# Contents Appendix H

Introduction to Tallinn  
Today's reality: Smart buildings  
Today's reality: Smart mobility  
Results ambition workshop policy  
Results ambition workshop strategy  
Results ambition workshop stakeholders  
Results ambition workshop stakeholders  
Contributions

H 5  
H 16  
H 18  
H 20  
H 22  
H 26  
H 28  
H 31









# Introduction to Tallinn

## Introduction to the city

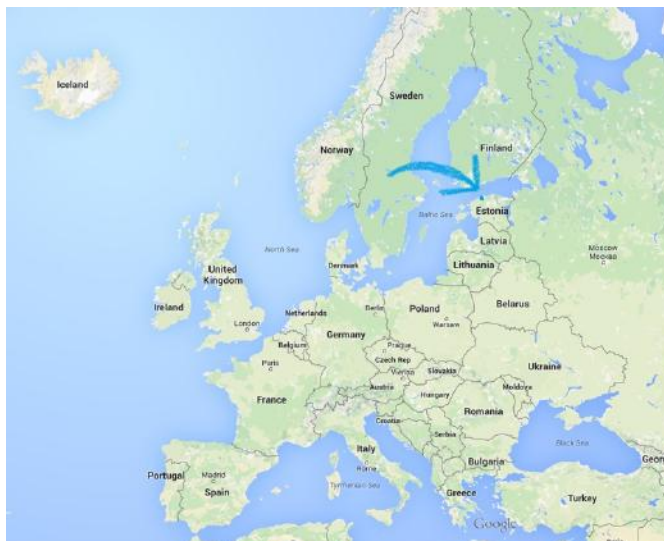
Tallinn is the capital and largest city of Estonia. Approximately 33% of Estonia's total population lives in Tallinn. Tallinn never fails to amaze visitors with its historic charm. At its heart is the Medieval Old Town, an area of cobblestone streets, gabled houses, churches and squares that developed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

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

## Selection of focus areas

The city has selected two focus areas for the R4E project:

- Smart buildings
- Smart mobility



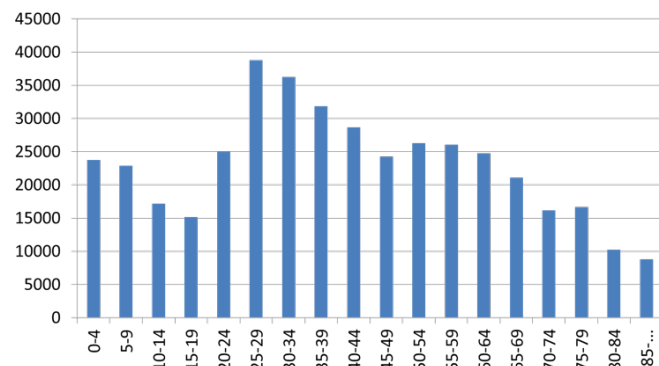




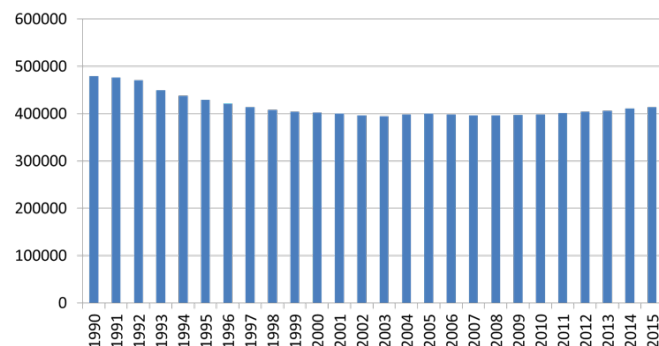
## Demographical aspects

- Size in km<sup>2</sup> 159,2 km<sup>2</sup>
- Number of inhabitants 438 569 (October 2015)

Age structure of the population  
Tallinn 2015



Population trends  
Tallinn



## Social aspects

- Level of education of citizens  
46,4% of citizens in Tallinn (ages 15-75) have a Tertiary Education attainment. Population with secondary education level: 89,6% (2014, Statistics Estonia)



- Connectivity level: Percentage of households with broadband internet in Tallinn 88.2%. Percentage of households with a computer in Tallinn 88.6%. Smart Phone Usage in Estonia: 60% (2014, TNS Emor)
- Unemployment rate: In Tallinn the unemployment rate is 3.5%, which is slightly lower than in Estonia 4.8% (30.04.15, Eesti Töötukassa - "Estonian Unemployment Insurance Fund")
- Share of population with energy poverty: Estonia has not introduced the concept of energy poverty in its legislation,

thus there is no statistics on population living in energy poverty.

- Percentage of people that require special care/needs: In 2014 ca 7% of the population in Tallinn had a disability that prevented them from working. 4% of city residents received disability pension (2014, Statistical Yearbook of Tallinn)
- Inclusive accessibility policies / indicators (e.g. related to access to public transport): 56% of the fleet are low-floor vehicles, making them accessible for people in wheelchairs or with baby strollers.

- Satisfaction level of citizens regarding buildings, mobility, urban spaces): In Tallinn, 89% of the respondents were satisfied to be living in Tallinn. The residents' satisfaction with their city's infrastructure and facilities is based on eight categories: public transport (59% satisfied), health care services (53%), sports facilities (55%), cultural facilities, the state of the streets (52%) and buildings in the neighbourhood, public spaces (68%), availability of retail shops and schools and other educational facilities. In all of these categories, a positive answer was given by more than a half of the surveyed residents of Tallinn. The residents of Tallinn gave a positive answer to four of five questions about the environment. They are the most satisfied with green spaces (81%). About 60% of Tallinn's residents are satisfied with the quality of the air, cleanliness and noise level.

**Economical aspects**

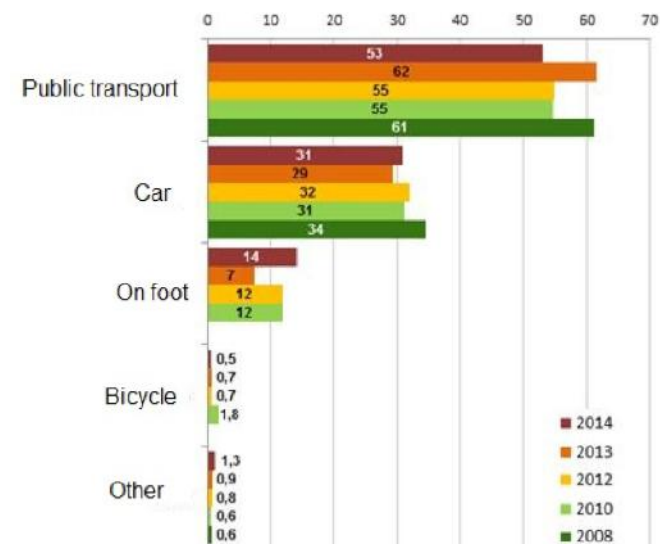
Income per head in comparison to the national average income:2013: Estonia 949€ monthly and Tallinn 1090€ monthly (2013, Statistics Estonia)

Tallinn is the financial and business capital of Estonia. The city benefits from the high level of economic freedom, liberal economic policy and has a highly diversified economy with particular strengths in information technology, tourism and logistics. Currently, over half of the Estonian GDP is created in Tallinn. 75% of residents are employed in the tertiary sector and 24% in the secondary sector (2013, Statistics Estonia). 78,9% of GDP is generated in the Services sector, 20,6% is generated in the Industry and construction sector (2012, Statistics Estonia).

In 2012 there were 21 787 buildings in Tallinn. Dwelling completions by type of building (number of buildings):

- 2009: 1 591
- 2010: 1 266
- 2011: 1 021
- 2012: 908
- 2013: 713

(2014, Statistical Yearbook of Tallinn)



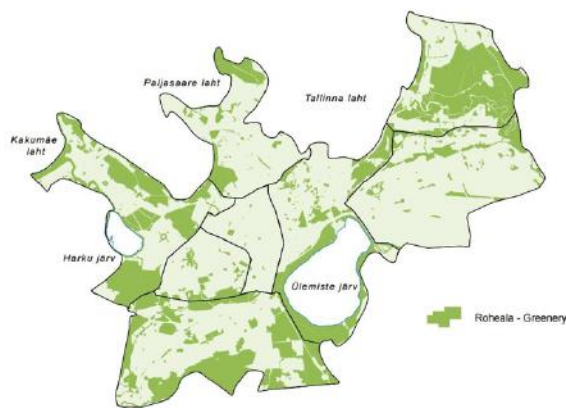
Mobility modal share: see graph. Decline in the use of public transport in 2014 was due to large-scale tram network renovations, thus the share of moving by car and on foot increased.

34,9% of the budget of investment projects in 2014 was allocated to building and reconstructing of roads and streets.

Expenditures on public transport forms 14,6 % of the city budget.

Area	Percentage (%)	Expenses in 2013 (million €)
Education	37,7	159,17
Public Transport	14,6	61,52
Social Welfare	9,6	40,53
Administration	7,3	30,72
Roads and streets	6,5	27,48
Culture	5,9	24,9
Water supply and sewage systems	3,4	14,5
Housing	3,3	13,83
Open Space Maintenance	1,7	7,40
Public Safety	0,86	3,63
City Planning	0,7	2,98
Environmental protection	0,4	1,73





Allikas - Source: Tallinna Linnaplaneerimise Amet - Tallinn Urban Planning Department

### Environmental aspects

Green areas: 38 946 677 m<sup>2</sup>, that is 24,4%, of Tallinn area.

Estonia lies in the northern part of the temperate climate zone. The climate in Tallinn is characterized by a fairly cold winter, a cool spring with little precipitation, a moderately warm summer and a long and rainy autumn. However, some summers have weeks at a stretch of temperatures around +30°C, and a warm, sunny summer can keep autumn at bay until mid-October. Average temperature in July +16,7°C. Average temperature in February -4°C. Tallinn receives 618 millimetres (24.3 in) of precipitation annually which is evenly distributed throughout the year although March and April are the driest months, averaging about 30 millimetres (1.2 in) while July and August are the wettest months with 74 millimetres (2.9 in) of precipitation. The highest recorded temperature in Estonia was +35,6°C in 1992 and the lowest temperature -43,5°C in 1940.

In its current cooperation with the state (Ministry of Environment) flood risk maps have been completed in Estonia, including Tallinn, showing the likely rise in the water level in 10, 50, 100 and 1000 years, and describing the potential adverse effects. Flood zones shall be construed as limitations in the comprehensive plans of city districts. These maps provide the basis of the recommendations by Tallinn City Planning

Department for areas located in the flood areas during the process of planning and issuing building permits. In February 2009, Tallinn joined the Covenant of Mayors. Accordingly, the city has undertaken the duty to reduce its CO<sub>2</sub> emissions by 20% by 2020 as a result of a 20% improvement in energy efficiency and a 20% share of renewable energy sources in the energy mix. Tallinn's present Action Plan for Energy Efficiency, which has been developed for the period 2011 to 2021, analyses energy-saving opportunities in Tallinn and sets out guidelines for the development of Tallinn's energy economy by the year



2021.

Type of urban space: 9 173 378 m<sup>2</sup> / 950 km of roads in Tallinn: 28,6 km of bus lanes, 940 stops for public transport, 377 321 m<sup>2</sup> city-owned parking lots, 252,5 km of bicycle paths.

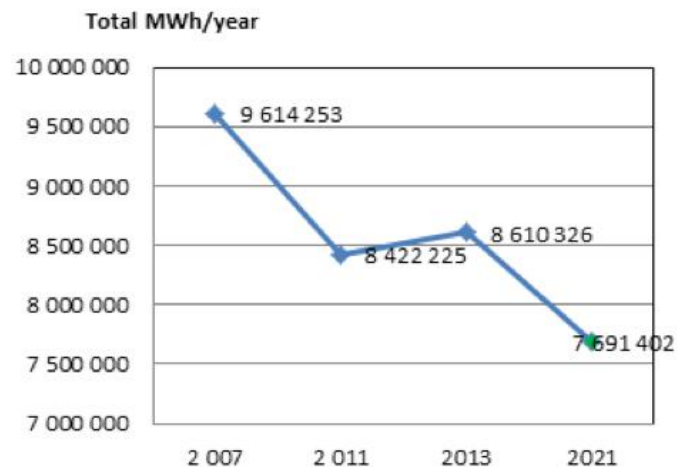
In 2014 36,7% of land under Tallinn was private-owned, municipal land was 31,1%, state-owned 14,6%. 17,6% of land under the city is unreformed land.

Buildings in the medieval old town are built mostly of limestone. Several residential districts of wooden houses built in the 19th and beginning of 20th century have been preserved. There are large districts of private houses in Nõmme, Pirita, Kristiine etc. In 1960s began the extensive construction of concrete slab apartment buildings in Mustamäe, Õismäe and Lasnamäe districts which lasted until the 1980s. In 2012 7.7% of residential houses were built before 1946; the share of houses built in 1946 - 1960 was 10.3%, in 1961 - 1970 26.4%; in 1971 - 1980 21.8% and in 1981 33.8%. 88.2% of households live in apartment buildings and 11.8% in private residences. The energy efficiency in houses built before 1991 is low: poor external wall insulation, only natural ventilation without

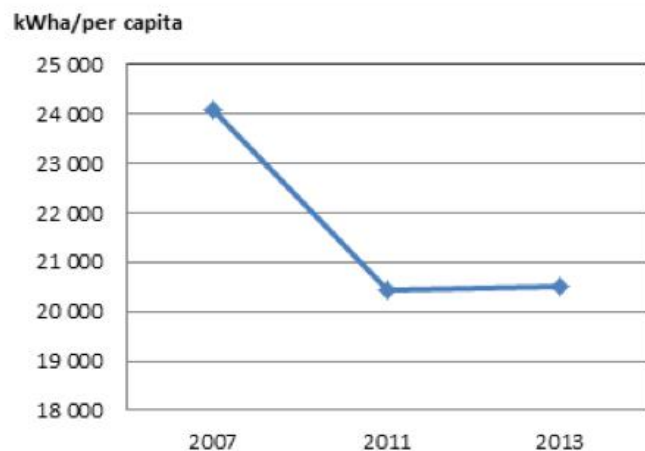


heat recovery, no indoor temperature control. The energy consumption in unrenovated residential buildings is 180 – 250 kWh/(m<sup>2</sup>\*year).

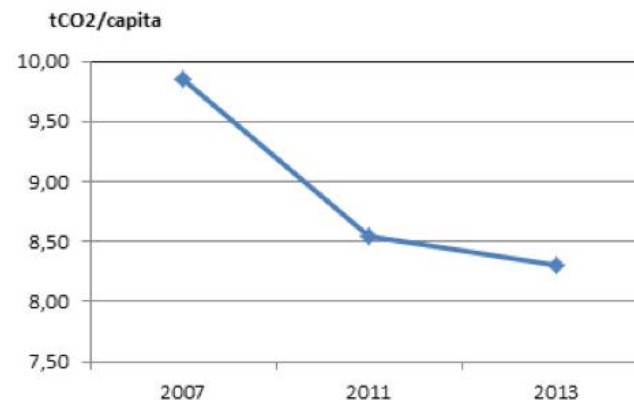
Total energy consumption:



Energy consumption per resident:



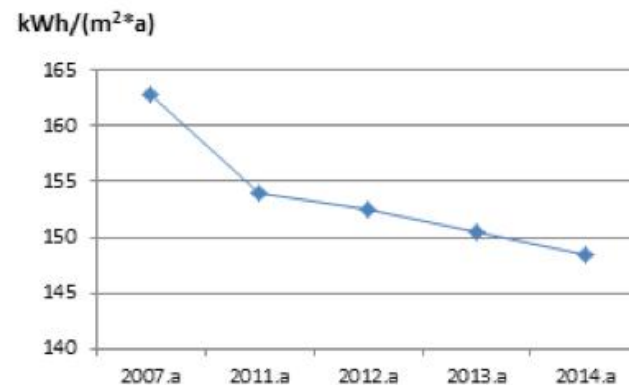
Total CO2 emission per head:



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

The fleet of Tallinn public transport is mainly running on electricity (trams and trolleybuses) and diesel (buses). In 2014 24 new hybrid Diesel-electric buses will be procured.

Municipal buildings energy consumption:



Firewood is widely used for heating in private houses. CHP plant in Tallinn uses wood chips. In 2014 the share of wood chips used in district heating was 40%. In recent years a

large number of different types of heat pumps have been introduced, to a lesser extent investments have been made in solar collectors and panels.

Annual average concentrations of air pollutants in Tallinn:

Pollutant	2013	2014
SO <sub>2</sub> µg/m <sup>3</sup>	1,03	1,07
NO <sub>2</sub> µg/m <sup>3</sup>	16,7	14,7
O <sub>3</sub> µg/m <sup>3</sup>	51,7	47,1
PM <sub>10</sub> µg/m <sup>3</sup>	14,1	14,87
PM <sub>2,5</sub> µg/m <sup>3</sup>	8,2	8,4
CO mg/m <sup>3</sup>	0,25	0,227

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

Noislevel L <sub>den</sub> in dB	Car traffic	Railway	Industry	Aircraft	TOTAL:
≥ 55	66,6	1,48	2,11	0	70,19
≥ 65	22,52	0,02	0,12	0	22,66

Water consumption:

- Water supplied in 2013 in Tallinn: 21 167 000 m<sup>3</sup>
- Water supplied per resident: 93 l/24h

(Source: 2013, Tallinn Water)

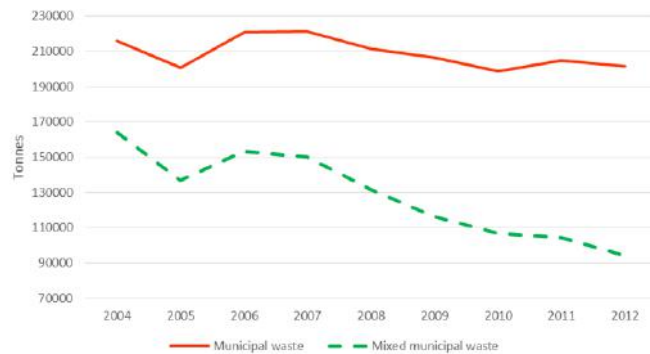
10% of consumers in Tallinn are supplied with groundwater

The water in Tallinn is mainly supplied by Tallinn Water (90% of the supply), the largest water utility in Estonia providing drinking water and wastewater disposal services to over 400 000 people in Tallinn and in several neighbouring municipalities of Tallinn. The potable water is produced from surface water at Lake Ülemiste. The company has two



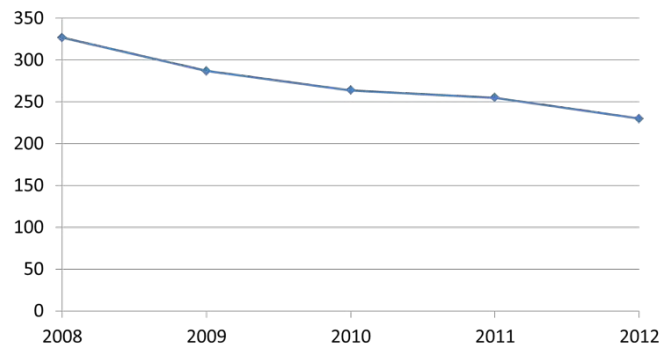
treatment plants Ülemiste Water Treatment Plant (WTP) and Paljassaare Wastewater Treatment Plant (WWTP). The public water supply system comprises almost 1,111 km of water networks, 17 water pumping stations and 64 ground water borehole pumping stations with a total of 93 boreholes throughout the entire service area. Source: Tallinn Water)

Residual waste:



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

Residual waste generated (kg/head)



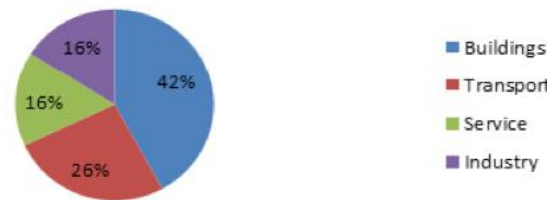
Type of waste collection: Organised Municipal Waste Collection Scheme.

Recycling rate (% of total waste):

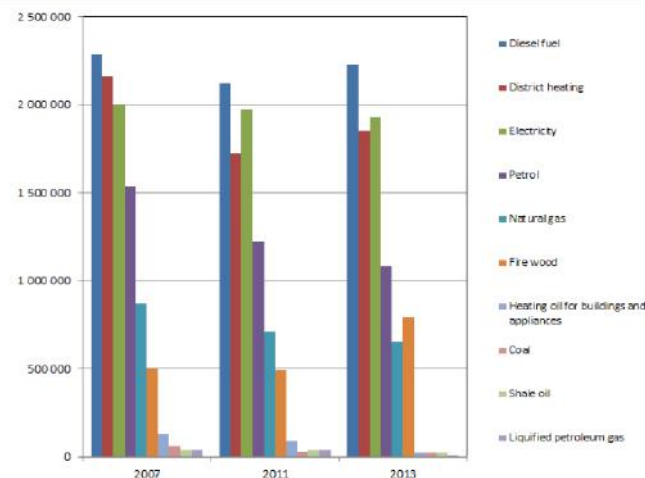
- 49% of household waste is recycled (2012)
- 57,8% of packaging is recycled (2013)

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

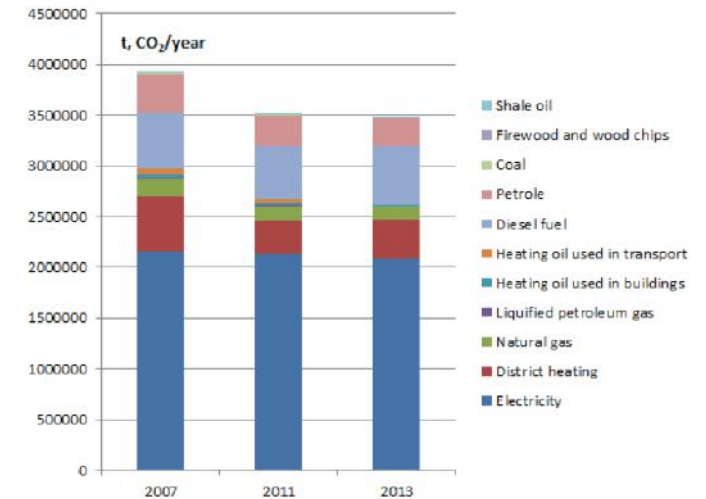
### Final Energy Consumption in 2013



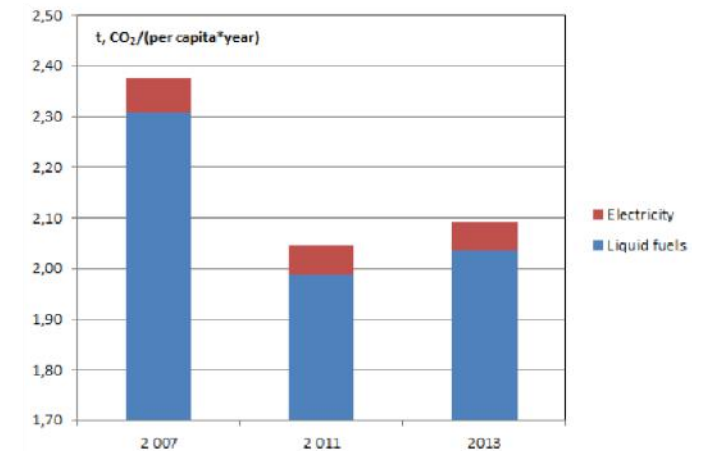
Total energy consumption by source:



Total CO2 emission:



CO2 emissions in Tallinn transport sector:



### Historical / cultural aspects

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

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

167553 passenger cars registered (2014, Statistical Yearbook of Tallinn)

91% of residents in Tallinn are homeowners



### Number of associations :

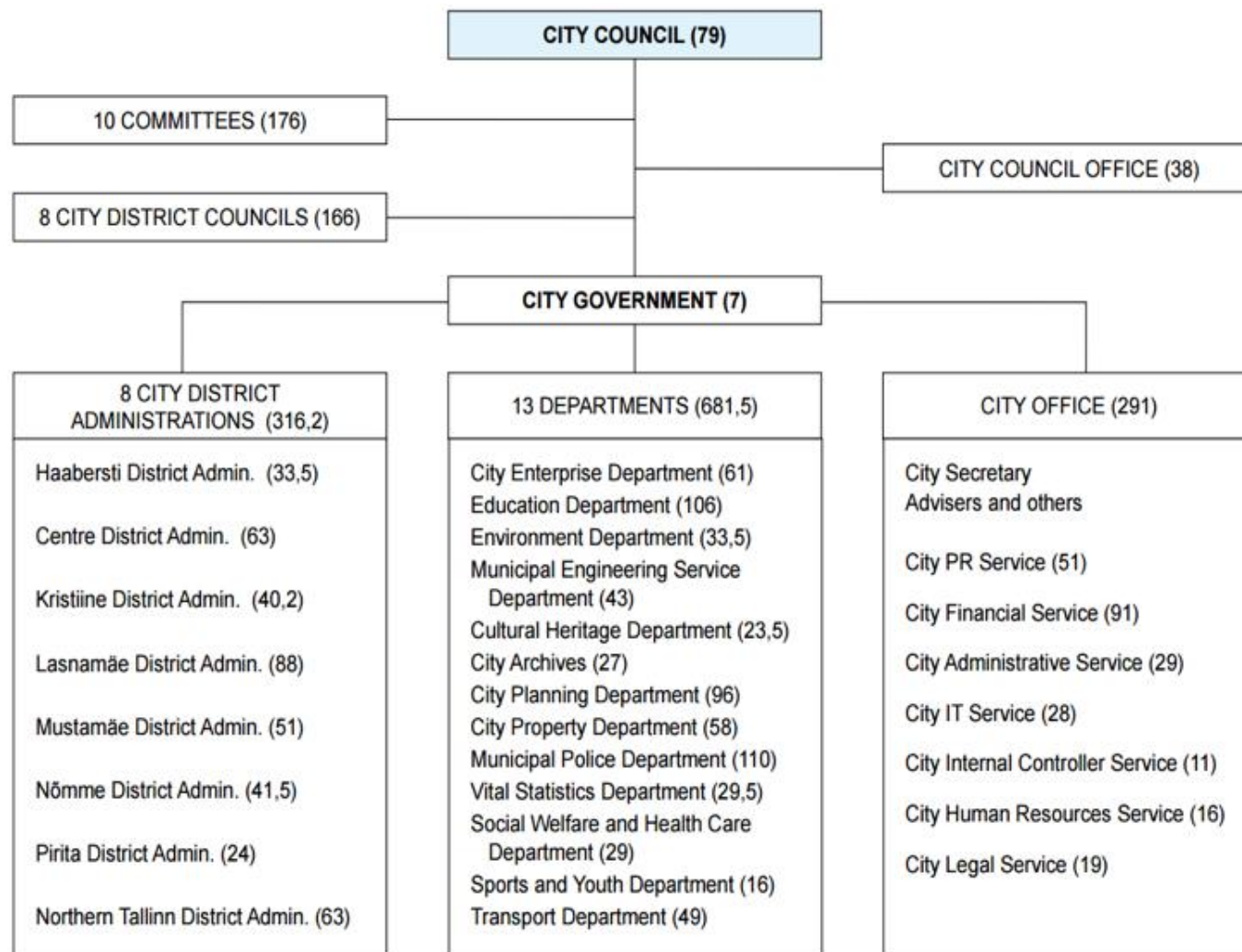
- 58 museums
- 40 galleries
- 14 theatres
- 10 cinemas
- 18 libraries
- 18 concert halls
- 11 culture centres
- 10 hobby centres for elderly
- 7 youth recreational centres
- 247 private hobby schools
- 178 cultural associations
- 610 folk culture groups
- 42 houses of worship







## Organisation



## Recent projects

- Tallinn participated in a 3-year project (2011-2014) called CASCADE of networking and mutual learning on local energy leadership. It supported cities in delivering the European Union 2020 targets for energy and climate change. Coordinated by EURO CITIES, the project involved 19 large European cities as partners, as well as thematic experts Koucky & Partners and Wuppertal Institute.
- Tallinn has also been involved in the EU project COMBAT from October 2009 until September 2011. The Covenant of Mayors in the Central Baltic Capitals (COMBAT) was an EU-funded project, spearheaded by Helsinki, Riga, Stockholm and Tallinn, with the objective of facilitating knowledge and experience-sharing on the development and implementation of Sustainable Energy Action Plans (SEAP). As part of the project, the four Baltic capitals pinpointed the key success factors and challenges encountered during the development process of their respective SEAP. In a second phase, the findings of the project were collected and outlined in a set of guidelines. These guidelines present how the four COMBAT cities prepared and developed their SEAP and identify critical factors that may be relevant to other municipalities.
- In February 2009, Tallinn signed the Covenant of Mayors. Accordingly, the city has undertaken the duty to reduce its CO<sub>2</sub>-emissions by 20% by 2020 as a result of a 20% improvement in energy efficiency and a 20% share of renewable energy sources in the energy mix. In 2011, Tallinn submitted the "Sustainable Energy Action Plan".
- Civitas Mimosa (2008- 2013) CIVITAS MIMOSA is an innovative collaboration among the cities of Bologna (Italy), Funchal (Portugal), Gdansk (Poland), Tallinn (Estonia), and Utrecht (Netherlands). MIMOSA is short for motto of the project: "Making Innovation in MObility and Sustainable Actions". The five MIMOSA cities joined forces to "learn how to move better, to live in better cities", by collectively exploring new approaches to sustainable transport and demonstrating new solutions with guidance from scientific and support teams. Through the implementation and evaluation of





different activities, the cities worked with their citizens towards a new and innovative concept of urban mobility. Tallinn introduced a new contactless ticketing system (Mifare card), real-time information system for public transport service, installed red-light enforcement cameras that can catch three categories of law breaking motorists: those who run red traffic lights, exceed the speed limit, or use the bus lanes and etc.

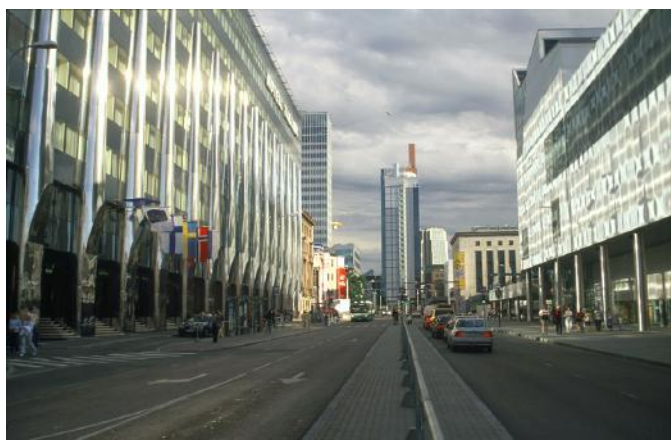
- Project Great (begins in September 2015) aims to exchange experiences and knowledge between cities on reducing traffic jams.
- R4R INTERREG IV C project which allowed local and regional authorities to make consistent comparisons thanks to a common method and exchange of transferable good practices related to local instruments in order to improve recycling performances.
- BECOSI – INTERREG IV A project with objective to map hazardous waste contaminated land sites in partner countries. (status – ongoing at the moment)
- IUWMM – INTERREG 3C CIP project with objective to make regional surveys and regional action plans for optimal integrated urban waste management. (duration was April 2005 – September 2007)

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

In 2011, Estonia launched a program for electromobility called ELMO to support the introduction of energy-efficient and environmentally-friendly electric cars and plug in hybrids. An electric vehicle fast-charging network, consisting of 165 fast chargers around Estonia, was built. Since establishing the programme there are 28 fast-charging stations in Tallinn. Tallinn municipality uses 29 electric cars. The first fast-charging station in Estonia was built in the city of Tallinn in 2009 at the Freedom Square underground car park. In total there are 252 electric vehicles, 85 of them belong to the public sector, 125 to legal entities and 42 to individuals.

In 2014 the city of Tallinn opened Tondiraba Ice Hall in the Lasnamäe district, which can be used for various sporting

events and concerts. The heat supply system in the Ice Hall effectively uses residual heat from the operation of cold machinery producing ice for the building's heating and hot water. If the residual heat is not enough, the system will use heat from the district heating network. The building was designed with heat recovery ventilation. The heating system in Tondiraba Ice Hall is a carefully designed solution containing various modern technology solutions with the aim of achieving high energy efficiency.



# Today's reality: Smart buildings



continue to invest in supporting the renovation of apartment buildings, and will continue to promote energy efficiency. In 2015-2020 a total of 142.5 million euros will be invested in the renovation of buildings owned by the city, resulting in calculated savings of 15,018 MWh/year and reduce greenhouse gas emissions by 50,195 tonnes.

The share of buildings in the total energy consumption of the city is nearly 40%. Apartment buildings in residential areas are mainly heated by district heating. Private houses in the Nõmme, Kristiina and Pirita districts use central heating systems based on a central furnaces or a boilers.

After 1991, Tallinn City Government started to improve the energy efficiency of the residential buildings owned by the city, thereby contributing to reduction of greenhouse gas emissions. The city has launched a project to install heat meters and new heating units that automatically control the indoor temperature. With the installation of heat meters in residential buildings, customers began to pay for the actual amount of heat they consumed. This gave them the chance to adjust the indoor temperature of the building by making the appropriate setting regardless of changes in the ambient air temperature. The energy savings achieved amounted to at least 18 – 20% of consumption, compared with the consumption before the renovation.

A total of 37.5 million euros was invested to renovate Tallinn's municipal buildings in 2011-2013, including 2.67 million euros derived from the sale of national CO<sub>2</sub> emissions. Mainly the façades of schools and kindergartens were insulated. It is estimated that annually 3370 MWh is saved through these measures.

In 2015-2020 the state will continue to support deep renovation of apartment buildings. It is expected that at least 400 residential apartment buildings will be renovated in Tallinn, with a closed net area of up to 1.2 million m<sup>2</sup> and a total investment of 240 million euros, which will reduce CO<sub>2</sub> emissions by 90,000 tonnes by 2020. The city of Tallinn will





Example of energy efficient building, using a heat pump with the source integrated in the foundation and PV panels.



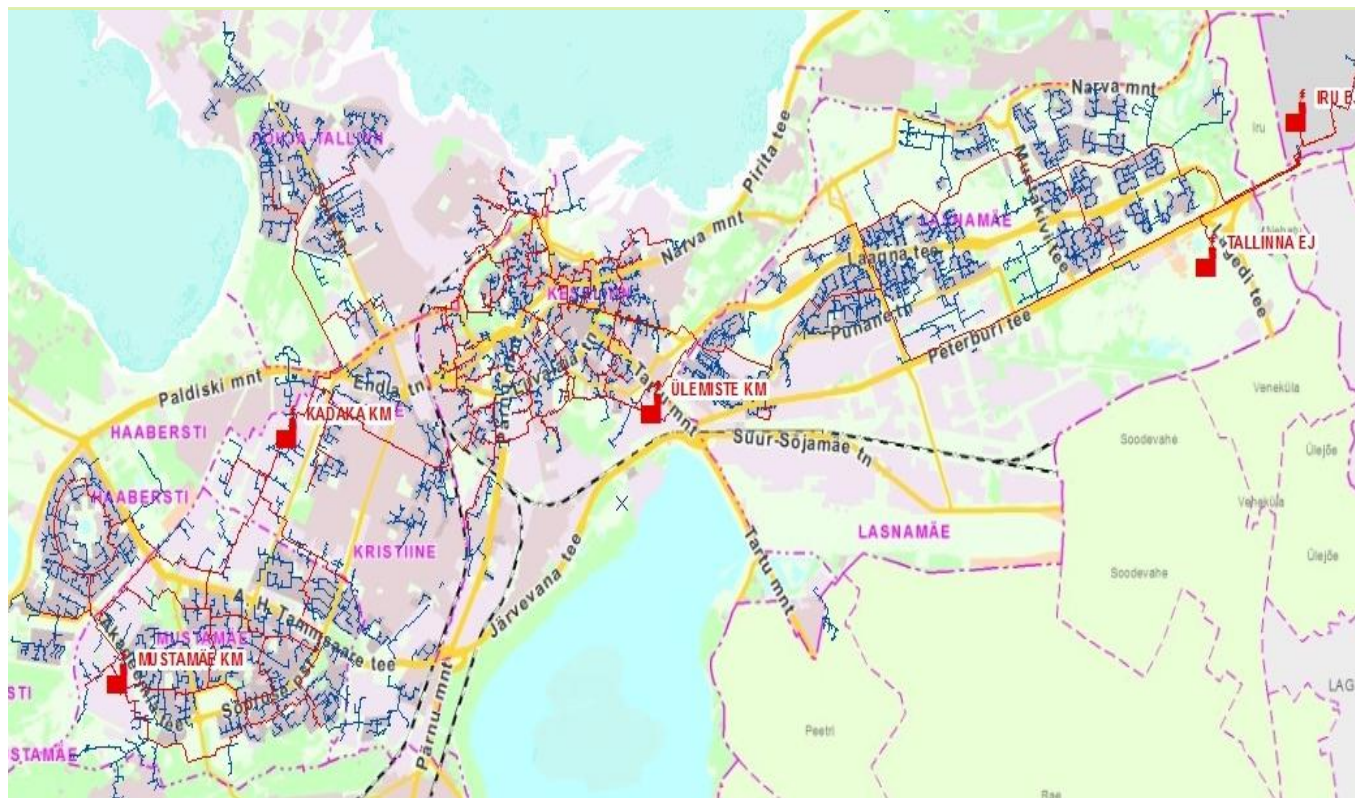
## Today's reality: Smart mobility



Tallinn is located between Lake Ülemiste and the Gulf of Finland, and the main bottleneck is in the middle of the city with width less than 2,4 km. The maximum distance from east to west is 13km. Approximately two-thirds of traffic passing through the city centre is inner transit between city districts. Urban sprawl has caused major problems as it generates additional mobility needs for people who live outside the administrative city area and commute to the city for work.

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

In Tallinn, active developing of public transport started at the beginning of 2005, when the city joined the CIVITAS SMILE project. Just a few examples of the improvements in the public transport systems are 24,2 km of bus lines, integrated ticket system in Tallinn and Harju County, creating public transport priority system, implementing real-time information system, purchasing new fleet, and offering discounts for different groups of public transport users. To promote a healthy lifestyle, 214 km of light traffic roads have been established in Tallinn.



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





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

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

Due to free public transport in Tallinn, the number of Tallinn residents has increased rapidly, which has had a positive impact to the city budget. The increased funds derived from the increase in Tallinn residents are allocated to improving the quality of public transport even further.



# Results ambition workshop policy



# 2015

## High Lights

The aspects in the city the municipality is most proud of:

- Free public transport
- Green public transport validation system (green card) also for other use: e.g. medicines
- Municipal housing projects to keep Estonians in Estonia (e.g. doctors, nurses, teachers)
- Parking areas directly connected to public transport (also using green card to enter)
- Online info of parking availability
- Hybrid buses
- Energy efficient houses: automatic control systems, use of PV in new buildings
- Municipal housings as an example for the private sector buildings, municipality taking the lead
- Good level waste management system with own centre for organising waste management and recycling centre
- Sharing services with neighbouring municipalities in the metropole region (e.g. bicycle paths, public transport, waste management)
- All services of the municipality are free
- Tallinn is the only place in Estonia with increasing population

## Priority in Policy

Which topics have the highest priority in the current policy:

- 2018 ambition: green capital of Europe (12 criteria, including public transportation, green areas, waste management)
- Green in the city: maintenance of trees (some over 500 yrs old), 25% of Tallinn is green with 60 parks, 51 fountains, 4 public beaches (of which two with a blue flag)
- Development of the sea shore: cruise tourism (world class cruise harbour), seaplane harbour, and opening of the city to the sea.
- Redevelopment of the public space: public and private, and tourist development
- Extension of Ulemista as transport hub (tram, train etc.)

# 2050

## General Ambitions for the City

- Citizens of Tallinn and Estonia get high quality services (any kind)
- Transportation, education and important services for everyday life are available for everyone (e.g. schools)
- Grow the services that are free for citizens
- Compromise between city life (tourists) and residents
- Talsinki (connection to Helsinki): card & tunnel
- Governance structure with neighbouring municipalities
- Keep Estonian people in Tallinn
- Grow to 500.000 inhabitants
- Enjoy the advantages of being a small nation
- Tallinn as front-runner for openness
- Noise reduction and air pollution minimised: 'open the window and hear the birds sing'



## Specific ambitions for smart buildings

1

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.

### Aspirations

- More renewable sources for heat production
- Guarantee affordable heating for people
- Bio-fuel heat plant
- Hospital: good climate, affordable, smart

2

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.

### Aspirations

- Modernise existing buildings
- Privately build buildings (ensure high energy classes)
- Soviet time apartment blocks: demolish or renovate?
- Deep renovation: all systems & online services

3

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.

### Aspirations

- People living in Tallinn regard city as being open to the sea
- Use heat from sea (energy for the city and heating)



## Specific ambitions for smart mobility

1

In 2050 the green card for free public transport is used widely, not only in Estonia, but also in Helsinki.

### Aspirations

- Green card for free public transport further expanded
- Green card use in Helsinki
- Wider use of card in Estonia

2

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.

### Aspirations

- Make city scape more dense - more functions
- More priority for pedestrians in 'above' space (car down)
- Build city in a way to use foot, bike, public transport
- Underground parking houses to free up space for buildings and places
- Less car use and more EV

3

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.

### Aspirations

- Connecting bicycle routes in city districts
- Increase pedestrian only streets in city centre
- Tram & bus in city centre, no lane for car, no parking space
- More lively boat traffic and water taxis



# Results ambition workshop strategy



**SMART BUILDINGS**

# 2015

## High Lights

The aspects in the city the strategy department, integral project managers and departmental managers are most proud of:

- Already a few zero-energy buildings are realised.
- Many apartment buildings are renovated, both facade and installations.
- Orphanage homes are renovated with heat pumps and solar panels.
- Almost all school buildings are renovated.
- Private owners are facilitated with loans and supported by the municipality to finance renovations on their homes and apartments.
- Houses have installed smart meters and internet-based monitoring tools for energy use.
- The climate stimulates to create heating systems, and where they are installed they are also used for central heating.
- Citizens are informed to understand how to save energy and how to 'deeply renovate'.
- The awareness is already high due to high energy costs

## Strategic ambitions for smart buildings

1

In 2050 we gained the knowledge and awareness to plan the city of Tallinn as an energy efficient smart city.

### Aspirations

#### Integral and smart planning and political support

- Smart politicians
- Good thinking, financing and political willingness for smart city
- Integrated planning
- City planning takes into account energy efficiency (location to the carbon footprint)
- More cooperation between city planning and universities



# 2050

## 2

In 2050 all energy used in buildings comes from renewable sources. Smart materials and equipment are applied to save energy.

### Aspirations

#### Renewable energy and smart materials

- Energy efficient buildings use renewable energy sources
- More renewable energy in local and districts heating
- A lot (too much) green energy
- Smart and energy saving materials

## 3

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.

### Aspirations

#### Zero energy buildings and districts

- A lot of zero energy using buildings
- New city districts are energy efficient
- Practical methods for planning time (so home offices or travelling is better)
- Smart grids

### Other aspirations

#### Appreciate cultural and historical buildings and re-purpose of buildings

- Tallinn still has old town centre that has to stay the same, but then renovated
- All older buildings are renovated and newly build houses are green buildings
- Reusing materials and buildings
- Re-use and good purpose for “empty” spaces

#### Smart monitoring and control (internet)

- The energy use of buildings are controlled over the internet and the micro-climate in each room meets the requirements and demands at that moment
- Buildings are comfortable and sustainable thorough long distance remote control and automated systems
- Internet of things

#### Awareness and cooperation for energy aware behaviour

- All citizens in Tallinn know and act energy friendly
- More cooperation between stakeholders

# Results ambition workshop strategy



**SMART MOBILITY**

# 2015

## High Lights

The aspects in the city the strategy department, integral project managers and departmental managers are most proud of:

- Free public transport
- Green card ticketing system
- Park & ride parkings to get access to free public transportation also using green card
- Real time info on public transport through position of buses and trams (indicating accurate arrival times)
- Traffic light control centre with monitoring of accidents and jams, with priority policy for public transport
- Cell phone apps with real time schedules
- New trams with energy efficient systems (break power regeneration) and displays with news and real time travel info for connections
- Research projects to optimise public transport networks, also using passenger counting information
- Public transport road planner on city website
- Bicycle lanes in the city

## Strategic ambitions for smart mobility

1

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).

### Aspirations

#### Connection for everyone to everywhere in less time:

- Good connections to the city centre and neighbourhoods
- Good public transport system
- Circular traffic ways
- Mobility for all
- Everybody has changed to good mobility
- Less time for travel around the city
- Connections to country side
- Integrated transport system for neighbourhoods



# 2050

## 2

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.

### Aspirations

#### Comfortable transportation (integrated systems and ticketing):

- Integrated planning
- Integrated ticketing systems
- Comfortable free public transport
- Comfortable transportation

#### Baltic connections (rail, tunnel infrastructure):

- Tallinn-Helsinki tunnel
- Helsinki-Tallinn tunnel and rail Baltica
- Rail Baltica Tallinn-Berlin
- Public transport terminals (bus/train/...)

## 3

In 2050 Tallinn is a liveable city where citizens get their services in walking/biking distance or at home. The is planned for humans: user friendly facilities and more green areas invite more sustainable behaviour. People choose to walk/bike to commute.

### Aspirations

#### Liveable city - pedestrian friendly (walking distance):

- Liveable city
- City for people
- More areas for pedestrians and cyclists
- Tallinn is a pedestrian friendly city
- Complex city for the citizens
- All functions available in walking distance
- Better connected integrated bicycle lanes

#### Less/no cars in centre and neighbourhoods:

- Less cars, more space for citizens
- No cars in the city centre
- Car-free inner city
- Bicycle rent systems
- City centre no cars: only public transport
- All commuting in the city is done via public transport, bike or foot

### Other aspirations

#### Reusing space and making it safe:

- More green areas
- Bypass the roundabout city centre
- Well connected parking houses in neighbourhoods - connected to public transport

#### Smart vehicles:

- (Public) transport without drivers
- Self-driving cars, car sharing

# Results ambition workshop stakeholders



## SMART BUILDINGS

# 2015

### High Lights

The aspects in the city the external stakeholders and strategic partners are most proud of:

- The Estonian renovation grand system for energy performance
- The Estonian energy dynamics simulation system
- The ministry of Estonia is prioritising and working on energy efficiency activities
- Tallinn municipality is currently working on renovation projects
- The cooperation in the granting system for apartment blocks
- The Rotermann Quarter is a pearl in the city, a nice environment in a residential area
- The diversity of the dwelling stock
- Efficient use of resources in ongoing pilot projects
- UUSLINNA: the first area to realise zero-energy
- A new Horizon 2020 project focussing on energy efficiency in buildings and also looking into behavioural aspects as indicators for energy use
- Good urban transport system
- Prioritising and supporting the public transport system
- Smart Apps in Tallinn (taxi's, maps, etc.)

# 1

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.

### Aspirations

- New technology's for renewable energy systems
- 50% of the buildings are zero-energy buildings
- Buildings are independent from networks
- Zero energy buildings connected to virtual power plants
- The city as one system
- Many new pilot areas for zero energy concepts
- Central heating & cooling systems
- The majority of buildings can generate for their own needs
- Affordable energy and free choice of where to buy
- New areas are 0-energy use
- Energy batteries are affordable
- Smart grids developed and in place
- Groups of buildings act as 'virtual power plants' to further increase efficiency and reliability (VPP = multiple buildings combined into a single logical energy actor via ICT)
- 100% smart lighting systems
- Buildings of all sizes act as autonomous grid-connected prosumers (dynamic control of load & Production profile)
- Technology of energy production
- Tallinn has district heating and cooling (NEW!) System
- Solar panels
- Energy meet consumption and service needs
- Tallinn smart energy production city
- Stay updated on technologies we do not know yet
- Buildings include renewable energy equipment to generate locally (solar, ground heating, heat pumps, etc.)

### Today's challenges

- Missing knowledge
- Public and private partnerships need to be established
- No specific targets exist suitable for specific engineering design, which leads to resource waste and the buying of nice toys that do not solve the problem.
- The historical and cultural heritage
- Sovjet buildings to be renovated
- Automation systems to be found
- Local energy production sources and technologies are missing to cover the consumption
- Monitoring tools and statistics for the energy use in municipality buildings are poor
- The head-builders have too much decision power to kill good ideas, too much driven on short term and costs
- Too few knowledge, and everybody wants to be a director, not an inventor.
- What is the status of systems: renovate or replace



## 2

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.

### Aspirations

- Central city planning for functionality
- Architectural development of buildings taking into account the smart city
- Building Act is amended starting from 2020 with the equipments and newly designed
- Teaching cooperation with different specialists
- Open space and public buildings systematically planned
- Demographic situation
- Stay flexible to change we cannot foresee yet
- Respecting the cultural heritage
- The system is not just Tallinn but all of Estonia
- Land use planning is based on sustainability aspects (CO2 etc.)
- Land use planning on systems planning
- What differs Tallinn from other partner cities?

### Today's challenges

- Missing knowledge
- Public and private partnerships need to be established key economic trends in the city
- Unclear strategic vision for the development of Tallinn
- Key population trends are unknown
- Spatial plan for the future is missing

## 3

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.

### Aspirations

- Smart monitoring system
- Develop monitoring system and services
- IT systems better integrated
- 50% of buildings participate in DMS programs
- WI-FI to LI-FI: start now
- Just monitoring system for municipality buildings state norm to be fulfilled
- Now too much control systems for public, they have to be integrated
- Guides for museums for tourists in Tallinn on apps
- New technologies are tested first

### Today's challenges

- Missing knowledge
- Public and private partnerships need to be established
- Different specialists do not work together
- We try to substitute deep understanding of the subject matter and system design with collective opinion-synthesis processes

# 2050

### Other aspirations:

#### Affordable for the people

- Availability and affordability for the people
- Affordable buildings for people
- Available building stock for everyone

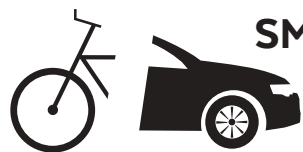
#### Energy efficiency in buildings

- 90% of flat houses from the Soviet time are soundly renovated
- Do we still need public buildings at all?
- A dominant share of buildings has a high energy performance
- All today resisting buildings a deeply renovated
- Buildings built after 2020 have a share of more than 30% of the stock
- Renovate the old wooden houses in a way that respects their cultural heritage
- Buildings have smart waste processing solutions
- Buildings in 2050 are multifunctional and resources are effectively used
- The buildings and houses in Tallinn form a historical statement, their energy system needs to be resolved.

#### Land use planning respecting mobility behaviour and the transport system

- Location of buildings contributes to effective transport
- The concept of self-managing city is turned into reality (see Tallinn Architectural Bienale)
- Mobility issues of buildings solutions are merged for better city environment
- Location of new buildings respecting the transport system
- Personal responsibility
- Land use planning on mobility footprint as well
- Smart citizens have changed their energy consumption patterns
- Changing behaviour
- Integrated city planning

# Results ambition workshop stakeholders



## SMART MOBILITY

# 2015

### High Lights

The aspects in the city the external stakeholders and strategic partners are most proud of:

- Free public transport
- Several options for public transport
- New ticket system
- Options for walking
- New trams and renovated tramlines
- Dedicated bus lanes
- Free parking
- Smart park & ride system
- Smart parking (95%)
- The way of policy making and agreements
- Pedestrian friendly city centre
- Local activism (e.g. cyclists)
- Helsinki-Tallinn twin-city concept

### Today's challenges

- Contradicting preferences, attitudes and habits of people
- Way of thinking: no big picture, solving everyday small things
- Political power games and lack of proper priorities
- Financial issue
- Lack of knowledge
- Political will
- Change of thinking
- Political & funding decisions prioritize car oriented development
- Too many cars, car-traffic based streets
- Lack of knowledge
- Elections are too often
- Lack of common agreement
- Land-owners/developers plans and wishes
- Different possibilities and readiness of people to pay
- Lack of funding
- System change requires a lot of time
- Lack of action (nobody willing to start)
- Different views
- Perhaps because of historical reasons. We should also pass the phase of 'car-loving' (children disease) in order to feel the problems of this phenomena
- Low knowledge about sustainable urban planning
- Lack of traffic measures for smart planning
- Lack of co-operation between stakeholders
- Short term political interests
- City government, political system
- Endless political struggle between Tallinn & national government
- Low capacity for smart planning on city & state level
- Real estate developers shape the city
- Soviet mentality rules
- Wrong priorities, contradiction between words and actions
- Budget (money)
- Knowledge

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.

### Aspirations

#### More and better urban space:

- More green space in the city
- Cleaner air
- Waterfront is mostly public area
- Less cars and more street space for walkers, cyclists
- Lot of green areas (parks) everywhere
- Liveable streets and high quality public spaces
- Sunday car-free streets
- City opened to the sea: shopping, cafés, parks, port for yachts
- Liveable streets, 0-traffic fatalities / injuries
- Tourist friendly
- Car-free city centre
- Enjoyable environment
- Pedestrian friendly city
- 1 ticket system for Estonia + integrated with road charging
- Liveable city: green, fresh air, place to spend free time
- More space for people and less for cars
- Traffic does not dominate urban space, streets are for living, mobility is on background
- 30% cycling, 30% walking, 30% public transport, 10% car
- Car ownership, use and parking reduced 3\*





2

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.

#### Aspirations

##### Smooth & seamless mobility:

- Getting from one place to the other takes max 30 minutes for everybody
- Good and quick logistics solutions between different places of city
- Main connection roads underground
- Tallinn city street and road network makes traffic smooth, no traffic jams in the city
- All important destinations are easy to access
- Transport solutions on different levels: underground, etc (Metro) in city centre
- Smart local logistics
- Better way on winter transport
- No congestion

##### Better public transport:

- Tram-line traffic in each city district
- Night buses
- Demand related public transportation
- Nationwide free public transport
- Public transport cheaper, also for tourists
- Efficient and optimised public transport
- Ticket free public transport
- New developments: rail and tram connections
- New tram network: + 50 km
- Very efficient public transport
- Doubling length of tram network

2050

3

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.

#### Aspirations

- Smart people, planning & governance:
- Smart city governance
- Smart people
- Tallinn attracts smart people
- Longer term view, in decision making
- Smart city planning, no additional need for moving
- Land use and city planning that takes into account mobility
- Strategically planned mobility
- Very good mobile apps what gives online info and ticket system
- Shorter distances for daily mobility
- Vision and plan-driven policies and actions
- Higher awareness on sustainable living issues
- Tallinn being the leader / front-runner in something innovative (but what?)

#### Other aspirations

##### International connections & twin-city with Helsinki:

- Tallinn-Helsinki tunnel
- Rail Baltica
- Tunnel connection between Helsinki and Tallinn
- New fast trains
- Big twin-city area with ~ 5 mil. citizens
- Waterways as a part of mobility
- Good connections with Helsinki (tunnel, ferry, planes, ...)
- Two level city
- 'Borderless' traveling to Finland
- Population <500.000, urban area 700.000

##### Traffic safety:

- Nobody dies or gets injured in traffic
- Safe, secure and smart traffic
- Traffic environment designed by zero-vision traffic safety principles
- Most streets & all centres with 20-30 km/h speed limit

##### Cycling:

- Proper bicycle connections
- More light traffic roads, more safer light traffic roads
- Parking lots for bicycles
- Well-planned and built bicycle network
- Bicycle share in mobility > 50%
- More cyclists in streets

##### Better parking:

- Green parking lots
- Smart road charging, no free parking
- Parking underground
- Smart parking - car drives directly to free parking lot
- City centre free of cars
- Old town free of cars
- Real time traffic management

##### Driverless cars & car-sharing

- Self driven cars
- Smart bike sharing points
- Less parking spaces on street (parking houses)
- Smart GPS oriented customer support of car drivers, smart cars which are lead by the system
- Shared cars as part of public transport
- More car sharing
- Daily life possible without car
- New transport possibilities: Google cars
- Driverless cars in streets (takes less space)
- Sharing vehicles (cars, bikes)
- Car sharing
- Self driving cars.





# Contributions

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

- |                   |   |                     |                                   |
|-------------------|---|---------------------|-----------------------------------|
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