IoT and smart cities
European projects

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7th Framework Program 2006 - 2013

IoT programs

- More homogeneous and user-friendly Internet of Things ecosystems
  - IoT at an earlier stage
  - Need to involve citizens and companies
  - By creating a common and simpler environment

- Internet of Things for Smart Cities
  - Create a link between cities and people to get a more efficient energy management, economic growth and development
  - Favour interdisciplinarity, international collaboration, and involve companies
  - Put the attention on trust, user control and transparency

IoT development projects

Internet of things architecture - 12 million € (2010 - 2012)
Going beyond individual designs for IoT devices, and outlining principles and guidelines for the technical design of its protocols, interfaces, and algorithms.
The goal is to have a standard protocol to favour the interoperability and scalability of IoT

Internet of things initiative - 1 million € (2010 - 2013)
International effort to create a strategic and technical vision for the IoT in Europe and an economically sustainable and socially acceptable environment for IoT technologies and respective R&D activities

VITAL - 2.7 millions € (2013 - 2016)
Introducing an abstract virtualized digital layer that will operate across multiple IoT architectures, platforms and business contexts.
Specific focus on smart city applications development, validated in London and Istanbul.

IoT for smart cities

Smart action - 0.75 million € (2013 - 2015)
Consolidate the research and technology transfer activities related to the increasing miniaturization of communication devices, with special attention to smart city applications, involving countries beyond Europe and companies.

REliable, Resilient and secUre IoT for sMart city applications - 3.5 million € (2010 - 2012)
Provide innovative IoT applications that will improve the citizens' quality of life by developing a framework to interconnect heterogeneous software and hardware smart objects, increasing their energy efficiency, and enabling secure and reliable exchange of information.

SocIoTal - 2.8 million € (2013 - 2016) → UniCan participed!
Transformation of the emerging IoT infrastructure to create a citizen-centric IoT.
Understanding of technological, socio-economic barriers for citizen participation in IoT.
Environment inspired by social media to provide awareness and control in citizens.

ClouT: Cloud of Things - 1.5 million € (2013 - 2016) → UniCan participed!
Communication and collaboration platform exploiting all information sources to make the cities smarter (efficient energy management, economic growth, development...).
Trials in four pilot cities: **Santander**, Genova, Mitaka, and Fujisawa.

SmartSantander: Santander as a Smart City

SmartSantander - 6 million € (2010 - 2013)
Santander as a city-scale experimental research facility in support of typical applications and services for a smart city.
More than 20000 sensor in the city and exploiting the results of other European projects (SENSEI and WISEBED).
Open Calls for the experimental facility to be used by researchers from outside the project and involvement of various types of users to develop new applications.

Horizon 2020
2013 - 2020

IoT programs

500 million € euros invested in the following topics [1]:

IoT platforms
Development of advanced platform architectures for smart objects
IoT European Platform Initiative (IoT-EPI)

Ecosystem
Ecosystem bringing together the research community, private sector and users
Alliance for Internet of Things Innovation (AIOTI) grouping projects from EU funded projects, FP7 and national IoT initiatives

Testing and development
Demonstration of several Large Scale Pilots (LSPs)
100 million € funding

Security and privacy
Enhance security and privacy of IoT applications
37 million € funding

Advanced IoT platforms

Europe promotes the idea of open and easy accessible IoT platforms architectures for smart objects, embedded intelligence and smart networks.

Creation of the IoT-European Platforms Initiative (IoT-EPI) in 2016, whose core is made of 7 research projects:

Core projects having for main objectives:

- Try to define unified IoT platforms and APIs (BIG IoT)
- Ensure interoperability among heterogeneous existing and future IoT platforms (inter-iot, symbIoTe)
- Create new services and products (AGILE, TagItSmart!, bIoTope)
- Improve the communication of devices through the use of semantics (VINICITY)

Additionally, 10 open calls to startups, companies, research centers and universities funding in total more than 100 IoT-related projects.

Large scale pilots (LSPs)

Support the testing and experimentation of new IoT related technologies by introducing IoT approaches to specific real-life industrial and societal challenges, such as:

ACTIVAGE PROJECT

Build the first European IoT ecosystem giving **interoperability** across existing heterogeneous platforms.

Provide **Active & Healthy Ageing** IoT based solutions and services.

AUTOPILOT

Increase safety, provide more comfort and create many new business opportunities for **mobility services.**

New services to involve autonomous driving vehicles, like autonomous car sharing and automated parking.

IOF 2020 INTERNET OF FOOD & FARM

Accelerate adoption of IoT for securing sufficient, safe and healthy **food** and to strengthen **competitiveness** of farming and food chains in Europe.

MONICA

Management Of Networked IoT Wearables – Very Large Scale Demonstration of Cultural Societal.

Very large-scale demonstration of multiple existing and new Internet of Things technologies for **Smarter Living**.

SYNCHRONICITY

Establish a reference **architecture** for the envisioned IoT-enabled city market place.

Deliver a Single Digital City Market for Europe.

Coordination performed by two additional projects:

CREATE-IoT

U4IoT

Mobilize end-user engagement with co-creative workshops and meetups, trainings
And stimulate collaboration between IoT initiatives

Smart cities

The main smart cities related projects are related to 3 calls made regarding the Smart City Lighthouse Projects. The main idea is that each project should be applied to several Lighthouse/Follower cities at once, demonstrating processes, technologies and scalable business models to transform their ecosystems into smarter and more sustainable places [2].

17 projects have been funded in this context, involving more than 110 different cities, mostly european.

Main focus of these projects:

- Smart buildings
- Smart grids (electricity, district heating, telecom, water distribution, etc)
- Energy storage
- Electric vehicles, smart charging infrastructures

Main goal: developing intelligent, sustainable, user-driven and demand oriented city infrastructures and services.

Examples close to Santander

atelier
Positive Energy Districts

AmsTErdam and BiLbao cItizen drivEn smaRt cities

Objectives in Bilbao:

- Implement 3,500 electric vehicles (waste collection, cleaning vehicles) and develop recharge infrastructure
- 5 500 new sustainable homes, 150 000 m2 of office spaces, 154 000 m2 of citizen spaces and 93 500 m2 of social and cultural facilities
- Geothermal and hydrothermal renewable energy to cover the thermal demand

→ **Save 1340 MWh of primary energy and 1700 tons of CO2 per year**

REMO URBAN
REgeneration MOdel for smart URBAN transformation

REMOURBAN

Objectives in Valladolid:

- Building envelope retrofitting plan
- Achieve a 'low energy district' by improving system efficiency and using renewable energy sources
- Clean powered (both public and private) vehicles
- Smartphone apps to enhance the intermodality among buses, rented bicycles and car sharing

→ **Save 2222 MWh of primary energy and 1147 tons of CO2 per year**

smart en city
SmartEnCity

Objectives in Vitoria-Gasteiz:

- Energy rehabilitation of facade and building roofs in 1313 homes
- Installation of central heating system and wood-fired hot water boiler
- Rehabilitation of public spaces (streets, squares, pavement, benches, landscaping)

→ **Save cost, reduce energy consumption, improve comfort**

Horizon Europe
2021 - 2027

Drivers and Aims

Demographic change

New “powerhouses“ in the global economy

Urbanisation

Scientific and technological developments

Climate change

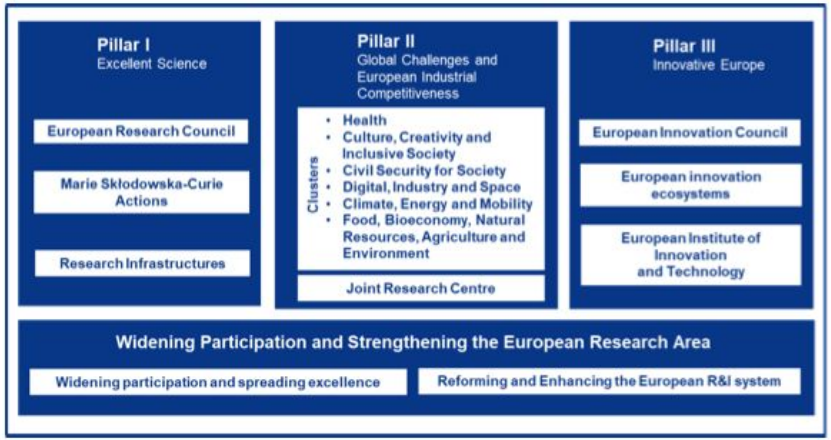
Ensuring Prosperity

Strengthen EU science & technologies thanks to increased investment in highly skilled people & cutting-edge research

Foster the EU‘s competitiveness & its innovation performance supporting market-creating innovation

Push forward EU‘s strategic priorities like the Paris Agreement on climate change and meet global challenges affecting the quality of our daily life

Structure



Open Science pillar €25.8 bn

- Supports frontier research projects defined and driven by researchers
- Funds fellowships and exchanges for researchers
- Invests in world-class research infrastructure

Global Challenges & Industrial Competitiveness pillar €52.7 bn

- Directly supports research relating to societal challenges
- Reinforces technological and industrial capacities
- Sets EU-wide missions tackling biggest problems

Open Innovation pillar €13.5 bn

- Making Europe a frontrunner in market-creating innovation
- Help develop an overall European innovation landscape
- Foster intergration of business, research, higher education and entrepreneurship

IoT within the structure of Horizon Europe

1 Cybersecurity ensuring the protection of the huge number of IoT devices

2 Industry: IoT as Key Digital Technology, developing strong design and production capacities in essential digital technologies

Space: Cost-effective, advanced satellite communications to connect assets and people in underserved areas enabled by IoT

Next Generation Internet: Technologies and systems for trusted and energy-efficient smart network and service infrastructures (e.g. IoT).

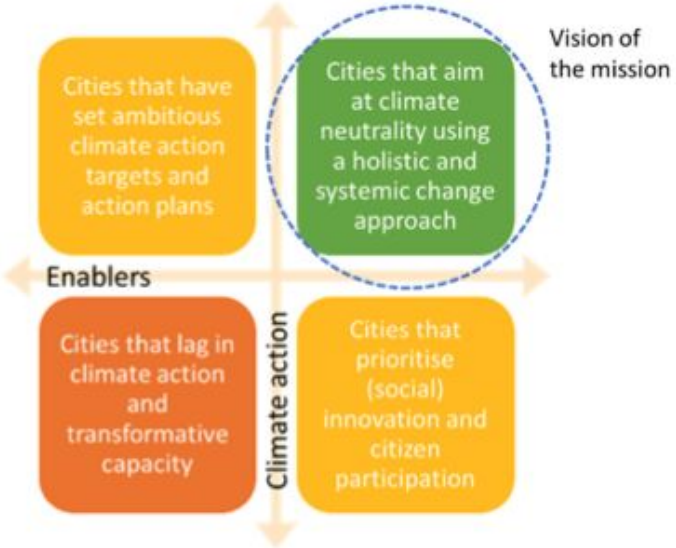
Ensure the infrastructure enabling IoT

3 IoT as great potential for developing a connected and automated transport and managing traffic across the whole transport network

IoT for electricity networks to integrate, renewables and new loads, managing electricity grids

Smart Cities as a mission

For increasing the effectiveness of funding by pursuing clearly defined targets Horizon Europe has invented five mission areas: 1) Cancer 2) Adaptation to climate change including societal transformation waters, 2) Climate-neutral and smart cities 3) Healthy oceans, seas coastal and inland Soil health and food. The citizens of the European Union are engaged to shape the missions in online discussion, citizen events and specialised conferences.



The mission Board for climate neutral and smart cities proposes:

“The EU commission should establish a mission that will support and promote 100 European cities in their systematic transformation towards climate-neutrality by 2030”

Smart technologies, data platforms and urban system modelling as driver:

- Improve efficient use of resource
- Better decision making
- Making use of urban system modelling

With use of world-class modern digital infrastructure, deployment of IoT, open and interoperable datasets for generating practical insights through big data analytics and AI.

Application examples:

- Energy efficiency through smart grids for renewable energy networks management
- Smart multimodal and integrated transport systems and solutions

Backup

IoT (http://www.internet-of-things-research.eu/partners.htm)

- TOWARDS A FUTURE INTERNET: Interrelation between Technological, Social and Economic Trends (https://ec.europa.eu/research/participants/portal/desktop/sedia/opportunities/fp7/calls/2008_s_129-170659.html)
- Cooperation "future internet" 2011, 2012 and 2013 (https://ec.europa.eu/research/participants/portal/desktop/sedia/opportunities/fp7/calls/fp7-2011-ict-fi.html for 2011)
- "ClouT: Cloud of Things for empowering the citizen clout in smart cities", 1.5 M€ 2013 - 2016 (https://cordis.europa.eu/project/id/608641, http://clout-project.eu/) Santander and UniCan involved!
- "Virtualized programmable InTerfAces for innovative cost-effective IoT depLoyments in smart cities", 2.7 M€ 2013 - 2016 (https://cordis.europa.eu/project/id/608682). Similar to RERUM (https://cordis.europa.eu/project/id/609094)
- "SMART ACTION, A reliable, smart and secure Internet of Things for Smart Cities" 0.75 M€, 2013 - 2015 (https://cordis.europa.eu/project/id/609024)
- "SOCIOTAL A reliable, smart and secure Internet of Things for Smart Cities" 2.8 M€, 2013 - 2016 (https://cordis.europa.eu/project/id/609112) Santander and UniCan involved!
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- "Internet of things initiative" 1 M€ 2010 - 2012 (https://cordis.europa.eu/project/id/257565)
- "Internet of things architecture" 12 M€ 2010 - 2013 (https://cordis.europa.eu/project/id/257521)

SmartCities (https://ec.europa.eu/digital-single-market/en/programme-and-projects/project-factsheets-smart-cities)

- Cooperation "Smart Cities and communities" 2012 and 2013 (https://ec.europa.eu/research/participants/portal/desktop/sedia/opportunities/fp7/calls/fp7-energy-smartcities-2012.html for 2012)
- "Renewable Mobility Services in Smart Cities" 2013 -2016, 2.45 M€ (https://cordis.europa.eu/project/id/609026)
- "Building Energy decision Support systems fOr Smart cities" 4.6 M€ (https://cordis.europa.eu/project/id/608723)
- Horizon Europe Factsheet (https://ec.europa.eu/info/sites/info/files/research_and_innovation/knowledge_publications_tools_and_data/documents/ec_rtd_factsheet-horizon-europe_2019.pdf)
- Horizon Europe Work programme 2018-2020 (https://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-comm-diss_en.pdf)
- Mission area climate neutral and smart cities (https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme/mission-area-climate-neutral-and-smart-ci s_en) (https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupMeetingDoc&docid=38178)
- Horizon Europe proposal (https://eur-lex.europa.eu/resource.html?uri=cellar:7cc790e8-6a33-11e8-9483-01aa75ed71a1.0002.03/DO nat=PDF)
- EU budget for the future Horizon Europe (https://ec.europa.eu/commission/sites/beta-political/files/budget-may2018-research-i n.pdf)
- Horizon europe (https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme_en)