

Renewable Awareness

Detailed Description

Renewable Awareness

Using Dissemination Equipment to understand more about environmental problems associated with energy.

Summary

Renewable Awareness is a Project from the Institute of Technology and Renewable Energies, ITER, which aims to announce all the research areas related with renewable energies, environment and new technologies in favour of the promotion of a social and touristic awareness where clean energies and new technological improvements converge with the respect for the environment, therefore contributing to sustainable development and to manage future zero CO₂ emission scenarios.

In order to fulfil the project, three dissemination installations were developed. Each of these installations is used to make society aware about the importance of individual responsibility when dealing with energy matters and tries to explain how this responsibility is a contribution to achieve a more sustainable behaviour which is founded on simple concepts such as energy saving, energy efficiency and the implementation of renewable energies

ITER pursues a more sustainable behaviour from both the Island's population and the tourist that visit the island of Tenerife now that it is fundamental for the social and economic development of the island and because it is absolutely necessary to face Climate Change.

The concepts dealt with in each installation and the way to approach them can be adapted to the needs of the participants. Each one of the equipments suggests a different way of approaching the concepts, all being compatible and nonexclusive. The technological walkway introduces the concepts visually and very easily to understand. The Visitors Centre encourages a second thought on what has been learnt. The Bioclimatic Dwellings is where the ideas translate into actions, where the concepts learned are applied and are there to experiment and prove that Zero CO₂ emissions does not mean less comfort.

The Bioclimatic Dwellings are one of the most peculiar and significant contributions to this Project. Twenty four different single-family houses designed following bioclimatic criteria, each of them energetically selfsufficient by its own photovoltaic panels and with solar thermal panels for warm water. These dwellings are a unique exhibition of real and replicable solutions both to integration of renewable energies and building designs proving that sustainable solutions are possible without having to resign aesthetics and comfort.

The singularity of this equipment is increased by the fact that these houses are offered as accommodation and the visitor has the opportunity to experience the comfort and exclusivity of living in housings of this type. The houses make up a macrolaboratory. Each house is equipped with small sensors that allow a real time monitoring and supply information about its thermal behaviour. This way, the occasional tenant can experiment changing elements in the house to modify this behaviour.

This accommodation is located in a zero CO₂ emission village; therefore it's the best alternative to participate in low CO₂ emission tourism.

Starting point

ITER is an investigation Institute founded in 1990, located in the Island of Tenerife. The Institute is mostly focussed in research and development works, although it also considers that dissemination and social awareness referring to energy matters is essential in an island, and therefore dedicates part of its resources to dissemination and awareness campaigns. Tenerife's only energetic resources are those generated from renewable sources and only 0.3 % of the total energy consumed in the island comes from these sources, the rest is imported as oil.

This high energetic dependence together with its geographical situation and the fact of being an island makes the promotion of energy rational use and the promotion of renewable energies very urgent. The population plays a very important role now that 43% of the total population of the Canary Islands lives in Tenerife, and each year 4.7 million tourists visit the island. This only highlights the importance of carrying out initiatives which aim for energetic diversification and energy saving.

With this purpose numerous initiatives are carried out, often aimed at the education system which dedicates more and more efforts to emphasize the importance of changing the energetic model towards the promotion of renewable energies and energy saving. Nevertheless, the population needs effective and applied examples in order for these changes to really be assimilated in their every day routine. Hence, the great importance of boosting equipments used to emulate real solutions in the development of this project now that they execute theoretical concepts.

Three quarters of the energy consumed in a house correspond to the consumption of air conditioning, hot water and lighting, and unlike other sectors, the trend is always increasing. There are many opportunities to save energy by using solar energy as an energy source, leading to savings in addition to conventional energy currently used to generate the interior comfort, improved living conditions without adversely affecting the environment. This is achieved using the passive and active principles to generate an energetically coherent architecture. These systems must be integrated into buildings since the early stages of design.

Development of the Project

ITER executes the promotion of this project. The Institute includes a dissemination department which coordinates the project and establishes the guidelines for the correct management of these equipments, although its outcome is the result of a multidisciplinary cooperation of investigators and technicians from the institute and of other organizations.

A clear example of this multidisciplinary cooperation is the Bioclimatic Dwellings Project, which started as an International Contest endorsed by the International Union of Architects. The idea of concentrating the most advanced bioclimatic techniques that were emerging in the world in one place motivated the project. The Technological Walkway is another example of this multidisciplinary cooperation, now that it is a combination of units, each dedicated to different technologies for the use of renewable energies and created by the specific department in charge of that area. On the other hand, the technical execution of all of the dissemination equipment included in this project has been led by the Sustainable Building Department of the Institute.

In order to fulfil the maximum dissemination capacity, the project focuses in the creation of dissemination equipments that directly combine theory and implementation.

Each equipment presents a way to approach both resident population and tourists. They bear the possibility of approaching the same concepts at different levels without necessary having to be interdependant, i.e. the three equipments perfectly complement each other within a same tour but are complete didactic units by themselves.

The Technological Walkway allows a simple and descriptive approach of the concepts, ideal for an introduction to the subject, The Visitors Centre, on the other hand, encourages the visitors to participate and further the information not only through its circuit of displays but with the organization of more specific events which allow a second thought in what has been learnt. To complete the tour, the Bioclimatic Dwellings admit the exercise of sensations, go one step further and see that the application of these ideas is possible and confirm that concepts such as bioclimatism, renewable energies integration, energetically selfsufficient and zero CO₂ emission do not imply comfort loss.

The three equipments are located within ITER's installations which perfectly frame them with three Wind Parks and a 24 MW PV solar platform called SOLTEN. The area also includes a

Thermal Power Station, another didactic resource and is an excellent area for the installation of renewable energies due to its climatic characteristics.

The complete project started in 1995. During this year, the International Contest for “25 Bioclimatic Dwellings for the Island of Tenerife” comes out so that the winners take part in the “laboratory” of dwellings built following bioclimatic architectural criteria, being energetically selfsufficient, and capable of optimizing their adaptation to the environment.

The International Tender attracted a total of 397 projects from architects from 38 countries out of which 25 were selected to create the housing development. The winner of the first prize was also in charge of building the Visitors Centre.

Once the contest was solved, the project that would allow the execution of both the Bioclimatic Dwellings and the Visitors Centre starts to take shape while paralelly, the Techonological Walkway starts to be designed.

The Technological Walkway was the first of the three equipments to be concluded and became a leading installation in Spain where visitors could experiment how renewable sources transformed into useful energy. The Walkway greatly contributed to the approach of the population to energy generating systems that used renewable resources and helped in their social integration. It worth mentioning that in 1998, year when the Walkway was inaugurated, the Canary Islands lacked almost completely renewable energy installations, being a very innovative subject equally distant to the population. Such common elements as a solar collector were totally unknown and their use was slightly widespread.

The Visitors Centre was inaugurated in the year 2004. It is a bioclimatic building specially characterized by its integration with the environment. The Visitors Centre counts with a circuit of displays which encourages the visitor to learn about energy matters such as their most common sources, their impact in the environment, their limited characteristics, as well as the alternative use of the renewable energies.

As well as dealing with contents related to the energetic problem, climate change and bioclimatism, the Visitor’s Centre has access to the monitoring system that controls each house. It’s a space where different activities both of technical and scientific nature can coexist and offer the local and the foreign visitor a way to participate actively.

The Centre also counts with an auditorium with 200 seats, several multipurpose rooms, a gift store and a cafeteria.

Bioclimatic Dwellings, The Dwellings were inaugurated in the year 2010. The Development comprises 24 different models of Bioclimatic Homes energetically selfsufficient and in a zero CO2 emission scenario. The development works as a macro laboratory that will help to determine

tools such as pattern designs for warm climates, that will highlight the replicability of the techniques used and will contribute to sustainable building in areas with similar climates.

Tenerife makes an important contribution to research and development in the implementation of renewable energies in homes and in the energetic improvement in architecture that will open new paths to continue working in this field.

Description of the Equipments

Visitor's Centre

This bioclimatic building is part of the Development of the Bioclimatic Housings and performs three different functions. First of all, the building is the starting point from where to part to the different equipments, being a dissemination equipment itself. The visitors are welcomed here and organized depending on the type of audience, the time they have and their interests.



The contents of the displays have been designed to complement those located in the Technological Walkway and the ones resulting from the monitoring of the Bioclimatic Housings, paying particular attention to their suitability and to the information contained, in order to maximize its educational efficiency.

The Visitor's Centre expects to draw the visitor's attention to energy matters; the sun as an energy source, traditional energy sources, consequences in the environment, their limited nature, the alternatives existing such as the renewable energies. The Technological Walkway will go deeper into these concepts later.

The displays that develop and materialize each of these units are placed along a one way tour prepared so that the visitor can go through independently.

These elements were designed emphasizing the concepts wanted to be transmitted so that they were manageable and intuitive lacking the need of additional texts or excessive explanatory panels.



Nonetheless, Couch screens have also been designed for those visitors who want more information.

In addition, Energy documentaries and other ones along the line are projected in the auditorium of the Centre which also hosts training and dissemination activities.

Some examples of these activities are:

- Dissemination Day “Development of 25 Bioclimatic Houses”
- Seminar “Copenhagen and beyond: Climate Change and Renewable Energies in Asia and Africa”, organized by Casa África and Casa Asia. ()
- Conference “European Policies and Climate Change during the Spanish presidency”, organized by the Tenerife Energy Agency. ().
- Training Conferences about Bioclimatic Architecture organized by the Italian Company CasaSoleil.

Technological Walkway

The Technological Walkway is an outdoor equipment full of small scaled practical elements used to explain how the different renewable energies work. Now that the Walkway is outdoors, all the natural resources needed to explain the renewable energies can be found in it.

The Walkway is located in a small valley, around an artificial stream that starts in a small pond in the head and ends in another one at the bottom. The stream helps to mitigate the climate inconveniences in the valley, reducing the strong winds and the high temperatures by the evaporation effect of the bodies of water and the surrounding vegetation.

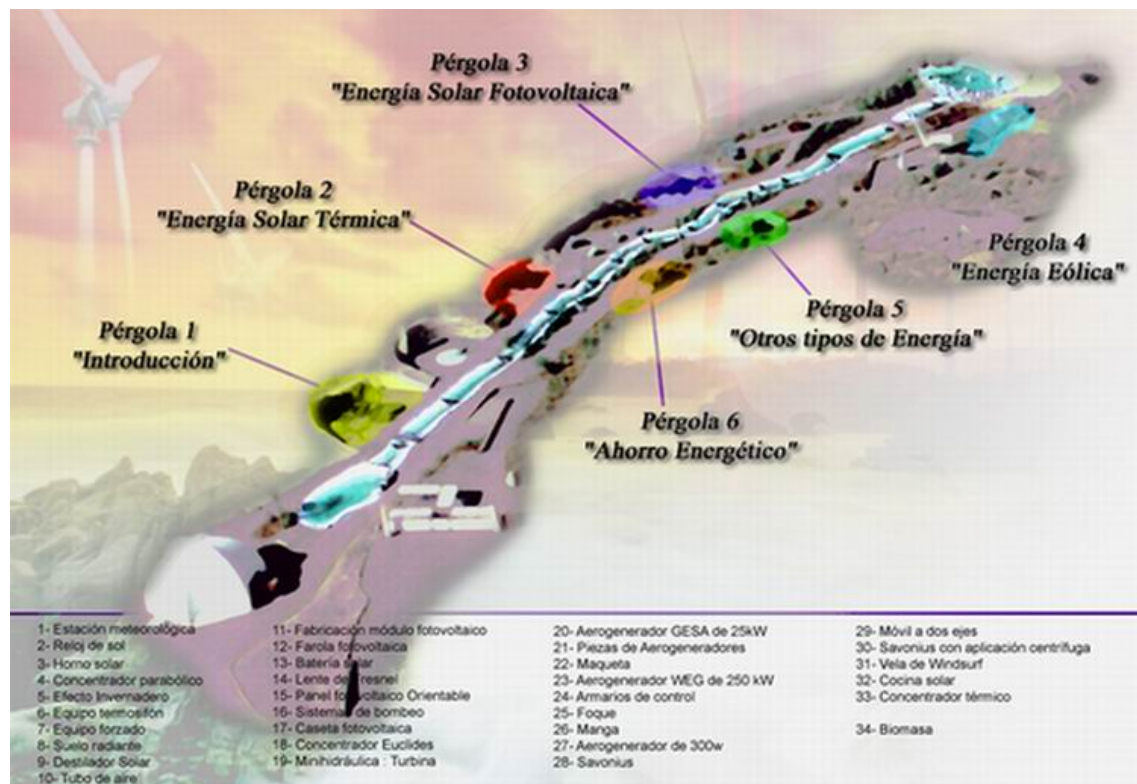
The Walkway aims to inform the visitors a little more about renewable energies and concepts related to them, such as energy saving, and the rational use of the resources all this framed within ITER’s installations and being an example of real application of this type of energies.

The path is a one way tour that runs along the stream allowing everyone to see the different units that compound the walkway without the need of a guide, although guided visits are also available.

The Technological Walkway is a useful complement for all stages of the education system (elementary, middle school, high school, university, professional associations, etc.), and at the same time is a recreational outdoor area, place for dissemination of renewable energies and of environment conservation for the tourists that come to visit.

The Technological Walkway is organized in separate thematic areas or units. The reason for this distribution is only didactic starting the visit with a general introduction to the energetic problem

and the consequences of consuming determined energy resources. The visit continues through specific displays on each renewable energy source and ends with a display aimed at how everyone can participate and get involved in order to contribute to solve the problem.



Each unit is located in distinguished areas of the walkway and all include two types of dissemination material.

a) *Information Panels*, which contain information related to the subject and about the interactive devices found in the display. Some of them include a short video or documentary that provides more information. All this is integrated under a shelter which keep the visitor's from the sun.

b) *Renewable Energies Interactive Devices*, such as solar panels, wind blades, etc. with corresponding posters describing characteristics and functioning. Some of these elements have been adapted so that the visitors can interact with them (activating switches, levers etc.) helping them understand how they work and learning about the technology.



PV Isolated Electrification



PV Module with battery for isolated Systems



Methane Biogas digester



Solar Thermal Module Devices



PV powered fountain in the stream



Sun lighter



Sun Oven



Small Hydro

Bioclimatic Houses

The 24 Bioclimatic Houses make up a development characterized for having zero CO₂ emissions. The use of the houses and everything that has to do with them has to be controlled very closely in order to achieve these emissions; this includes the water supply and transport among others. This equipment is not only a display of renewable energy integration and bioclimatic solutions; it is also used as accommodation. This small accommodation area will allow technical-scientific public to experiment and evaluate the results and assess the experience while enjoying the native culture, the surroundings and the local traditions. This environment friendly accommodation, also respectful with the cultural and social values of the community, will favour a fruitful and enjoyable exchange of experiences between residents and guests, committed to diminishing pollutants and promoting the technologies of the future.

24 different designs of single family houses that use passive solar conditioning systems. These systems are planned differently, with different building solutions, different materials and different combinations to face same weather conditions and aiming at the same inside comfort. Different renewable energy sources have been installed, combined and integrated differently in each design.



LA GERIA

Dedicated to Loyola de Palacio del Valle Lersundi
Architects: César Ruíz-Larrea Cangas, Enrique Álvarez-Sala Walther, Carlos Rubio Carvajal, Javier Neila González, Alberto Monedero Frías y Gonzalo Ortega Barnuevo
Country: Spain
First prize



EL CAMINITO

Dedicated to Georges Peri
Architects: Natasha Pulitzer, Sergio Los, Enrico Cozza, Alberto Miotto, Cristina Boghetto, Sergio Lot, Annamaria Bertazzon y Salvatore Pandolfo
Country: Italy
Second prize



LA ESTRELLA

Dedicated to Robert Hill
Architects: Marta Puig Adroer y Sergi Serra Casals
Country: Spain
Third prize



EL CUBO

Dedicated to Werner Bloss
Architects: Luc E. G. Eeckhout y Jan Van Den Broeke
Country: Belgium
Third prize



CASA BERNOULLI

Dedicated to Leopoldo Guimarães
Architect: Neil G. Swift
Country: United Kingdom



EL ALISIO

Dedicated to Roger Van Overstraeten
Architects: Madelaine Fava, Daniel Fauré y Gaëlle Breton
Country: France



EL MURO

Dedicated to Wolfgang Palz
Architects: José Luis Rodríguez Gil y Javier Rueda
Descalzo
Country: Spain



EI GAVIÓN

Dedicated to Karl-Heinz Wehnert
Architect: Brian Hemsworth with thanks to Dan Burr
and Mark Richard at RFR
Country: France



LA GEODA

Dedicated to Gerard Wrixon
Architects: Eduardo Vadillo Ruiz y Joaquín López
Vaamonde
Country: Spain



LA TEA

Dedicated to Jos Beurskens
Architect: Anne Mathilde Petri
Country: Dinamarca



LAS BÓVEDAS

Dedicated to Melim Mendes
Architect: Jaime Navascues Lacourly
Country: Spain



COMPACTA

Dedicated to Adán Martín Menis
Architects: Fernando de Retes Aparicio, Miguel A.
Valverde Alarcón, Isabel García Laloma y Manuel
Ródenas
Country: Spain



EL RÍO

Dedicated to Joachim Luther
Arquitecto: Morel Cedric
País: France



EL PUEBLO

Dedicated to Anthony Lewis
Architects: Kaarina Löfström y Markku Kolehmainen
Country: Finland



NOCHE Y DÍA

Dedicated to Hermann Scheer
Architects: Pablo Mosquera Arancibia y Francisco J. Fernández. Pareja
Country: Spain



LA VELA

Dedicated to Rafael Martín Moyano
Architects: Joel Rutten y Kriti Siderakis
Country: France



EL BERNEGAL

Dedicated to Arthouros Zervos
Architects: B. Sánchez-Montañés Macías, José Pérez de Lama Halcón y A. Luis Ballesteros Rodríguez
Country: Spain



EL DISPOSITIVO

Dedicated to Erik Lundtang Petersen
Architect: Pablo La Roche, Ignacio de Oteiza y Francisco Mustieles
Country: Venezuela



EL ESCUDO

Dedicated to Werner Kleinkauf
Architect: Alfonso Fernández Castro
Country: Spain



LA RELIGA

Dedicated to Giuliano Grassi
Architects: Nahim Dagdug, Nora Esquivel, José M. Rosales, Jorge León y Fernando Ramírez
Country: Mexico



EL PATIO

Dedicated to Francisco González Reyes
Architect: Ángel Díaz Domínguez
Country: Spain



ARCILLA

Dedicated to Jürgen Schmid
Architects: Harry Bent and Anneli Lyytikä, biologist Katriina Bent
Country: Finland



DUNA

Dedicated to Antonio Luque López
Architects: Ángel Luis García Palmas, Nylian
González Anzola y Natalia Bernárdez García
Country: Spain



EL CANGREJO

Dedicated to Peter Helm
Architects: David Dobereiner y Dan Chin
Country: USA

These 24 different designs share the following characteristics:

Passive Solar Energy

The homes are thermally insulated to prevent the loss of heat and reduce the noise coming from the outside. The main purpose is to reduce heat loss and make the best use of solar heat.

The Bioclimatic Houses use passive solar energy in different ways, sometimes combining them. It can be used directly with large south facing areas; indirectly with walls and roofs for storage; insulated (non integrated into the house, heat is transferred in and out of living area) and dual gain systems (using the advantages of the first three systems).

In addition, the houses include other features which help with cooling such as the shape of the house and the outside finish, the materials used, air flow, and different orientation depending on sun and wind conditions.

To achieve passive solar cooling, some houses have an indirect gain system using storage walls or roofs. When heating, the collector system is exposed to the sun during the day and covered during the night transferring heat into the house, operating reversely for cooling. Small fountains and ponds are also used to cool some of the houses using evaporation.



Another notable feature in the Housing Development is collection of systems used to intake natural light, allowing it to reach directly into both the core of the house and other adjacent areas. The use of raised windows, sunshades, skylights and side lighting also reduces energy costs.



Environmental Impact

The layout and orientation of every house has been carefully studied so it blends into the surroundings. Special care has been taken to create a microclimate around the homes. Most designs are based on local architecture.

The native vegetation has been respected and has prospered due to appropriate watering. Most of the plants are different species of the Euphorbia cactus and other endemic shrubs.

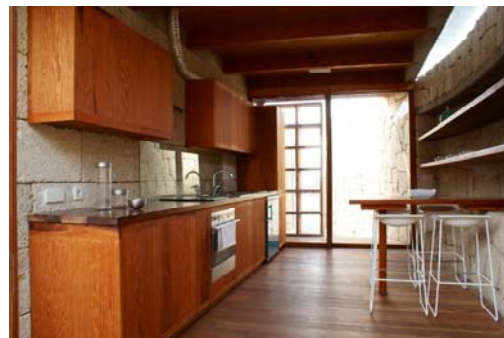
The garden in every house corresponds to the design requirements outlined in the original Project submitted for the tender although under no circumstances will any plants species be used that may be harmful to the environment.



Energy & Water Saving

The domestic appliances are perfectly adapted to the needs of the visitors (capacity, power, etc.) and have the European's Union's "Energy Label".

The main energy savings that deal with lighting start with the design and orientation of each house, always bearing this in mind to use natural light as much as possible. Each house has low consumption light bulbs which consume 80% less energy than conventional ones and have photoelectric and presence sensors that can switch off unnecessary lights saving between 10 and 80% of the total energy.



Every house has ventilators and water flow reducers; interruptive discharge flushes or with double push-button in order to make a more rational use of water. There are other more unusual examples of water saving systems such as a dry toilet or systems of double water flow, which means the water can be re-used for other purposes.

Power supply

Every house features photovoltaic systems integrated into the roof, façade or building elements to generate electricity. All the houses are connected to a common network to make an optimum use of the dual concept of production–consumption, i.e. the installation manages to produce the same amount of energy the house consumes which favors stability in the system and avoids the limitations of an isolated network.



The Development is an excellent example of renewable energy integration in building and provides different designs for the use of natural resources to produce electricity such as curtain walls and glass roofs with glass-glass photovoltaic panels (made on site) or photovoltaic panels used as shadow elements to control solar radiation.

Water supply

The development is supplied by a desalination plant that uses reverse osmosis and a purifying system. This water is used for water consumption and irrigation through three distribution networks.

The hot water is supplied by low temperature active solar power systems installed in each house with a solar power collector. These systems are perfectly integrated in each design.



Bioclimatic Laboratory: Each house has to be appointed with a monitoring system that provides data and results from the 24 different designs that will help to make this project replicable. The monitoring system makes each house an individual laboratory, but when working together makes a macro laboratory. The main goal of the bioclimatic laboratory is to provide criteria and design patterns standards to reduce energy consumption and the sustainable generation of energy in single family homes located in warm climates. The project is based on monitoring the energy consumption and comfort values in different types of energy efficient housing, under real conditions, with the ultimate goal of a comparative study that includes design guidelines and standards for integration systems and active solar home systems concluded from energy efficiency real data.

In addition, the small sensors in each house allow real time monitoring and supply information about its thermal behaviour. This way, the occasional tenant can experiment changing elements in the house to modify this behaviour.

Management of the Dissemination Facilities

The dissemination equipments are managed together, now that their independent management is very similar. Nonetheless the Bioclimatic Houses have an additional management for the **accommodation**.

The **common management** provides a “tour” approach where the visitor can start in the Visitor’s Centre and then continue through the Technological Walkway and end with the Bioclimatic Houses. This management works to adapt the visit as much as possible to the visitor’s expectations and objectives so that both ITER and the visitor do the best performance. ITER offers free guided visits so that everyone has the chance to visit the dissemination facilities. The guided visits are reserved by filling in an on-line questioner (www.iter.es), by phone (922 747700), by email (paseo@iter.es) or directly in the Visitor’s Centre. When the appointment is made, the visitor specifies what interests they have, how much time they want to spend, the information level etc. The dissemination facilities can also be visited without a guide, now that they have been designed for that purpose.

This type of Management has the following advantages:

The dissemination tasks are constant. The education centres receive a training schedule they can use to complement their classes.

It encourages tourists to complement their visit to the island with scientific and technical facilities in a privileged environment.

It establishes a constant exchange between the social demand for training and the advances in investigation fields, creating a bond among these two sectors.

Due to the specific characteristics of the Dissemination Equipment of the Bioclimatic Houses so that they can be used as a macro laboratory, these have an additional management that deals with their use as accommodation. Each house is equipped with small sensors that allow a real time monitoring and supply information about its thermal behaviour. This way, the occasional tenant can experiment changing elements in the house to modify this behaviour.

This Management system is basically in charge of offering the bioclimatic houses as a short term accommodation for anyone who wants to visit the island and is based on similar accommodation systems. The Houses have their own webpage <http://casas.iter.es> where the bookings can be made. This webpage also contains information of additional services, their singular conditions and technical information, although there is more complete information in

ITER's webpage www.iter.es. With this management system the visitor has the opportunity to experience the

comfort and exclusivity of living in this type of housings. This accommodation is located in a zero CO₂ emission village; therefore it's the best alternative to participate in low CO₂ emission tourism.

This management system not only contributes to the dissemination of the project but also generates real data during the stays that is essential for the development of the investigation projects that are carried out. In addition, the economic contribution is used for maintenance and constant improvements needed in this kind of installations.

Result Assessment

This Project has given very good results since it began; the fact that better illustrates this is that the dissemination facilities receive more than 8.500 visitors on average.

Other remarkable results:

The Technological Walkway was appointed by UNESCO as “Centre of Excellence” for dissemination and training in Renewable Energies.

The Technological Walkway has been used to design similar dissemination facilities such as the José Segura Clavell Park.

These equipments have hosted macro events such as the first seven editions of the Eolica Festival, which concentrated on average of 15.000 people per edition and that gathered music, renewable energy workshops, guided visits, conferences, etc.

The Visitor’s Centre hosts events of scientific and technical nature, promoted not only by ITER but by other organizations. Some examples of the events organized by other entities are:

The Meetings "Water and Energy" of the Workshop of the Joint Parliamentary Assembly ACP-UE, organized by the above mentioned Assembly.

International Conferences of TUI Environment “Innovation and tools for energy saving”, organized by TUI Environment.

Seminar of Design Patterns, use and rehabilitation of Houses to reduce energy, organized by the Tenerife Energy Agency.

Seminar “Copenhagen and beyond: Climate Change and Renewable Energies in Asia and Africa”, organized by Casa África and Casa Asia.

The International Renewable Islands Conference. Future markets, organized by INSULA (International Scientific Council for Island Development) a Non-Governmental Organization cooperates with UNESCO.

The scientific and technical papers written about these facilities are:

The presentation “BIOCLIMATIC HOUSES–ITER AN energy efficiency model.” Given in the Energy Efficiency in the Touristic field Conference, celebrated in Madrid, March 2011.

Results Presentation of the project “ITER’s Bioclimatic Laboratory” celebrated during the XV edition of the International Climate Change Conference, celebrated in Copenhagen in December, 2010.

Paper presented to the Energy and Environmental Education Conference celebrated in CEMACAN de Torre Guil in November 2006.

The development of technical and dissemination materials that are used to promote the visits to the facilities, to complement their contents and for general spreading.

The presence in mass media both local and international, since the inauguration of the first equipment 12 years ago has been very numerous. These equipments have had big repercussion both in specialized dissemination media as in more general ones. Its worth mentioning that after the inauguration of the last equipment, the Bioclimatic Houses, the media repercussion has increased exponentially appearing in multitude of communications especially the ones related with tourism, among them we can highlight the filming made by the Cardinal company Entertainment about the Bioclimatic Houses for the TV program Galilean from the German channel PRO 7. "Housings of the future, the first village CO₂=0".

Awarded with the FECITEN Award 2009 given by the Federation of Initiatives and Touristic Centres of Tenerife.