GCEF | GERMAN CZECH ECONOMIC FORUM

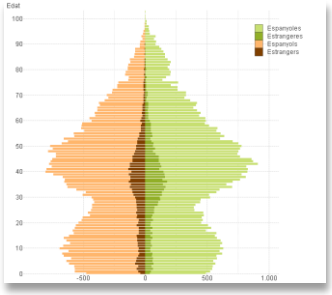
The Sant Cugat Experience

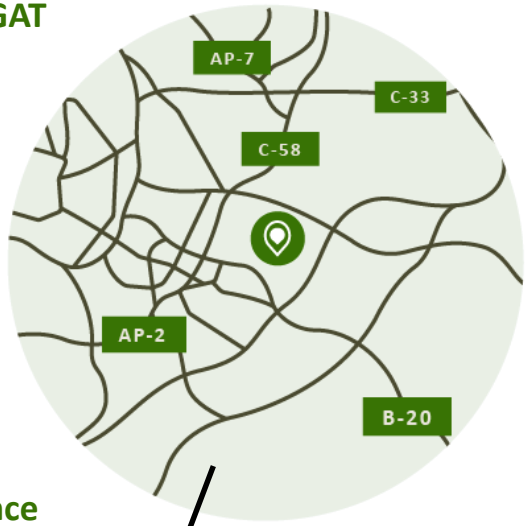
November 2022

AJUNTAMENT DE SantCugat

Location & Population

- **Directly connected** to the highway infrastructure network leading to the airport and port of Barcelona in 30 min.
- Well established **public transport system** by train and bus.
- Surrounded by **Collserola Natural Park with over 8,000Ha** of nature reserve.
- One of the **youngest cities** in Spain, with 95,000 inhabitants and an average age of 38.
- **92% of inhabitants feel happy to live** in Sant Cugat and 78.5% believe it to be civic and safe.





France
7 hours

SANT CUGAT

Barcelona Airport (El Prat)
30 minutes

Port of Barcelona
30 minutes

Barcelona
Tunnels, 10 minutes

City data

- The total surface area of the municipality **is 48,320 ha,** of which **(44%) are protected.**
- **1,876 km of public roads**, **50 km of bike paths**, and **41 km** of pedestrian exclusive area
- **13 urban parks** with over 780,000m2. **0,6 tree per inhabitant.**
- **135 Km** bus network
- 200 electrical cabinets with more than **20,000 lighting points**
- **88 municipal buildings** (schools, sport facilities, adminstratives, libraries…)
- Around **21 GWh** consumption/year **4,000 Tn CO2** emissions/year





unicef

Child friendly city

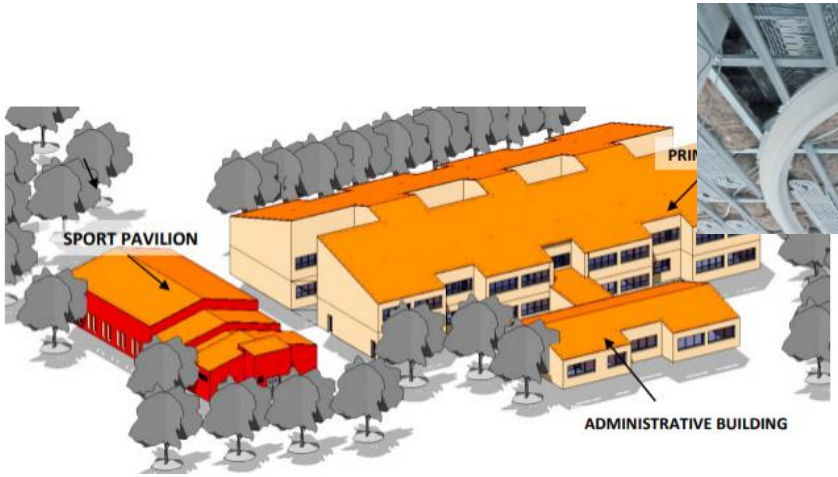
GeoFit

www.geofit-project.eu

The innovation project Geofit is developing a holistic and novel approach to geothermal retrofitting: is cost-competitive, easy to install, and capable of providing efficient low-temperature-heating & high-temperature-cooling by using the most innovative tools and methods.

Installation of a **geothermal energy system** in the Pins del Valles School, through **12 vertical boreholes** (120m deep) and a horizontal well (100 m), with a **40kW heat pump** for the heating of the 3 buildings

A **radiant ceiling cold system** will also be installed in the school's administrative building.



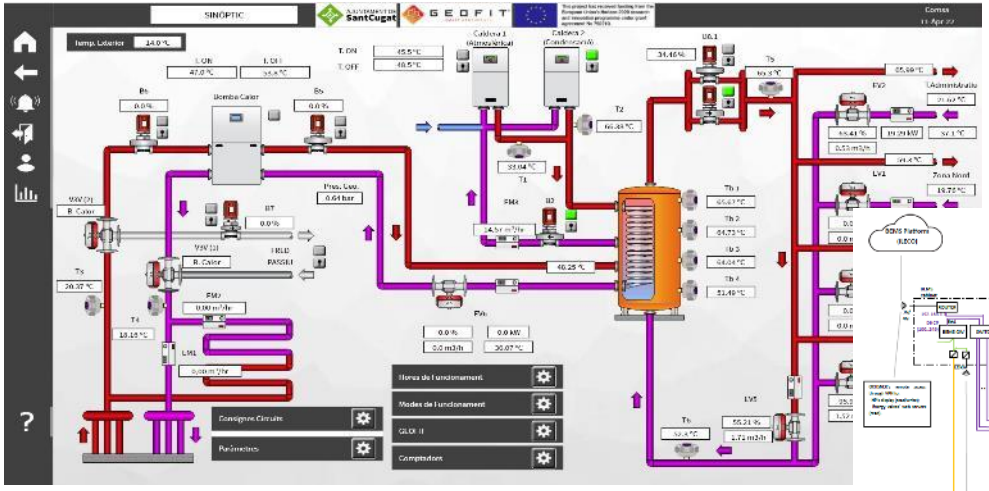
The GeoFit Project has received funding from the European Commission H2020 Programme under Grant Agreement No. 792210

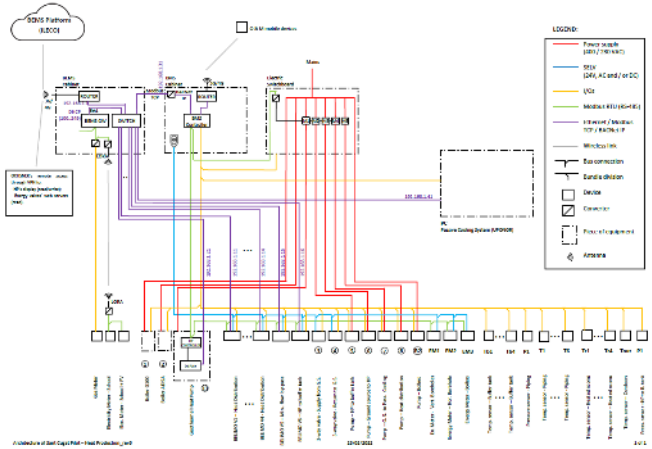
GeoFit

www.geofit-project.eu

The yearly savings generated by the ECMs predicted are 43608 kWh ± 4198 kWh with a level of accuracy of 90% for the electricity, and a monthly saving of 32056 kWh ± 1152 kWh for the **gas,** with the same level of accuracy. The expected **savings**, together with other actions carried out, is around **60%**

BEMS generation with dashboard control building data.





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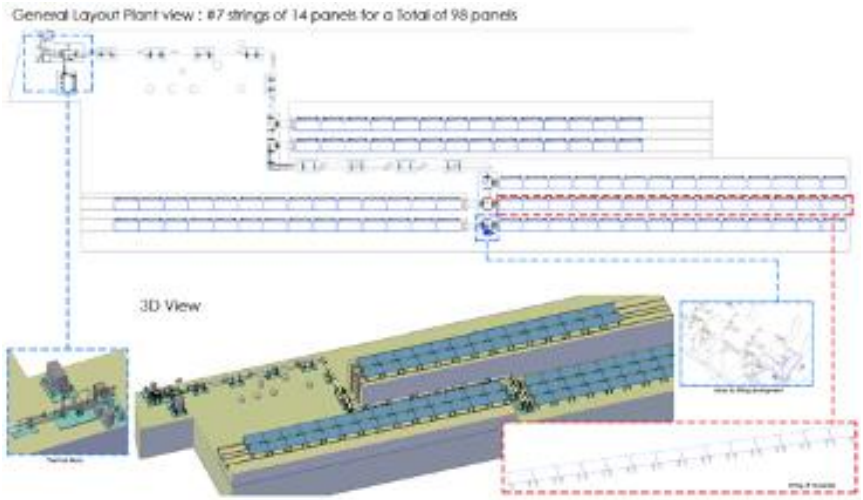
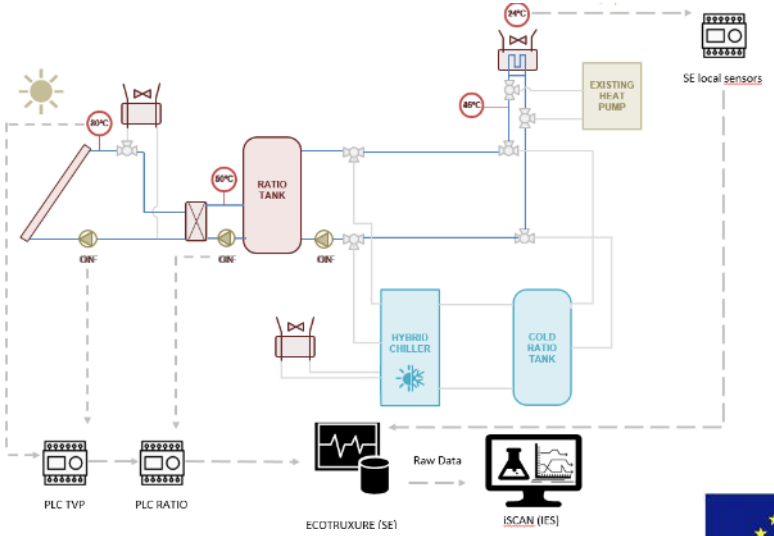
SunHorizon

www.sunhorizon-project.eu

The main goal of the Project is to provide heating and cooling to residential and tertiary buildings, with lower emissions, energy bills and fossil fuel dependency. **5 technological packages** (TP) are developed in the project.

In Sant Cugat, the technological package works through the installation of a system of **solar thermal** (192 m2) of **high efficiency collectors** with a **heat pump** (60 kW), an **absorption chiller** (50kW), and a **hot water tank** (10m3) in a municipal cultural centre (Casal de Mirasol). At the same time, the project develops a **BEMS** with data control dashboard from the 10 rooms building. The main goal of the project is to **save Primary energy by 65%.**



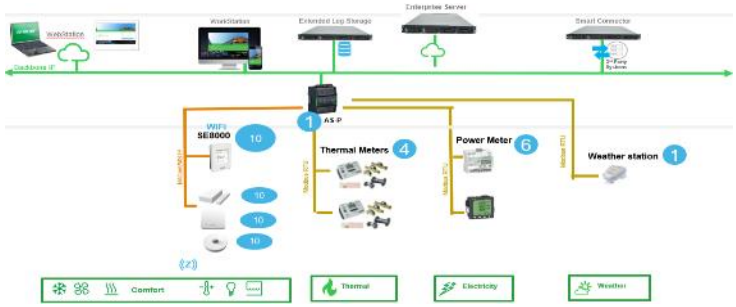


This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 818329

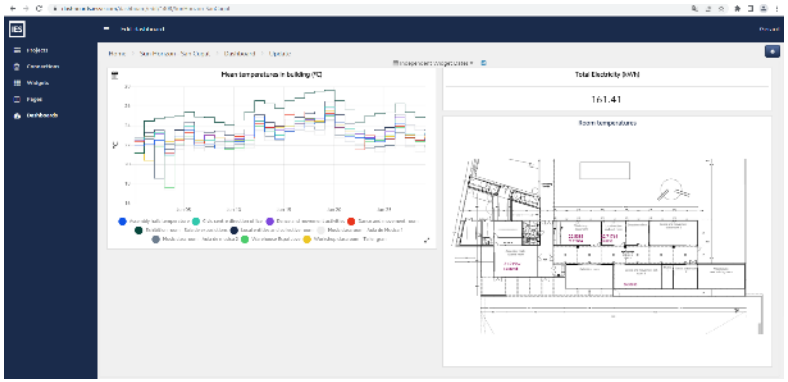
SunHorizon

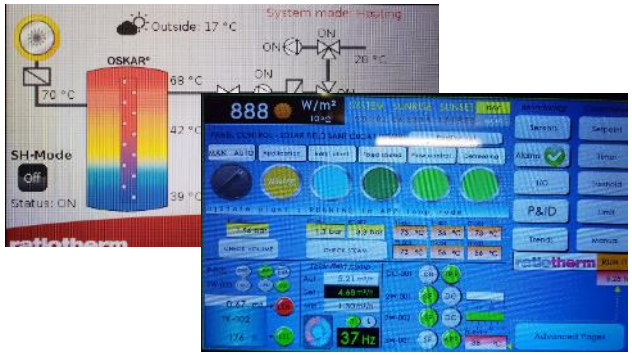
www.sunhorizon-project.eu

Along with the control sites of every system, and in order to manage the new facility, up to **51 sensors** have been used: 40 of them installed in the rooms (T, H, motion, door sensor), 10 used as energy metters, and a weather station. dashboard



Description	Qty
Fancoil Controller + Sensor (T, H, CO2)	10
Zigbee Sensor (T, H, CO2)	10
Zigbee Window/door Sensor	10
Zigbee Sensor (T, H, motion) - Battery	10
Weather station	1
Electricity meter	6
Thermal meter	4





The SunHorizon Project has received funding from the European Commission H2020 Programme under Grant Agreement No. 818329

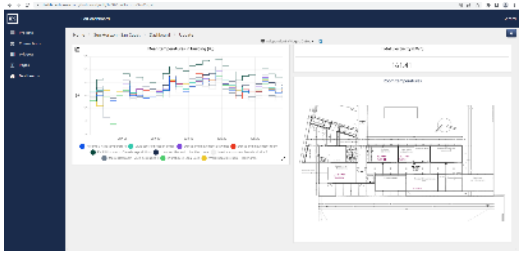
BD4NRG

www.bd4nrg.eu

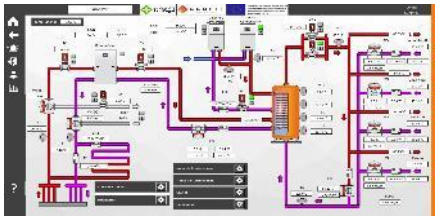
The Sant Cugat pilot will test the big data analysis of 3 municipal buildings to seek the greatest energy savings but maintaining thermal comfort. In particular, the Thermal Comfort Validator (TCV) tool -a cross-platform web- app that estimates the Predicted Mean Vote comfort inside a building-, will be leveraged, to predict occupant's comfort levels per proposed intervention.

This will facilitate considering both energy consumption savings and thermal comfort in EPC and building renovation machine learning (ML) to bridge the gap between controllable building parameters and thermal comfort, by conducting an extensive study on the efficacy of different ML techniques for modelling comfort levels, while trading off with energy efficiency. The main benefit will be a finer grained and more accurate thermal comfort prediction

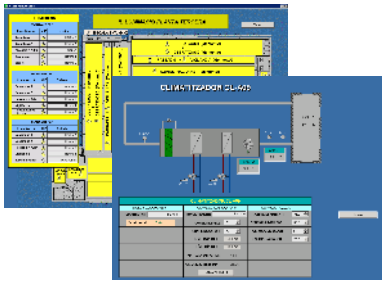
Building #1



Building #2



Building #3



The BD4NRG Project has received funding from the European Commission H2020 Programme under Grant Agreement No. 872613

BD4NRG

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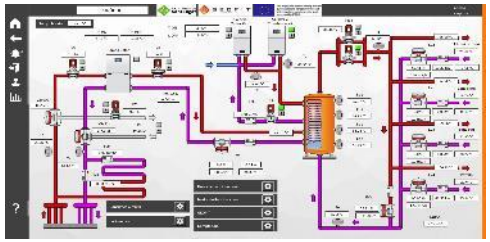
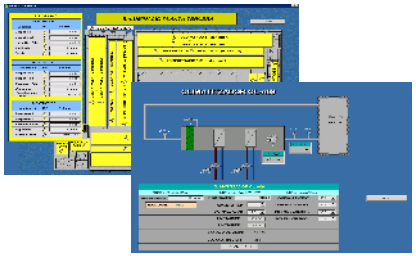
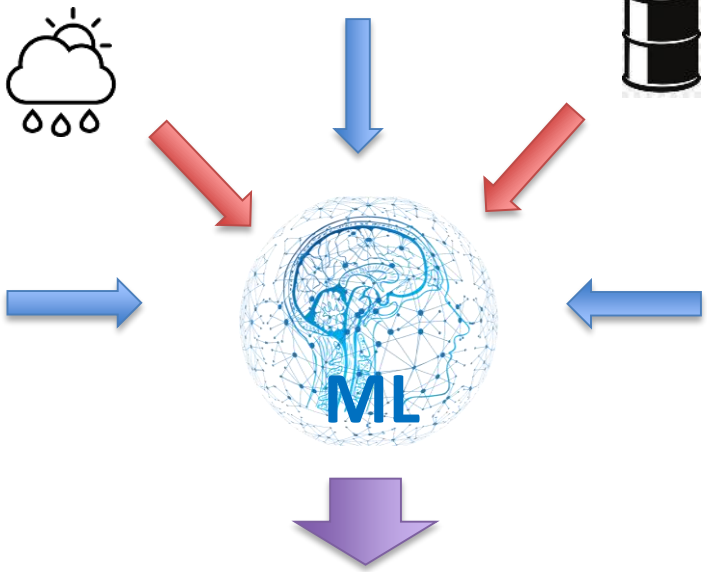


Weather forecast

Cost energy forecast

Building #2





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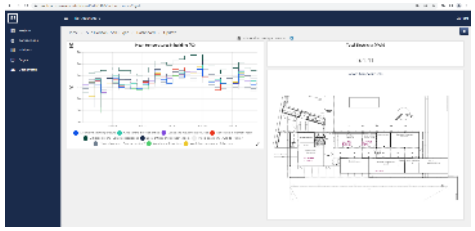


Thermal Comfort Validator

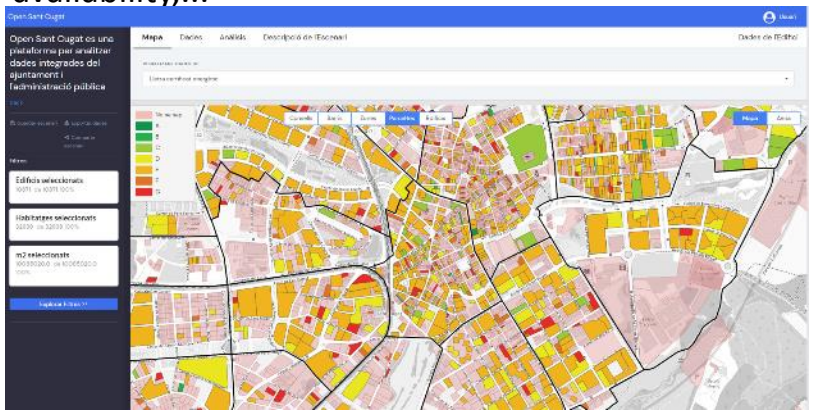
The BD4NRG Project has received funding from the European Commission H2020 Programme under Grant Agreement No. 872613

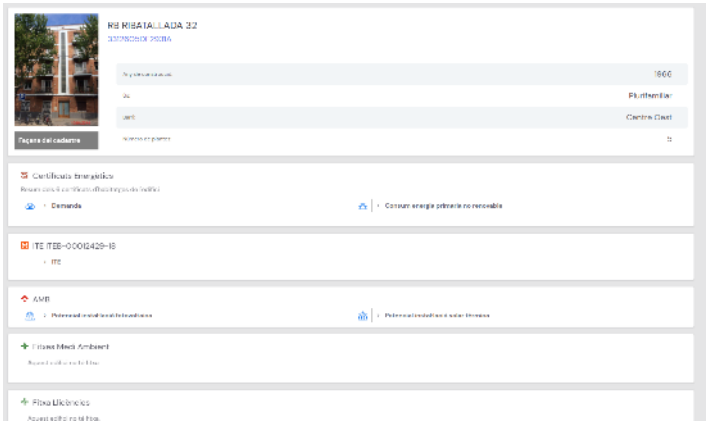
OpenSantCugat Platform

Nearly 40% of the city's energy consumption comes from the private housing and industrial parks of the municipality. Municipal energy consumption is only 1% of the total energy consumption of the city. We cannot meet our energy reduction objectives (Convent of Mayors and PAESC) if we do not act on private building.
http://virtuoarc.salleurl.edu/scapp/

The City Council works on the creation of a platform open to citizens, based on three axes and users with different levels of access to information:

- **Citizens:** with access to more relevant information about energy consumption, water, year of construction and comparison with other similar buildings.
- **Service companies:** It allows to know the state of the buildings; year of construction, renewals made, existence of renewable energy production systems,... . This information helps to take commercial actions from energy professionals and new business opportunities.
- **Municipal staff:** Inspection tasks and other relevant information; sewer network connection, license availability,...



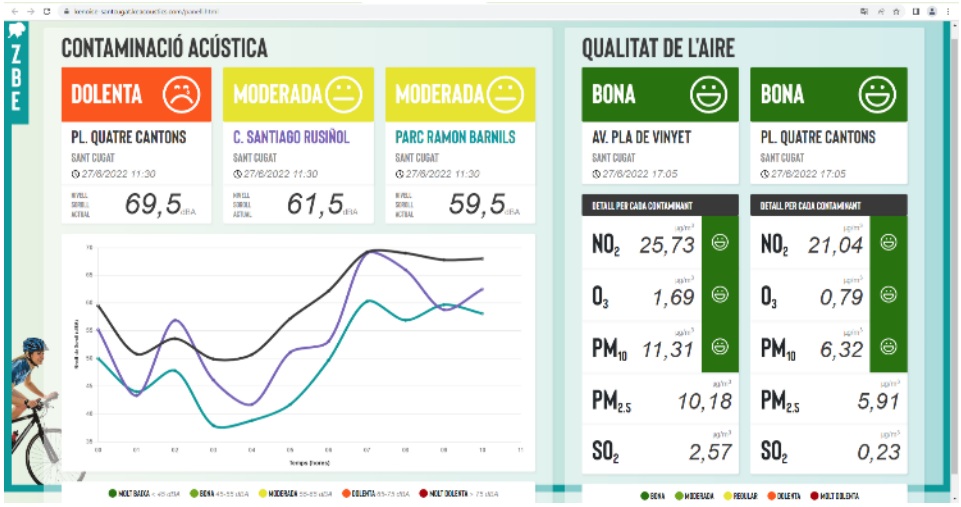


Environmental quality sensorization

Along with the implementation of a low emission zone (4 km2) , environmental quality sensors have been installed on the roads in the center of the most important municipality. The sensors detect air quality and acoustic containment.

The information is shown to citizens through a screen installed on public roads, and can also be checked on the web. The new steps are to create a direct link from the City Council website, and a data repository (planned for this week).

https://kenoise-santcugat.keacoustics.com/panell.html

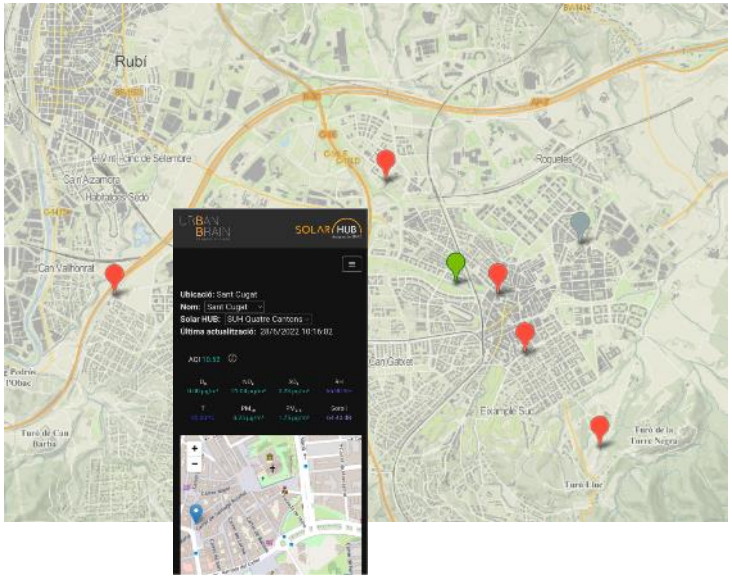


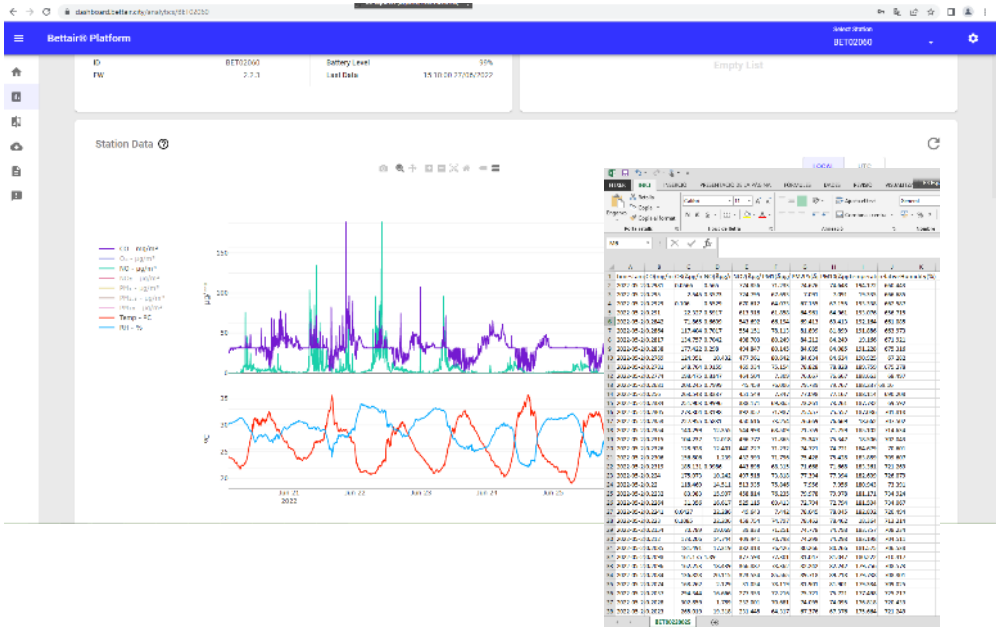
Environmental quality sensorization

Other sensors. Public-private collaboration. The municipality can be a living-lab for the development of new technologies.

Up to 7 sensorization points are available for one year and free of charge, measuring the acoustic level and environmental quality.
https://dashboard.bettair.city/home

The impact of the implementation of the low emissions area has been a **20% reduction in vehicle emissions.**





The lighting network, a network of telecommunications and services net.

Pilot test of security cameras installation, in the area of the monastery. The transmission of the images is carried out through the electrical network of public lighting.

The public lighting cabinet is the hub of all the information received from the electricity grid, and it sends the information to the City Council's servers through optical fiber.

No more SIM cards or dependency of external networks for the transmission of municipal data. The public lighting network becomes a telecommunications network, where lighting will be another service to provide. And there will be others (surveillance cameras, environmental quality sensors, irrigation network control, street cleaning, communication with citizens with informative screens,...)

Conclusions & Lessons learnt

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- **European projects** are a good tool to get closer to new technologies, but they require an extra effort from the municipal staff.

- The building as a "**living being**“. a third of the energy consumed in the city comes from the buildings sector. The City Council, as a public administration, has the duty to promote new solutions and alternatives. But we have to **engage the private owners**.

- In relation to data: Capacity to analyze **data collected.** The **availability of the data**. The ownership of the data generated is from the City Council. **Unknown or inaccessible data.**

- The smart cities tools as a **transparency tools.**

- No **standardization** of the BMS / BEMS. The lack of standardization means a difficulty in the management of the building and the compatibility between systems.

- Are the **maintenance managers formed** in all this new technology?

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Thank you for your attention

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