LIFE 12 ENV/ES/000222

GREEN TIC:

Reducing Carbon footprint of Information and Communication Technologies

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LIFE GREEN TIC: REDUCING CO$_2$ FOOTPRINT OF INFORMATION AND COMMUNICATION TECHNOLOGIES

LIFE GREEN TIC PROJECT BASIC DATA

Project reference: **LIFE 12 ENV/ES/000222**
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Project end date: **31/08/2016**
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PARTNERS

Beneficiary: **Fundación Patrimonio Natural de Castilla y León (FPNCYL)**
www.patrimonionatural.org

Partners:

Fundación San Valero (FSV)
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Photo page 2: "ICT Carbon Footprint". Alberto Domínguez

THE ENVIRONMENTAL ISSUE

Combating climate change is a priority for the European Union (EU). The EU contributes to it by implementing the LIFE programme, its funding instrument aimed at encouraging the development of innovation projects within the framework of the European Union policy in regard to environment.

It is under this programme that the LIFE Green TIC project arises with the aim of contributing to reduce CO$_2$ emissions from the Information and Communication Technologies sector (ICT).

According to several recent studies, it is estimated that the ICT sector currently consumes 10% of the total amount of energy consumed in the European Union and it is responsible for 4% of its CO$_2$ emissions.

PROJECT OBJECTIVES

This LIFE project has been designed to demonstrate that it is possible to enhance the positive impact of ICT on the environment and to reduce their ecological footprint through proper planning and selection of adequate equipment and services, rendering green procurement criteria and the application of best practices by ICT users.

In order to do so, the following objectives were set:

- To demonstrate and quantify the potential that a better use of ICT has for reducing CO$_2$ emissions, by both reducing the carbon footprint of the sector and promoting such use to achieve better environmental services.

- To model and promote good practices and green procurement criteria in the ICT sector by enforcing pilot actions in education centres as well as in public buildings and equipment.

- To demonstrate the added value of new devices, ICT applications and procedures available in the market to achieve the objective of reducing CO$_2$ emissions.

- To contrast, through three pilot demonstrative actions in the administrative, educational and urban management sectors, the effectiveness of new processes, devices and more sustainable and efficient ICT applications.

- To define and disseminate standards of control and regulation of ICT to ensure greater energy efficiency and to lower CO$_2$ emissions.

- To encourage all ICT users to adopt responsible behaviours when using these technologies, so as to help to reduce their energy consumption.

- To boost the citizens and small businesses initiatives to develop ideas and ICT solutions to help strengthen environmental management through the use of open data, environmental information and social networks.

ACTIONS DEVELOPED BY THE LIFE GREEN TIC PROJECT

To contribute to the Green TIC project's objectives, the following actions have been designed to be developed between September 2013 and August 2016:

1. Development of Green ICT Strategies and Action Plans

This Action was intended to demonstrate the usefulness of developing and implementing strategic and planned approaches in organizations to reduce the environmental impact and carbon footprint of the use, therein, of information and communication technologies.

To achieve this, each of the three partners, based on a common methodology, carried out different pieces of work aimed at elaborating their own Green ICT Strategies or Action Plans.

Under this methodology, the following contents for Green ICT Plans were defined:
- Inventory and analysis of ICT infrastructure and equipment.
- Gather of data about energy consumption and CO_2 emissions.
- Analysis of ICT policy of the organization.
- Propose Green ICT policies for the organization.
- Establish a system for monitoring energy consumption.
- Lay out Green ICT Policy Indicators

2. Green ICT procurement

A Green Procurement Manual for ICT Products has been developed based on the information gathered and the previous work done. This manual is a document with the necessary information to be taken into account by any person or entity intending to access to green or sustainability criteria when purchasing ICT equipment. It has the following structure:

- <u>Fundamental concepts</u>: the life cycle of products, eco-labelling and energy efficiency labelling schemes, applicable legislation, etc. In addition and, as part of work done when creating the guide, a set of criteria covering all phases of an ICT product´s lifecycle have been established.

- <u>Green procurement criteria for ICT product groups</u>: the green or sustainability criteria to be taken into account when acquiring an ICT product or product group, have been explained, as so have been the eco-labelling or energy efficiency labelling schemes that enable the possibility of verifying their

1- Desktop computers, integrated desktop computers, thin clients/all-in-one CRITERIOS DE SOSTENIBILIDAD	ENERGY STAR	EU ECOLABEL	TCO CERTIFIED	NORDIC ECOLABEL	BLUE ANGEL ECOLABEL
ENERGY EFFICIENCY	√	√	√	√	√
POWER CONSUMPTION MANAGEMENT	√	√			
POWER SOURCE EFFICIENCY	√	√	√	√	
RESOURCE USE					
NOISE		√	√	√	√
USER INFORMATION	√	√		√	√
PRODUCT LIFETIME		√	√	√	√
HEALTH, SECURITY AND EMISSIONS			√	√	
END OF LIFE CYCLE MANAGEMENT			√	√	
END OF LIFE DESIGN		√	√	√	√
ERGONOMICS			√	√	
PLASTIC PARTS AND THEIR ADDITIVES		√	√	√	√
OTHER HAZARDOUS SUBSTANCES		√	√	√	√
RECYCLED CONTENT		√	√		
COMPANY BEHAVIOUR			√		
WORKING CONDITIONS			√	√	
PACKAGING		√	√	√	
TRACEABILITY				√	

compliance. The work has sought the balance between technical information and clarity and has used some tools to make the information more understandable. Some of them are the tables summarizing criteria according to product, product group and labelling scheme. The table related to desktop computers and similar is included above as an example.

3. Best Environmental Practices in the Use of ICT

One of the outputs of the project is a "Best Practices Guide for ICT Users", which contains various recommendations for them to make a more intelligent and responsible use of different equipment and devices, reducing energy consumption, prolonging their useful life and, consequently, reducing their carbon footprint.

Sixty good practices have been identified and are of application for the categories below:

- Computers and monitors (13)
- Smarthphones, Tablets and the like (23)
- Printing and Imaging Equipment (15)
- Information management, e-mails, etc. (9)

4. Sustainability Lab: social involvement in the design of ICT solutions for environmental management

This action has been aimed at creating a "laboratory" based on the use of social networking to promote ideas and open solutions for entrepreneurs, students and ICT users. These ideas will contribute to the improvement of management, information and participation within the environmental field through the following:

- Use of participatory methodology: designing a participatory tool for all stakeholders based on the use of ICT (blog and social networking in this case) within the scope of co-creation and validation of innovative solutions.
- Promotion of ideas of entrepreneurs that can help to generate new environmental ICT products and services.
- Support for entrepreneurs in the exchange of experience and implementation of ideas.

After more than a year of publications, posts and dissemination of activities related to the project, the Laboratory completed its development with a final event called "Green ICT Competition -

Entrepreneurs". This action was considered, from the very beginning, essential to accomplish one of the main objectives of the laboratory: to get ideas and proposals from young students and entrepreneurs to achieve a more efficient use of ICT and to put ICT at the service of environmental management and information.

The following figures summarize the results of participation in the competition:

- 40 participating teams.

- About 150 young people (under 30 years), forming part of such teams.

- 98 proposals, 18 of which were projects, 13 actions and 67 shared ideas.

PILOT ACTIONS

In addition to these generic actions, three pilot actions have been developed aimed at testing different experiences related to the application of Green ICT policy within the fields of administration, education and smart cities:

1. **Pilot Action 1: virtualization in the Environmental Resources Centre of Castilla y León in Valladolid (PRAE building).**

The objective of this action has been to test and demonstrate the potential that ICT infrastructure virtualization has for energy saving, as compared to conventional solutions, both in Data Centres and desktops.

Virtualization is to simulate, through "virtual" machines, the existence of real physical machines (servers or PCs) with all their components and to render all necessary resources for their operation.

Through virtualization in PRAE, the consolidation of all servers in Data Centres (Data Centre 1 and 2) has been achieved, by including the 12 previously existing servers and 2 data storage cabinets, in one

Data Centre with 4 servers + 1 pilot server and a disks cabinet, meeting strict energy efficiency standards. Besides, part of individual computers and monitors (screens) of each desktop, have been replaced by "thin client" computers, devices without hard disk.
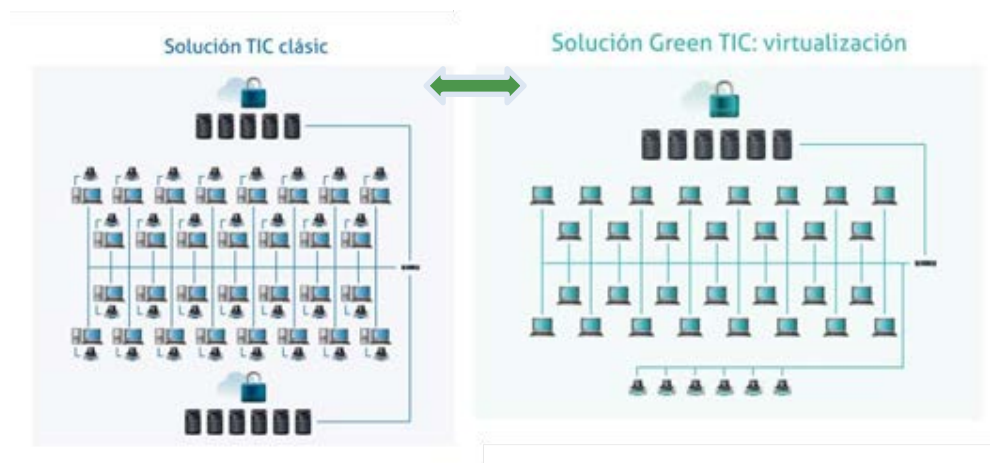
2. Pilot Action 2: Virtual Campus in the university area of San Valero Group and at their Vocational Training Centre (Zaragoza).

This action, led by the San Valero Group, was aimed to demonstrate the potential for reducing CO$_2$ emissions by installing and testing a virtual campus for vocational training and for university master courses and postgraduate programmes.

The following measures have been taken as part of this action:

a) Virtual Campus for Official Higher Vocational Training Courses.

San Valero has been a pioneer entity in the consolidation of an on-line training in four specific skill areas in higher vocational audiovisual communication training courses.

b) "Virtual Campus" for Postgraduate University Courses.

This action aimed at digitising 100% of teaching and learning materials, achieving a significant saving of paper, eliminating the transportation and shipping thus saving CO$_2$ emissions.

c) "PaperCut" Software for printing and copying management and control.

The San Valero Group has implemented a service with equipment for copiers, printers and common reprographic devices containing, among its criteria, options and elements of rationalization of use, early prevention of errors and applications based on eco-sustainability and eco-efficiency.

3. Pilot Action 3: Smart urban environmental management of the city of Logroño

The main purpose of the pilot action of the city of Logroño focused on the installation of a network of sensors measuring parameters of air quality and noise on a main street in the centre of the city. These sensors would be located on the street lighting infrastructure with LED technology to manage road traffic and street lighting in the most efficient way as regards environmental quality, health and energy saving.

The selected "pilot street" is La Paz Avenue in its section between Colón and Juan XXIII Avenues. Thirty-six lamps were installed together with the different sensors that will provide information on the following parameters: PM_{10}, NO_x, SO_2, O_3, noise (dB), traffic flow, temperature, humidity, rain and wind.

Once the entire infrastructure was set up and the procedures of data gathering and processing validated, the experimental stage started in order to assess the impact that the different lighting and traffic flow management measures in the pilot street had on air quality and noise levels. Among other issues, the following were analysed during this experimental stage:

- Effect that reducing lighting by half had on energy consumption.

- Impact of the use of motion detectors on street lighting.

- Influence of calm traffic regulation (30 km/h) on the air quality and noise parameters.
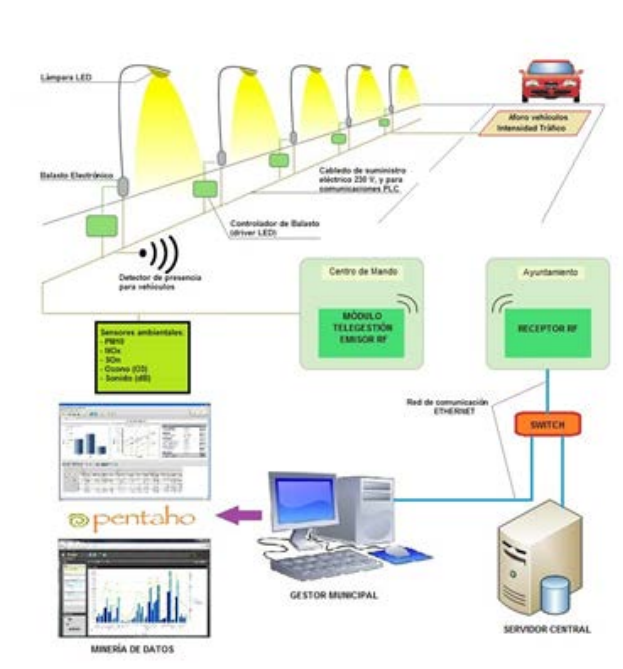
PROJECT RESULTS

Throughout these actions, the LIFE GREEN TIC Project has helped demonstrate the high potential for reduction of energy consumption that can be achieved with a responsible use of information and communication technologies.

Thus, in the application of ICT to the administration and education fields, by implementing paperless, e-administration and virtual campus policies, the San Valero Foundation has managed to reduce CO$_2$ emissions by more than 154 tonnes in two years, 31.4 tonnes as 110 vocational training students switched from classroom to online education. In the university area of San Varelo Group, a reduction of 65.6 tonnes in emissions has been reached due to the application of the virtual campus to 2042 students, and the implementation of San Valero Green ICT Action Plan has reduced 56 tonnes.

As for Logroño City Council, it has achieved total savings of about 51 tonnes of CO$_2$ by applying rationalization and modernization policies for computer equipment as well as for printers and paper usage.

Finally, the application of virtualization policies in the PRAE building by the Natural Heritage Foundation of Castilla y León, both in its Data Centre and in its job positions (desktops), has achieved energy savings of about 31%, therefore, more than 18.500 kWh per year, and a reduction of CO$_2$ emissions of about 13.2 tonnes within two years of implementation of the pilot action.

As a whole, the project's actions have helped to achieve an emissions reduction of 218 tonnes of CO$_2$ equivalent in two years

Emissions reduction (t CO$_2$ eq)	FPNCYL	Logroño	FSV	Total
electricity	-13,00	-11,93	-62,23	-87,16
paper	-0,19	-39,00	-73,50	-112,69
petrol			-18,22	-18,22
total per partner	-13,19	-50,93	-153,94	-218,06
TOTAL LIFE GREEN TIC project			-218,06	

In addition, the project has made available to public administrations, companies and citizens the different tools and methodologies that will facilitate the implementation of Green ICT policies and best practices and their consequent reduction of energy consumption and CO$_2$ emissions. These tools and methodologies include, among others:

-   A methodology for developing Green ICT strategies or action plans.
-   A manual for the green procurement of ICT equipment and devices.
-   Guidelines for energy saving best practices targeting ICT users.

DISSEMINATION

The activities carried out under the project and referred to in its dissemination strategy have been aimed at achieving the following objectives:

-   To disseminate the project results.
-   To increase the information and public awareness of the carbon footprint and environmental impacts of the use of ICT.
-   To promote the implementation of Green ICT policies and criteria in public administrations, the education sector and businesses, especially SMEs.

All partners have globally contributed to the dissemination of the project results in each of the actions. Furthermore, as there is specialization of each of the partners (being this the main added value of the partnership) an enhanced dissemination addressed to specific stakeholders has been carried out, as follows:

- FPNCYL: to ICT professionals sectors, Department of the Environment and Regional Government of Castilla y León.

- FSV: to the education community, professional ICT sectors, Department of the Environment and Regional Public Administration of Aragón (specifically through the Climate Change and Environmental Education Service).

- Logroño City Council: to smart cities and local authorities in general.

Partnerships with third parties who have contributed to the dissemination of results and project activities have also been established.

Project Partners have maintained an active presence in national and international forums for the dissemination of the project among the stakeholders and potential beneficiaries of its results. The following can be highlighted among them:

- Forum of the International Telecommunication Union - ITU). Madrid 18/09/2013. 3rd Green Standards Week.
- III Smart Energy Congress. Enertic. Madrid, 23/04/2014.
- Green Week on "Circular Economy" – Brussels, 03/06/2014.
- UE Regional - Workshop on Energy Efficiency and Climate Change. Brussels, 04/06/2014.
- MATELEC - International Exhibition of Solutions for the Electrical and Electronics Industry – Madrid, 28/10/ 2014.
- National Environmental Congress (CONAMA). Madrid, 24/11/2014.
- I National Congress of Smart Cities. Madrid, 24/03/2015.
- National Congress of Communication and Environmental Education (COMEA). Valladolid, 14/04/2015.
- Hack for Good - #H4G University of Valladolid, 16/04/2015.
- International Conference on Critical Raw Materials – International Research Centre in Critical Raw Materials for Advanced Industrial Technologies (ICCRAM). Burgos, 25/06/2015.
- CONAMA Local / Greencities and Sustainability Forum. Málaga, 07/10/2015.

VALORIZATION AND TRANSFER OF RESULTS

Finally, some specific examples of transfer of the project that have already been carried out can be mentioned. Different organizations, especially regional energy agencies, technological centres, educational centres and public administration have shown interest in the project´s results:

- Transfer Case 1: ICT Energy Efficiency Network "EFFICIENTIC"

    Creating a Partnership to promote a regional cooperation project on ICT energy efficiency. This cooperation has resulted in the drafting of a project that has been submitted to the INTERREG program Sudoe, with institutions in Spain, Portugal and France. The project aims at capitalising the experience of monitoring energy consumption, ICT energy audits and Green ICT strategies by applying it to 30 pilot projects in 3 countries, as well as the development of e-learning training materials for professionals and students in the ICT sector.
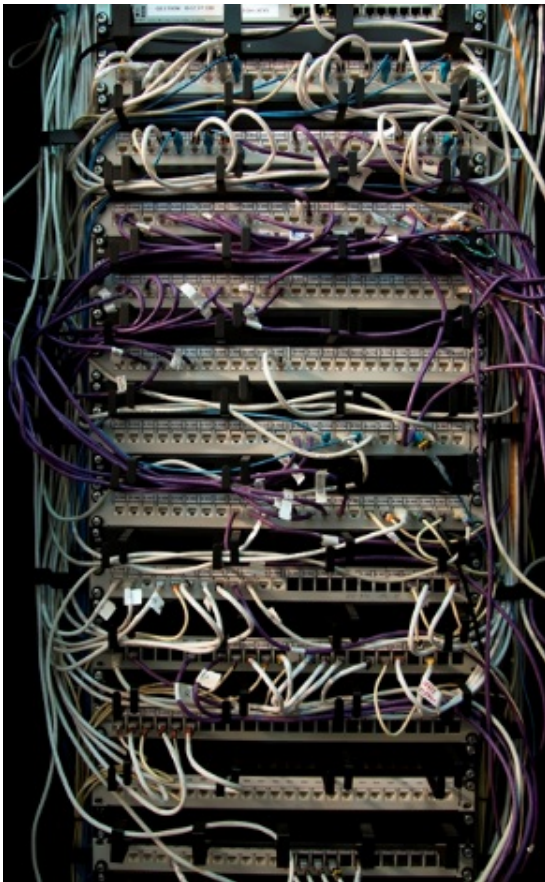
- Transfer Case 2: Dissemination of Best Practices.

    The Regional Government of Castilla y León, through the Directorate General of Telecommunications, has used the educational materials developed under the LIFE Green TIC Project, namely infographics summarizing the *Best Practices Guide for Energy Saving for ICT Users*, to distribute them online to more than 18,000 public employees. At the same time, a training webinar about the contents of this Guide was organized through the online training platform.

- Transfer Case 3: Green ICT Procurement Day.

    The Local Energy Agency of the Murcia City Council, asked the LIFE Green TIC consortium to organise a training day on green ICT procurement and best practices on energy saving for regional stakeholders (regional and local government, business and professionals in the sector, universities, etc.). This event took place in the city of Murcia on 4th May 2016.

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