Fundación Centro de las Nuevas Tecnologías del Agua

Knowledge at the service of society

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Presentation

The Fundación Centro de las Nuevas Tecnologías del Agua (CENTA) currently plays a major role in the water sector, performing diverse functions and tasks aimed at promoting better management of water resources with an innovative, sustainable and supportive approach.

CENTA has fifteen years’ experience as a research centre in the field of waste water treatment for small communities, rural areas and decentralised treatment. It has become an indisputable reference point in the field at international level. As an official Research Institute, it also acts as a platform for technology and knowledge transfer, acting as a social catalyst through its international cooperation and environmental awareness raising programmes.

This Foundation carries out its R&D&I activities around two main areas:

- Research, development and technology validation for water treatment.
- New tools for the integrated management of river basins.

These areas focus their activities on three axes:

- Running research, development and innovation projects
- Technical observatory on water purification and reuse, and
- Management of the Carrión de los Céspedes Experimental Plant (CCEP).

The CCEP is a publicly-owned Singular Scientific and Technical Infrastructure, at the service of innovation and progress in the field of water. This experimental centre, the only one of its kind in the world, has a surface area of 41,000 m² dedicated to R&D&I. Currently, it houses over 20 experimental systems using different technologies, which are being used for research and innovation projects as well as for the approval and validation of equipment and processes. To perform these activities, collaboration agreements have been signed with companies, universities and other research centres.

Maximum acknowledgment for its work was granted to this centre by the United Nations Office of the International Decade for Action “Water for Life”, which in 2008 declared the Carrión de los Céspedes Experimental Plant a World Reference Centre in the field of Water Treatment.

CENTA’s main characteristic is that both public and private sectors work together on a basic project in which the local dimension is projected internationally. State of the art technologies and extensive water treatment coexist in the same experimental space and all the work on access to drinking water is supplemented by the implementation of adequate basic sanitation systems.
Aerial view of the Carrión de los Céspedes Experimental Plant (Seville, Spain. 2009)
Development of the R&D Plan for Constructed Wetlands in Andalusia (Spain)

> Funding: Water Agency of the Andalusian Regional Ministry of the Environment (Spain).

> The main objective of this plan is to study and analyse the feasibility of constructed wetlands as an appropriate technology for water treatment in small communities in Andalusia.

> It has a three-step approach:

  > A review of the state of the art and preliminary research in the CCEP.

  > Construction and monitoring of water purifying plants with different types of constructed wetlands in different places in the region.

  > Drafting of a Master Plan with the conclusions.

Evaluation study of appropriate technologies for water treatment in small communities in Spain

> Funding: Ministry of the Environment and Rural and Marine Affairs (Spain).

> Project in collaboration with the Spanish Hydrographical Centre.

> This project will produce three documents:

  ➢ The international situation of water treatment in small communities
International R&D&I trends in the field

Production of a “Handbook for the implementation of water treatment systems in small communities”

Reuse of purified waters for environmental purposes: replenishment of aquifers by means of reactive barriers and forestry for energy purposes

> Funding: Ministry of Science and Innovation (Spain).

> Basic research project in collaboration with the Universities of Alcalá de Henares, Rey Juan Carlos (Madrid) and the University of Cordova

> Study of the applicability of two technologies for the reuse of treated urban waste water for environmental purposes in small communities: agricultural techniques (green filters and irrigation of biomass and biofuel crops) and surface replenishment systems (horizontal reactive beds).

> Methodology based on the exhaustive study and monitoring of the system (water, soil and reactive materials in the case of reactive beds, water, soil, plants in the green filter). Identification of the biological, geological and chemical mechanisms involved in the processes of transformation and/or retention and/or extraction of contaminants in each compartment.

Water reclamation by means of Constructed Wetlands in small settlements

> Funding: Water Agency of the Andalusian Regional Ministry of the Environment (Spain).

> The object of this research is to evaluate the capacity of different types of constructed wetlands and how to combine them as wastewater reclamation treatments, and analyse the end uses of reclaimed water.
The study results have been assessed under both the E.U. Urban Wastewater Directive-UWWTD (91/271/EEC), so to evaluate the purifying capacity of this type of systems, and Spanish Royal Decree (1620/2007), in order to evaluate their reuse capacity.

Integrated solution for the treatment of waste water, rainwater and sludge in small communities by means of constructed wetlands

> Funding: Ministry of the Environment and Rural and Marine Affairs (Spain).


> To develop and study an experimental prototype for an urban waste water treatment plant based on the technique of subsurface flow constructed wetlands to achieve integrated water and sludge treatment.

> To define sizing and design criteria for the different elements of the system (hydraulic loads, organic loads, hydraulic residence time), and guidelines for its operation and maintenance.

Research on clogging in horizontal subsurface flow constructed wetlands.

> Funding: Water Agency of the Andalusian Regional Ministry of the Environment (Spain).

> The object is research into clogging in one horizontal flow constructed wetland in the Experimental Plant of Carrión de los Céspedes (CCEP), Seville, Spain.

> The efficiency of this system for removing some pollutants has been studied and the amount of accumulated solids evaluated.
Practical recommendations will be obtained during the study, since the final objective is to continue research into clogging and evaluate the effect of different flooding periods for control purposes.

Reuse of waste waters regenerated by using non-conventional technologies

> Funding: Andalusian Regional Ministry for Research, Science and Enterprise (Spain).

> Excellence Project in collaboration with the University of Cadiz.

> To study the appropriate design, sizing and operational mode of different water treatment technologies (lagooning, constructed wetlands, peat filters, trickling filters and rotating biological contactor), and how to combine them and/or use other technologies to comply with the parameters required by Royal Decree 1620/2007 on the reuse of waste waters.

Reuse of waste waters: study of the efficiency of different technologies for removing organic contaminants

> Funding: Andalusian Regional Ministry for Research, Science and Enterprise (Spain).

> Excellence Project in collaboration with the University of Almeria.

> To evaluate the core effect on the quantification process of polar and non-polar pesticides, phenol compounds, volatile compounds, and polycyclic aromatic hydrocarbons in urban waste water effluent from purifying plants with secondary or tertiary treatments by means of liquid and/or gas chromatography coupled to mass spectrometry detection systems.

> Study of the efficiency of treatment using conventional and non-conventional technologies installed in the CCEP for the removal of
organic contaminant families defined by the EU as priorities from urban waste water.

> Evaluation of the quality of the effluents subjected to tertiary treatment for possible reuse in line with the uses provided for in Royal Decree 1620/2007.

**Production of eucalyptus biomass (Eucalyptus camaldulensis Dehn.) in a Green Filter**

> Funding: Water Agency of the Andalusian Regional Ministry of the Environment (Spain).

> Project in collaboration with the University of Cordova and the Ibersilva Company.

> Estimate of the quantity of biomass produced by Eucalyptus camaldulensis planted in the Green Filter at the CCEP, evaluation of the nutrient accumulation in E. Camaldulensis, and possible modelling of the system.

**Effectiveness of different waste water treatment systems for removing pathogens with a view to planned water reuse**

> Funding: Water Agency of the Andalusian Regional Ministry of the Environment (Spain).

> The main objective is to investigate the effectiveness of different waste water treatment systems for removing pathogens with a view to planned water reuse.

> Besides the study of the parameters required under the E.U. legislation (R.D. 1620/2007), the scope of the project has been widened to include the analysis of other relevant parasites present in waste waters (Cryptosporidium sp. and Giardia sp.).
MELIA PROJECT: Mediterranean dialogue on integrated water management

> Project under the VI Framework Programme involving 45 partners from both the EU and the Mediterranean region (Spain, Italy, France, Cyprus, Greece, Turkey, Morocco, Algeria, Tunisia, Egypt, Syria, Lebanon, Jordan and the Palestinian Territories)

> Coordination project where the main objective is to contribute to the search for solutions which could be applied on both sides of the Mediterranean to solve the problems of water management.

> Study of the operational models applied to water resources in the region with a view to using them as a basis for negotiations on sustainable water management.

> Establishment of dialogue and communication channels at technical, socio-economic and political levels between the partners and other experts to set up a common knowledge framework.

NOVIWAM: Novel Integrated Water Management Systems for Southern European Regions

> Project under the VII Framework Programme jointly coordinated by the Andalusian Water Agency, CITAndalucía and CENTA, which involves 19 partners from 5 countries (Spain, Albania, Cyprus, France and Portugal).

> The objective is to consolidate a network of research clusters aimed at improving management models in the river basins of Southern Europe.

> The CENTA will lead a study into the current situation of such models, which is necessary in order to define the strategy for the implementation of the improvements recommended under the project. Such improvements will be defined during exchanges of personnel, knowledge, and technology, both within and outside the
consortium. The end result should be key tools that will help to achieve the good ecological and chemical status required under the Water Framework Directive.

**WAT: Water and Territories**

- Project under the Spatial Territorial Cooperation Programme for South West Europe 2007-2013 (Interreg IV-B SUDOE). 22 participating partners from 3 countries (Spain, France and Portugal).

- The Project aims to develop an integrative approach thought local pilot experiences, that depending on the partner location, tackle issues ranging from water scarcity to water quality, at different basin scales.

- The goal of the Project is to lay out global strategic solutions to provide an improved water management combining technological solutions with socio-economic factors, institutional analysis and land use management, as well as social consensus of the measures. This will help implementing the Water Framework Directive (2000/60/CE).

- Likewise, the Project will provide a framework to compare legal and institutional contexts regarding water and land use management through the partnership regions (Spain, France and Portugal).

- Specifically, the Andalusian working package is working on the implementation of environmental flows in the upper Guadalete basin.

**CENIT: TEcoAgua. Development of sustainable technologies for the Integral Water Cycle**

The general objective of the work is the study and proposal of ecoefficient alternatives for the treatment and management of sewage sludge generated in
small and medium size municipalities. In order to achieve that objective the following specific objectives were established:

> Literature review regarding different applicable alternatives to the treatment and management of sewage sludge generated in small and medium size municipalities.

> Characterization and quantification of sewage sludge generated in small and medium size wastewater treatment plants (WWTPs).

> Application of OSA process to reduce surplus sludge draining in activated sludge systems, on its modality of extended aeration, in small and medium size settlements.

> Application of technologies for the in situ treatment of the sludge produced in small and medium size WWTPs. Assessment of the quality of the final product and its potential valorization.

> Elaboration of a guide for the treatment and management of surplus sludge generated in small and medium size WWTPs.

CENTA is directly involved in the Phase 2 “Characterization and quantification of sewage sludge generated in small and medium size WWTPs” providing its facilities in the CCEP, including its treatment systems as well as its analytical laboratory.
Equipment validation

During meetings attended by CENTA in Brussels, it has been observed that current trend in the European Union is to establish a European system for the verification of environmental technologies in order to facilitate their marketing, as is already the case in the United States of America and Canada. In the USA, this process is called *Environmental Technology Verification* (ETV) and has the backing of the EPA.

The EU Environmental Technology Plan is intended to eliminate obstacles to the full exploitation of environmental technologies, thereby ensuring a leading position for the EU in the development and implementation of these technologies.

Since 1995, CENTA has been working at the Carrión de los Céspedes Experimental Plant on prototypes from private companies for monitoring and validation purposes. Today, 11 systems are being validated, the main standardised trials being as follows:

- Trial of water purification efficiency under the UNE-EN 12566-3 standard, Annex B, for the CE mark of “Small waste water treatment facilities for communities under 50 population equivalent”.

- Trial under Resolution MEPC.2 (VI) of the IMO (International Maritime Organisation) “Revised guidelines on implementation of effluent standards and performance tests for sewage treatment plants on ships”.

- Evaluation test on pilot prototypes for the treatment of urban waste waters, to determine the behaviour of facilities and the compliance of purified effluent with the limits imposed by the Royal Decree-Law 11/95 on the Reuse of Purified Waste Waters.
Iberoamerican cooperation programme for training and technology transfer in the field of integrated water resource management

> This Programme is supported and promoted by the Conference of Iberoamerican Water Directors (COIAD), with the support of the Iberoamerican General Secretariat (IBGSE), and the institutional backing of the Iberoamerican Forum of Ministers of the Environment. Its objectives include the following:

- To offer qualifications and training in the field of integrated water management in all of Latin America, at political, technical and general levels.

- To establish an Experimental Plant for Non-Conventional Water Treatment Technologies. This would encourage technology transfer and development through dialogue between the parties and countries.

> To comply with the first of these objectives, a Training Programme consisting of ten thematic areas has been drawn up. CENTA has taken part in the thematic area on Supply and Sanitation by giving a course on “Non-Conventional Technologies for Waste Water Treatment”, which was held last February in Santa Cruz de la Sierra (Bolivia) and in August in La Antigua (Guatemala).

> As regards the second objective, the CENTA Foundation, commissioned by the Ministry of the Environment and Rural and Marine Affairs has given technical advice for the design and drafting of the Experimental Plant building project, which is to be constructed in the Uruguayan municipality of Canelones, near the capital Montevideo. It will be based on the design of the Carrión de los Céspedes Experimental Plant (Seville).

> Funding: Ministry of the Environment and Rural and Marine Affairs (Spain).
Technology Transfer Programme with Morocco in the field of Water

> Funding: Water Agency of the Andalusian Regional Ministry of the Environment (Spain).

> CENTA’s first actions in Morocco were carried out in the framework of the Community Initiative Programme (CIP) Interreg II Spain-Morocco (1994-1999) and Interreg II Spain-Morocco (2000-2006).

> In the framework of the Interreg II Operational Programme, a Technology Transfer Programme (TTP) has been carried out under which CENTA has transferred water technology to the North of Morocco. This transfer has resulted in, among other things, the establishment of a Water Technology Transfer Centre (TTC) in Tamouda, Tetuan, which has been jointly managed since then by CENTA and the Loukkos River Basin Water Authorities.

> The TTC is located on the land of old forestry land which was ceded by the High Commissioner for Water and Forestry to the Tetuan Urban Authorities, which in turn put it at the disposal of the Regional Water Directorate of the Loukkos River Basin (currently, the ABHL) so that it could house the facilities in the vicinity of the city of Tetuan. It covers a surface area of three hectares on a terraced area overlooking the River Martil, protected by the Tamouda pine woods.

> The TTC has a lot of space, plentiful service infrastructure, energy and communication systems, as well as waste water sewers and drinking water pipes. The centre also has offices, meeting rooms, classrooms and a store-workshop, as well as a fully-equipped laboratory for the analyses required for monitoring the quality of treated water.

> This centre is similar to the initial design of the Carrión de los Céspedes Experimental Plant (CCEP), its counterpart where trials of small-scale water treatment techniques are being run very successfully.
Collaboration Project with the Moroccan National Office for Drinking Water

> Funding: Spanish Agency for International Development Cooperation (AECID).

> In the field of international cooperation, the CENTA Foundation has signed an agreement with the National Office for Drinking Water (ONEP).

> This agreement is aimed at exchanging knowledge and experiences between both parties and running projects in different fields related to water supply, sanitation, protection of the resource and environmental management in general.

> During 2009, the following activities have been carried out under this agreement:

  ➢ In January, technicians from CENTA travelled to Rabat to give training courses on waste water treatment technologies for small communities.

  ➢ In April, a delegation of technicians and officers from the ONEP travelled to Seville to attend a training course on waste water treatment.

Analysis and studies to elaborate a proposal on a management system for basic environmental sanitation services in the West Bank (Palestinian Territories)

> Funding: Spanish Agency for International Development Cooperation (AECID).

> The project envisages the study and analysis of the sanitation and water treatment situation in the West Bank in order to establish lines of action that would define the technical aspects of the management of the service, covering the basic environmental sanitation problems, adapting this service.
Participation in the AZAHAR Programme of the Spanish Agency for International Development Cooperation

> In a panorama of unequal development in the field of water purification in the Mediterranean countries, the Azahar seminars appear to be an innovative solution which remains faithful to the belief that knowledge transfer is essential for achieving acceptable living standards not only in the regions which can afford to fund their own research projects, but also in those where resources must be used to address more pressing social needs.

> Funding: Spanish Agency for International Development Cooperation (AECID).

> In 2003, a seminar was held on “The Use of Low-Cost Technologies for Waste Water Treatment”. There, the different situations of the participating Mediterranean regions were discussed, leading to the conclusion that it was possible to extrapolate the Andalusian experience in low-cost waste water treatment systems.

> In 2008, Carrión de los Céspedes hosted the seminar on “Waste Water Treatment in Small Communities”, in which the Mediterranean Arc concluded that it was necessary to enhance the communication channels between the neighbouring communities as a channel for knowledge and training for those who require it urgently.

Participation in the Alliance for Water Training Programme

> In 2009, CENTA has taken part in training courses in the Central American countries of Costa Rica and El Salvador.

   The main objectives were to identify the problems faced in each region, to ascertain the progress achieved, to improve technical capacities and to elaborate strategic proposals. The trainees came from Costa Rica, Panama, El Salvador, Nicaragua, Guatemala and Honduras.
Organisation of the Smallwat International Conference

> The Smallwat initiative, in its 2002 edition, was an exceptional international meeting point and a forum for debate between professionals, universities, companies and public administrations responsible for the management of sanitation services. Under the auspices of CENTA, the organising body of the Seville meeting, “New Water Management Models” were discussed and the need for sustainable practice in the field of waste water treatment and sanitation in disperse and rural areas conveyed to the participants.

> Five years later, in 2007, CENTA organised another Smallwat conference with a dual perspective: the analysis of water sanitation systems in small communities and current scientific progress to improve them. Through this approach, between social reality and science, an accurate picture of the state of sanitation facilities throughout the world was obtained, a step towards achieving the Millennium Development Goals. Once again, the Carrión de los Céspedes plant became the driving force and focus of an international meeting which showed how essential it is to have teams properly trained for the application of technological solutions in less developed countries.

> We are currently preparing the third edition of this conference, in 2011, which will take place in Morocco, and again, its main objective will be the
quest for sustainable solutions for sanitation and waste water treatment in disadvantaged countries.
Support for drinking water supply to rural areas in Northern Morocco

> In 1995, the Kingdom of Morocco started to design the Drinking Water Supply in Rural Areas Programme (PAGER) with a view to ensuring the supply of drinking water to a population of 11 million inhabitants living in 31,000 small villages.

> In this context, since the year 2000, the Andalusian Water Agency, through CENTA, has been giving strong support to the Programme by installing simple water supply systems in several rural communities. These systems are low-tech water supply infrastructure (regulation tanks, distribution networks, public fountains, washing places, and drinking troughs), in places where access to drinking water is a more pressing matter than the quality of the service.

> Overall actions carried out by CENTA under the PAGER Programme have benefited more than 20,000 inhabitants, at an approximate cost of €1,500,000.

Support for the National Programme for Environmental Improvement in Rural Schools in Morocco

> As in most countries, in Morocco, urban and rural schools belong to the same national educational system. They should both offer educational opportunities to children and young people in towns and in the country. But unlike urban schools, rural ones do not have the same infrastructure.

> CENTA, through a Framework Cooperation Agreement signed in 2007 with the water authorities of the Loukkos River Basin, is a partner in this Programme. Actions essentially consist of installing basic drinking water supply and sanitation infrastructure.