



Smart Cities projects

Smart Cities projects

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Bicizen
Sensor network for the management
of a smart city
TraceFood



Groof

The GROOF project aims to disseminate and demonstrate an alternative way of participating in the reduction of CO2 emissions in compliance with European directives.

Click to see
the project
video

The project

It consists of 3 main steps:

- The identification of barriers and opportunities to provide the best appropriate guidance to future project operators located in North-West Europe.
- The development of 4 pilots in France, Belgium, Germany and Luxembourg.
- Looking for carriers of rooftop greenhouse projects located in northwest Europe and Spain. Applications will be collected in 2019 through an open call for the project.

More information

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Team

Sostenipra is a research group from the Institute of Environmental Science and Technology (ICTA-UAB) in the field of Industrial Ecology, which is dedicated to applying methods such as life cycle analysis and eco-efficiency in a systemic way at a process, urban or regional scale. We lead projects in the sustainable management of resources and in the water-energy-food nexus at city scale. We are a consolidated group recognized by the Generalitat (SGR 1683), made up of professors, researchers in training and postdoctoral fellows, and the company Inedit Innovación.



Sirah

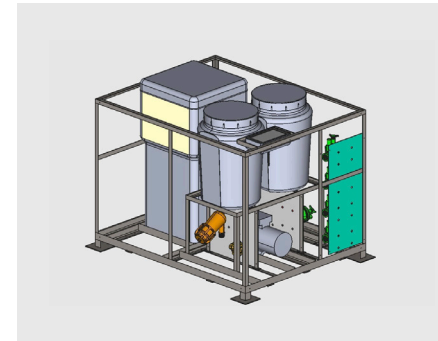
The goal is to develop products and technologies from laboratory settings to market scale. The project is based on 2 products: SIRAH alpha and SIRH beta.



The project

The alpha build is a basic irrigation system with a basic sensor setup and open access 3D files. The easy access to the 3D model of the product aims to increase its diffusion and demands a “do it yourself” attitude towards urban agriculture. The SIRAH beta model, on the other hand, will integrate a water recirculation system to collect and reuse leached water and nutrients.

This system includes greater irrigation control based on previously generated and validated models. Together with the UPC, it is intended to integrate environmental models within the SIRAH beta product to further adapt to climatic conditions in greenhouse productions through the development of a visual interface to monitor critical variables for the agricultural system.



More information

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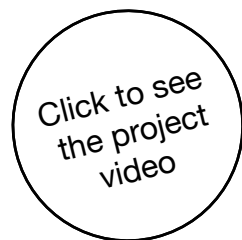
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FoodE

The main objective of FoodE is to involve local initiatives of the European Union in the design, implementation and monitoring of sustainable city / region food systems (CRFS) from an environmental, economic and social point of view.



The results of FoodE will have an impact on job creation, promoting the local economy, strengthening the role of local communities in meeting the Sustainable Development Goals, as well as identifying and strengthening of the relationships between the different actors of the food chain.



The project

The way used by FoodE to achieve these goals consists of the following steps:

- Evaluate and classify the sustainability of various types of urban food systems.
 - Actively involve citizens in the joint creation and choice of innovative urban food systems.
 - Implement innovative and sustainable pilots in various EU cities.
 - Implement and validate a methodology based on citizen science that promotes public and private associations in CRFS.
 - Develop a set of policy briefs, guidelines and recommendations.
- Direction to civil society, academia and public / private actors.

More information

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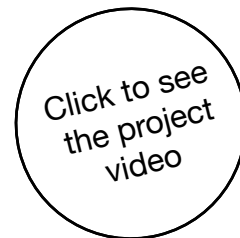


The team

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ECIU University

The ECIU University is an initiative of the European Consortium of Innovative Universities (ECIU) that creates a groundbreaking and innovative educational model on a European scale.



The project

Through the initiative, ECIU alliance builds the ECIU University with open and flexible system, an entire new concept of the European University for the future.

The ultimate goal of the ECIU University project is to establish a true European University where learners, researchers, business, public organizations, citizens and associations are enabled to create relevant innovative solutions for real life challenges with real societal impact.

The ECIU University is an ambitious

undertaking, with distinctive features that makes it unique:

- Societal impact by solving societal challenges.
- Flexible, diverse and tailored education for students and for any person interested in learning.
- Development of challenge-based education.
- Development of challenge-based research and innovation.
- Embedded mobility.



More information

www.eciu.org

The team

Currently, 12 universities are members of the ECIU University Alliance: Universitat Autònoma de Barcelona, Aalborg University (Dinamarca), Dublin City University (Irlanda), Hamburg University of Technology (Alemanya), Kaunas University of Technology (Lituània), Institut National des Sciences Appliquées (França), Linköping University (Suècia), Tampere University (Finlàndia), Universidade de Aveiro (Portugal), University of Stavanger (Noruega), Università degli Studi di Trento (Itàlia), University of Twente (Holanda).





SMART-ER

Port the development of joint strategies or vision documents, and concrete action SMART-ER project answers to the Horizon 2020 Work Programme 2020 – 16.

Science with and for Society (SwafS) where European University alliances selected under the Erasmus+ pilot were called to sup plans empowering the ‘European Universities’ research

and innovation transformations, as well as the (initial) implementation of the respective action plans, where possible in connection with other relevant EU or national funding sources.

The project

Through this Horizon 2020 support, ECIU University is piloting a Virtual Research institute on SMART European Regions as a model for institutional transformation at research and innovation level based on a Challenge-based research approach.

SMART-ER suggests a new model of barrier-free collaboration overcoming languages, borders, disciplines and sectors, pushing the barriers of fundamental research and applied science, mobilising innovation ecosystems and empowering engaged and active citizens to transform the way we live and work, choosing a bottom-up, research community approach.



Team

The ECIU University Research Institute for Smart European Regions (SMART-ER) is a research, innovation and education strong alliance, enabling all 12 ECIU University member institutions jointly to address complex societal challenges under the framework of the UN SDG11 (Sustainable cities and communities).

Jointly, the institutions will pilot capacity building programmes (Seed Programme and SMART-ER Academy) and citizen science initiatives that will be used as a testbed to put into practice all the mechanisms and structures built.

More information

Coordination of ECIU University project at the UAB

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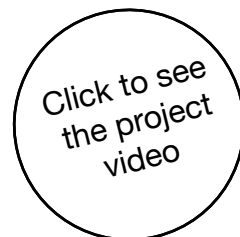
CARE Citizen Arenas



The purpose of Citizen Arenas for Improved Environmental Quality & Resource is to connect, organise and re-unite academia and society and to make citizens actors in the research project.

The project

Their participation is foreseen alongside the full research cycle from the design to the collection of data and dissemination. As such, we use this exploratory project to tackle different facets of issues related to environmen-



More information
citizenarenas.eu

tal quality and resource use (air, water, waste, energy, etc.). We are building an international team of researchers with multidisciplinary expertise and a shared desire to co-create a European community around sustainability and citizen science.

In particular UAB will focus on two different aspects, water & energy consumption and food waste treatment.

For the part of water & energy consumption, we will focus on the measurement and analysis of water and energy use and its environmental consequences. We will begin by monitoring energy and water use and installing metres/sensors for energy use devices (computers, heaters, etc.) and water use (showers, washing machines, etc.). Citizens will report their estimated water and energy consumption then compare it with the actual monitored data. We will then calculate consumption patterns, analyse their environmental impacts and propose best practices and challenges for their implementation.

For the part of food waste treatment, we will make citizens aware that food is a major contributor to household solid waste and that it does not “disappear” and needs treatment and if possible recovery. This pilot will make citizens conscious of their main role in household food management, waste

generation and possibilities to separate waste to allow its use as sources for new materials. It also has the goal for the citizens to be aware of their impact on climate by the generation of greenhouse gases associated with organic waste treatment. Citizens will be involved in their own organic waste management and receive compensation in the form of bioproducts that can be used immediately. As a consequence, more resilient and self-sufficient communities will emerge from this strategy.

Team

The Composting Research Group (GI-COM) from the Department of Chemical, Biological and Environmental Engineering at Universitat Autònoma de Barcelona, was created in 2000 with a clear objective: the study of the composting process as a sustainable technology for the biological treatment of organic waste. Currently, without forgetting composting, the group's research focuses on the production of bioproducts through Solid State Fermentation of organic wastes. Finally, it also focuses on the world of nanotechnology and the environment.

Circular B30

Circular B30 is a Territorial specialization and competitiveness project (PECT) which aims to position the Mollet-Cerdanyola axis as a reference territory in the circular economy through the collaboration of the quadruple helix and the creation of a network of OpenLabs in the territory.



The project

The overall strategy of the project is based on the concept of research and open innovation, which proposes that this is carried out in a more collaborative way and with the participation of society in its definition and development to achieve a waste model 0. For this reason, the project incorporates co-creation as an emerging approach to deal with many of the territorial challenges identified as priorities, a vision that encourages creativity and collaboration between different social actors that must include citizens, users, staff researcher, social entities, public authorities, business sector, creative sector and entrepreneurial people, in order to identify problems and provide solutions.



More information

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The team

The project is coordinated by Cerdanyola del Vallès City Council and has the participation of Mollet del Vallès City Council, the Autonomous University of Barcelona (UAB), the UAB Research Park, ESADE, EURECAT and the Associació Àmbit B30.

AstroPlant MELiSSA

The Micro-Ecological Life Support System Alternative team, or MELiSSA for short, has been working for over 27 years to create a closed life support system for long term missions in space.

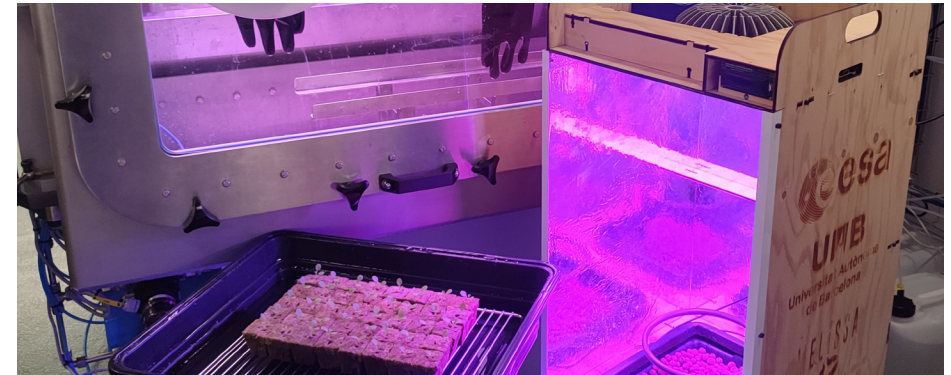
The project

It is finetuning how microorganisms, chemicals, catalysts, cyanobacteria and plants interact to process waste and deliver unending supplies of oxygen, water and food. It is organised as a loop of compartments with specific functions within the ecosystem, one of them being the plant compartment, which provides potable water, food, and oxygen to the crew, and removes CO₂ from them.

Besides launching bacteria into space, formulating groundbreaking software on algae growth and developing new water-treatment facilities, MELiSSA is also turning to the citizens to help gather as much data as possible on crops that show potential for astronauts in space, such as spinach, lettu-

ce, herbs and strawberries.

AstroPlant goes in this direction: it is a citizen science initiative that aims to inspire home-gardeners, schools, urban farmers and enthusiasts to nourish seeds selected by the MELiSSA team. Data recorded via a smartphone app will be sent to ESA for processing. Getting the data needed directly by ESA would take centuries, but using a citizen science initiative like this would make it feasible. The challenge with AstroPlant is to perform a first evaluation of very large number of crops and cultivars in hydroponic conditions and looking at things like the i) Plant growth duration; ii) To characterise plant composition, iii) and to ultimately create mathematical plant growth models of a



large number of species and cultivars. For MELiSSA, the availability of those models is essential in order to be able to control the plant compartment and the overall MELiSSA loop in space.

of Barcelona. The goal of the MELiSSA pilot plant is to gradually integrate and demonstrate, in terrestrial conditions, the various processes involved in MELiSSA for their subsequent adjustment to space.

The team

MELiSSA is an international collaboration led by the European Space Agency (ESA) that is focused on developing a self-sustainable life support system for long-duration space missions. The goal of MELiSSA is to generate food, recover water and regenerate the atmosphere by using the concomitant waste products, that is, CO₂ and organic waste, and utilising light as an energy source.

Due to the challenge this represents, a pilot plant was opened in 2009 at the facilities of the Autonomous University

Click to see
the project
video

More information
www.astroplant.io

Intermedit

With the support of the Pirineos Mediterráneos Euroregion, it was born to contribute to the knowledge and dissemination of the thousand-year-old link between the counties of the Balearic Islands, Catalonia and Occitania through their archaeological heritage.



Connecting with the heritage through new technologies (3D digitization of archaeological objects, virtual visits, etc.) has allowed the project to be up to the new challenges facing society today.

The team

Universitat Autònoma de Barcelona (CORE Patrimoni and UAB Open Labs), el Museu Arqueològic d'Eivissa i Formentera and Museu d'Arqueologia de Catalunya.

More information

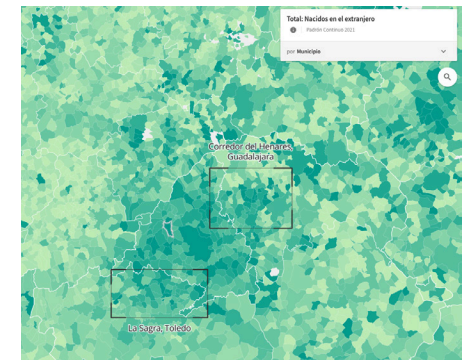
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Explorador social

Interactive, agile and open access tool for the visualization and dissemination of data. Allows you to create personalized maps and download data from the Spanish area on various topics of interest.

At the same time, it allows data to be explored at different territorial scales (autonomous, provincial, municipal and by census section). This tool enables the generation of maps by selecting geographical areas, the creation of attractive reports and presentations, the comparison of variables and the dissemination of the maps created by social networks.



The team

This tool is the result of the collaboration of the Center for Demographic Studies of the UAB and Social Explorer Inc.

Click to see
the project
video

More information

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LoRaWAN

Low Power Wide Area Network (LPWAN) communication technologies provide a cost-effective, long-range, low-power solution for wireless device networks.

They have many applications on the Internet of Things (IoT) industry. LoRaWAN is one of the most popular LPWAN technologies used in IoT due to its more than 5km coverage in non-urban areas.



The project

There is a LoRaWAN network installed at the Universitat Autònoma de Barcelona (UAB) working at 868MHz with two gateways. We used the HTZ Communications software to simulate the coverage of this LoRaWAN network. Measurements of the coverage of this LoRaWAN network were conducted inside and outside the university campus. A portable LoRaWAN device with GPS was used to position the measurements taken. The simulation results are compared with actual measurements to validate and improve the simulation, analyze the accuracy of the simulation, evaluate the quality of the UAB LoRaWAN network showing good results.

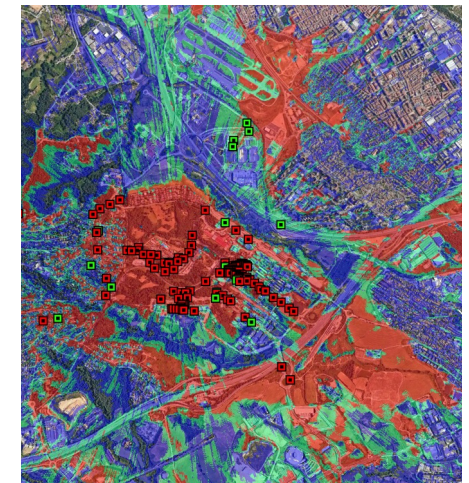
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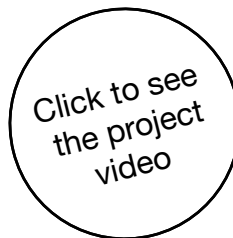
The team

The UAB Laboratory for Hardware-Software Prototypes & Solutions (CEPHIS) works on the research and development of new hardware and software codesign methodologies, based on the use of virtual components (IP cores) to increment the productivity of the custom-designed electronic systems. The research lab is formed by professors, doctors, engineers and technicians who are nationally and internationally well known by their knowledge and research contribution in the fields of specification, design and development of hardware system prototypes and their integration in any kind of microelectronic solution.



Smart Kiosk BCN

The global digitalization process and the use of portable devices like tablets and cell phones allowing continuous access to information, have had an impact on newsstands so urban kiosks selling newspapers are becoming obsolete.



The project

The 'Smart kiosk BCN' project proposes more than 40 different options that allow the recycling of these urban infrastructures. Our proposals work as a network of urban facilities to provide new smart services, taking advantage of digital technologies (apps; digital devices; digital infrastructure) and providing the urban public spaces with relevant functions that make a significant contribution to the local inhabitants.

Three main samples:

- Kiosks recycled configuring a ne-

twork of smart 'food-points' in which daily waste food from supermarkets and restaurants can be delivered and distributed.

Benefits: Urban resilience; reducing food waste; A new smart food urban circuit.

- Kiosks adapted to provide a network of smart 'agro-points' in which assessment and other services are offered in regard to the development of urban local agriculture.

Benefits: Climate-proof urbanism; ur-



More information

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ban agriculture in the city; sustainability awareness.

- Kiosks transformed into smart 'cyclo-points' providing assessment and services to cyclists: bicycles repair; information about cycling safe routes in the city...etc.

Benefits: sustainable mobility; healthy city; wellbeing urbanism.

The team

A project developed by the Observatory of Urbanization at the UAB, lead by Francesc Muñoz.



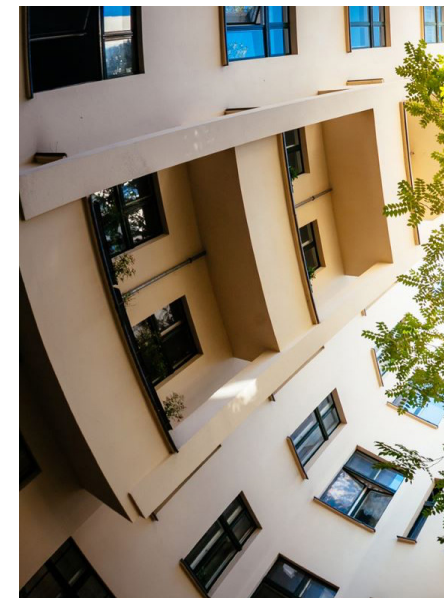


Uforest

Uforest (full name “European Alliance on Interdisciplinary Learning and Business Innovation for Urban Forests Project”) is a three-year Knowledge Alliance project co-funded by the Erasmus+ Programme of the European Commission.

The project

The project creates cross-sectoral alliances that bring together universities, businesses and public administrations of often non-collaborative disciplines such as urban planning and architecture, with forestry and urban ecology, as well as with socio-economic and information and communication technologies (ICT). Finally, the alliance is the basis for the development of new training and support to students and practitioners working towards innovative urban forestry projects



Team

In its approach, Uforest aims to provide results with a global dimension and a potential for transfer to national and international networks. To this end, it relies on European Forest Institute (EFI) -one of the main European research and networking institutions-, as well as with research centers, public entities, universities and consulting firms such as ERSAF (Italy), ETIFOR (a spin-off of the Padova University), Politecnico de Milano (Italy), Agresta (Spain), Universidad Transilvania de Brasov (Romania), Forest Design (Romania), Trinity College (Dublin, Ireland), Green City Watch (The Netherlands), Nature Based Solutions Institute (Canada), CREAM and the Universitat Autònoma de Barcelona.

More information

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Trenchip

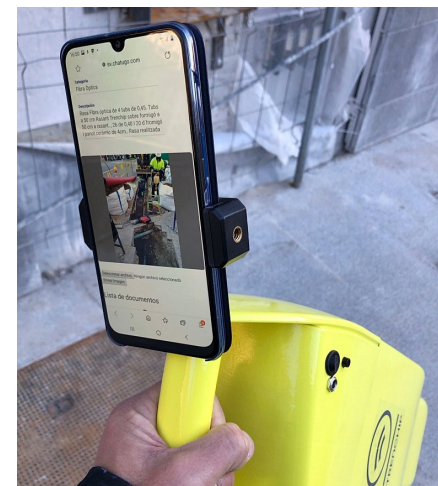
The UAB has collaborated with the company Chatu Tech to develop a pipeline detection system that reduces the time and costs of a construction site.



The project

The system, called Trenchip, makes it possible to mark, accurately locate and record information about specific points in trenches and underground conduits. The information about the installations is sent and processed in the cloud, so it can be consulted and kept up to date from anywhere via an application and a geographic information system.

By accessing the data reported through the web and mobile app, you have control at all times over the information linked to the sensors and can make decisions based on updated data, as well as ensure the security of information on the infrastructures.



The team

CIMITEC-UAB is a pioneering Centre on the applications of Metamaterials (and other structures) to the development of high performance and low cost RF/microwave circuits, reducing their dimensions and/or including new functionalities CIMITEC combines both basic and applied research. We explore new concepts, ideas and structures, in order to apply them to the industry needs.

Click to see
the project
video

More information

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Smart Windows

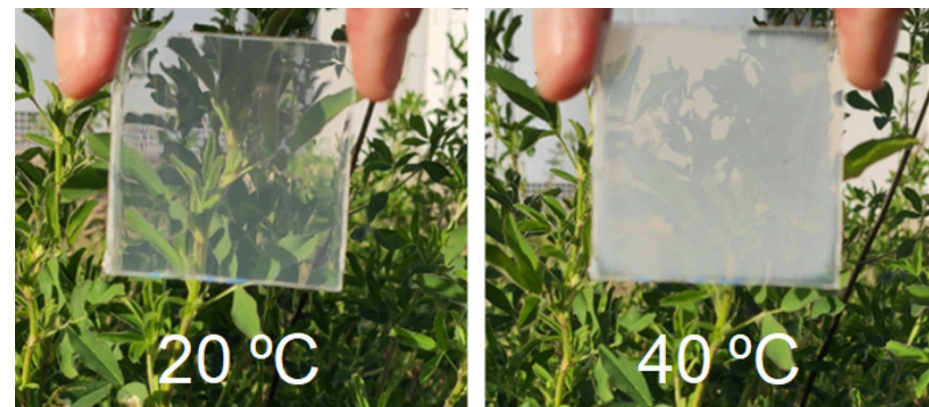
Smart windows (SWs) are among the main strategies proposed to enhance energy efficiency in buildings and lower their impact on greenhouse gas emissions.

The project

By adapting solar radiation transmittance to weather conditions, SWs allow control of light and energy fluxes between outdoors and indoors, thus reducing the need for air conditioning and artificial lighting and increasing user's comfort. However, current SW devices suffer from severe drawbacks that hamper their broad use, such as high prices, low photostability and lack of intrinsic capacity to enable both self-regulation and user control of light transparency.

To overcome these limitations, the Department of Chemistry of the UAB, ICN2 and CSIC has recently pioneered a novel SW technology. The invention

consists in the preparation of polymer-wax composite films that undergo photo-, thermo- and electroinduced transition from a transparent to an opaque state. Several improvements result from this approach that should make our technology very appealing for the SW and other related markets (e.g., transportation windows, awnings, greenhouses): (i) the use of low-cost and readily-available non-photodegradable materials, (ii) facile fabrication and integration into already installed windows; (iii) the capacity to trigger transparency changes with user-controlled stimuli (low voltages) and relevant environmental conditions (sunli-



ght, ambient temperatures).

Actually, by using these SW materials on house models exposed to summer sunlight intensities and outdoor temperatures, a decrement of 5-6 °C in indoor temperatures is accomplished relative to regular windows.

The team

The Department of Chemistry of the UAB is structured in four units, according to the following fields of knowledge: Analytical Chemistry, Physical Chemistry, Inorganic Chemistry and Organic Chemistry. It is one of the largest Departments of the UAB Campus and one of the most active in research, generating approximately 20% of the University's economic resources in this regard.

More information

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HANSEL project

The concept of Smart City has received an increasing interest in the recent years as a way to address the challenges posed by densely populated urban areas, by means of technological solutions that bring sensing, communication and processing capabilities to facilitate a “smart” management of such cities.

The project

In this context, one of the most important aspects is the provision of positioning and navigation services, which are essential for applications such as mobility and traffic management, access control, geofencing, public health and safety, logistics and last mile deliveries,



just to mention a few. HANSEL is a research project funded by the European Space Agency (ESA) that aimed at developing a positioning platform capable of supporting the requirements that the aforementioned Smart City users and applications might need in terms of localization accuracy and availability. The project was carried out by a consortium led by Rokubun and formed by TrafficNow, LINKS and Universitat Autònoma de Barcelona (UAB). The ultimate goal was to develop a software and hardware testbed for blending different positioning technologies such as Global Navigation Satellite Systems (GNSS), in particular GPS and Galileo, WiFi, and terrestrial cellular signals, with the aim of providing a seamless indoor/outdoor positioning experience, circumventing most of the problems found by users in urban environments.

The work carried out by UAB focused on the provision of GNSS positioning to Internet of Things (IoT) users, which are equipped with small battery-powered sensors that need to report their gathered data, along with their current position, to a remote central processing facility. Reporting their position is often a key requirement because data, per se, may be useless in certain applications if not geo-tagged. It is for this reason that many IoT sensors incorpo-

rate GNSS chipsets to exploit GNSS signals that are available anytime, anywhere on Earth, and can be used without the need of any additional infrastructure. Unfortunately, processing GNSS signals is a very demanding and power-hungry task that seriously compromises the battery lifetime of IoT sensors. Actually, many IoT sensors do only activate the GNSS chipset when they have no other choice to locate themselves. This usually comes after trying first with other low-power technologies such as Bluetooth, Ultra-Wideband, or even Wi-Fi. So for IoT positioning, GNSS is often the last card to be played.

Team

The Signal Processing for Communications and Navigation (SPCOMNAV) research group carries out fundamental research on statistical signal processing, with emphasis on estimation and detection theory. This fundamental knowledge is applied to real-life applications at the intersection of signal processing and wireless communications, such as positioning and navigation systems, digital communications, intelligent transportation systems and next-generation mobile networks.

Metropolitan Laboratory of Ecology and Territory of Barcelona (LET)

LET is a project that seeks to contribute to develop new criteria, concepts, cartography, databases, models and indicators for the functional analysis of the metropolitan system from a socio-ecological perspective, in order to influence public policies and land use planning.

The project

LET has been promoted by the Barcelona Metropolitan Area (AMB) through the Barcelona Institute of Regional and Metropolitan Studies (IERMB) with the collaboration of Center of Ecological Research and Forest Applications (CREAF) and it belongs to the Open Labs Network of the Barcelona Autonomous University (UAB).

The LET is launched with three fundamental objectives:

- Promote applied research to generate knowledge about the metropolitan socio-ecological system and identify critical / strategic elements for the planning and management of the territory.
- Complete and update databases and cartographic information on the most relevant biophysical variables in the metropolis of Barcelona, in accordance with the administrations invol-



ved, so that they can be used in the sustainable planning of the territory.

- Propose various functional key indicators (metabolic efficiency, biodiversity conservation, landscape functioning, ecosystem services, global change

and social cohesion) and apply them to monitor the metropolitan dynamics of Barcelona and to the planning tools (green infrastructures, periurban agriculture, etc.) to be deployed.

The team

The LET team is made up of researchers and technicians from the Barcelona Institute of Regional and Metropolitan Studies (IERMB) and the Centre for Ecological Research and Forestry Applications (CREAF), postdoctoral and pre-doctoral researchers linked to LET, and associated researchers from other institutions that collaborate on specific projects

More information

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Bicizen

Bicizen is a project that aims to create a platform where urban cyclists collaborate to make their city more bike-friendly. The app intends to create a space where citizens, municipalities, researchers, associations, and enterprises can interact with each other to fight the different problematics of urban cycling.



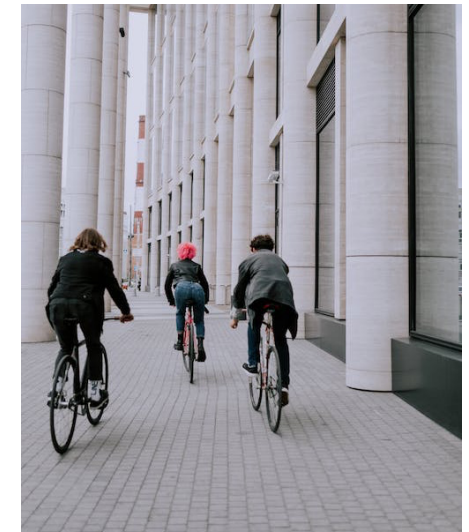
The project

The team, composed by researchers from five different European universities, has been funded by the ECIU SMART-ER, and will present the first version of the app the 15th of November in the Smart City World Congress. The problems faced by the platform are the quality and distribution of cycling

infrastructure, physical and psychological safety when cycling, bicycle theft, parking availability, and obstructions. Apart from mapping the aforementioned problems, we will offer a space for sharing ideas, propose actions and co-create the urban cycling app of the future.

Team

City Lab Barcelona is a research group at the Institute for Environmental Science and Technology at the Universitat Autònoma de Barcelona (ICTA-UAB) that studies city dynamics using formal experiments and direct observation.



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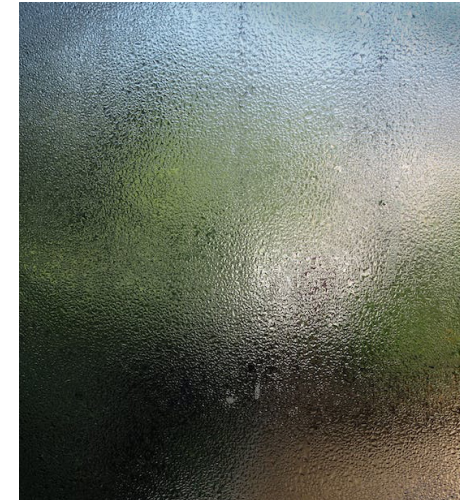
Sensor network for the management of a smart city

Design of a functional IoT prototype composed of an ESP32 microprocessor and a network of four sensors, which collect data from their environment every certain time. The aim of the project is to collect data to carry out studies on the environment.



More information

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The project

This project is mainly made up of a network of four sensors that make five measurements and a microcontroller, where the purpose of the two elements is to make measurements and collect data from the environment, to finally end up seeing this data graphed in Node-Red. The aim of the work is to create a functional prototype, which is capable of collecting data from the environment, so that later this data can be used for various purposes of study.

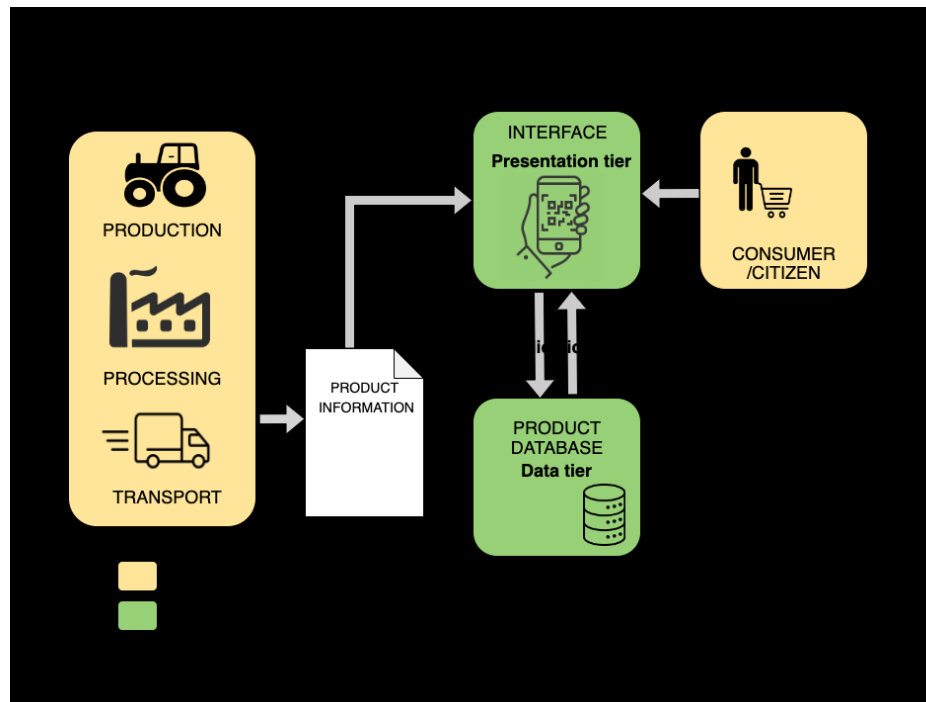
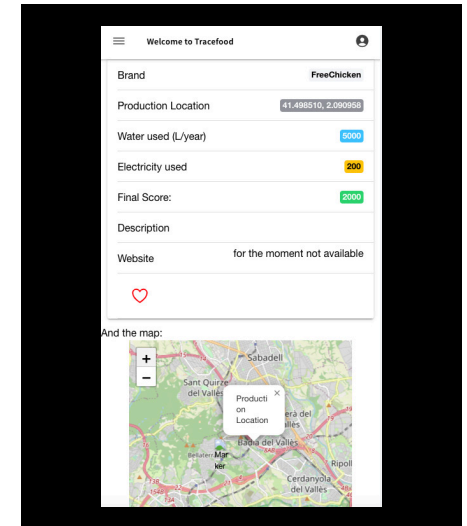
Specifically, this prototype collects data on humidity, temperature, distance, fire detection and pollution. These collec-

ted data are sent with WiFi wireless communication protocol (IEEE802.11) from the sensor network, to finish visualizing the measured data in graphs on Node-Red. Once measured and graphed, a range of possibilities opens up to be able to carry out studies or all kinds of data processing.

Thus, the project aims to teach that, with a low budget and not very high knowledge of programming, sensors and electronics, it is possible to achieve a module which gives very relevant information about the environment.

TraceFood

A progressive web application to trace the impact of our food. This bachelors project is aimed at creating a prototype for a progressive web application (PWA) that can be used to trace the environmental impact of food products.



More information

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The project

It enables the producer to create a life cycle analysis (LCA) of their product and, at the same time, allows the consumer to access this information directly through the app. Through this approach, the app promotes a direct and transparent way of displaying the impact of products, creating territorial integration and citizen empowerment.

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