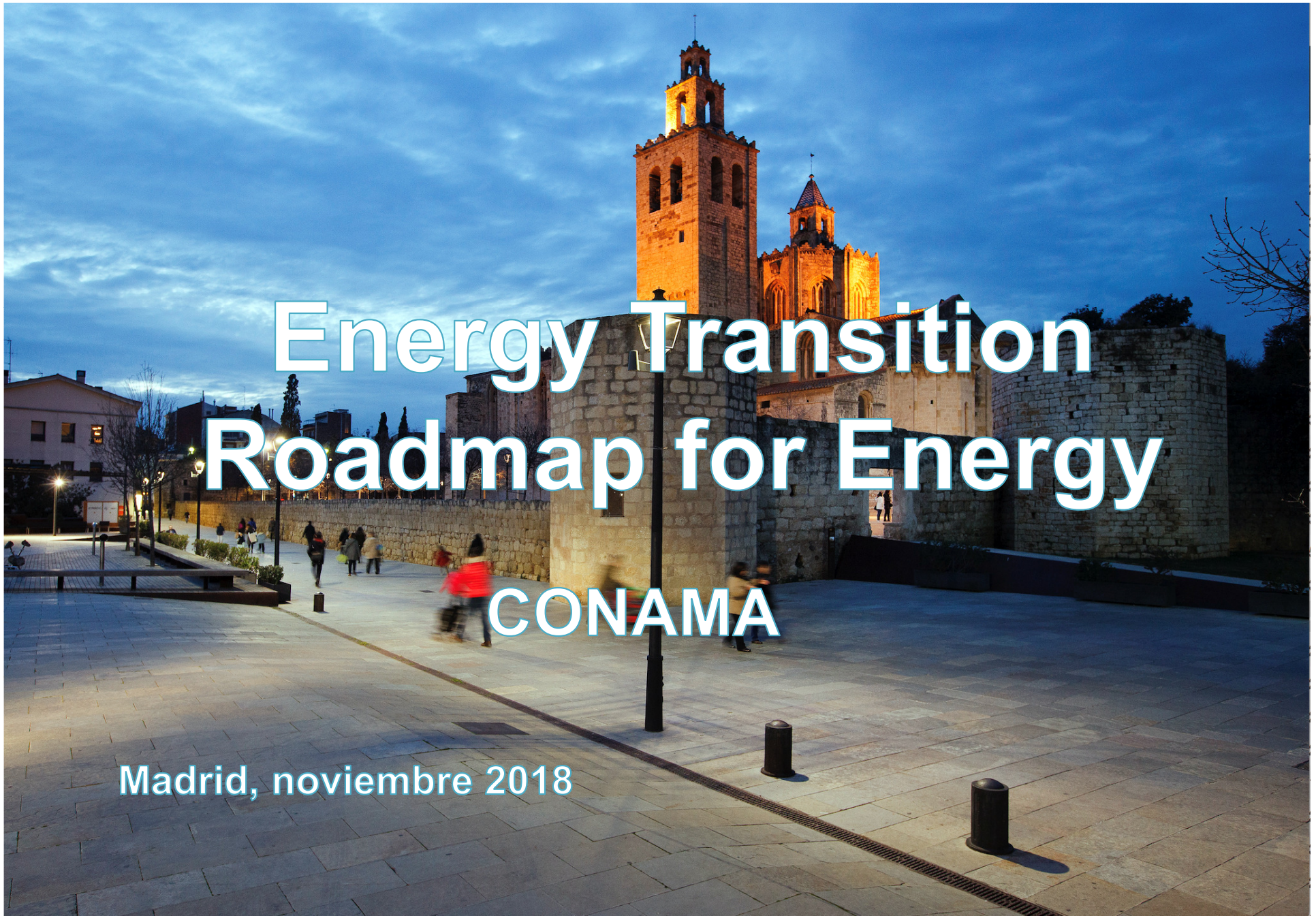

Energy Transition
Roadmap for Energy
CONAMA
Madrid, noviembre 2018

SMART URBAN SPACES

Ajuntament de SantCugat

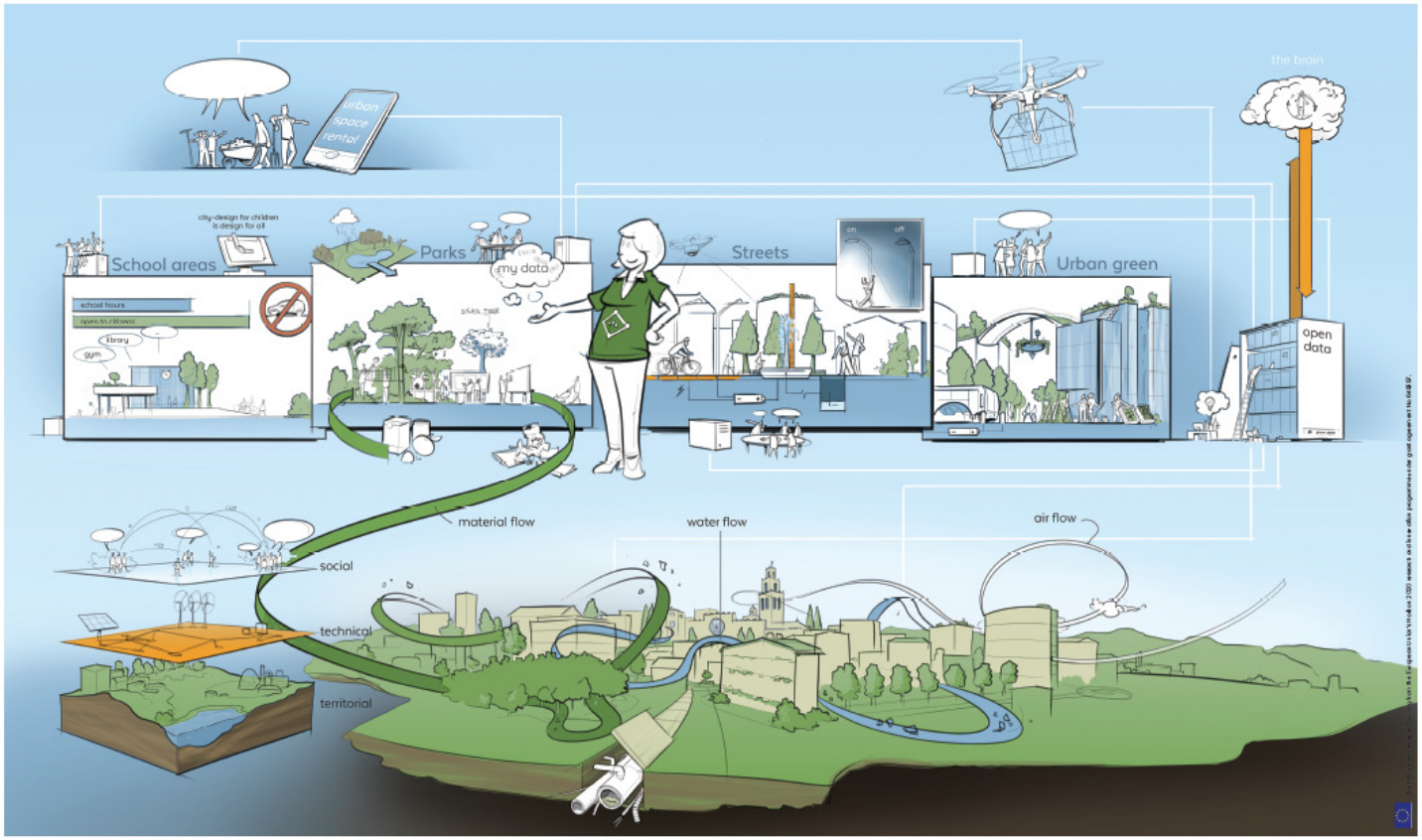
HIGH-QUALITY ENVIRONMENT FOR WELL-BEING IN SANT CUGAT 2050

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

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

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

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



Elements of the desired future scenario are:

Empowered people

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

Multi-use of urban space

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

Resilience of the city

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

Open data & smart grid

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

Financing model

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

Version 15 June 2016

R4E ROADMAPS FOR ENERGY*

SMART BUILDINGS

Ajuntament de SantCugat

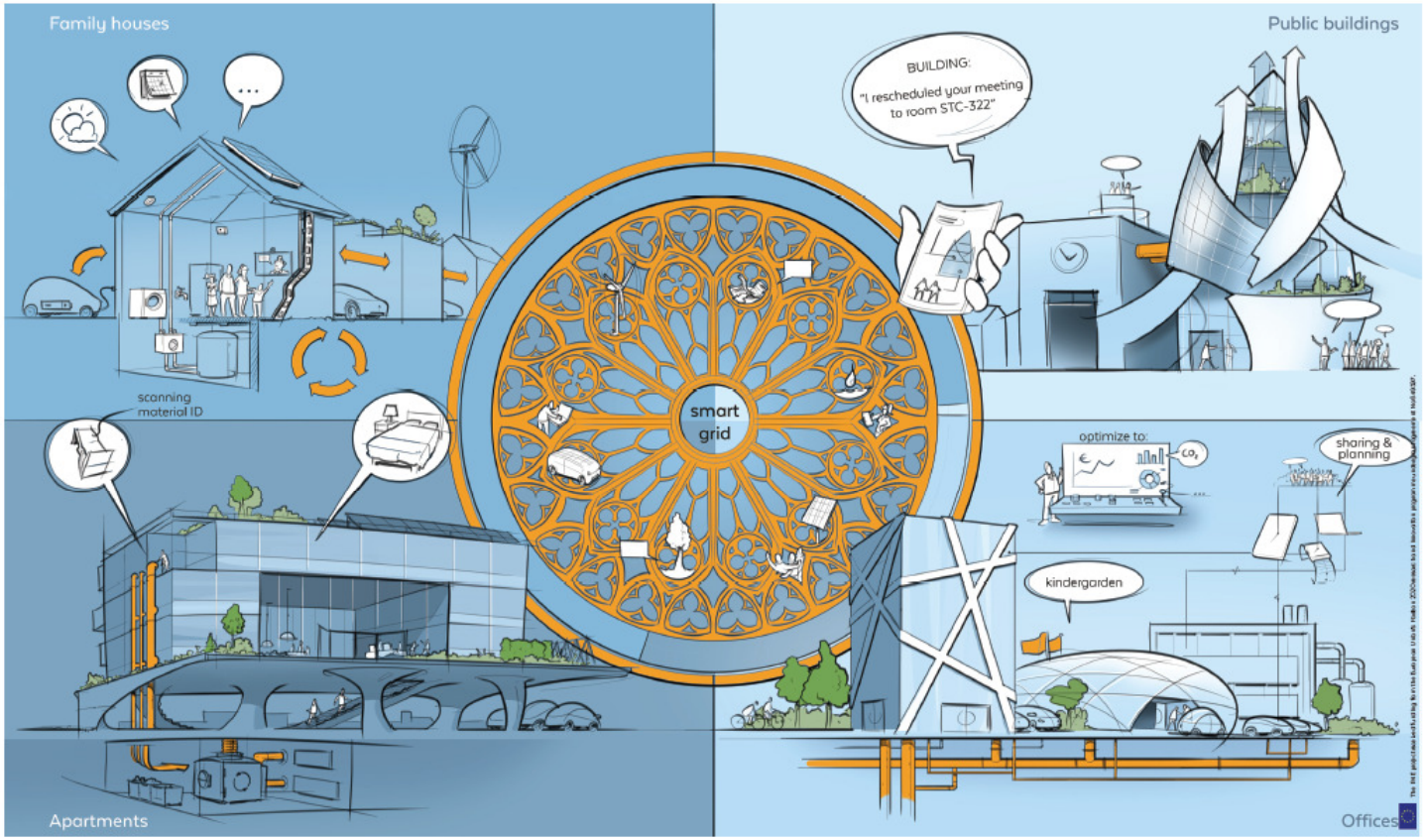
SMART CITIZENS ENJOY SMART BUILDINGS IN SANT CUGAT 2050

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

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

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

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



Elements of the desired future scenario are:

Smart communities

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

Saving through sharing

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

Empowerment by example

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

Campuses as incubator

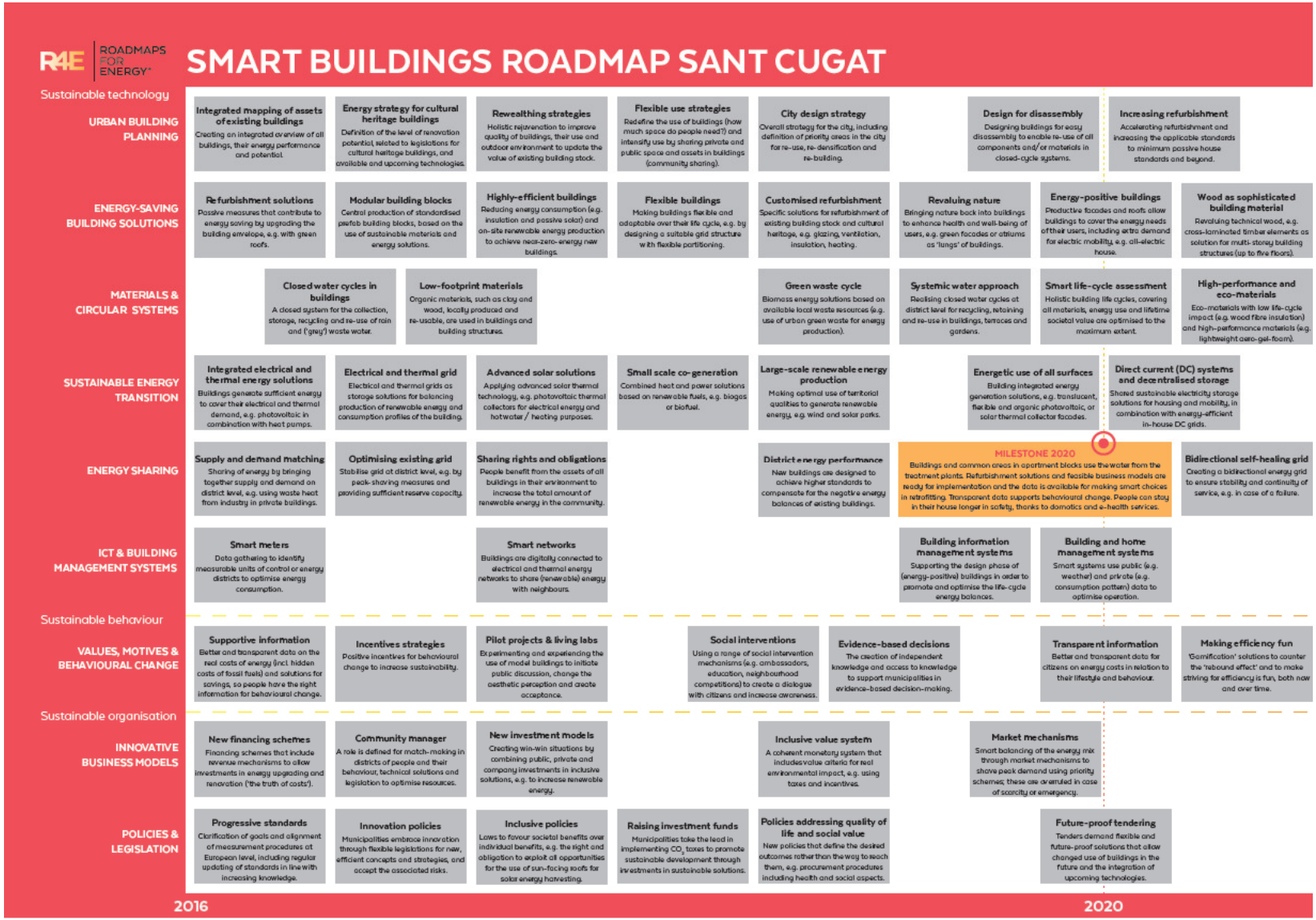
In 2050, offices and campuses are small villages in themselves, providing local facilities and services. They open up to citizens and connect to the community. The controlled environment of campuses and the predictable patterns of use, make them ideal incubators to test new solutions for energy exchange,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

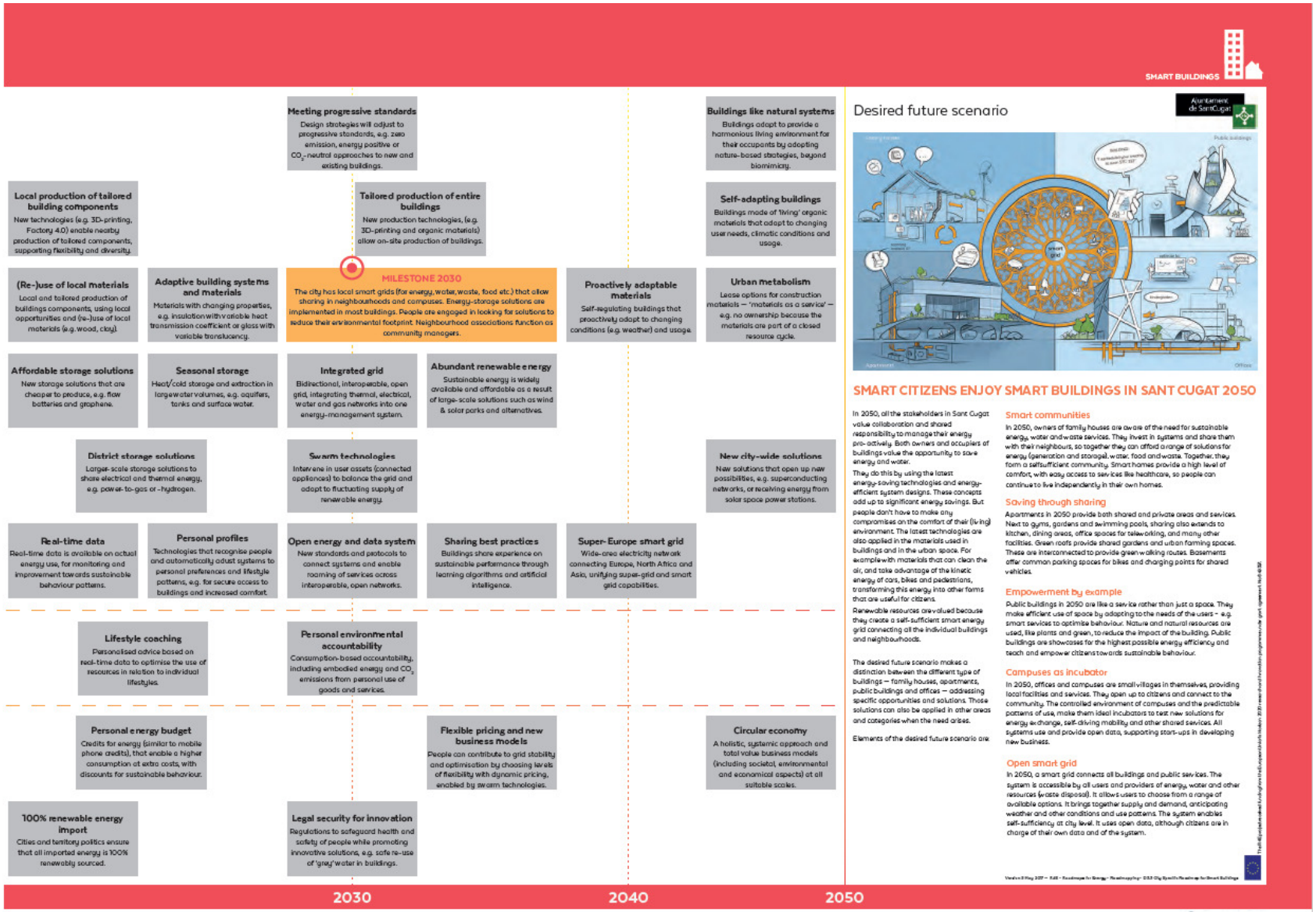
Open smart grid

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

Version 15 June 2016

R4E ROADMAPS FOR ENERGY


R4E ROADMAPS FOR ENERGY*
SMART BUILDINGS ROADMAP SANT CUGAT
Sustainable technology
URBAN BUILDING PLANNING
Integrated mapping of assets of existing buildings
Creating an integrated overview of all buildings, their energy performance and potential.
Energy strategy for cultural heritage buildings
Definition of the level of renovation potential, related to legislations for cultural heritage buildings, and available and upcoming technologies.
Rewealthing strategies
Holistic rejuvenation to improve quality of buildings, their use and outdoor environment to update the value of existing building stock.
Flexible use strategies
Redefine the use of buildings (how much space do people need?) and intensify use by sharing private and public space and assets in buildings (community sharing).
City design strategy
Overall strategy for the city, including definition of priority areas in the city for re-use, re-densification and re-building.
Design for disassembly
Designing buildings for easy disassembly to enable re-use of all components and/or materials in closed-cycle systems.
Increasing refurbishment
Accelerating refurbishment and increasing the applicable standards to minimum passive house standards and beyond.
ENERGY-SAVING BUILDING SOLUTIONS
Refurbishment solutions
Passive measures that contribute to energy saving by upgrading the building envelope, e.g. with green roofs.
Modular building blocks
Central production of standardised prefab building blocks, based on the use of sustainable materials and energy solutions.
Highly-efficient buildings
Reducing energy consumption (e.g. insulation and passive solar) and on-site renewable energy production to achieve near-zero- energy new buildings.
Flexible buildings
Making buildings flexible and adaptable over their life cycle, e.g. by designing a suitable grid structure with flexible partitioning.
Customised refurbishment
Specific solutions for refurbishment of existing building stock and cultural heritage, e.g. glazing, ventilation, insulation, heating.
Revaluing nature
Bringing nature back into buildings to enhance health and well-being of users, e.g. green facades or atriums as 'lungs' of buildings.
Energy-positive buildings
Productive facades and roofs allow buildings to cover the energy needs of their users, including extra demand for electric mobility, e.g. all-electric house.
Wood as sophisticated building material
Revaluing technical wood, e.g. cross-laminated timber elements as solution for multi-storey building structures (up to five floors).
MATERIALS & CIRCULAR SYSTEMS
Closed water cycles in buildings
A closed system for the collection, storage, recycling and re-use of rain and ('grey') waste water.
Low-footprint materials
Organic materials, such as clay and wood, locally produced and re-usable, are used in buildings and building structures.
Green waste cycle
Biomass energy solutions based on available local waste resources (e.g. use of urban green waste for energy production).
Systemic water approach
Realising closed water cycles at district level for recycling, retaining and re-use in buildings, terraces and gardens.
Smart life-cycle assessment
Holistic building life cycles, covering all materials, energy use and lifetime societal value are optimised to the maximum extent.
High-performance and eco-materials
Eco-materials with low life-cycle impact (e.g. wood fibre insulation) and high-performance materials (e.g. lightweight aero-gel-foam).
SUSTAINABLE ENERGY TRANSITION
Integrated electrical and thermal energy solutions
Buildings generate sufficient energy to cover their electrical and thermal demand, e.g. photovoltaic in combination with heat pumps.
Electrical and thermal grid
Electrical and thermal grids as storage solutions for balancing production of renewable energy and consumption profiles of the building.
Advanced solar solutions
Applying advanced solar thermal technology, e.g. photovoltaic thermal collectors for electrical energy and hot water / heating purposes.
Small scale co-generation
Combined heat and power solutions based on renewable fuels, e.g. biogas or biofuel.
Large-scale renewable energy production
Making optimal use of territorial qualities to generate renewable energy, e.g. wind and solar parks.
Energetic use of all surfaces
Building integrated energy generation solutions, e.g. translucent, flexible and organic photovoltaic, or solar thermal collector facades.
Direct current (DC) systems and decentralised storage
Shared sustainable electricity storage solutions for housing and mobility, in combination with energy-efficient in-house DC grids.
ENERGY SHARING
Supply and demand matching
Sharing of energy by bringing together supply and demand on district level, e.g. using waste heat from industry in private buildings.
Optimising existing grid
Stabilise grid at district level, e.g. by peak-shaving measures and providing sufficient reserve capacity.
Sharing rights and obligations
People benefit from the assets of all buildings in their environment to increase the total amount of renewable energy in the community.
District energy performance
New buildings are designed to achieve higher standards to compensate for the negative energy balances of existing buildings.
MILESTONE 2020
Buildings and common areas in apartment blocks use the water from the treatment plants. Refurbishment solutions and feasible business models are ready for implementation and the data is available for making smart choices in retrofitting. Transparent data supports behavioural change. People can stay in their house longer in safety, thanks to domotics and e-health services.
Bidirectional self-healing grid
Creating a bidirectional energy grid to ensure stability and continuity of service, e.g. in case of a failure.
ICT & BUILDING MANAGEMENT SYSTEMS
Smart meters
Data gathering to identify measurable units of control or energy districts to optimise energy consumption.
Smart networks
Buildings are digitally connected to electrical and thermal energy networks to share (renewable) energy with neighbours.
Building information management systems
Supporting the design phase of (energy-positive) buildings in order to promote and optimise the life-cycle energy balances.
Building and home management systems
Smart systems use public (e.g. weather) and private (e.g. consumption pattern) data to optimise operation.
Sustainable behaviour
VALUES, MOTIVES & BEHAVIOURAL CHANGE
Supportive information
Better and transparent data on the real costs of energy (incl. hidden costs of fossil fuels) and solutions for savings, so people have the right information for behavioural change.
Incentives strategies
Positive incentives for behavioural change to increase sustainability.
Pilot projects & living labs
Experimenting and experiencing the use of model buildings to initiate public discussion, change the aesthetic perception and create acceptance.
Social interventions
Using a range of social intervention mechanisms (e.g. ambassadors, education, neighbourhood competitions) to create a dialogue with citizens and increase awareness.
Evidence-based decisions
The creation of independent knowledge and access to knowledge to support municipalities in evidence-based decision-making.
Transparent information
Better and transparent data for citizens on energy costs in relation to their lifestyle and behaviour.
Making efficiency fun
'Gamification' solutions to counter the 'rebound effect' and to make striving for efficiency is fun, both now and over time.
Sustainable organisation
INNOVATIVE BUSINESS MODELS
New financing schemes
Financing schemes that include revenue mechanisms to allow investments in energy upgrading and renovation ('the truth of costs').
Community manager
A role is defined for match-making in districts of people and their behaviour, technical solutions and legislation to optimise resources.
New investment models
Creating win-win situations by combining public, private and company investments in inclusive solutions, e.g. to increase renewable energy.
Inclusive value system
A coherent monetary system that includes value criteria for real environmental impact, e.g. using taxes and incentives.
Market mechanisms
Smart balancing of the energy mix through market mechanisms to shave peak demand using priority schemes; these are overruled in case of scarcity or emergency.
POLICIES & LEGISLATION
Progressive standards
Clarification of goals and alignment of measurement procedures at European level, including regular updating of standards in line with increasing knowledge.
Innovation policies
Municipalities embrace innovation through flexible legislations for new, efficient concepts and strategies, and accept the associated risks.
Inclusive policies
Laws to favour societal benefits over individual benefits, e.g. the right and obligation to exploit all opportunities for the use of sun-facing roofs for solar energy harvesting.
Raising investment funds
Municipalities take the lead in implementing CO_2 taxes to promote sustainable development through investments in sustainable solutions.
Policies addressing quality of life and social value
New policies that define the desired outcomes rather than the way to reach them, e.g. procurement procedures including health and social aspects.
Future-proof tendering
Tenders demand flexible and future-proof solutions that allow changed use of buildings in the future and the integration of upcoming technologies.
2016
2020


SMART BUILDINGS
Meeting progressive standards
Design strategies will adjust to progressive standards, e.g. zero emission, energy positive or CO_2-neutral approaches to new and existing buildings.
Buildings like natural systems
Buildings adapt to provide a harmonious living environment for their occupants by adopting nature-based strategies, beyond biomimicry.
Local production of tailored building components
New technologies (e.g. 3D-printing, Factory 4.0) enable nearby production of tailored components, supporting flexibility and diversity.
Tailored production of entire buildings
New production technologies, (e.g. 3D-printing and organic materials) allow on-site production of buildings.
Self-adapting buildings
Buildings made of 'living' organic materials that adapt to changing user needs, climatic conditions and usage.
(Re-)use of local materials
Local and tailored production of buildings components, using local opportunities and (re-)use of local materials (e.g. wood, clay).
Adaptive building systems and materials
Materials with changing properties, e.g. insulation with variable heat transmission coefficient or glass with variable translucency.
MILESTONE 2030
The city has local smart grids (for energy, water, waste, food etc.) that allow sharing in neighbourhoods and campuses. Energy-storage solutions are implemented in most buildings. People are engaged in looking for solutions to reduce their environmental footprint. Neighbourhood associations function as community managers.
Proactively adaptable materials
Self-regulating buildings that proactively adapt to changing conditions (e.g. weather) and usage.
Urban metabolism
Lease options for construction materials — 'materials as a service' — e.g. no ownership because the materials are part of a closed resource cycle.
Affordable storage solutions
New storage solutions that are cheaper to produce, e.g. flow batteries and graphene.
Seasonal storage
Heat/cold storage and extraction in large water volumes, e.g. aquifers, tanks and surface water.
Integrated grid
Bidirectional, interoperable, open grid, integrating thermal, electrical, water and gas networks into one energy-management system.
Abundant renewable energy
Sustainable energy is widely available and affordable as a result of large-scale solutions such as wind & solar parks and alternatives.
District storage solutions
Larger-scale storage solutions to share electrical and thermal energy, e.g. power-to-gas or -hydrogen.
Swarm technologies
Intervene in user assets (connected appliances) to balance the grid and adapt to fluctuating supply of renewable energy.
New city-wide solutions
New solutions that open up new possibilities, e.g. superconducting networks, or receiving energy from solar space power stations.
Real-time data
Real-time data is available on actual energy use, for monitoring and improvement towards sustainable behaviour patterns.
Personal profiles
Technologies that recognise people and automatically adjust systems to personal preferences and lifestyle patterns, e.g. for secure access to buildings and increased comfort.
Open energy and data system
New standards and protocols to connect systems and enable roaming of services across interoperable, open networks.
Sharing best practices
Buildings share experience on sustainable performance through learning algorithms and artificial intelligence.
Super-Europe smart grid
Wide-area electricity network connecting Europe, North Africa and Asia, unifying super-grid and smart grid capabilities.
Lifestyle coaching
Personalised advice based on real-time data to optimise the use of resources in relation to individual lifestyles.
Personal environmental accountability
Consumption-based accountability, including embodied energy and CO_2 emissions from personal use of goods and services.
Personal energy budget
Credits for energy (similar to mobile phone credits), that enable a higher consumption at extra costs, with discounts for sustainable behaviour.
Flexible pricing and new business models
People can contribute to grid stability and optimisation by choosing levels of flexibility with dynamic pricing, enabled by swarm technologies.
Circular economy
A holistic, systemic approach and total value business models (including societal, environmental and economical aspects) at all suitable scales.
100% renewable energy import
Cities and territory politics ensure that all imported energy is 100% renewably sourced.
Legal security for innovation
Regulations to safeguard health and safety of people while promoting innovative solutions, e.g. safe re-use of 'grey' water in buildings.
2030
2040
2050
Desired future scenario
Ajuntament de Sant Cugat
SMART CITIZENS ENJOY SMART BUILDINGS IN SANT CUGAT 2050
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The desired future scenario makes a distinction between the different type of buildings — family houses, apartments, public buildings and offices — addressing specific opportunities and solutions. These solutions can also be applied in other areas and categories when the need arises.
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Project proposals
BUILDING STRATEGY

Project n. 1 – "CITY BUILDING'S DATA PLATFORM"

- **The goal is to have a kind of library where users can share all database with regards to sustainability in buildings, a platform where users can interact and get/offer whatever they need to improve the energy performance of their buildings, where they can get proposals to make retrofitting easier for those who aren't experts and want to take a decision if it's convenient or not to plan a retrofitting. The platform will allow to make visible best practises in terms of sustainability, and will let policy makers to be up to date**

Project proposals
BUILDING STRATEGY

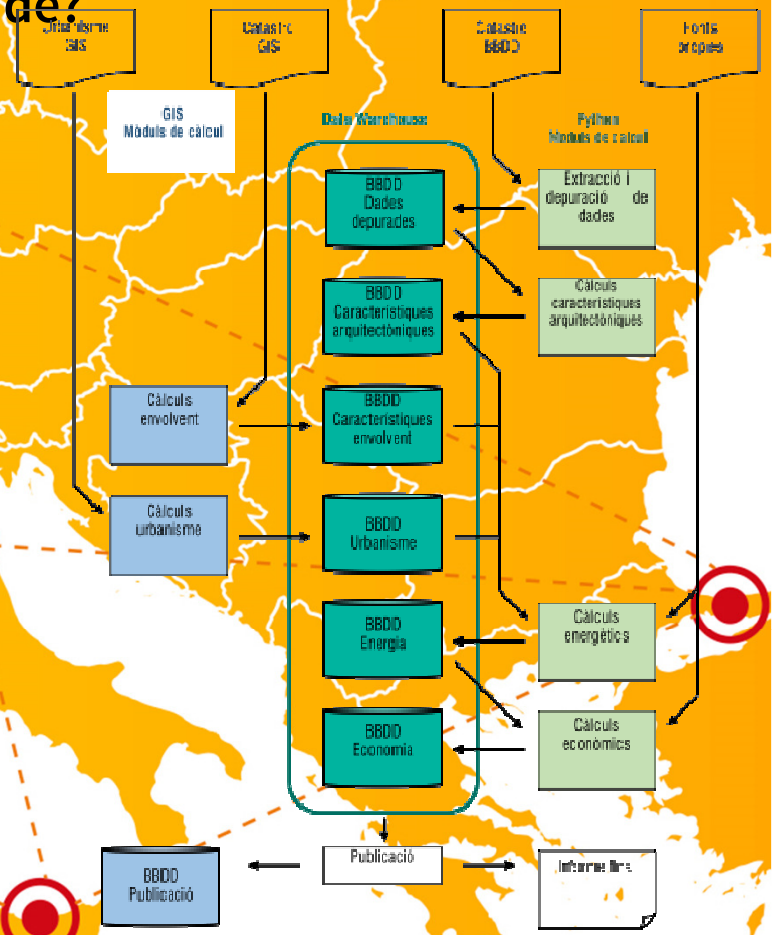
KEY QUESTIONS TO BE ANSWERED I

- Do all of us agree on the importance of including both private and public buildings?
- Which should be the levels of interaction:
- Potential users:
  - Policy makers
  - Energy suppliers
  - Private companies
  - Government
  - Technicians
  - Research centers
  - Citizens
  - …

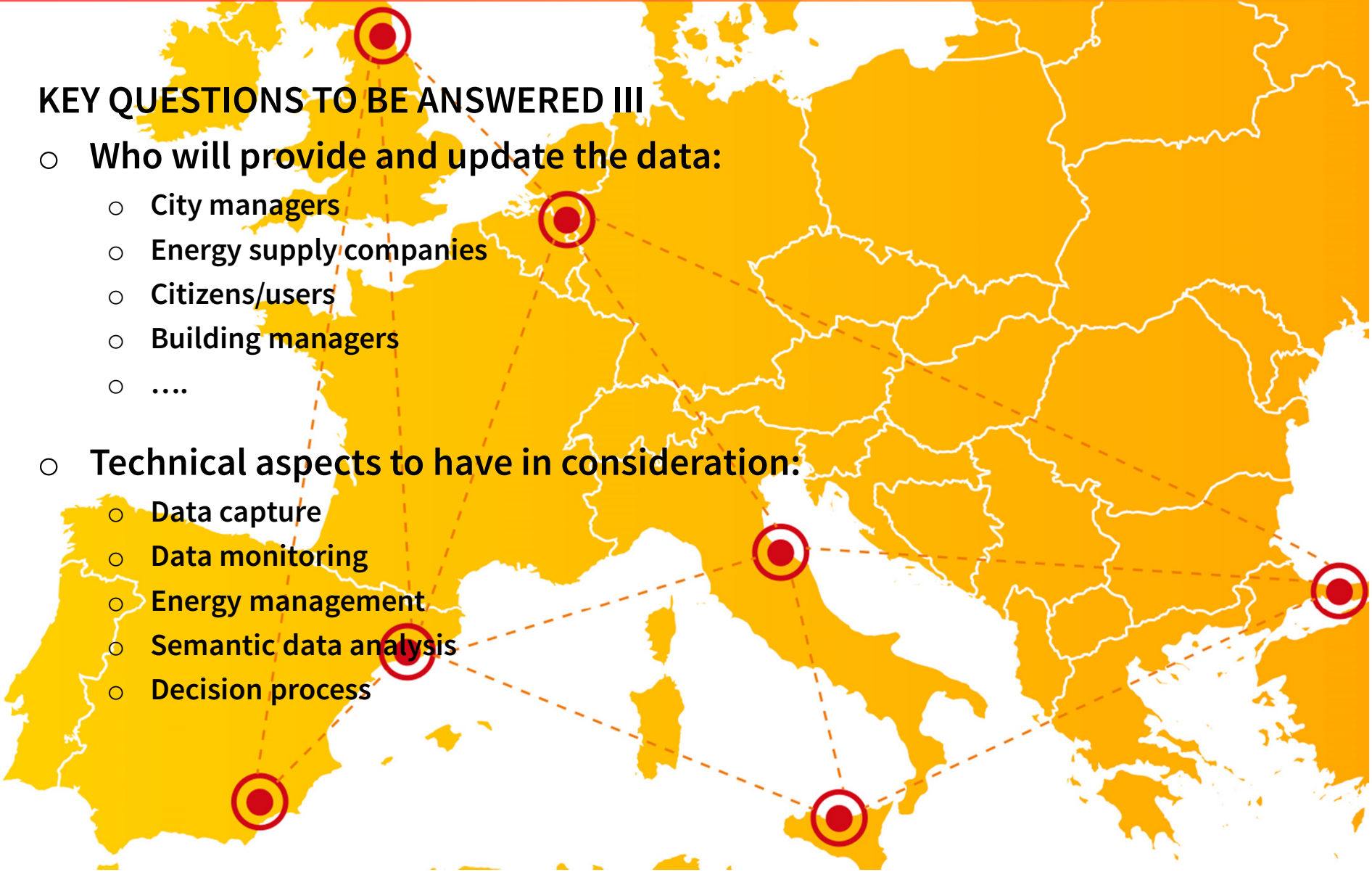
Project proposals
BUILDING STRATEGY

KEY QUESTIONS TO BE ANSWERED II

- What kind of data should the platform include?
  - Building information:
    - Year of construction or last major retrofitting
    - Physical features, materials, surfaces, façades, etc.
    - Use of the building
  - Energy performance
    - Energy resource
    - Energy demand profile
    - Energy consumption and production
  - Users information
    - Number of occupants
    - Users behaviour
  - Other sustainable information like:
    - Water reuse systems
    - Water treatment plants
    - Green walls and roofs
    - Waste treatment
    - City information



Project proposals
BUILDING STRATEGY



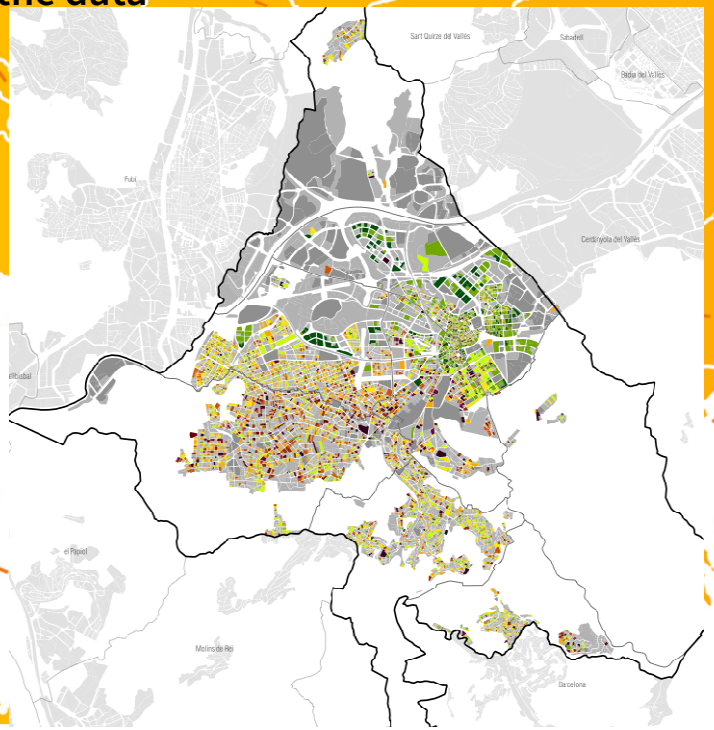
KEY QUESTIONS TO BE ANSWERED III

- Who will provide and update the data:
  - City managers
  - Energy supply companies
  - Citizens/users
  - Building managers
  - ….
- Technical aspects to have in consideration:
  - Data capture
  - Data monitoring
  - Energy management
  - Semantic data analysis
  - Decision process

Project proposals
BUILDING STRATEGY

KEY QUESTIONS TO BE ANSWERED IV

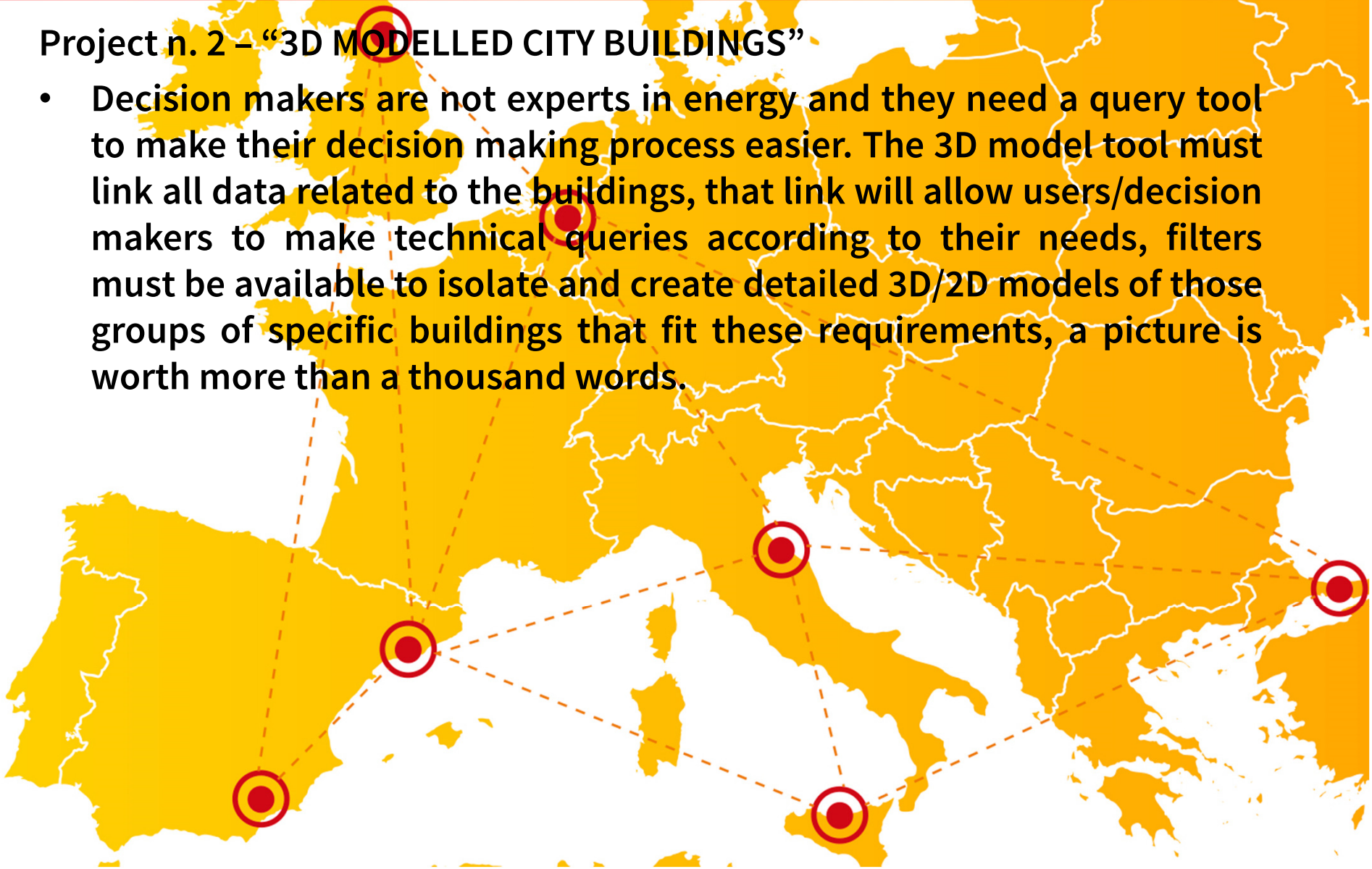
- Which are the benefits of the project:
  - Common city database
  - Strength the relationship among public administration, users, stakeholders
  - Create a network of users and stakeholders
  - Promote an homogeneous treatment of the data
  - Increase the citizens awareness
  - Set the basis for future projects
  - …



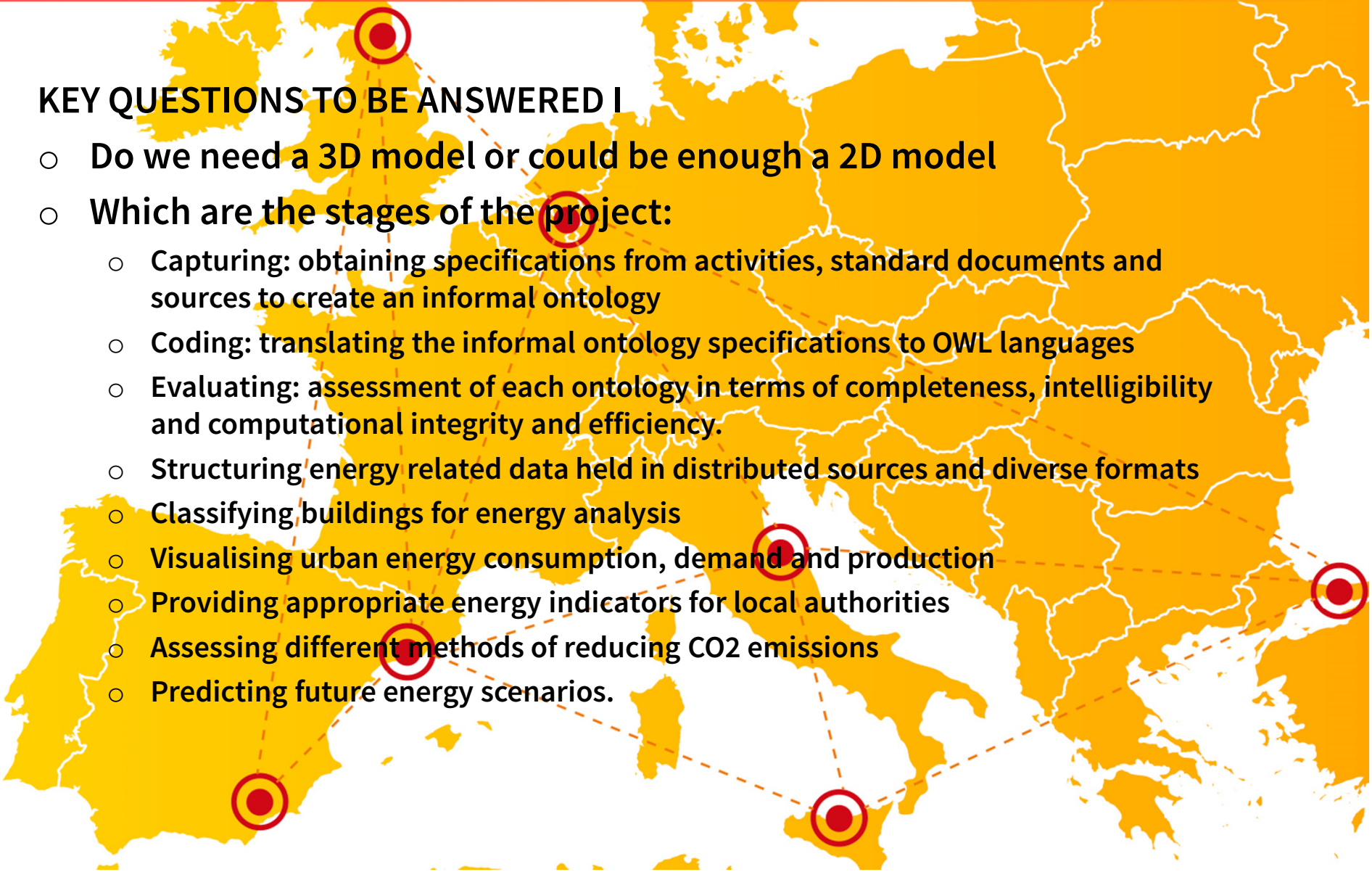
Project proposals
BUILDING STRATEGY

Project n. 2 – "3D MODELLED CITY BUILDINGS"

- **Decision makers are not experts in energy and they need a query tool to make their decision making process easier. The 3D model tool must link all data related to the buildings, that link will allow users/decision makers to make technical queries according to their needs, filters must be available to isolate and create detailed 3D/2D models of those groups of specific buildings that fit these requirements, a picture is worth more than a thousand words.**



Project proposals
BUILDING STRATEGY



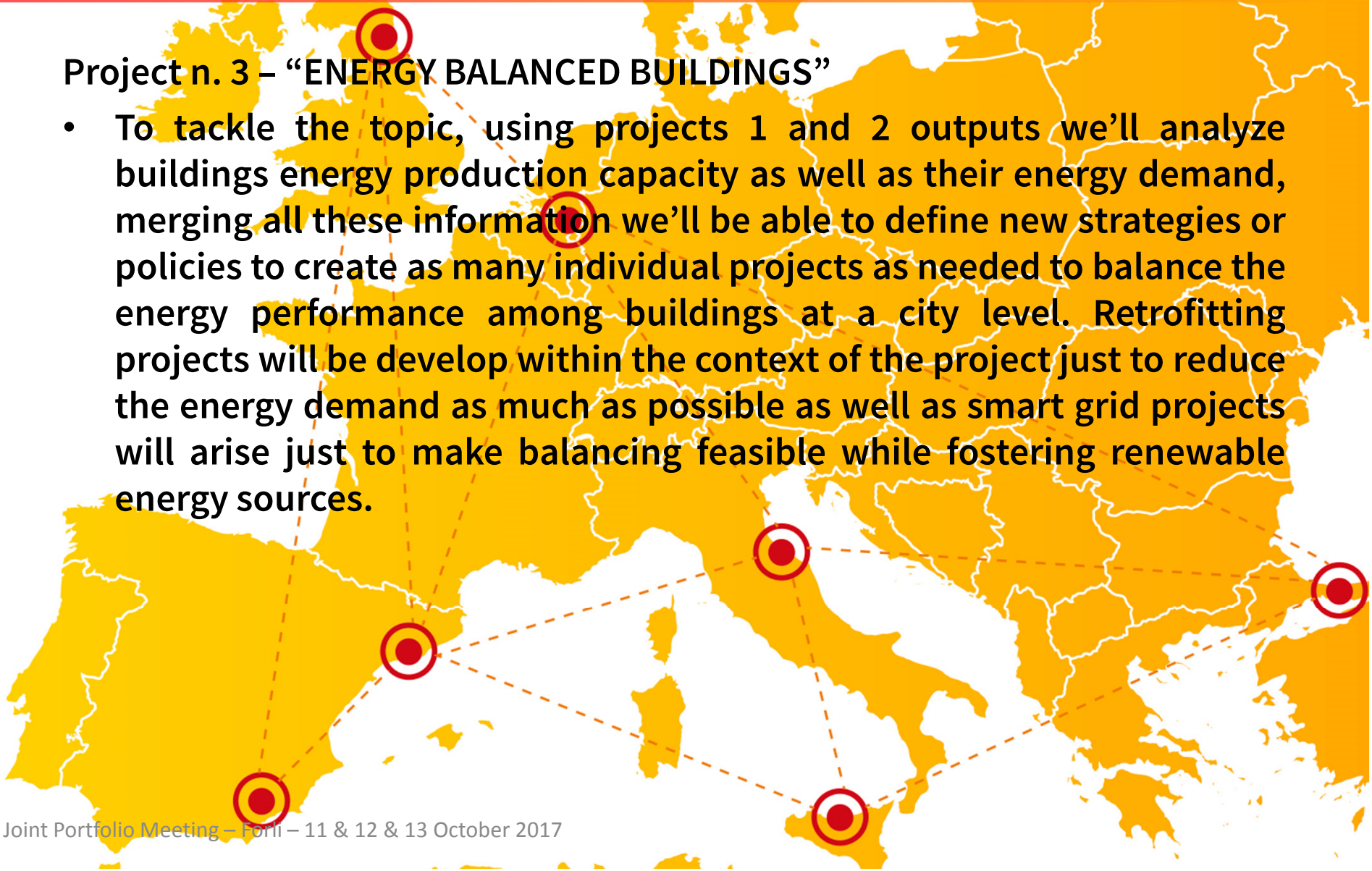
KEY QUESTIONS TO BE ANSWERED I

- Do we need a 3D model or could be enough a 2D model
- Which are the stages of the project:
  - Capturing: obtaining specifications from activities, standard documents and sources to create an informal ontology
  - Coding: translating the informal ontology specifications to OWL languages
  - Evaluating: assessment of each ontology in terms of completeness, intelligibility and computational integrity and efficiency.
  - Structuring energy related data held in distributed sources and diverse formats
  - Classifying buildings for energy analysis
  - Visualising urban energy consumption, demand and production
  - Providing appropriate energy indicators for local authorities
  - Assessing different methods of reducing CO2 emissions
  - Predicting future energy scenarios.

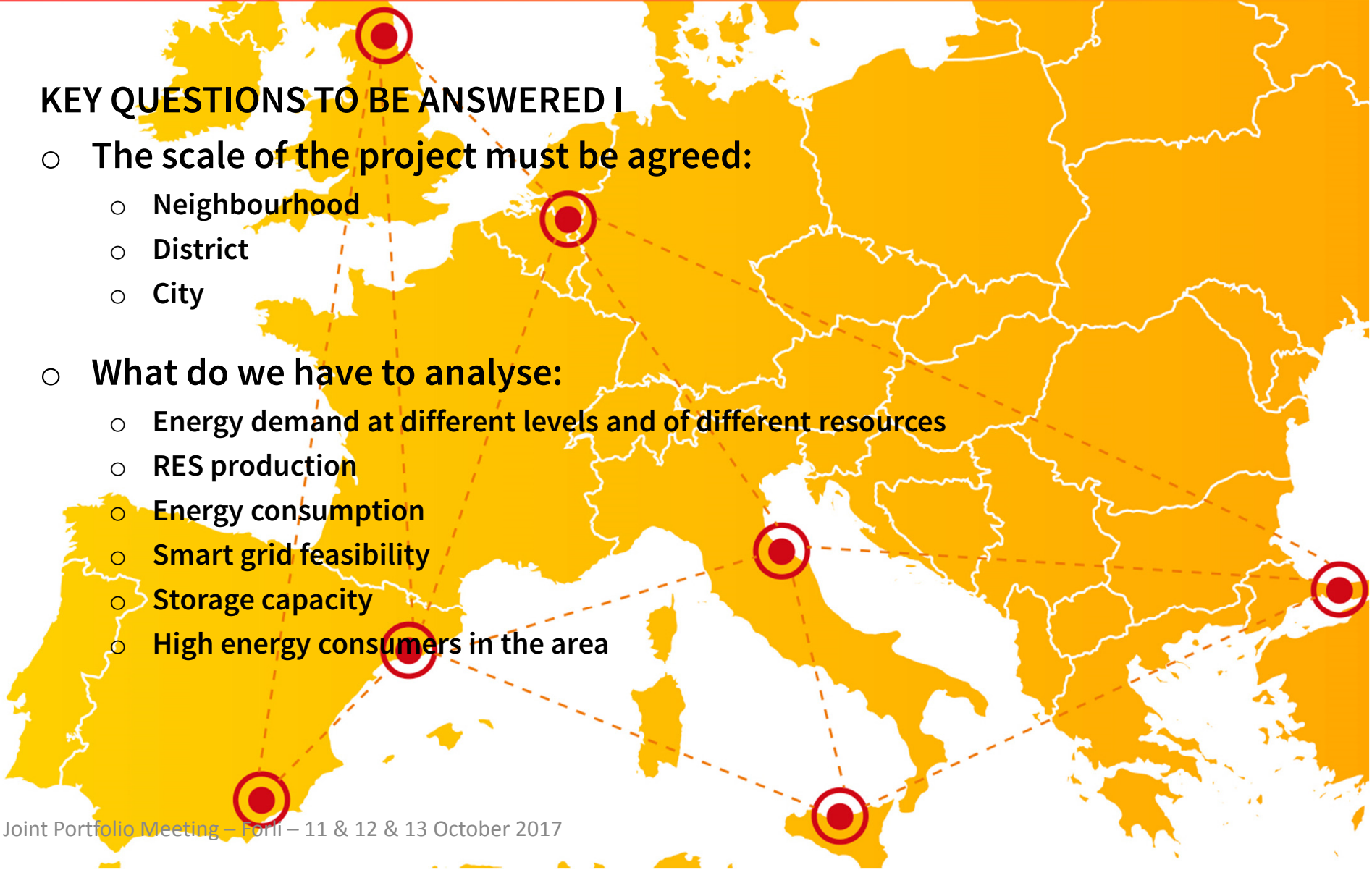
Project proposals
BUILDING STRATEGY

Project n. 3 – "ENERGY BALANCED BUILDINGS"

- **To tackle the topic, using projects 1 and 2 outputs we'll analyze buildings energy production capacity as well as their energy demand, merging all these information we'll be able to define new strategies or policies to create as many individual projects as needed to balance the energy performance among buildings at a city level. Retrofitting projects will be develop within the context of the project just to reduce the energy demand as much as possible as well as smart grid projects will arise just to make balancing feasible while fostering renewable energy sources.**



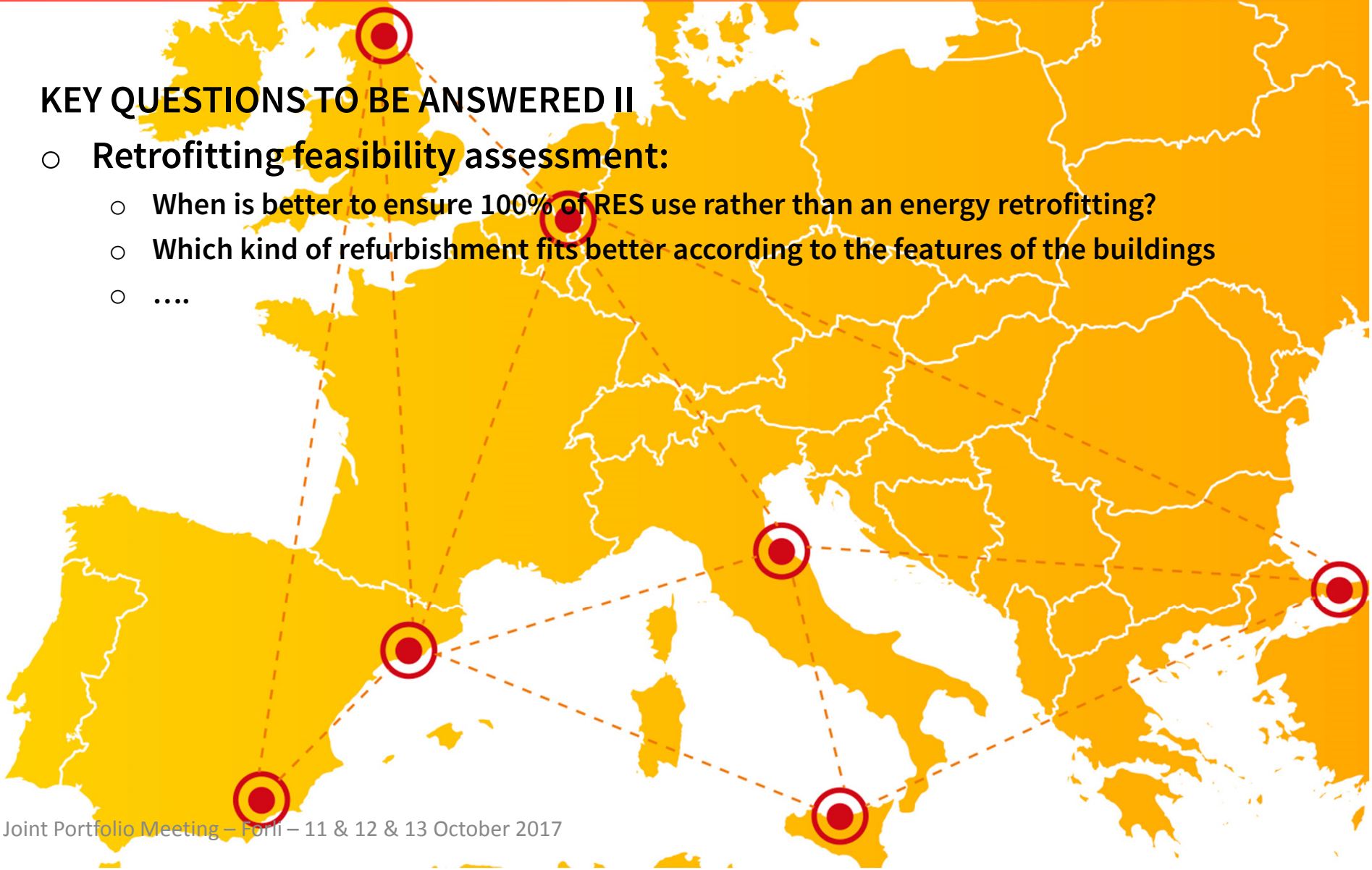
Project proposals
BUILDING STRATEGY



KEY QUESTIONS TO BE ANSWERED I

- The scale of the project must be agreed:
  - Neighbourhood
  - District
  - City
- What do we have to analyse:
  - Energy demand at different levels and of different resources
  - RES production
  - Energy consumption
  - Smart grid feasibility
  - Storage capacity
  - High energy consumers in the area

Project proposals
BUILDING STRATEGY



KEY QUESTIONS TO BE ANSWERED II

- **Retrofitting feasibility assessment:**
  - **When is better to ensure 100% of RES use rather than an energy retrofitting?**
  - **Which kind of refurbishment fits better according to the features of the buildings**
  - **….**

Project proposals
BUILDING STRATEGY

Project n. 4 – "City Buildings' Energy Retrofitting Business Incubator"

- **The main idea is that cities become incubators and foster new models of business making them feasible and attractive for investors. The incubator should include new business related to energy retrofitting, energy supply at city level, an energy marketplace in the city, sharing and creating a sort of smart grid where citizens can buy and sell their energy as well as visitors can use this smart grid as a charging point for e-vehicles**

Project proposals
BUILDING STRATEGY

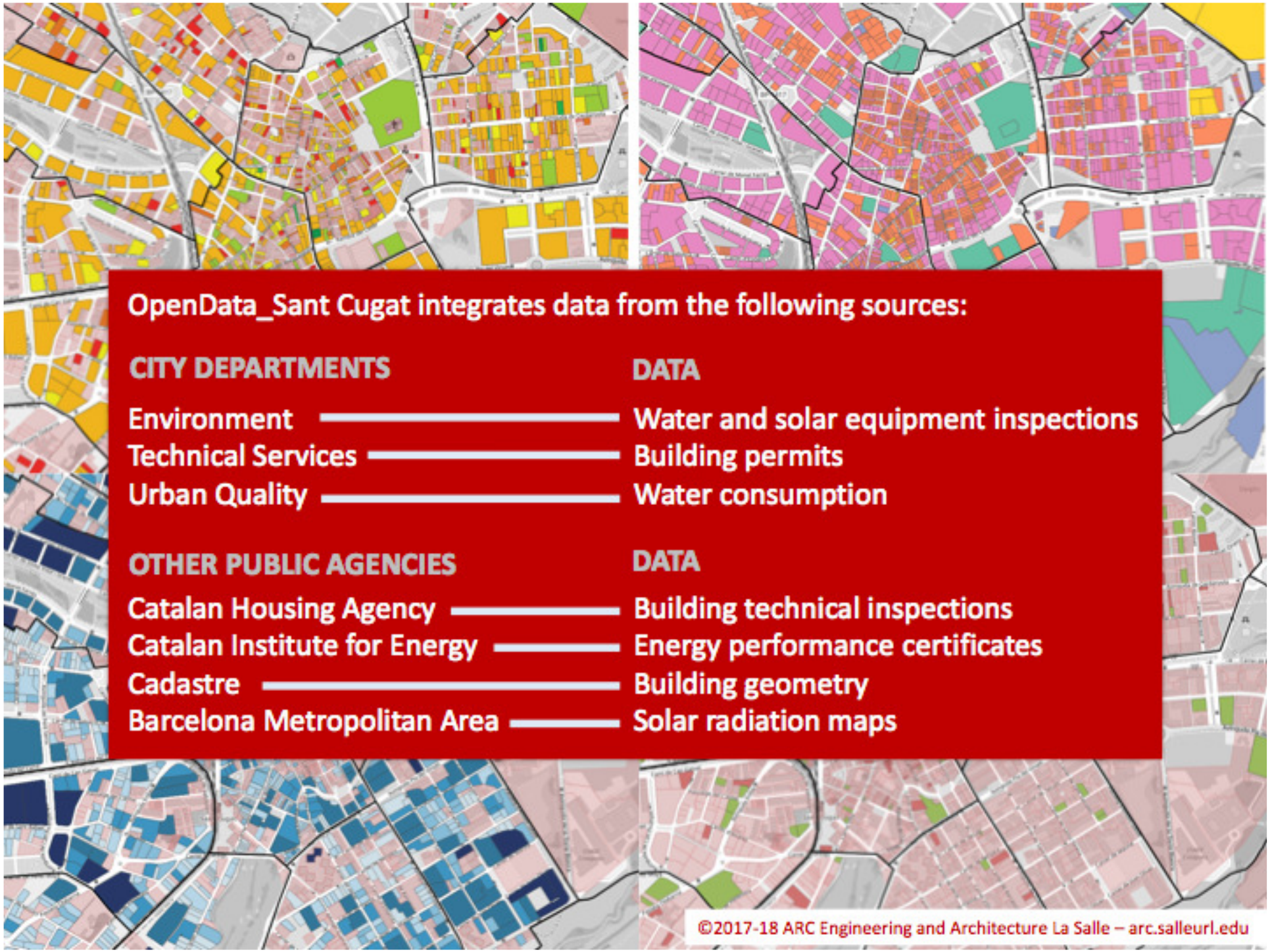
KEY QUESTIONS TO BE ANSWERED I

- Who must be involved?:
  - City governments
  - Citizens
  - ESCO companies
  - Financial companies
  - Energy supply companies
- How to get fund to make it feasible:
  - Public funding
  - Private funding
  - crowdfunding
  - Incentives to foster the final users engagement in the process
  - …

A platform to integrate city's building energy information with public data

AJUNTAMENT DE SantCugat

RESEARCH GROUP
ENGINEERING AND ARCHITECTURE
LA SALLE


OpenData_Sant Cugat integrates data from the following sources:
CITY DEPARTMENTS
DATA
Environment
Water and solar equipment inspections
Technical Services
Building permits
Urban Quality
Water consumption
OTHER PUBLIC AGENCIES
DATA
Catalan Housing Agency
Building technical inspections
Catalan Institute for Energy
Energy performance certificates
Cadastre
Building geometry
Barcelona Metropolitan Area
Solar radiation maps
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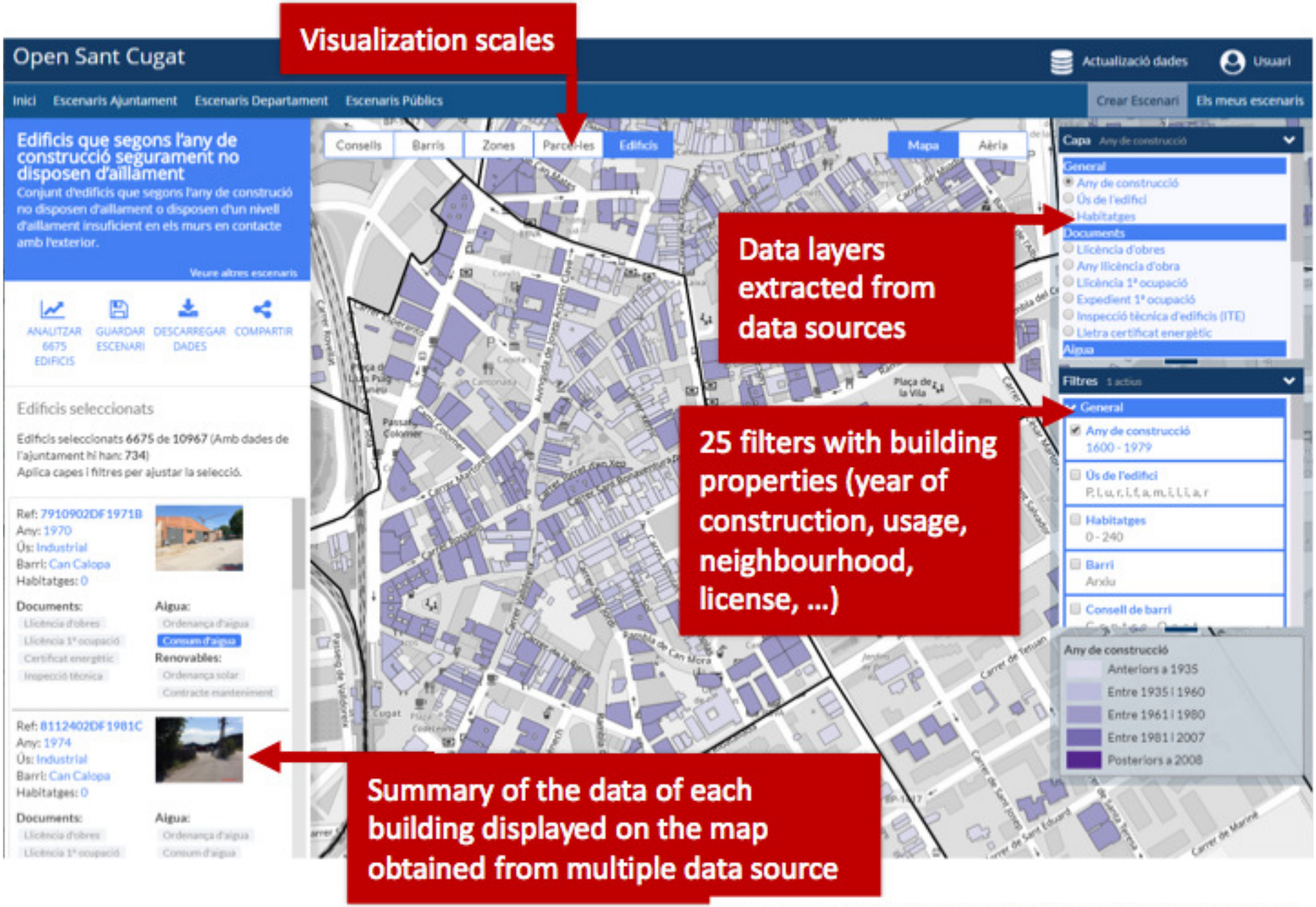


CHESS
SET UP

Combined HEat Supply System by using Solar Energy and heaT pUmPs

This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 680555

Sant Cugat's Sport Center pilot

- The pilot aims to heat the large swimming pool (25 m long) of the Sport Center
- The main components of the project is a high efficiency **ASHP (COP 5.0)** designed for he project, and a **big scale TSE** (100 m3)

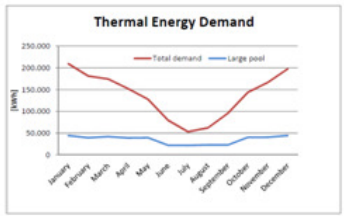
Bid | Final design | Constr. Starts | Constr. End

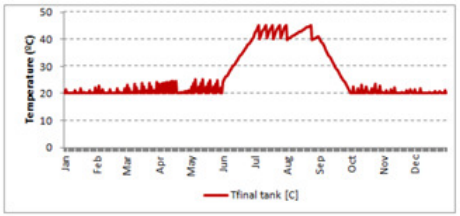
Sant Cugat – Sports Centre (Budget: 800,000 €)

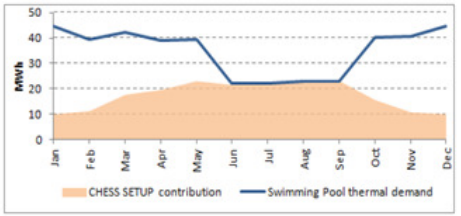
Original status:
- Open every day
- Thermal energy demands:
  1 large swimming pool
  1 small swimming pool
  1 Spa
  Showers
  Dehumidifier
  Heating
- Current HVAC system: Gas boilers
- Thermal demand:
  Total: 1,645 MWh/yr
  Large swimming pool: 421 MWh/yr

CHESS SETUP proposal:
- Investment cost:
  970,000 €
- 160 PV-T (256 m²)
  45% seasonal thermal eff.
  15% electric eff.
- 100 m³ thermal store
  (20°C – 45°C)
- 1 heat pump
  97.5 kW thermal
  17.2 kW electrical
  COP 5.6
- 1 buffer tank (1 m³)

Results:
- Demand covers (large swimming pool):
  50% yearly contribution
  (208 MWh//yr)
  100% summer contribution
- Energy savings:
  187 MWh/yr thermal;
  60 MWh/yr electrical;
- CO_2 savings:
  65 TCO_2/yr
- Costs savings:
  21,000 €/yr







First proposal:
- 1,600 m3 thermal storage
- 580 PV-T (900 m²)
- Demands covered:
  100% all swimming pools
  22% DH (summer only)
  11% DHW (summer only)
- Cost ?

Rev. I (04/2017):
- 200 m3 thermal storage
- 350 PV-T (560 m²)
- Demands covered:
  100% all swimming pools
  7% DH (summer only)
  0% DHW
- Cost: 1,600,000 €

Rev. II (09/2017):
- 135 m3 thermal storage
- 255 PV-T (408 m²)
- Demands covered:
  60% all swimming pools
  0% DH
  0% DHW
- Cost: 1,300,000 €

Rev. III (10/2017):
- 100 m3 thermal storage
- 192 PV-T (307 m²)
- Demands covered:
  50% all swimming pools
  0% DH
  0% DHW
- Cost: 1,200,000 €

Rev. IV (11/2017):
- 100 m3 thermal storage
- 160 PV-T (256 m²)
- Demands covered:
  50% large swimming pool
  0% DH
  0% DHW
- Cost: 950,000 €

This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 680556

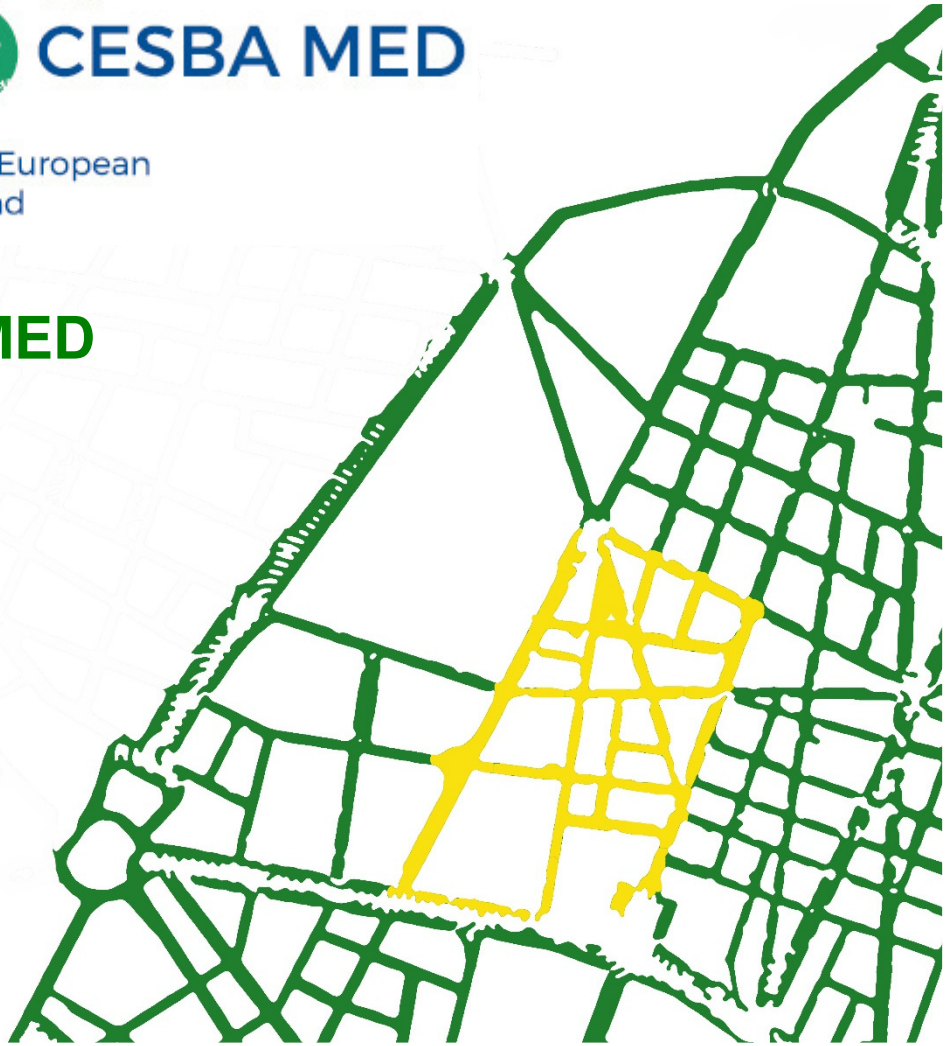
Interreg Mediterranean

EUROPEAN UNION

CESBA MED

Project co-financed by the European Regional Development Fund

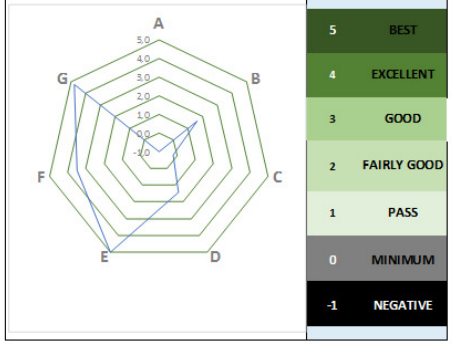
Introducció al Projecte CESBA MED



Objectius

- L'**objectiu principal de CESBA MED** és la creació, test i capitalització d'un sistema d'avaluació de la sostenibilitat d'àrees urbanes de la Mediterrània.
- Altres **objectius més específics** són:
  - Millorar la qualitat i la mesurabilitat dels Plans de millora urbana i d'edificis públics
  - Reforçar les capacitats de les Administracions Públiques a través de formació

	ISSUE	Score	Weight
A	Built Urban Systems	-1,0	1%
B	Economy	1,6	5%
C	Energy	-0,2	30%
D	Atmospheric emissions	1,4	19%
E	Non-renewable sources	5,0	8%
F	Environment	3,5	20%
G	Social aspects	4,8	17%
TOTAL BUILDING SCORE		**2,2**	



5	BEST
4	EXCELLENT
3	GOOD
2	FAIRLY GOOD
1	PASS
0	MINIMUM
-1	NEGATIVE

CESBA
Common European Sustainable Built Environment Assessment
Assessment harmonised with CESBA

NewTREND

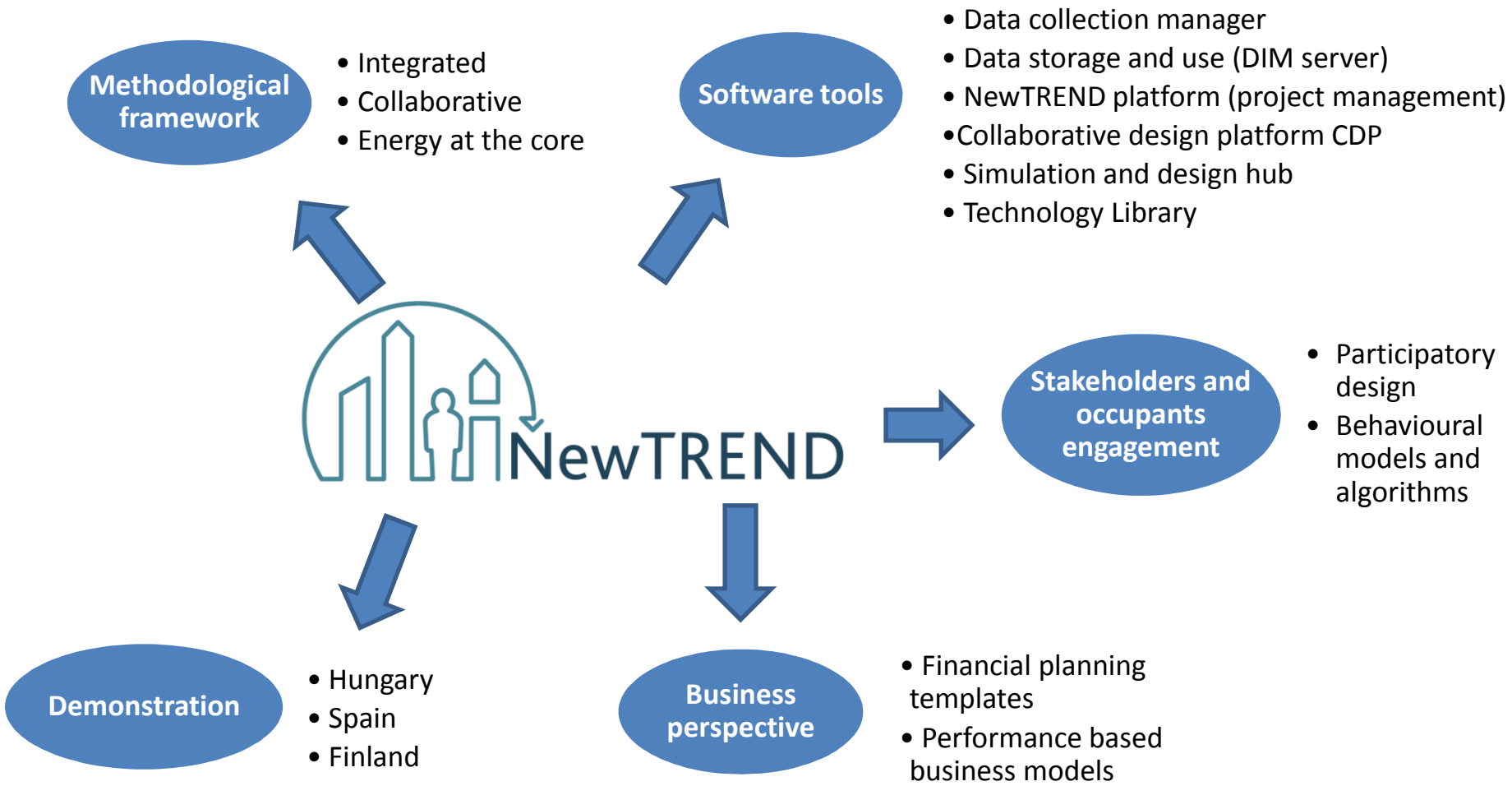
NEW Integrated Methodology and **T**ools for **R**etrofit Design Towards a Next Generation of **EN**ergy Efficient and Sustainable Buildings and **D**istricts

Project Overview

Ajuntament de Sant Cugat del Vallès

Horizon 2020 Research and Innovation Framework Programme
H2020-EeB-2015 Innovation Action

Grant agreement no.: *680474*



SUN HORIZON PROJECT: Executive Presentation

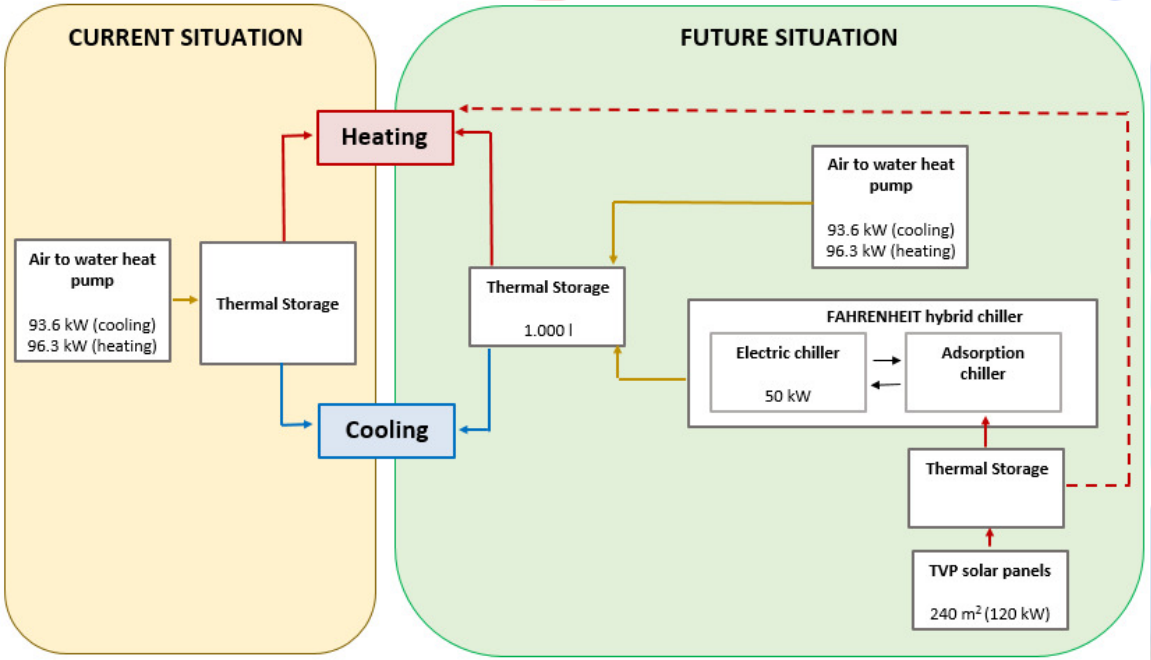
Sun Horizon

Sun Coupled Innovative Heat Pumps

This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 818329

Technology Objectives and Activities

The pilot will be based on the **FAHRENHEIT** hybrid adsorption-compression chiller, where the adsorption unit will receive heat from **High-Vacuum Solar Thermal Panels.**



SunHorizon technologies involved

FAHRENHEIT
TVP solar panels
THERMAL STORAGE

The appliance of this solutions will suppose a positive environmental impact.

Primary energy savings: 170.34 MWh/year
GHG emission savings: 20.23 tCO2/year

Investment: 194,500 €

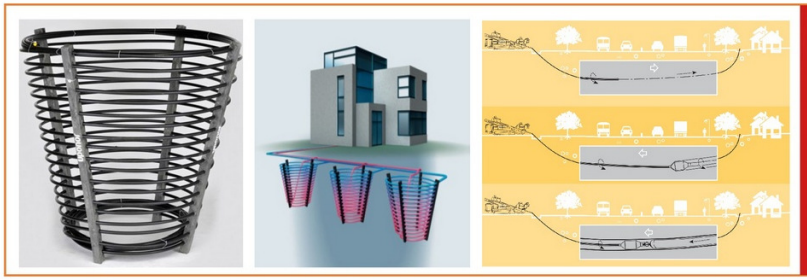
This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N818329

GEOFIT

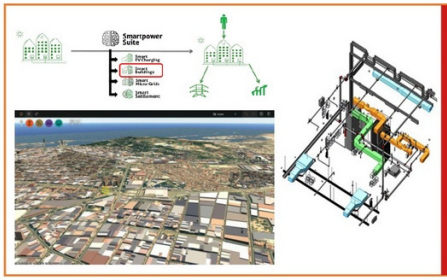
GEOTHERMAL TECHNOLOGIES

This project has received funding from the H2020 programme under Grant Agreement No. 792210

GEOFIT
GEOTHERMAL TECHNOLOGIES



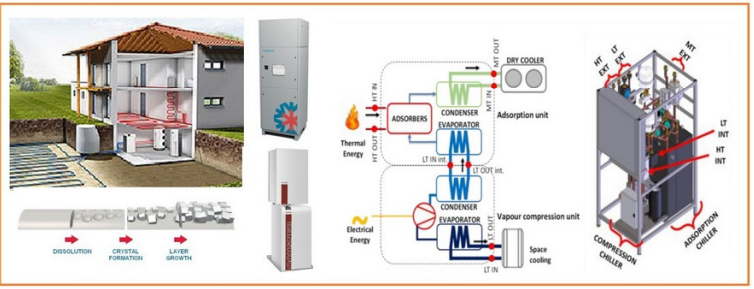
Shallow-Earth Non-Standard Heat Exchanger Concepts Coupled to Innovative Drilling Techniques



GEOTHERMAL Systems as Flexible Assets, BIM at the Building Level and Linked into BIM at the City Information Modelling Level

Ground Penetrating Radar and Structural Health Monitoring to Reduce Risk

Novel Technologies and Integrated System Concepts Delivering Ultra-Efficient Heating and Cooling Solutions



Pilots in Four EU Countries of Different Building Types with Different Soil Conditions

San Cugat Site
Primary School

Talence Site
Office Space

Sant'Apollinare Site
Historical Building
Conference and Office Center

Galway Site
NUIG Kingfisher
Sport Center

Aran Islands Site
Residential Dwellings

GeoFit - Funded by the EC - G.A. 792210

GEOFIT
GEOTHERMAL TECHNOLOGIES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SantCugat
santcugat.cat
Thank you for your attention