

# SUDOE STOP CO2

## Improving energy efficiency in South West Europe transport stations

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## Why Sudoe Stop CO<sub>2</sub>?

- ❑ Transport and construction count for 60% CO<sub>2</sub> emissions in Europe.
- ❑ The SUDOE policies aim at improving energy efficiency as well as promoting the use of renewable energy sources in public buildings through the implementation of networks and joint experimentation providing funds (ERDF – INTERREG SUDOE) to do it.
- ❑ Transport stations (railway, bus/coach) are voracious energy demanding facilities and potential exemplary buildings to influence people towards a carbon neutral way of living , in which the collective transport should play a basic role.

## State of the art

Following an preliminary survey in cities of more than 50.000 inhabitants - 244 stations were identified. A more accurate assessment (sampling 104 stations) confirmed the initial assumptions:

- Old buildings averaging **90 years old** – (30 for bus/coach) – some of them classified as historic buildings
- Weak use of **renewable energies** – **Only 5 % of the sample**
- **85 % lacked of EPBD certification**
- **Sustainable Mobility** – electric reloading facilities (25 %), bicycle parking lots (40 %), accessible cycling paths (20 %)
- Energy invoice is one of the main worries of managers but indoor comfort is not.

Opportunities vs constraints (heritage status, situation, safety, operative need)

## Goals/results :

- Energy efficiency evaluation/labelling tool specifically designed for transport stations.
- Sustainable station network to share best practices in order to improve energy efficiency and raise public awareness
- Innovative solutions: Development of BIM methodology for the improvement of energy efficiency and energy management of transport stations.
- Feasibility of the aforementioned methodology through case studies.

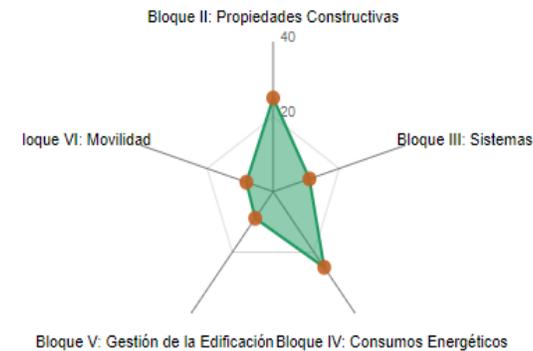
## Evaluation/labelling tool:

The main objective was to help station managers to easily identify the weakest points in terms of energy efficiency and give them the possibility of comparing the building with similar stations across the SUDOE territory.

The on-line tool requires inputs such as consumption/m<sup>2</sup>/passenger, building materials, thermal insulation, lighting & HVAC systems, use of renewable energy and mobility criteria.

As a final result, the tool outputs a energy efficiency score rating from one to five stars.

	Puntuación Bruta	Block Weight	Puntuación Ponderada (X)
Bloque II: Propiedades Constructivas	1,00	25,00	25,000
Bloque III: Sistemas	0,44	25,00	10,987
Bloque IV: Consumos Energéticos	1,00	25,00	25,000
Bloque V: Gestión de la Edificación	0,59	15,00	8,793
Bloque VI: Movilidad	0,81	10,00	8,095
<b>Score</b>			<b>77,8756</b>
<b>Rating</b>			<b>★ ★ ★</b>



# Sustainable station network:

- Resulting from the use of the evaluation tool, the project STOP CO2 created a network to raise awareness, share experiences & best practices to improve energy management.



So far 65 stations have been assessed. The best were awarded in a ceremony celebrated in Santander in 2019.

# Innovative solutions

The main result is an innovative methodology based on BIM.

- Definition of model requirements and information transfer protocols with the Level of Development (LOD).
- Interoperability between the BIM commercial software and energy-analysis software.
- Specification of requirements for each type of energy study. Low LODs (LOD 100) are restricted to non-detailed energy studies. Higher LODs (200 and 300) are required to represent the building and equipment for energy studies beyond the conceptual design stage.
- BIM combined with smart technologies as a way to manage and monitor energy issues in transport stations

## Our case studies :

**Arcachon railway station (France):** management and operational control using BIM technology.



The 3D model was associated with a hypervisor creating a link between the digital model in IFC format and a monitoring system (centralized management).

It included the definition of indicators enabling the process to report any dysfunction of the energy system.

## Our case studies :

### Cartagena coach & bus station (Spain): renewable energies and monitoring



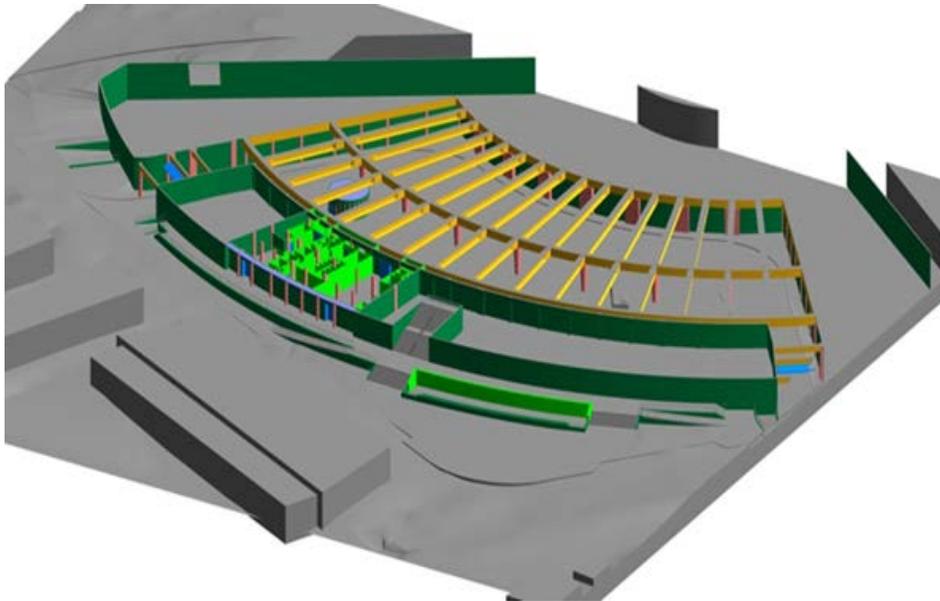
BIM methodology was used to simulate different alternatives to improve building energy efficiency and reduce CO<sub>2</sub> emissions.

One of the solutions evaluated and finally implemented was the installation of solar photovoltaic panels for the self-consumption of the bus station.

The pilot project included the implementation of a monitoring system for energy consumption of the building and other items related to comfort, integrated with the city's Smart Platform.

## Our case studies :

**Torrelavega coach & bus station (Spain):** Improving lighting systems and energy management.



Thermal and energy studies on the 3D model proposed different alternatives to reduce energy consumption.

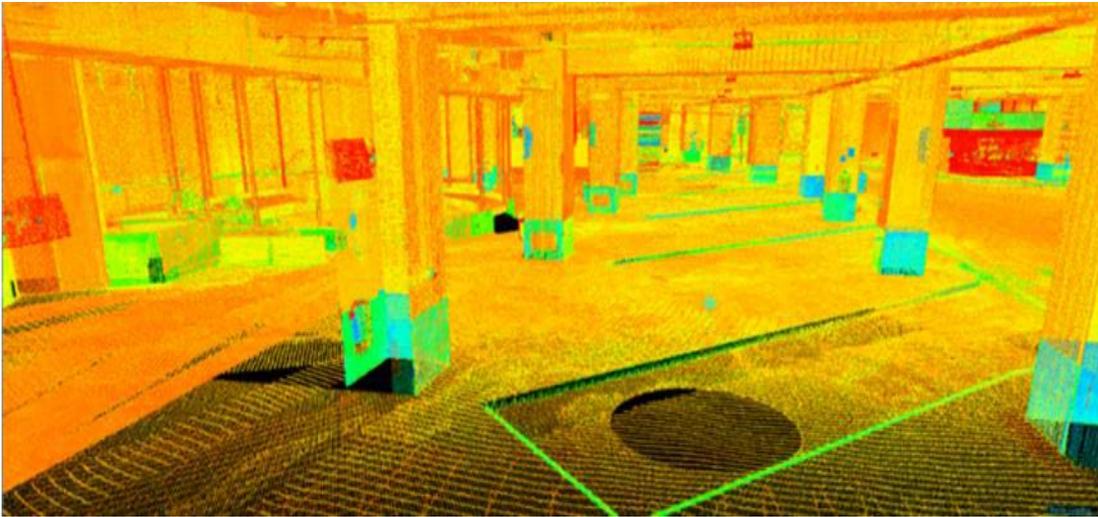
The solutions included replacing the lighting system, as well as passive actions such as the use of natural light (reflecting painting) or improving air circulation.

The process was completed with the refurbishment of the whole lighting system, reducing consumption by up to 40%

The digital mock-up was enriched with new elements to be used as a tool for building maintenance and management

## Our case studies :

**Porto Campo 24 de Agosto bus station (Portugal):** improving comfort without additional energy costs



Sudoe Stop CO<sub>2</sub> Methodology permitted identifying the most adequate energy solutions for the bus station, as well as predicting building response to potential refurbishment actions.

The proposed solution included the improvement of traveler thermal comfort through the creation of isolated independent areas acting as waiting rooms as well as other actions to mitigate energy consumption related to building management.

# Conclusions:

Optimization of energy efficiency in transport stations relies on 3 basic questions:

- Planning - A better understanding of building behavior/performance is essential
- Energy Management – In high energy demanding buildings a special attention should be put both on staff (human behavior) and systems.
- Monitoring – Energy systems and other related issues (indoor comfort, working conditions) must be accurately monitored

Digitalization must/should play a key role to achieve efficient transport stations.

# Thanks for your attention

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