

## Moving towards an off-grid Hostel Network– Spain

### SUMMARY

**Project Description:** The project is aimed to improve the environmental performance of its facilities and the minimization of the hostels' carbon footprint

**Project Type:** Energy Efficiency, sun & wind

**National Association:** REAJ (Red Española de Albergues Juveniles)

**Project Location:** Youth Hostel “Mar i Vent”

**Estimation of number of reduced tonnes of**

**CO2 per year:** 8.44 tones CO2 per year

**Total Funds Requested:** £ 25,000

**Total Project Cost:** £ 31,266

**Annual £ saves and ROI (return of investment):** £ 3,197.14 per year – ROI 11.55 years

**Extra benefits:** The savings generated by this investment will be used for the hostel's next sustainable development project: a system to collect and storage rain water, to be used in the garden irrigation system and possibly in the toilet tanks.

### **Why should this project be funded ahead of others?**

After an already long standing record of environmental awareness, both among staff and usual and new customers, and sustainable development measures, the “Mar I Vent” hostel intends, with the project presently submitted to the HISF, to move forward to new achievements in their “lifelong” learning... and putting into practice their environmental responsibilities.

The specific value of this project to be considered by the Fund is the hostel's owner, management and staff proven eagerness to do the right thing by the planet and to continuously move along a trail of sustainable development.

This project is a step to be now taken, after having already taken many previous steps... and to be followed by many others, in our path towards a sustainable future.



## DETAILED PROJECT INFORMATION

### Purpose / objectives

The Valencian public agency for the youth, owner of five Youth Hostels in this Spanish Mediterranean region, as part of its statutory mandates, will sustain a hostel network whose purpose is to promote, by providing a space for recreational activities and informal training, an integral development of young people's personality.

To promote a hostel's atmosphere which favors this awareness, the agency has included among its general policy guidelines, the improvement of the environmental performance of each one of its facilities and the minimization of the hostels' carbon footprint, that is to say: their contribution to the production of CO<sub>2</sub>, and, subsequently, to the greenhouse effect .

As in any average household, most of our hostels' carbon footprint emissions, comes from “indirect” sources, i.e. Fuel burned to produce goods and utilities far away from the final consumer.

When using electrical appliances and lighting systems, we are consuming grid electrical energy... and most of the grid electricity produced in Spain is still obtained from fossil fuels (coal, petrol and natural gas power plants), an activity that, every year, generates millions of tons of greenhouse gases (GHGs), specially CO<sub>2</sub>, main gas responsible for global warming.

To reduce our carbon footprint we must, therefore, reduce our grid electricity consumption and, as a final goal, to totally eliminate our grid dependence.

Being aware that there still is a lot to be done and that our “final destination” is a long term one, and one that will need further investments, we are nevertheless determined to take step by step actions, implementing our environmental policy in a progressive manner, in all our network hostels.

The project we submit for approval to the Hostelling International Sustainability Fund reflects, subsequently, what can be considered as a small step towards our final environmental goals.

### Methodology

Moving towards our final environmental policy goals, we intend to start with two modest but necessary actions in one of the Valencian most visited sea side Hostels , “Mar i Vent”, which translates “Sea and Wind”:

**1. Reduction of energy consumption** in the hostel by replacing of all conventional luminaires and the introduction of LEDs, both indoors and outdoors, in the hostel's garden.

**2. On site power production;** by means of combining 12 photovoltaic cells modules with a wind power generator. The energy will feed directly the lighting system and the permanent consumption systems such as the refrigerated storage unit. The non-instantly consumed surplus energy will be stored in 24 batteries, for use as needed in all other electrical appliances present al the hostel.

## **Monitoring plan**

The Valencian Regional Government set up in 2012 a plan for energy saving and efficiency in all public buildings, including its youth hostel network. The regional youth agency monitors in an ongoing basis the monthly electricity bills of every hostel in order to analyse the consumption patterns and to design ways to minimise energy use.

Every year, the youth agency is under the legal obligation to send the Valencian Energy Agency (AVEN) its findings and strategies implemented to reduce consumption. Verifying the actual results of the investments foreseen in the project we are presently submitting to the HISF will be a fundamental chapter in the next yearly AVEN report.

## **Contribution of the project to sustainable development**

The little history of the “Mar I Vent” building and its inhabitants is one of adapting to changes: both political/sociological and technological.

The facilities started functioning as a hostel in a time when Spain was a non-democratic country, with an extremely traditional Catholic approach to youth education. The hostel was a “women hostel”: intended to provide for summer seaside holidays to single young women, under the careful behavioural and moral supervision of elder women instructors.

When democracy came to Spain with the 1978 Constitution, this segregation by gender was no longer admissible and subsequently the Hostel was practically abandoned for several years.

Until the moment when, first the Ministry of Culture, in Madrid, and then the newly created (1989) Valencian regional agency for the promotion of the youth (IVAJ), changed the hostels “reason for existence” forever.

The environmental awareness of the “Mar I Vent” hostel's managing staff, under the youth agency direction and support, was present long before the Spanish general population gave much consideration to any sustainability considerations.

In 1985 the main concern was windows renovation. Due to the hostel's situation, meters from the sea coast line, salted humidity corrosion had deeply affected the building isolation. New corrosion resistant windows were installed and the building reinforced isolation saved a great deal of the energy used by the central heating system.

In 1990 the hostel was also pioneer in forbidding smoking in the premises. A general health and environmental oriented measure as this one was not taken in Spain until 2006.

In the year 2000 “Mar I Vent” took a fundamental leap forward in its “sustainability path” by introducing two measures:

### **Recycling programme**

Separated containers were introduced both for customers and staff use; especially at the kitchen and dining areas. “Problems and solutions” awareness panels were introduced to inform customers of the reasons and relevance for the planet of recycling

### **Introduction of photo thermal modules with water tanks**

Living in a Mediterranean town, with our enormous percentage of sunny days, the use of solar power to directly heat tap water almost completely eliminated the use of fossil fuel at the building.

There is an existing auxiliary oil boiler, in case of cloudy or rainy days, but since the hostel main occupancy occurs during spring and summer, the boiler use is negligible.

All this considered the following declaration is deemed necessary:

THE HOSTEL'S STAFF AND THE REGIONAL AGENCY are proud of the steps already taken at “Mar I Vent” and they are determined to go on with further measures to favour sustainable development, from a holistic approach.

Therefore, as a group of people and as an institution, they consider applicable the Sustainable Development Matrix, a green development strategy founded on a belief that, for anything to sustain itself over time, it must optimize or balance different human needs:

#### **PLANET:**

They understand that the planet has limited resources and that humans and nature Co-exist and, for this reason, efficiency concerns (less resources used to get results) must guide its decision making processes. The use of state of the art sustainable technology and renewable energy sources is key to this goal. Minimizing the amount of pollutants produced and understanding that humans must effectively integrate with nature, not separate from it paves the way to a sustainable future, for the future of our civilization.

#### **PEOPLE:**

They believe they provide services to meet quality-of-life needs and they want to meet those using innovative ways, being willing to share with others their knowledge, gained through their years of experience. They accept their own ethical responsibility in sustainable development and consider essential to contribute to raising young people who are aware of their responsibility to the environment.

#### **PROFIT:**

They recognize that effective and efficient means of production and cost control practices throughout the project are vital to its success and overall sustainability. They are also aware that over the long term, there can be no economic capital without preserving and maximizing environmental and social capital.

## Environmental impacts

We do not foresee any adverse environmental effects caused by the installation of the new solar cell panels. With regards to the wind power generator, its small size and the fact that it will be located inside the hostel's garden, at ground level, will ensure that the possibility of birds being affected by its blades movement is remote.

The replacement of the old luminaires could cause negative effects if it weren't for the fact that their disposal, according to the Spanish legal mandates, will follow the environmental waste disposal regulation and luminaires will be delivered to the Environmental authorities officially designated treatment plants.

## Estimations of emission reductions

Our consultant estimates the following annual savings and carbon footprint:

### A. - Replacement of traditional lighting system and introduction of LEDs:

SUMMARY OF SITUATION	
Current annual cost	£3.874,77
Enhanced annual cost	£1.424,18
Annual savings (£)	£2.450,59
Annual savings (Kwh)	14.643,20
<b>CO2 annual emissions avoided (Tons)</b>	<b>4,77</b>
KgCO2 emitted per Mwh (grid)*	325,878 KgCO2/MWh

\*according to Spanish mix of electricity generation's sources

The details for the above calculations are shown in the following table:

Standard luminaire installation			LED luminaire installation		
Equipment Data	Value	Units	Equipment Data	Value	Units
Luminaire No	130	parts	Luminaire No	130	parts
Per Unit Power	100	W	Per Unit Power	48	W
Per Unit Power consumption (luminaire + equipment)	115	W	Per Unit Power consumption (luminaire + equipment)	51	W
Per unit consumption in reduced mode of operation	115	W	Per unit consumption in reduced mode of operation	31	W
<b>Consumption profile</b>			<b>Consumption profile</b>		
Full consumption***	8	h.	Full consumption	8	h.
Reduced consumption	0	h.	Reduced consumption	0	h.
Annual days in use**	220	days	Annual days in use	220	days
<b>Consumption costs</b>			<b>Consumption costs</b>		
Daily energy consumed	119.600	Kwh	Daily energy consumed	53.040	Kwh
Annual energy consumed	26.312	Kwh	Annual energy consumed	11.669	Kwh
Energy Cost (grid)	0,12	€/Kwh	Energy Cost (grid)	0,12	€/Kwh
Annual cost of energy	3.211	£	Annual cost of energy	1.424,18	£
<b>Operational costs</b>			<b>Operational costs</b>		
Luminaire lifespan	15.000	h.	LED lifespan	50.000,00	h.
Per year using hours	1.760	h.	Per year using hours	1.760	h.
Time to replacement of luminaire per luminaire and year replacement cost	8,52	years	Time to replacement of LED per LED and year replacement cost	28,41	years
	43,49	£		0,00	£
Maintenance cost	663,38	£/year	Maintenance cost	0,00	£/year

Euro/GBP rate exchange: 1,229

(assuming a 10 year project)

\*\* According to hostel occupation data

\*\*\* anual mean of use

This is equivalent to the carbon footprint provided by a standard car (130gCO2/km), traveling 0.9 times around the Globe (or 36.707km).

## B. - Autonomous energy power production (off the grid)

We intend to use a combined photovoltaic-wind powered system with storage in batteries located in the hostel building. The main energy provider system is the photovoltaic one, due to the high number of sunny days all over the year (>300 days). The wind power system is the secondary one and is intended just to ensure a minimum amount of produced renewable energy, especially in the occasional periods of cloudy days, taking advantage of the predictable sea-to-land and land-to-sea fluxes of wind typical in the coastal line. Because of this no further calculations are provided for the wind powered system.

PHOTOVOLTIC SYSTEM			
Province	Valencia	No of PV modules	14,3
Site	Piles	Peak PV module power (Wp)	300
peak power installed (Kwp)	4,3	PV module surface (sqm)	1,67
steppness angle of PV panels (°)	30	PV total surface (sqm)	23,9
DC/AC conversion efficiency	98%	minimum inverter power (W)	3440
total system efficiency	82%	No of Inverters	1
selling price (£/Kwh)	0,122		
wind energy generator (W)	1.300		

The estimated lifespan of the combined system is 25 years, although the benefits are calculated just for a period of 10 years. For all calculations our consultant assumes a total of installed power (LED) of 7.002W, and applies a simultaneous use factor of 60%, for a maximum overall consumption of 4.200W.

Taking into account the sun energy distribution all over the year, our consultant obtains an annual production of 6.116,74 Kwh that yields 3.7 TonCO<sub>2</sub> emissions avoided. This is equivalent to the carbon footprint of a 15.332Km of a standard car (130gCO<sub>2</sub>/km). Combining both effects, there is a total **CO<sub>2</sub> reduction of 8.44 Tons**

## Saved funds and ROI (return of investment)

The savings generated by this investment will be used for the hostel's next sustainable development project: a system to collect and storage rain water, to be used in the garden irrigation system and possibly in the toilet tanks.

Economic savings		
	Annual savings (1 <sup>st</sup> year)	Total Savings* (10 years)
Substitution of current lighting system	£2.450,59	£28.557,36
Electricity produced by local renewable energy sources	£746,55	£7.465,51
<b>Minimal Savings</b>	<b>£3.197,14</b>	<b>36.019,34£</b>
Return Of Investment (ROI)		
Investment	£31.266,00	
Loss coefficient	0,85%	
Minimum annual savings	£3.197,14	
Net annual profit	£2.717,57	
PayBack period	11,55 years	
ROI= (Net profit/investment)x100	8,69%	