institute iMdea water

imdea **water** institute

annual report

2019

www.water.imdea.org

Eloy García Calvo
Director, IMDEA Water Institute
May 2020

annual report
2019
www.water.imdea.org

In 2019, IMDEA Agua's most relevant activity indicators grew similarly to previous years. Contracted researchers, links with scientists from other institutions, national and international projects, especially H2020 projects, contracts signed with companies and institutions, scientific articles, participation in committees, diffusion and communication events, and the intense activity of our spin-off Metfilter, are the indicators that show the growth of our activity in 2019.

Of the 11 international projects underway, IMDEA Agua holds the technical-scientific leadership of two out of five H2020 projects. The overall objectives of these projects are: gaining knowledge in areas that use the electrical characteristics of microorganisms to generate drinking water and treat wastewater with major energy savings; areas related to the impact of chemical products and microplastics on the environment; sustainability in aquiculture and governance.

The 16 nationally funded projects deal with different themes, but those that use nature-based technology to treat and regenerate wastewater, and those related to the biological status of waters, e.g., detecting cyanobacteria, or recovering osmosis membranes to be later applied in nano- and ultrafiltration, are worth mentioning.

Of the R&D contracts, it is worth highlighting four of them, two signed with the World Bank for research activity in Lake Chad and Bulgaria, and two Framework Contracts with the EU, Directorate General for Environment and the European Parliament, forming part of European research consortia.

The spin-off Metfilter has focused its activity on water treatment from the oil and gas industry, successfully finished several pilot tests and shared the ownership of the technology with a company from the sector.

IMDEA Agua continues to coordinate an interuniversity PhD programme with the universities of Alcalá and Rey Juan Carlos with 30 students registered for the programme and seven defended theses in 2019. IMDEA Agua researchers have directed 26 master's theses in four different master's programmes.

Outreach is a very important activity related to water and its social perception. Events like the International Woman's and Girls in Science Day, International Water Day, Feria Madrid for Science and Innovation, National Science Week and European Researchers Night are events that IMDEA Agua very actively participates in, and its activities involving the public are generally successful. There have been hundreds of articles, interviews, video reports, and press releases in the media about our institute members' activities.

Among the recognitions received, it is worth highlighting the multidisciplinary team of researchers at IMDEA Agua known as Bioforward, which won the Spanish edition of Climate Launchpad 2019, the world's biggest competition of green business ideas. Its coordinator, JM Ortiz, won the jury' best pitch award. Two awards for best posters in international congresses, the best article 2018 in a first-quartile journal and the best presentation at an international symposium are some of the distinctions made to our researchers.

Finally, I want to thank all those who, by belonging to the institution or participating in its activities, have maintained their commitment, enthusiasm and daily efforts to our institution to improve every day and be more useful for the society to which we belong.

words from the director...

annual report 2019

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IMDEA Water Institute

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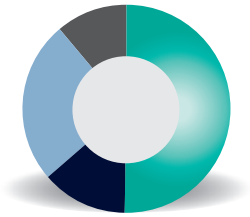
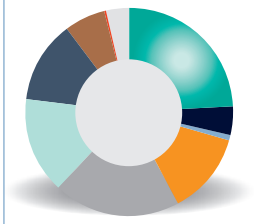
Human Capital



- **46** Researches
- **12** Laboratory staff
- **23** Associated researchers
- **10** Administration and management staff

Scientific results



- **50** Articles in journals, 40 in high impact journals (Q1)
- **9** Books chapters
- **2** Scientific-Technical Reports
- **26** Lectures
- **41** Round tables and experts panels
- **31** Participation in Scientific Committees
- **26** Oral Communications
- **13** Posters
- **1** Patent
- **7** PhD thesis defended

Origin of funds

- Total income **4.050.508 €**
- **46%** from projects & contracts
- **11** Active international projects
- **12** National and regional projects
- **12** contracts, **3** of them Framework contracts with European Union

1

Spin-off METfilter

with water treatment in 3 sectors (urban, petrochemical, livestock)

4

pilot plants

membrane technology, outdoor mesocosm facilities, microbial electrochemical technologies, land application systems

4

High-level up-to-date specialized laboratories

chemical analysis, soil, biology and microbiology and geomatic

overview

IMDEA Water Institute is a public non-profit organisation promoted by the Madrid Regional Government, engaged in excellent research focused on contributing the innovative elements necessary in a strategic sector such as water, as well as providing highly competitive postgraduate lectures and courses. Training for scientists and professionals, primordial for IMDEA Water, is carried out through organising and collaborating in doctorate programmes, masters and other courses, thus helping to compensate society for the effort made in maintaining the Institute.

vision

The institute's vision is to become an internationally acknowledged centre of excellence for research and innovation on water issues. Helping Madrid take pride of place among the regions generating knowledge and facilitating innovation, by providing solutions to problems and challenges in water management.

mission

The mission is to foster multidisciplinary research and innovation on water issues, generating affordable and sustainable solutions for water-related issues and management. Likewise, to create an efficient development model for science and technology in collaboration with the production sector.

The IMDEA Water Institute has developed prestige and recognition in the areas of sustainable management of water bodies, quality and pollution, water treatment and water reuse and economic and institutional analysis.

RESEARCH GROUPS

Soil and Water Quality in the Environment

Membrane Technology

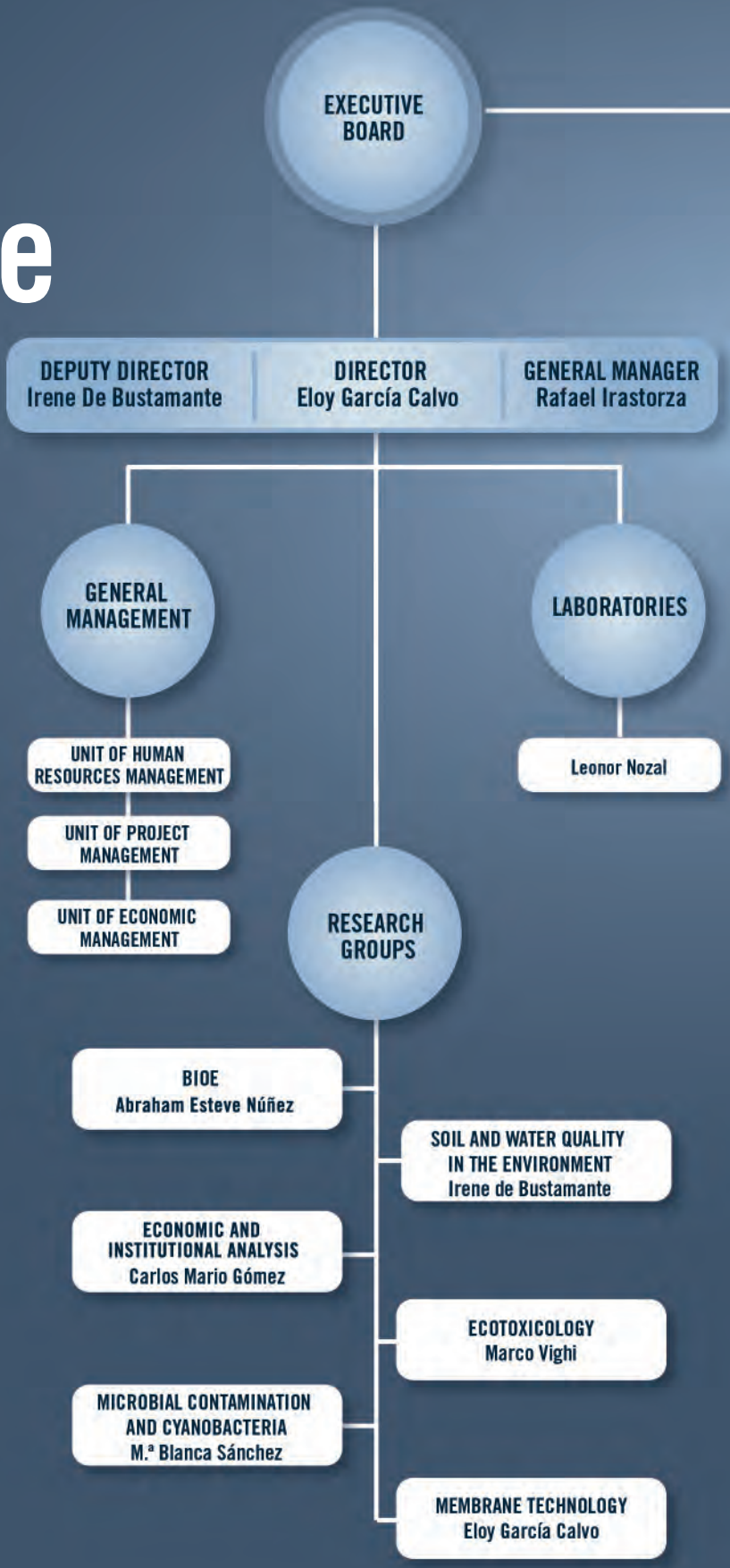
Bioe

Economic and Institutional Analysis

Microbial contamination and Cyanobacteria

Ecotoxicology

our structure



our structure

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Water management consultant in innovative water supply strategies
Texas. USA

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Department of civil and Water Engineering
Laval University. Quebec. Canada

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Technical Director
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collaboration

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Universitat d'Alacant
Universidad de Alicante

Universidad Rey Juan Carlos

Universidad de Jaén

Instituto Geológico y Minero de España

ECOVID
Centro de Investigaciones y Servicios Ambientales

IÑALES
PARQUE NACIONAL

Universidad Complutense Madrid

CSIC
Consejo Superior de Investigaciones Científicas

KISR
معهد الكويت للأبحاث العلمية
Kuwait Institute for Scientific Research

centa

FCIHS

CENTRO PARA EL CONOCIMIENTO DEL PAISAJE

UNIPAZ
Instituto Universitario De La Paz.

Centro Nacional de Areas Protegidas
CNAP

JGI

SECRETARÍA DEL AGUA

Universitat de Girona

Universidad de la Guajira

INIA
Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria

COLLABORATION WITH COMPANIES

sacyr sadyt INDUSTRIAL
DAM Depuración de Aguas del Mediterráneo
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GRUPO SOIL
aqualia
Wasser
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Mahou
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a-c ing AQUA-CONSULT INGENIEROS
Petronor
Experis IT ManpowerGroup
nanoelectra
GRUPO EULEN
GAMMA TECNOLOGÍA Y MEDIO AMBIENTE

PLATFORMS AND ASSOCIATIONS

RHC Renewable Heating & Cooling European Technology Platform
geoplat
AEDyR ASOCIACIÓN ESPAÑOLA DE DESALACIÓN y REUTILIZACIÓN
ΣH2O PLATAFORMA TECNOLÓGICA ESPAÑOLA DEL AGUA
water footprint network
ASERSA Asociación Española de Reutilización Sostenible del Agua ¡Reutiliza Agua!
afre ASOCIACIÓN DE FABRICANTES PARA AGUA Y RIEGO ESPAÑOLES
IWA International Water Association
Medio Ambiente Asociación Nacional GN Medio Ambiente
netwerch2o
Water Europe Technology & Innovation
EUMED professionals & experts consortium
QWI WATER IS OUR CONCERN
Aeas Asociación Española de Abastecimientos de Agua y Saneamiento
RED ESPAÑOLA PARA EL DESARROLLO SOSTENIBLE
SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK A GLOBAL INITIATIVE FOR THE UNITED NATIONS
IDA International Desalination Association
OECD Water Governance Programme

infrastructures and scientific equipment

Chemical Analysis Lab
Basic Analysis Unit

In this unit we analyse several physical and chemical parameters laid down in the regulations on control of water quality and dumping.

Equipment

- Particle counter for water samples (0.2 microns and 2 microns). LS_200 model from Particle Measuring System Inc.
- Visible UV spectrophotometer (190-1.100 nm). UV-1800 model from Shimadzu.
- Total Organic Carbon (TOC) Analyzer. TOC-V CSH model.

Applications

- Organoleptic assays: Colour and turbidity.
- Physical-chemical testing: Basic parameters such as pH, conductivity, temperature, redox potential, Total Kjeldahl Nitrogen, total phosphorus, free and total chlorine, alkalinity, suspended solids (TSS), total organic carbon (TOC), DBO_5, DQO, total nitrogen, etc.

Chemical Analysis Lab
Chromatography Unit

Liquid Chromatography coupled to Ultraviolet-Visible (HPLC-UV)

High resolution liquid chromatography (HPLC) is one of the most widely used separation techniques, due to its versatility and broad field of application.

Equipment

The HPLC Model 1200 (Agilent Technologies) apparatus includes a vacuum degasser, quaternary pump, automatic injector, thermostatted column compartment and diode detector (DAD).

Applications

The field of application for this technique is very wide-ranging. Some of the applications are listed here:

- Determination of organic pollutants (pesticides, herbicides, phenols, PCBs).
- Pharmaceutical products (antibiotics, sedatives, painkillers).
- Foodstuffs: artificial sweeteners, antioxidants, additives.
- Quantitative analysis of compounds of interest.

Ion Chromatography

Ion Chromatography is a variant of High Performance Liquid Chromatography (HPLC). Separation and determination of ions is carried out, based on the use of ion exchange resins. This type of chromatography is subdivided into cation and anion exchange chromatography, with the latter featuring most applications.

Equipment

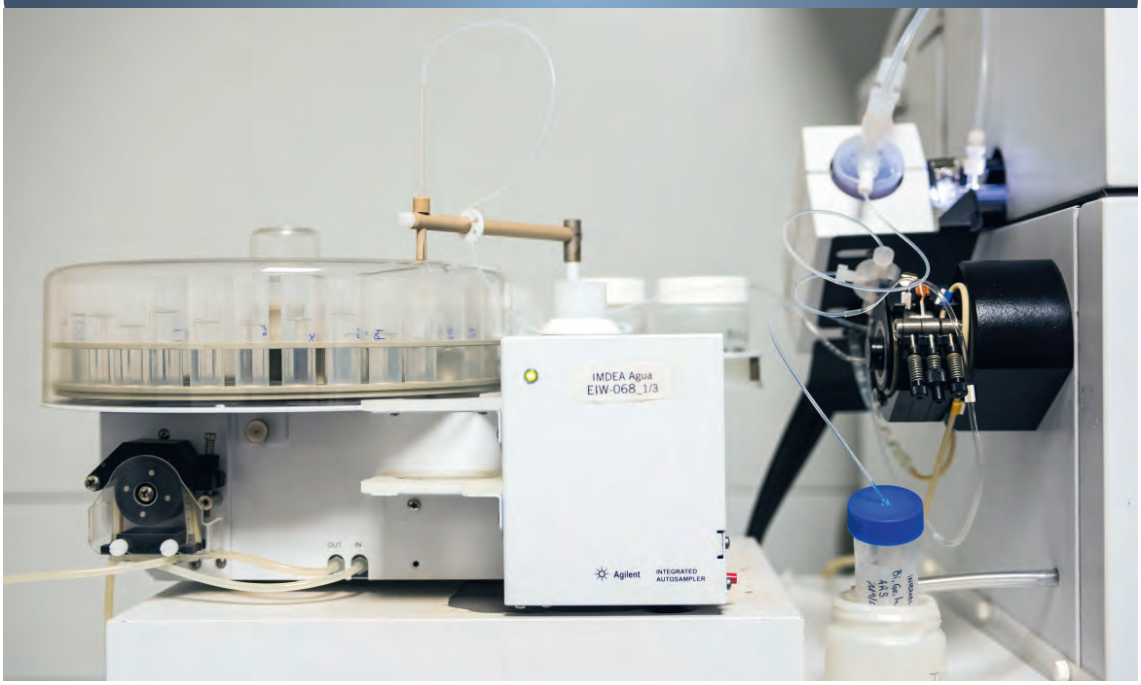
- Dual channel Ion Chromatography system model 861 Advances compact IC (Metrohm), with sequential chemical suppression and samples ultrafiltration. Simultaneous determination of anions and cations with conductivity detector.

Applications

With detection by conductivity.

- Anion analysis (F^-, Cl^-, NO_2^-, Br^-, NO_3^-, PO_4^{3-}, SO_4^{2-}) in aqueous matrices.
- Cation analysis (Na^+, NH_4^+, K^+, Mg^{2+}, Ca^{2+}) in aqueous matrices.

Chemical Analysis Lab
ICP-MS Unit



The analytical technique with the greatest potential for determination of trace level elements in all types of matrices. It is usually necessary to perform a sample digestion.

Equipment

Inductively coupled plasma - mass spectrometer (ICP-MS), model 7700 x (Agilent Technologies). High levels of performance, reliability and automation. Includes a collision cell system in helium mode; greater sensitivity, less background noise, increased removal of spectral interferences and 'no gas' mode. Option of coupling separation techniques such as high performance liquid chromatography (HPLC).

Applications

- The majority of elements in the periodic table can be analysed using this technique.
- Semi-quantitave multi-element analysis. To determine the major and minor elements in a sample. Allows semi-quantitative determinations of elements for which there is no comercial standard with an error lower than 15%.
- Quantitative analysis of elements of interest Linear dynamic range of 8 orders of magnitude (ng/L (ppt) – mg/L (ppm)) and low detection limits (ng/L (ppt)) for most elements
- Gauging the isotopic ratios of an element.
- Analysis of small sampling volumes (<600 µl)
- Analysing solid biological, organic and inorganic samples by acid digestion and microwave treatments.
- Environmental applications (waters, soils, sediments and residues).
- Determining metals and possible contaminants in soils (fertilisers) and inland drinking waters (dumping).
- Speciation of metals in complex matrices.
- Quantification of inorganic nanoparticles.

Chemical Analysis Lab
Mass Spectrometry Unit

Mass Spectrometry (MS) is a highly sensitive instrumental analytical technique able to quali- and quantitatively assess all types of mixtures of substances. In addition, this technique also determines the molecular mass of a compound, as well at the different fragments resulting from controlled break-up of the same, providing highly valuable information on the molecular structure. The ions are separated according to their mass/charge (m/z) ratio and detected.

The great advantage of high-resolution mass spectrometry compared to low resolution is the greater precision and accuracy of the mass, due to the more high-performance features of the time of flight-quadrupole analysers (TOF and QTOF). These allow unequivocal identification of the exact mass of a compound.

Equipment

- Bidimensional Gas Chromatography/ MS (GC x GC/ TOF). Pegasus (LECO) and GC model 7890A from Agilent Technologies.
- Gas Chromatography / Triple Quadrupole (GC-MS/MS). GC model 7890A and triple quadrupole detector model 7000 (Agilent Technologies). This system is coupled to a Gerstel twister brand Autosampler.
- Liquid Chromatography (LC-QTOF) equipment. Triple TOF 5600 model (AB sciex).
- Liquid Chromatography /MS (LC-TOF) equipment (model G6280B, Agilent Technologies).
- Liquid Chromatography /Triple Quadrupole (LC-MS/MS) (model 6495A, Agilent Technologies).

Applications

- Analysis of organic micropollutants in waters by GC-MS/MS (organochlorine and organophosphorus pesticides, trihalomethanes, polyaromatic hydrocarbons) by means of LC-MS (TOF) y LC-MS/MS (QTOF) (drug and multi-residue)
- Determination of impurities in pesticide products.
- Assays to determine exact mass and fragmentation studies.
- Identifying compounds, or fragments of the same, by their mass spectrum in comparison with GC-MS libraries.
- New analytical, methods are constantly being developed to adapt to the new requirements laid down in current legislation on monitoring water quality and control parameters.

Soil Lab

IMDEA-Water has a laboratory dedicated to analysis of soils, sediments and similar solid matrices, such as humus or reactive materials. Activities mainly focus on determining physical-chemical properties for characterisation from an agronomic standpoint. The study of these solid matrixes is of prime importance, as characterising the soil-water system is crucial when assessing the use of water in activities such as irrigation or artificial recharge of aquifers. The impact on soil of water reuse for environmental purposes is highlighted, as it depends on the quality of the water utilised, which will vary depending on its source. This procedure thus helps define the efficacy of treatments whose effluents may be used in one of the environmental uses, or to analyse water quality according to source. In short, soil monitoring is a necessary tool when assessing the management of water resources.

Equipment

- Area for pre-treatment of samples.
- Richards plates to calculate moisture retention.
- Microwave/Oven for digestion and extraction.

Applications

- Texture.
- Moisture, pH and electrical conductivity.
- Organic Matter.
- Total nitrogen, assimilable phosphorus, nitrates.
- Total calcium carbonate.
- Cation exchange capacity and exchangeable bases (Na^{+}, K^{+}, Ca^{2+}, Mg^{2+}).
- Exchangeable aluminium.
- Metals.
- Phosphates retention.
- Assimilable boron.
- Calcium carbonate equivalent content.
- Amorphous content (Si, Al, Fe).
- Total organic carbon content.
- Moisture retention curve.

Biology and Microbiology Lab

The Biology and Microbiology Laboratory supports water quality monitoring programs through standardized and innovative methods to achieve the objectives set by the Water Framework Directive (DMA 2000/60/EC).

Equipment

Microscopy unit: the microscopy unit is equipped with high-quality optical microscopes, with high-resolution photo-mounting systems, to facilitate identification and counting microscopic organisms:

- Light microscope.
- Stereo microscopes.
- Digital photo camera.

Cyanobacteria and cyanotoxins unit:

- Incubator for cyanobacteria and bacteria cultures.
- Rotary evaporator with a cooling system, Buchi, for extraction of cyanotoxins.
- Solid Phase extraction equipment, for concentrating toxin extracts.

Molecular biology unit:

- Electrophoresis gels Documentation System.
- Real Time PCR (AB7300) for quantitative and qualitative gene studies.
- Nano-photometer (Epoch) for the quantification of DNA and RNA.
- Gel electrophoresis equipment (Biorad) for DNA and RNA.
- Thermocycler (PCR) for DNA amplification.
- Homogenizer for DNA extraction (Precellys).

Ecotoxicology unit:

- Incubators for testing under standard conditions.
- Cultures of algae, invertebrates and fish.
- Tanks of different sizes for standard and microcosm tests.
- Bathtubs with automatic temperature and lighting regulation.

Field equipment for ecological monitoring of rivers:

- Equipment for measuring temperature, conductivity, dissolved oxygen and pH in situ.
- Electrical contact indicator.
- GPS.
- Screens and networks for macroinvertebrate and phytoplankton sampling.
- Flowmeter.

Applications

- Monitoring of cyanobacteria blooms and their toxins (microcystins) in surface waters.
- Analysis of microbiological indicators *(E. coli, Enterococcos, Coliforms, Costridium, Pseudomonas aeruginosa)* to determine the quality of drinking and recreational waters.
- Analysis of biological indicators for the determination of the ecological state of the waters.
- Determination of Minimum Inhibitory Concentrations (MICs) of microorganisms (antiobiograms).
- Acute and chronic toxicity tests with algae, invertebrates and fish following standard protocols (ISO, OECD).
- Microcosm and mesocosm test at the population and community level.

Pilot Plants

Membrane technology

In the laboratory of membrane technology the following equipment can be found:

- Two laboratory-scale cross-flow stainless steel test units for flat-sheet membranes. The systems can be used as a microfiltration, ultrafiltration, nanofiltration or reverse osmosis.
- A spiral wound ultrafiltration and reverse osmosis membrane pilot plants that can be coupled and used in serie.
- Three stirred cell (lab scale) for ultrafiltration and nanofiltration membranes.
- A membrane bioreactor for wastewater treatment.
- Laboratory scale electrodialysis system.
- Laboratory scale forward osmosis system.
- Automatic membrane coating device with different coating speeds and different coating thicknesses to prepare membranes for different applications.
- Table to conduct membrane autopsies.

Microbial electrochemical technologies

The Microbial Electrochemical Technologies pilot plant provides an ideal space for companies in the sector that want to perform pre-industrial tests based on the interaction microorganism-electrode.

- Gradostat
- Lab-scale microbial electrochemical reactor for environmental biotechnology studies.
- Electrocoagulation reactor for wastewater treatment and removal of pollutants.

- Pre-Industrial microbial desalination stack for sustainable desalination of brackish and sea water using organic matter.
- MET4Nitrogen: It is a treatment system designed for the removal of nitrogen from waters with low loads of organic matter.
- METland® for treating real wastewater and removed of pollutants.
- Electrogenic biofilters for treating different kinds of wastewaters containing organic matter.
- Gas cromatography
- Electrochemical instrumentation.
- Microbial electrochemical fluized bed reactors (MEFBR) for wastewater treatment and to produce valuable products (bioelectrosynthesis).

Outdoor mesocosm facilities

- Artifical ponds: Twenty-four artifical ponds (1 m3) for assessing the fate and effects of chemicals in lentic ecosystems.
- Aritificial channels: Nine artificial channels (5 m length, 30 cm wide) for assessing the fate and effects of chemicals in lotic ecosystems.
- Biodiversity lagoon: artificial lagoon (30 m3) for growing aquatic plants and invertebrates for their use in the experiments.

Land application systems

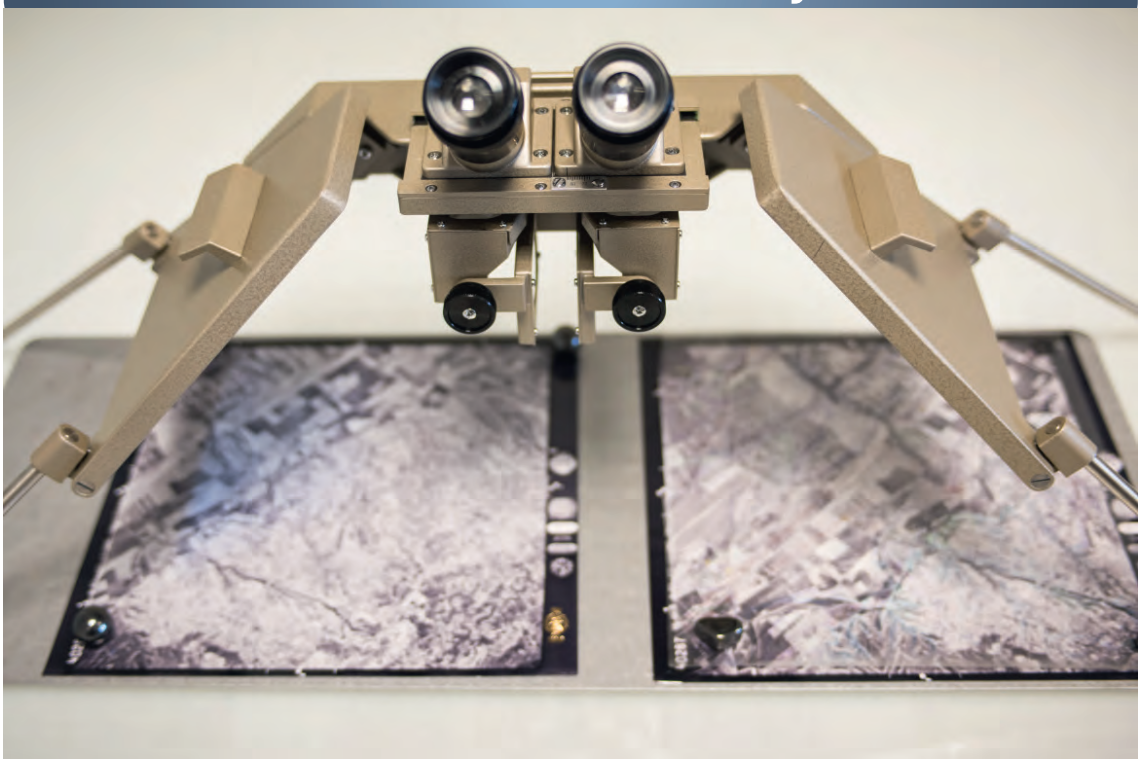
Pilot plant to carry out wastewater treatment and reuse researchs using nature-based solutions.

- Vegetation filters: two plots of 50 m^2 equipped with: flow meters, irrigation hydrants, impulse pumps, possibility of installing ttanks to test any type of water, piezometers and lysimeters.

- Column leaching equipment: The equipment is used to study the contaminant reactive transport under variable saturated conditions. The system includes the following components:

1. Peristaltic pump to provide at a controlled rate the influent containing the contaminant solution to the system.
2. Flow cell filled up with the reactive porous media through which contaminants infiltrate.
3. Vacuum chamber and pressure regulator (unsaturated conditions only): The flow cell outlet is connected to the vacuum chamber through which the moisture content is modified.
4. Tensiometers with pressure transducers: to measure the soil water tension in the flow cell. The tension is then related to the water content using the porous media-water retention curve.
5. Oxygen dipping probes to monitor the redox conditions in the flow cell. The optical measurement is based on the fluorescence-quenching effect of oxygen.
6. Fraction collector to sample at regular time steps the effluent from the flow cell.

Geomatic Laboratory



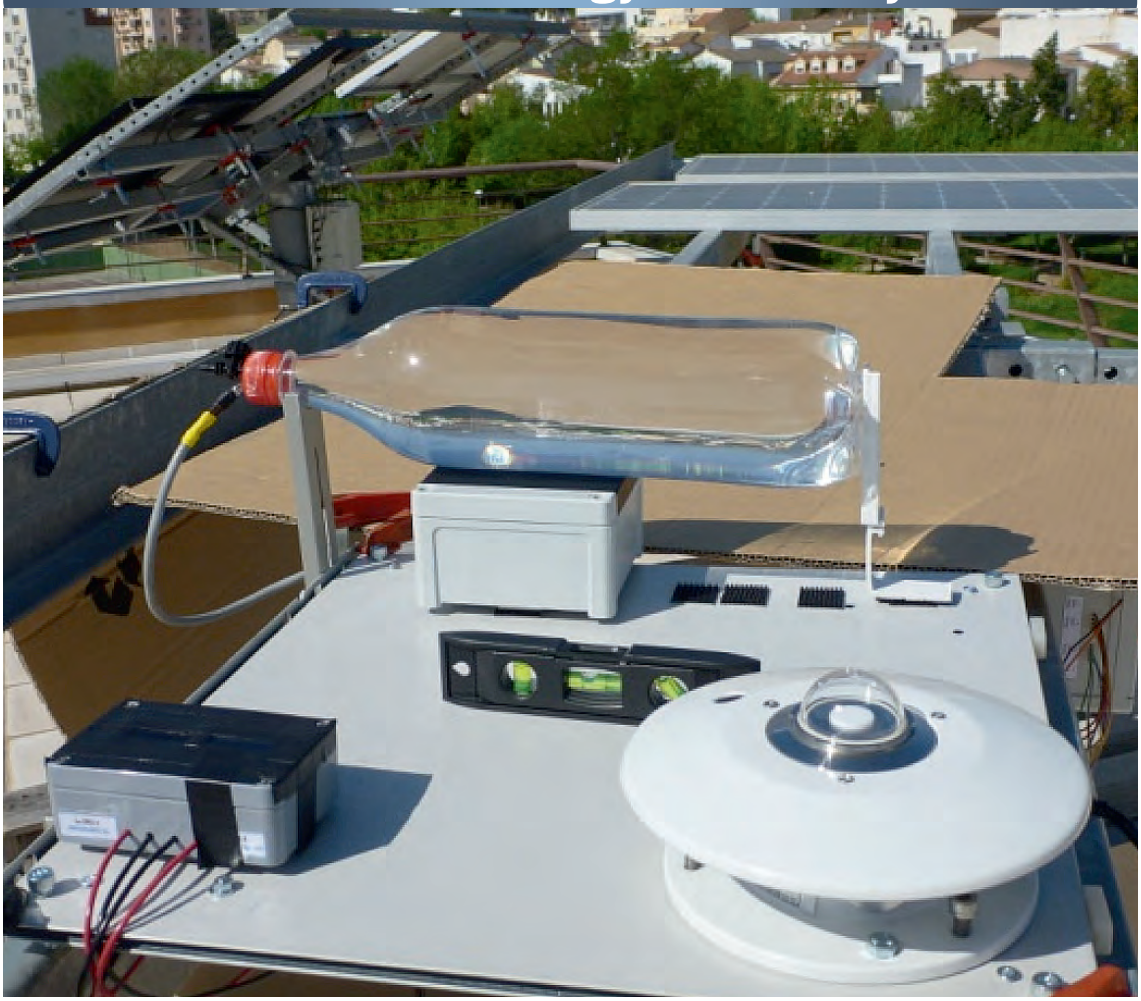
The Geomatics Unit is a resource that provides an infrastructure dedicated to solutions based on new technologies. The Lab has a complete framework consisting of a set of hardware, software, and databases, with which a wide range of needs are covered, such as:

- Modelling.
- Development of specific maps using remote sensing techniques, GPS and conventional documentary sources.
- Automation of data collection.
- Application of simulation models.

Equipment

- ARCGIS.
- GIS IDRISI.
- GIS ILWIS.
- GIS GVSIG.
- SAGA GIS.
- QUANTUM GIS.
- ERDAS IMAGINE.
- ER-MAPPER.
- OPTICKS.
- Geostatistics SURFER.
- Spatial Metric Analysis -FRAGSTAT.
- Estimation of Soil Parameters, Hydrologic Modelling - HEC and SWMM family.
- Automated water data collection systems.
- Water Erosion Models - WEAP.
- Hydrogeological models: Hydrus 1D, CXTFIT, PHREEQC-2.
- Statistical analysis programs: Tanagra, R.
- Terminals under a central server.
- Peripherals of different sizes, including printers, plotters and a medium format scanner.
- Support materials that aid data collection and its inclusion in drive systems (laptops, pagers, GPS and SLR cameras).

Water and Energy Laboratory



Manufacturing

Soldering station, vacuum pumps and chambers for cell encapsulation with silicone.

Electronic testing

- DC power supply.
- Oscilloscope.
- Function generator.
- Bench multimeter.
- Datalogger.
- Basic sun simulator (artificial lamp).

Outdoors monitoring

- Pyranometer.
- UV radiometer.
- Portable spectroradiometer.
- Temperature sensor, wind speed, wind direction.
- Portable datalogger.
- Calibrated solar cells.
- Pumps.
- Shunt resistors for PV modules testing.
- Flowmeters.
- Hand multimeters.
- Waterproof temperature sensors.
- RTD sensors for modules temperatures.
- Adjustable mounting structure.

projects and contracts

projects and contracts

1. Projects

1.1. Urban and Industrial Wastewater Treatment

1.1.1. Microbial Desalination for Low Energy Drinking Water (MIDES)

http://midesh2020.eu/

Objectives

The MIDES H2020 Project is focused on the development of new desalination technologies with low energy consumption. MIDES is the acronym for MIcrobial DESalination, and we use bioelectrochemical systems for desalination of seawater with energy consumption below 0.5 kWh m^{-3}, using the energy contained in organic matter.

General activities

MIDES project is made up of 10 partners from 7 different countries, a broad consortium that covers all the aspects of the project may involve, from the development of materials to the modelling and control of processes, with a remarkable scientific and technical development of the systems.

Expected results

The project envisaged the validation of MDC technology at pilot plant scale for brakish and sea water desalination, in order to determine the most favourable markets for the application of technology, from water treatments for industry, tertiary systems, decentralized desalination, to other potential uses.

1.1.2. Advanced Nutrient Solutions With Electrochemical Recovery (LIFE ANSWER)

http://life-answer.eu/en/

Objectives

ANSWER aims to demonstrate the technical and economic feasibility of combining electrochemical and bioelectrochemical technologies for treating wastewater from food&beverage industrial sector. Moreover, we are integrating circular economy strategies to make ANSWER a sustainable solution.

General activities

The project is being conducted at demo scale in one of the largest beer production plant of Europe (Alovera, property of MAHOU). The solution consist in combining an electro-

coagulation module and a microbial electrochemical Fluidized bed Reactor (ME-FBR) for treating a real brewery wastewater effluent.

Expected results

We expect to fulfil all dicharge limit for water re-use by both removing organic pollutants from effluent and producing energy because of the valuable gases generated in ME-FBR. Moreover, we expect to convert nutrients from wastewater into an organic fertilizer. A number resilience assays will demonstrate the robustness of the solution.

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1.1.3. Low-energy technology for drinking water: microbial desalination (BioDES)

Objectives

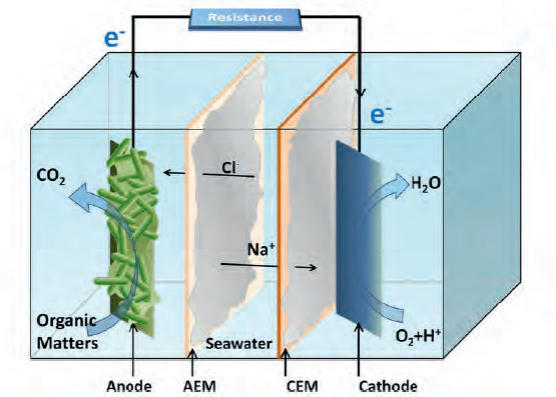
BioDES aims to develop an innovative and low-energy technology for drinking water production, using Microbial Desalination Cell technology either as stand-alone or as pre-treatment step for RO, and develop a sustainable desalination process for fresh water production.

General activities

The project has been focused on overcoming the current limitations of MDC technology at lab scale, such as low desalination rate, high manufacturing cost, biofouling and scaling problems on membranes, and optimizing the microbial-electrochemical process.

Expected results

Among the obtained results, it is important to note the 85% reduction in energy cost compared with current desalination, 75% reduction of the cost of desalinated water, and the 20-fold increase of fresh water production compared to state-of-the-art MDC systems. The experimental results will allow the scale-up of the technology and further validation in real environments.



1.1.4. Electricity driven low energy and chemical input technology for accelerated bioremediation (ELECTRA)

https://www.electra.site/

Objectives

ELECTRA is a 4-year Research Innovation Action consisting of one EU-Chinese- consortium. ELECTRA aims to jointly develop and test highly innovative bioelectrochemical systems in bioremediation at both laboratory scale and environmentally relevant conditions.

General activities

ELECTRA will lift microbial electrochemical systems to a next level for field applications and *in situ* remediation of pollutants. ELECTRA will deliver two sets of 10 innovative environmental MET-based biotechnologies, tailored for different environmental matrixes (wastewater, groundwater, flooded soil…) and accelerating the removal of several classes of pollutants and mixtures thereof.

Expected results

In the environment, electron-flow typically limits degradation, and is difficult to control; this major hurdle can be overcome with electromicrobiology. We expect to develop new solutions minimizing or eliminating energy and/or chemical needs for removing different pollutants from different matrixes.

1.1.5. 3D-Printing electricity-producing bacteria: a new paradigm for developing graphene-based biosensors (PRINTBIO)

https://attract-eu.com/selected-projects/

Objectives

The overall goal of PRINTBIO is to "domesticate" and to 3D print the electricity-producing bacteria form the genus *Geobacter* to convert this strain in *à-la-carte* bioelectrochemical biosensor using graphene-based screen printed electrode as electrochemical platform.

General activities

We are following a 3D printing approach to create *Geobacter*-derived functional using a electroconductive and biocompatible hydrogel. Moreover we will follow a system biology approach to test genetically engineered. *Geobacter* strains able to switch on-off the capacity of electricity production conditioned to the presence of a specific analyte.

Expected results

To develop a proof of concept case regarding the use of a novel bioelectrochemical 3D-platform for detecting pollutants by using the metabolism of electroactive bacteria from *Geobacter* genus.

1.1.6. Microbial electrochemical reactors based on fluid-like electrodes: a new biotech platform for performing environmental applications (MET-FLUID)

Objectives

Our project aims to design, construct and operate a microbial electrochemical fluidized bed reactor ME-FBR platform to explore different biotechnological applications with an environmental focus. We have designed a work plan to accelerate the screening of the technology with a sole purpose: to identify potential environmental cases that can lead to successful projects beyond MET-FLUID.

General activities

We are exploring both anodic and cathodic electrochemical performance by using fluid-like electrodes. In this context we are investigating the use of new materials, and microorganism with novel capacities for removing pollutants or synthesize high valuable products.

Expected results

We expect to develop a bioelectrochemical platform for finding new environmental application in the field of bioremediation of bioelectrosynthesis at proof-of-concept level. At the end of the Project the TRL c) should be high enough to suggest a further development.

1.1.7. Design and construction of electrogenic wetlands for the removal of emerging pollutants in urban wastewater

Comunidad de Madrid

Objectives

Our project aims to evaluate the role of microbial electrochemistry in the biodegradation of emerging pollutants from real urban wastewater generated at IMDEA Water Institute.

General activities

We have constructed a electrochemically-assisted constructed wetland, so-called METland®, in the facilities of IMDEA WATER with the purpose of treating the dairy production of wastewater from the institute. We are **monitoring the pollutant removal (including COD, nutrients and emerging pollutants) together with ecotoxicological parameters of treated wastewater**.

Expected results

We expect to setup the operation conditions for METland® technology to achieve the optimal removal of pollutants from a real urban wastewater with low COD. The treatment in combination with ultrafiltration should generate a water with re-use quality.

1.1.8. Design, construction and validation of METlands technologies applied to the disposal of nutrients in wastewater

Comunidad de Madrid

Objectives

This project aims to explore the electron donor capacity of vegetal waste for promoting nitrate reduction (denitrification) in bioelectrochemically-assisted constructed wetland (so-called METland®).

General activities

Our *modus operandi* includes the exhaustive analysis of potential materials through a circular economy strategy. We are treating real wastewater from IMDEA water headquarters using a denitrifying prototype of METland® in combination with ultrafiltration. We are also exploring the microbial communities responsible of coupling electrons from waste and nitrate reduction.

Expected results

We expect to setup the operation conditions for generating a nitrogen-free high quality effluent from an office building that may serve as inspiration for future implementations.

1.2. Reclaimed Water Reuse

1.2.1. Water reclamation by using a new concept of land application systems (FILVER+)

Objectives

FILVER+ aims to develop an Amended Land Application System (ALAS) as a technology for secondary and tertiary treatment enhanced by the application of low cost and easy to get amendments. Target contaminants are nutrients, pathogens and contaminants of emerging concern.

General activities

Test different soil amendments to improve attenuation of target contaminants; identify reactive processes in the vadose zone; upscale experimental results to pilot scale evaluating the performance of the ALAS; economical and financial analysis.

Expected results

The enhanced treatment achieved by Filver+ will entail a sustainable solution for small and scattered populations transforming residues (wastewater and pruning wastes) into valuable resources.

1.2.2. Irrigation of crops with surface water contaminated with pharmaceuticals and trace metals: natural attenuation or health risk? (FatePharM)

Objectives

FatePharM aims to assess the fate in the environment of pharmaceuticals and trace metals and the associated risk for human health during unplanned water reuse for crop irrigation.

General activities

Assess the contamination status of several environmental compartments; identify contaminant transport dynamic through the soil; evaluate the impact of chemical mixtures on soil quality; elucidate the fate of antibiotic resistance bacteria, assess the translocation of contaminants through the crops.

Expected results

Data from the extensive research of FatePharM will contribute to determine the level of exposure for the environment and the human health in unplanned water reuse for crop irrigation.

1.3. Economic and Institutional Analysis

Objectives

Analyse the link between water, policies, the economy and institutions.

General activities

Applied research on the following issues: analysis of the design and implementation of economic policy instruments for sustainable water management (economic behavior analysis, Economic Policy Instruments-EPIs); economic dimensions of Integrated water resources management (environmental & natural resources economics, hydro-economic modelling and analysis/prioritization of water investments, CBA, CEA, cost-recovery analysis, new decision-making methods, socio-ecological modelling, economic evaluation of ecosystem services, regulatory impact assessment, link environmental policy-macroeconomic performance, climate change adaptation and disaster risk reduction and nexus approach); urban water cycle economic regulation and water governance.

Expected results

Make useful scientific contributions for addressing current global and local water management challenges.

1.4. Membrane Technology

1.4.1. Innovation and recycling of membranes for water treatment (INREMEM) http://inremem.simplesite.com/

Objectives

The main objective of the INREMEM project is to recycle disposed reverse osmosis membranes (at laboratory scale) and to transform them into membranes that will be used in the treatment of waters from different sources: wastewater, surface water and osmotic solutions.

General activities

INREMEM studies the development and implementation of recycled membranes in 5 different water treatment technologies:

a) biomembranes for the treatment of surface water,

b) membrane bioreactors for wastewater treatment,

c) forward osmosis for wastewater treatment,

d) electrodialysis for the regeneration of osmotic solutions and

e) membrane distillation for the regeneration of osmotic solutions.

Expected results

INREMEM provides an alternative membrane management route to the disposal in landfills of end-of-life membranes. INREMEM will contribute to circular economy approach as well as to the effort of the European Union to become a "recycling society".

1.4.2. Immobilized Laccases for the degradation of aromatic compounds from wastewaters (LIDA)

http://www.cyted.org/es/lida

Objectives

The network is composed by 15 research groups 7 Ibero-American countries. The main objective of LIDA network is to develop sustainable strategies based on immobilized novel laccase enzymes for the degradation of phenolic and aromatic compounds from different industrial wastewaters.

General activities

The network organizes different dissemination and training activities and promotes the exchange of professors and PhD students between the research groups participating in the project. LIDA networks looks for new funding opportunities to carry out research projects.

Expected results

The network will boost the cooperation between research institutes and industries, creating new consortiums, research projects and promoting the scaling up of sustainable enzymatic systems for water treatment.

1.4.3. Hybrid wastewater treatments based on recycled membranes with the objective of zero liquid discharge (ZLD) (INREMEM 2.0)

Objectives

The main objective of INREMEM 2.0 is the recovery of valuable compounds such as water, nutrients (phosphates or nitrates) and other salts (NaCl), from wastewater with high salinity content, using hybrid systems based on recycled membranes coming from discarded RO membranes.

General activities

INREMEM 2.0 proposes the combination of different hybrid systems based on recycled membranes (Membrane Bioreactor, Nanofiltration, Membrane Distillation and Electrodialysis) with the aim of treating wastewaters with high salinity content**.** In addition, the project will perform the Life Cycle Assessment and the Life Cycle Costing of the proposed hybrid systems.

Expected results

INREMEM 2.0 will obtain high quality water fit for crop irrigation and valuable compounds from high salinity wastewaters. In this sense, INREMEM 2.0 promotes the movement of membrane technology and wastewater treatments towards the concept of zero liquid discharge (ZLD) and circular economy.

1.4.4. Preparation of H2020 project: Life cycle thinking for membrane technology (MEMCYCLE)

Objectives

The main objective of MEMCYCLE is to contribute in changing the actual economic model towards a circular economy model by creating a missing link of membrane waste management focused on end-of-life membrane sorting, disassembly/separation, recycling and re-introduction of the recycled material into the market.

General activities

MEMCYCLE will allow the meeting of different stakeholders, from producers to end-users with the advice of an interdisciplinary panel of experts. These alliances will also be a motivation for posterior collaborations, research actions and synergies that can be extrapolated to other fields or technologies valuable in the circular economy transition within the water sector.

Expected results

MEMCYCLE will provide important social and environmental benefits. It will increase the sustainability of water treatments based on membranes, improving their durability and it will reduce the environmental costs associated with this technology reducing wastes.

1.5. Ecotoxicology

1.5.1. Tools for Assessment and Planning of Aquaculture Sustainability (TAPAS) http://tapas-h2020.eu/

Objectives

TAPAS is a four-year EU Horizon 2020 collaborative research project formed by 15 partners and aimed to promote and consolidate the environmental sustainability of the European aquaculture sector.

General activities

TAPAS research looks into different aquaculture sectors by performing eight different case studies in both marine and freshwater environments. These case studies will help to test, improve and develop new models for far- and near-field environmental impact assessments, providing better monitoring, observation, forecasting and early warning technologies.

Expected results

One of the key project outcomes is the Aquaculture Toolbox, which provides tools and guidance to support the planning and licensing of aquaculture in Europe. TAPAS will enhance the public image of aquaculture and contribute to a better understanding of the sustainability of aquaculture in the EU.

1.5.2. Impacts of MicroPlastics in Agro-Systems and Stream Environments (IMPASSE)

http://www.waterjpi.eu/joint-calls/joint-call-2016-waterworks-2015/impasse

Objectives

The general aim of IMPASSE is to assess the environmental fate, effects and risks of microplastics in agricultural and freshwater environments, and to find solutions which will safeguard agricultural sustainability, economic goals, and human and animal health.

General activities

The project is formed by four European partners and one Canadian. Among other activities, the project plans to perform field experiments to monitor environmental concentrations of microplastics, and laboratory experiments to test the impacts of those on terrestrial and aquatic organisms.

Expected results

The project provides knowledge that underpins the development of safe environmental policies and management regarding the use of plastics in the EU, and will develop a new model for the transport, distribution and fate of microplastics in soil and stream systems.

1.5.3. Effects of global change on the emission, fate, effects and risks of chemicals in aquatic ecosystems (ECORISK2050)

https://ecorisk2050.sites.uu.nl/

Objectives

ECORISK2050 aims a) to assess how the input of chemicals from agriculture and urban environments and their fate, transport and effects are affected by global climate change; b) to identify potential adaptation and mitigation strategies, and c) to develop a set of tools for use by industry and policy makers.

General activities

The project will organize training activities and secondments for 13 early stage researchers dedicated to tackle different aspects of the fate, effects and risks of chemicals in the environment. Knowledge gained by experiments and modelling approaches developed within the project will help to forecast future risks of chemical pollution.

Expected results

The project will deliver the next generation of scientists, consultants and industry and governmental decision-makers who have the knowledge and skill sets required to address the changing pressures that chemicals emitted by agricultural and urban activities pose to aquatic systems on the path to 2050.

1.5.4. Pesticide risk assessment for amphibians and reptiles (PERIAMAR)

Objectives

The PERIAMAR COST action aims to develop a strategy to coordinate efforts in order to address the research needs relative to pesticide risk assessment for amphibians and reptiles at the European level.

General activities

The action will integrate expertise provided by herpetologists, ecologists, toxicologists, environmental chemists and risk assessors trough several meetings and workshops, and will provide opportunities for early researcher and senior researcher exchange across more than 20 institutions in Europe.

Expected results

The action will stimulate networking and training in order to maximize the capacities of the scientific community to prevent amphibian and reptile declines because of environmental pollution, and will contribute to the development of sustainable pesticide regulations and policies.

1.5.5. Smart tools and technologies to assess the environmental fate and risk of contaminants under climate change (CICLIC-ECOREST)

https://www.proyectociclic.com

Objectives

The CICLIC project aims to develop smart environmental technologies and tools that can be used to monitor the occurrence, fate and impacts of contaminants in Mediterranean wetland ecosystems in a scenario of climate change.

General activities

The project is formed by three sub-projects (WETANPACK, TRAPPER, ECOREST), which will perform field assessments and monitoring in the Albufera Lake (Valencia) and the Llobregat delta (Barcelona). In-situ chemical and biological monitoring will be performed to parameterize models and risk scenarios.

Expected results

CICLIC proposes an innovative toolbox that will include aspects regarding massive data analysis, novel contaminant monitoring and analytical techniques, wastewater reuse and analysis, metabolomics, environmental and ecological modelling, ecotoxicological tools, and ecosystem vulnerability and resilience analysis.

1.5.6. Assessing the risk of anthropogenic contaminants in the Amazon River (SILENT AMAZON)

SILENT AMAZON

http://www.silentamazon.com/

Objectives

The main goal of the SILENT AMAZON project will be to assess how and to what extent current demographic pressure and industrial activities are impacting the Amazonian biodiversity at local and regional scale.

General activities

SILENT AMAZON will perform the largest chemical monitoring campaign performed so far in the Amazon River and will take water, fish and plant samples to monitor the presence of pharmaceuticals, pesticides, fragrances, persistent organic pollutants, microplastics, metals and other industrial compounds (PFAS).

Expected results

The project will provide maps of chemical pollution and risk-based information regarding priority substances and biological groups that are expected to be impacted. Overall, the project will contribute to the development of sustainable chemical use practices and environmental regulations in the region.

1.6. Cyanobacteria and Cyanotoxins

1.6.1. Smart alert against harmful cyanobacterial blooms for the water industry (CIANOALERT)

Objectives

The objective of the CianoAlert project is to develop a smart real-time monitoring system to harmful cyanobacterial blooms forecast in inland water bodies.

General activities

The solution proposed is based on combining wireless sensor network technology (deployment of sensors into the water) with satellite remote sensing and Remotely Piloted Aircrafts (RPAs), together with Information Technologies (IT) and intelligent user interface. This cutting-edge solution will allow to collect a massive quantity of data (BigData) on the density and distribution of cyanobacterial blooms in wide areas intended for human consumption and aquaculture.

Expected results

CianoAlert will generate an accurate, sensitive and easy handling real-time system to understand the cyanobacterial bloom dynamics in lakes and reservoirs, which will allow to improve the water management of affected areas.

1.6.2. Development of a predictive model for the management of algae and cyanobacterial proliferation events associated with climate change based on remote sensing techiques and data acquisition systems (CianoMOD)

CianoMOD

Objectives

CianoMOD project targets four objectives related to cyanobacteria and algae blooms:
a) To determine the mechanisms that allow outcrops of cyanobacteria.
b) To stablish their relationship to climate change.
c) To obtain insight on their environmental consequences.
d) To create monitoring and prediction mechanisms.

General activities

CianoMOD will develop the following tasks:
a) Historical analysis of water properties.
b) Continuous water monitoring with sensors.
c) Correlation of measurements with satellite images.
d) Creation of mathematical models to predict cyanobacteria outcrops.
e) Development of online platforms for remote data query.

Expected results

CianoMOD results will be presented as
a) a methodological protocol for the study of cyanobacteria outcrops,
b) the development of a "predictive" model,
c) the construction of a consultation platform in Internet and
d) the development of a participatory strategy for raising awareness of society.

With the support:

GOBIERNO DE ESPAÑA
VICEPRESIDENCIA CUARTA DEL GOBIERNO
MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO
Fundación Biodiversidad
PIMA adapta
oecc Oficina Española de Cambio Climático

1.7. Tool Development for Water Resource Management

Objectives

The general aim of the research line is the development of digital spatial tools to support the management of water resources, through the correct assessment of the present state of the resource and its possible evolution in different scenarios.

General activities

Tasks areas are related to the spatial-temporal analysis and management of water resources through different tasks as:

a) Model development using remote sensing information.
b) Development of instruments for decision support.
c) Construction of automatic data collection systems.
d) Development of on-line participatory platforms.

Expected results

Expected results are related to digital products such as algorithms development derived from remote sensing imagery analysis, decision support systems for water management and best practices, development of water models using GIS techniques or construction of collaborative web maps.

1.8. Hydraulic Heritage

Objectives

Research into water heritage aims to resolve conflicts between the existence of heritage structures and the current social need for development and growth. Specific objectives concentrate on the evaluation, visibility and potential development as socio-economic resource of water heritage.

General activities

Four main working lines have been created:

a) Inventory of heritage systems using digital technologies.

b) Development of spatial structures for decision making.

c) Analysis of socio-economic values to support for endogenous economic development.

d) Assessment of heritage and traditional landscape impacts.

Expected results

Research and technical development undertaken pursuit results related to the development of action plans related to the integral consideration of water heritage, the application of virtual and augmented reality and the construction of collaborative on-line tools.

1.9. Water and Energy

1.9.1. Solar Photovoltaic and Solar Disinfection

Objectives

To explore the potential of integrating solar photovoltaic technologies in water treatment processes to solve the problem of safe drinking water access and wastewater treatment.

To develop new systems based on solar disinfection that can be included in drinking water treatment and in wastewater treatment, especially in tertiary treatments replacing artificial mercury-based UV-lamps.

General activities

a) photovoltaic-photochemical hybrid solar systems for the simultaneous production of drinking water and electricity and the reduction of environmental impacts.

b) low-cost monitoring systems based in open-hardware.

c) solar disinfection systems.

Expected results

Development of clean and sustainable solutions for industrial and rural applications, increased system efficiency, cost reduction, energy saving, making water treatment systems accessible to communities with limited resources and infrastructure and improving access to safe drinking water in emergencies.

1.9.2. Attracting Talented Researchers within the Spanish Campus of International Excellence 'Smart Energy' and the region of Madrid (GOT ENERGY TALENT)

http://gotenergytalent.uah.es/

Objectives

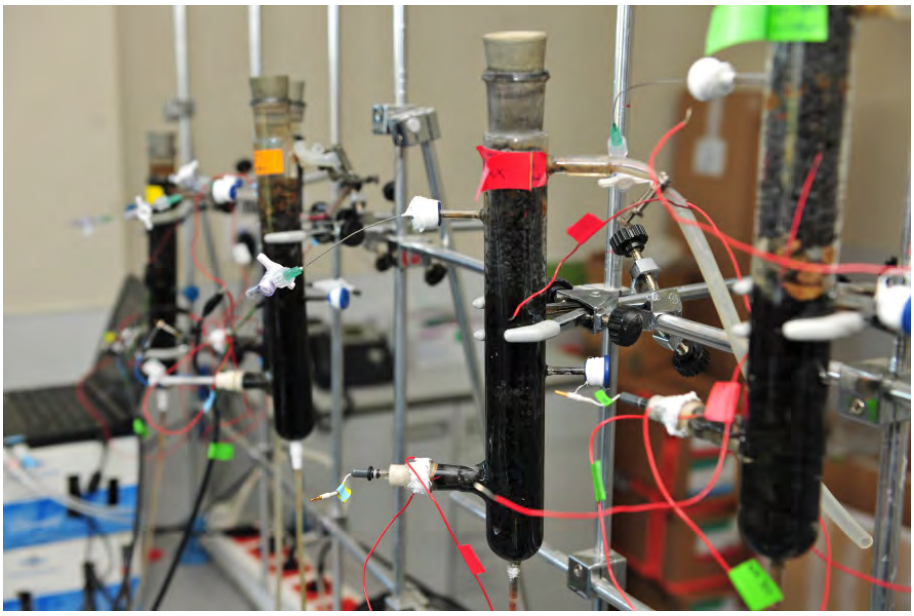
GOT ENERGY TALENT is a highly competitive, merit-based fellowship programme aimed at incorporating postdoctoral talent to enable them to conduct their own research project and bringing it closer to the society.

General activities

GOT ENERGY TALENT will bring in 34 experienced researchers to develop a 24-month stay through 2 open calls at international level, over its 60 months of implementation. The postdoctoral fellows will have a full trans-national mobility experience and access to the research facilities of the organizations partnering the programme. IMDEA Water is a host institution.

Expected results

The project address to produce a positive effect not only in terms of excellent science and talent attraction but also by strengthening the regional economy and promoting international networking.



2. Contracts

2.1. Economic and Institutional Analysis

2.1.1. Framework Service Contract in five (5) lots for provision of external expertise on regulatory and policy issues in the field of environmental policies, climate change, sustainable development, public health and food safety: (Lot II: climate change). European Parliament

Objectives

A framework contract to provide support to the work of the Committee on the Environment, Public Health and Food Safety (ENVI) in the European Parliament regarding the impacts, benefits and costs of issues and policies related to climate change (Lot II).

General activities

Support in terms of briefings, in-depth analysis, studies and workshops to be held.

Expected results

Full assistance to the Parliament implementation assessments, Committees´ own initiatives and Commission initiatives.

2.1.2. Framework Contract on economic analysis of environmental policies and analytical support in the context of Better Regulation. DG Environment, European Commission

Objectives

A framework contract to the European Commission to support economic analysis of European environmental policies.

General activities

Support in consultation processes (design, assistance, analysis reports…) and in the evaluation of environmental policies and regulations (background documents, assessment reports, elaboration of strategic documents…).

Expected results

Full assistance to the Commission in the process of carrying out economic analysis of environmental policies (to be designed to deliver their objectives in a cost-effective manner and considering the linkage economy-environment and also measuring progress consistently with environmental directives and the work on Circular Economy) within the framework of Better Regulation (the Agenda to design and evaluate EU policies and laws transparently and backed up by the citizens and stakeholders).

2.1.3. Framework Contract on evaluation, review and development of EU water policy. DG Environment, European Commission

Objectives

Supporting the evaluation, review and development of freshwater policy for Europe.

General activities

Support to: working/expert groups; organisation of workshops; development of guidance documents and technical reports on issues related to implementation EU water policies and other specific areas; policy development; evaluation of the WFD and REFIT process of the FD.

Expected results

Full assistance to the Commission in issues dealing with: the CIS of the WFD (Water Framework Directive) and FD (Floods Directive); integrated assessment of the implementation of the EU water legislation (WFD, priority substances Directive, GWD and FD) and 2nd River Basin Management Plans (RBMPs) and the 1st Flood Risks Management Plans (FRMPs); WFD/FD implementation in Member States; infringement cases, evaluation of the WFD and the REFIT (Regulatory Fitness and Performance Programme) of the FD.

Integrated Assessment (IA) of the 2nd planning cycle of River Management Plans (RBMPs)

Objectives

An assignment within the referred FC for the review process of the WFD to assess how the knowledge from the WFD planning process was used to address significant pressures impairing the status of water bodies (WBs).

General activities

It analyzed the knowledge used in the 2nd RBMPs and PoMs, particularly: implementation and effectiveness of measures (1st RBMPs); water status changes; updated RB characterization and policy integration.

Expected results

a) Details on how DPSIR conceptual model was linked to the WFD planning steps; drivers and 4 pressures (nutrients, chemicals, hydro-morphological and water abstraction) affecting WBs status; coherence, consistency and effectiveness on the implementation of planning phases;
b) Recommendations for strengthening coordination and coherence of the WFD planning steps and on the WFD potential adaptation in the context of its review.

2.1.4. Update of the economic analysis needed for the preparation of the third River Basin Management Plans (RBMP) in Bulgaria. World Bank

THE WORLD BANK
IBRD • IDA

Objectives

A study aimed at updating the economic analysis needed for the preparation of the 3rd RBMPs (River Basin Management Plans) in Bulgaria, based on the stocktaking and gap analysis review of the 2nd RBMPs and the European Commission´s Member State Assessment Report on the second planning cycle.

General activities

Economic analysis of water use; CEA; affordability analysis of main and supplementary measures; CBA of supplementary measures; assessment of HMWBs; Baseline BAU scenario; environmental costs assessment; resource cost assessment with any increasing pressures under BAU scenario; financial cost recovery of water services; water pricing and fees and extent of non-recovered financial costs of water services and environmental and resources costs.

Expected results

Full updated economic analyses as an input to overall work programme to prepare 3rd cycle RBMPs.

2.1.5. Economic valuation of the aquatic ecosystem services of the Community of Madrid. Support for the implementation, monitoring and integration of the Natura 2000 network of the Community of Madrid Nº 04 68621. Community of Madrid / TRAGSA

Objectives

An assignment aimed at showing the relevance of valuing aquatic ecosystem services as a key link to connect the natural environment and the well-being of citizens in order to understand why it is necessary to preserve them (as per their structure, processes, functions and services).

General activities

Main tasks carried out were: literature review; application of the assessment framework based on the diagnosis of the conservation status of rivers and wetlands across the region; and draw up conclusions and lessons learned in relation to action plans for the restoration of aquatic ecosystems in the region.

Expected results

Establishing the foundations to prioritize actions based on the most important pressures on ecosystems (i.e. restoration of habitats to increase their regulatory capacity in relation to the excessive presence of nutrients and other polluting loads).

2.1.6. Cost recovery in the use of groundwater in the upper Guadiana and the Doñana locations. WWF Spain

Objectives

A contract aimed at describing the state, the ecological status and water demand and use of the referred aquifers as well as assessing and proposing more effective economic instruments (based on modelling responses and costs estimation) achieve environmental objectives as referred to in the WFD.

General activities

Diagnosis of the necessary and available information to apply the methodologies of cost calculation and cost recovery; literature and RBMPs review; Modelling and application of the methodology to the case studies; Assessment and conclusions.

Expected results

Application of an approach based on the economic analysis of cost-recovery scenarios (addressing financial, environmental and resource costs) in both study areas, which allows proposing new cost-recovery instruments and achieving the good status of these water bodies.

2.2. Reclaimed Water Reuse

2.2.1. Lake Chad Basin Groundwater Information. World Bank

Objectives

Conceptualization and model development of the Lake Chad groundwater flow model (steady-state, 2008-2011 period) at the basin level. Calibration, principal results and findings of the modelling process and predictive analysis of management scenarios.

General activities

a) Assessment of current knowledge from previous hydrological works for groundwater studies in the Lake Chad Basin aquifer system
b) groundwater model conceptualization and
c) numerical model definition, calibration procedures and results.

Expected results

a) Updated groundwater conditions in the Lake Chad Basin, data gaps and data quality.
b) Conceptualization of the hydrological status and system dynamics (climate, hydrologic, abstraction) to date.
c) A numerical groundwater flow by integrating all the new available data and information.

2.2.2. Study of water regeneration through land application systems: removal of nutrients and emerging pollutants. Laboratorios tecnológicos de Levante S.L.

Objectives

Design a vegetation filter irrigated with treated wastewater characterized by high salinity to abate loads of nutrients and contaminants of emerging concern.

General activities

Investigate soil properties and select appropriate soil amendments to avoid salinity problems, determine best configuration of amendments, select plant species tolerant to high salinity levels, monitoring soil physico-chemical properties and quality of infiltrating water.

Expected results

Demonstrate that vegetations filters, when properly adapted, are able to guarantee contaminant attenuation even in the presence high salinity levels.

2.2.3. Sustainable desert ecosystem management with use of treated wastewater for forage irrigation in Kuwait. Kuwait Institute for Scientific Research (KISR)

Objectives

The project is aimed to evaluate:

a) quality of TWW, produced in different water treatment plants in Kuwait;

b) forage biomass yield and nutritional quality responses to TWW irrigation

c) potential accumulation of emerging contaminants in the soil and forage biomass.

General activities

a) Summarize existing information

b) Sampling TWW, chemical analysis and results assessment

c) Field experiments at KISR

d) Evaluation of forage nutrition qualities

e) In-vitro and in vivo studies

f) Soil Health Assessment of Intensive Agricultural Practices on Desert Native Ecosystem.

Expected results

The deliverables will demonstrate the safe use of TWW for forage irrigation, as an economically appealing alternative to discharge of this resource into sea, without causing degradation of soil quality, ecosystem sustainability or risk of food safety.

2.2.4. Studies for the removal of sulfates in mining waters SADYT

2.3. Ecotoxicology

2.3.1. Implementation of the Ecotoxicology and Environmental Monitoring Unit at IKIAM. IKIAM

Objectives

To develop and implement an Ecotoxicology and Environmental Monitoring Unit at the Regional University of the Amazon of Ecuador (IKIAM) capable of evaluating the water quality status of the Napo River making use of advanced ecotoxicological methods.

General activities

Researchers from Ecuador and Spain will work together in the standardization of toxicity test protocols with Amazonian organisms, the identification of the pollution sources of the Napo River, the evaluation of concentrations of pesticides and metals and the design of toxicity studies to assess the contamination risks on populations and communities.

Expected results

This project will contribute to the consolidation of the ecotoxicology research line at IKIAM and will collaborate with National Laboratory of Reference in Waters (LNRA) of Ecuador to improve the prospective risk assessment of chemical substances. It will make a proposal for the inclusion of new toxicological tests in the Ecuadorian regulation.

2.4. Membrane Technology

2.4.1. Use of end-of-life reverse osmosis membranes to treat wastewater for industrial and agricultural use (REROM). Research Council (TRC) of Oman.

Objectives

REROM aims to investigate the potential recycling/modification of discarded reverse osmosis desalination membranes for reusing them in wastewater treatment obtaining water fit for industrial and agriculture reuse.

General activities

Cost effective membrane reuse in lower specification applications, potential recycling of valuable materials and conversion of RO into micro-porous separation devices will be assessed both technically and financially.

Expected results

REROM will establish the technical and economic viability of membrane recycling outside the EU context for wastewater treatment and reuse. REROM will provide good quality water that give a chance for the farmers to plant different types of crops and encouraging Omani investment in the agricultural sector in a cost-effective manner.

3. Other innovation grants and international initiatives

3.1. Urban and Industrial Wastewater Treatment

3.1.1. EIT CLIMATE-KIC. Pre-incubator programme.

Objectives

The objective is supporting entrepreneurs who have a climate business idea and the motivation to make it happen, including tailored workshops, a community of climate entrepreneurs, and the support to further develop of ideas and creation or improvement of business plan.

General activities

BioForward team (led by Ortiz, J.M. and integrated by Landaburu, J., Esteve, A., Ramirez, M., Wardman, C. y Barroeta, B.) won the jury award of G**reenhouse Programme,** organized by **EIT Climate-KIC (Spain)**. *Biotechnology-based water desalination solution with low energy consumption.* AVAESEN. Valencia. 13 December 2019.

Expected results

BioForward team has taken advantage of being in the entrepreneur ecosystem provided by Greenhouse programme, gaining a clear vision of the business model for the project/ idea and communication skills, helping to further development of BioForward concept.

3.2. Economic and Institutional Analysis

3.2.1. OECD Water Governance Initiative. Water Policy Dialogues Brazil, Argentina and Peru. (2016-on going) http://www.oecd.org/cfe/regional-policy/water-governance-initiative.htm

Objectives

IMDEA is one of the 100+ members of the OECD GWI (the most relevant policy forum on water governance worldwide with public, private and civil society stakeholders). The GWI shares knowledge and good practices on water governance, advices governments in water reforms implementation and supports the OECD Principles on water governance.

General activities

IMDEA participates twice a year in the meetings of the GWI to share good practices supporting better governance in the water sector at global scale. In 2018, IMDEA also provided expertise within the framework Country-Specific Policy Dialogues to the Governments of Argentina and Peru.

Expected results

The Policy Dialogues assess multi-level governance and issues identified by the governments (i.e. water abstraction charges in Brazil, economic regulation of water and sanitation services in Argentina and Peru or the use of economic policy instruments in Peru).

3.2.2. EIP on Water. Action Group AG225. River Restoration (RiverRes).

Objectives

To provide a Roadmap to address policy challenges as opportunities for innovation through river restoration, as examples of nature-based solutions so to increase the effectiveness of EU directives and policy implementation.

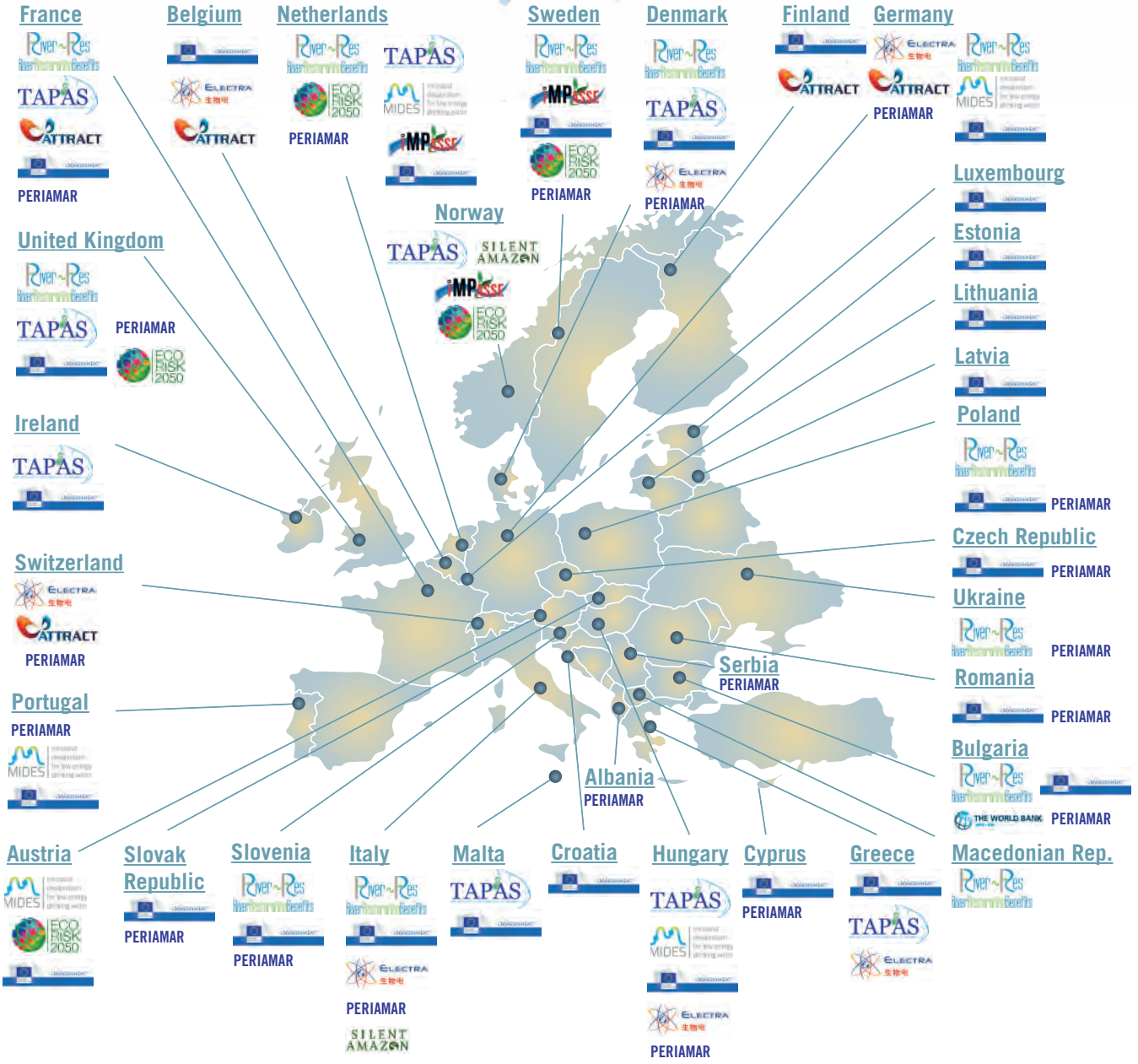
General activities

To develop DSS tools to identify and assess the cost and benefits of river restoration projects and the implementation and monitoring of restoration measures; act as think tank (regarding public participation, communication in river restoration to identify barriers, tools, incentives and strategies to involve stakeholders); to test and demonstrate the DSS Tools (application in specific river restoration demonstration sites -RiverRes Living Labs); knowledge sharing and capacity building.

Expected results

To target projects reducing hydro-morphological pressures and facilitate their "re-naturalization" improving their ecological status and enhancing potential ecosystem services delivery.

European collaboration in projects, contracts and other european initiatives



International collaboration in projects, contracts and other international initiatives

research groups

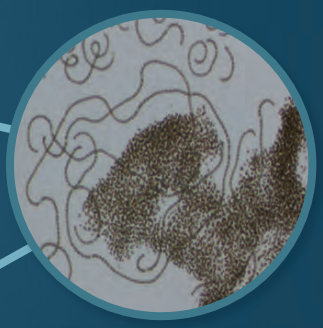
Membrane Technology

Ecotoxicology

Soil and Water Quality in the Environment

research groups

Bioe



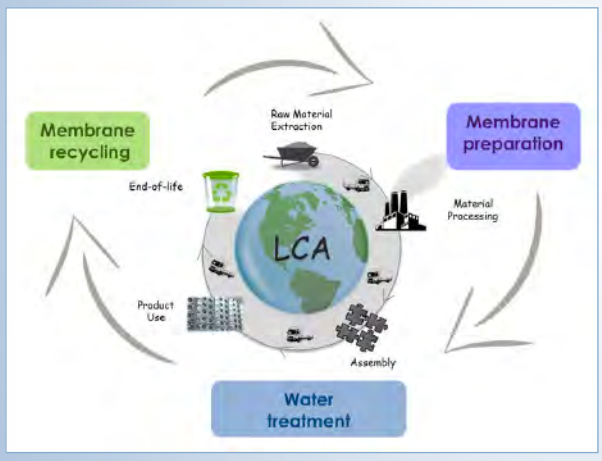
Microbial contamination and Cyanobacteria

Biological and Advanced oxidation technologies

Economic and institutional analysis

Water and energy

Membrane Technology



The group is focused on studying the whole membrane process life cycle: from membrane preparation to their use in water treatment until their recycling.

- Development of new generation antifouling membranes by surface modification and the addition of functionalized groups and nanoparticles.
- Evaluation of different types of membranes (reverse osmosis, nanofiltration, ultrafiltration) in water treatment.
- Modification of recycled membranes and their implementation in urban wastewater treatment by membrane bioreactors (MBR) and desalination by electrodialysis (ED).

Membrane Technology

Dr. Mohamed Khayet Souhaimi
Associated Researcher

Dr. Eloy García Calvo
Main Researcher

Dr. Serena Molina Martínez
Researcher

Dr. Raquel García Pacheco
Associated Researcher

Dr. Junkal Landaburu Aguirre
Researcher

Dr. Nataraj Sanna Kotrappanavar
Researcher

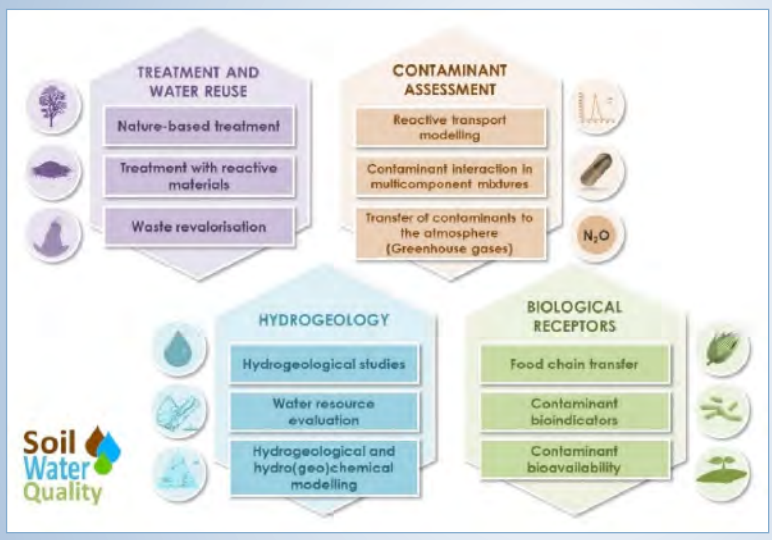
Helena Ocaña Biedma
Research Support

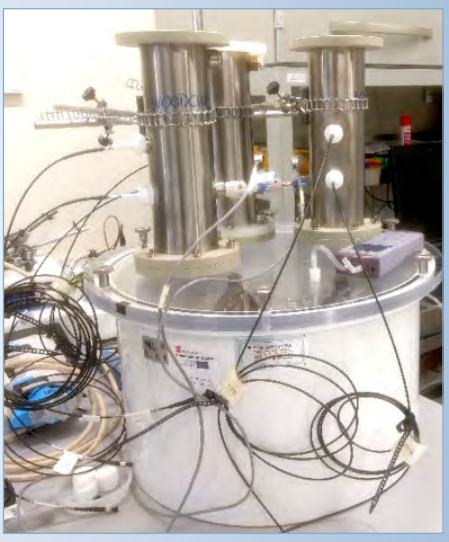
Amaia Ortiz de Lejarazu Larrañaga
Predoctoral Researcher

Jorge Senán Salinas
Research Support

Laura Rodríguez Saez
Research Support

Soil and Water Quality in the Environment





The research activity of our group is dedicated to assess environmental contamination in soil and water compartments and to adapt nature-based solutions to treat contaminated water. In particular, we investigate:

- The adaptation and improvement of non-conventional treatment technologies based on natural attenuation processes such as land application systems (Nature-based solutions);
- The transfer and interaction between chemical substances (mainly nutrients, metals and contaminants of emerging concern) in multiple scenarios developing specifically designed experiments and reactive transport models;
- The bioavailability of contaminants in soils by the use of bioindicators and the study of their transfer into the food chain through crop consumption.
- The quantity and quality of water resources through hydrogeological studies based on the application of multiple tools (numerical, hydrochemical and hydrogeochemical models).

https://www.soilwaterquality.es/

Soil and Water Quality in the Environment

Dr. Irene de Bustamante Gutiérrez
Main Researcher

Dr. Juan Antonio Pascual Aguilar
Associated Researcher

Dr. María de las Virtudes Martínez Hernández
Researcher

Dr. Lucila Candela
Associated Researcher

Dr. Raffaella Meffe
Researcher

Jorge Antonio Hernández Martín
Research Support

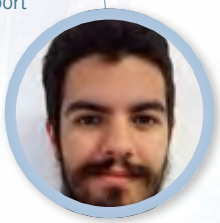
Dr. Ana de Santiago Martín
Researcher

Silvia Barge Álvarez
Research Support

Gloria Teijón Ávila
Research Support

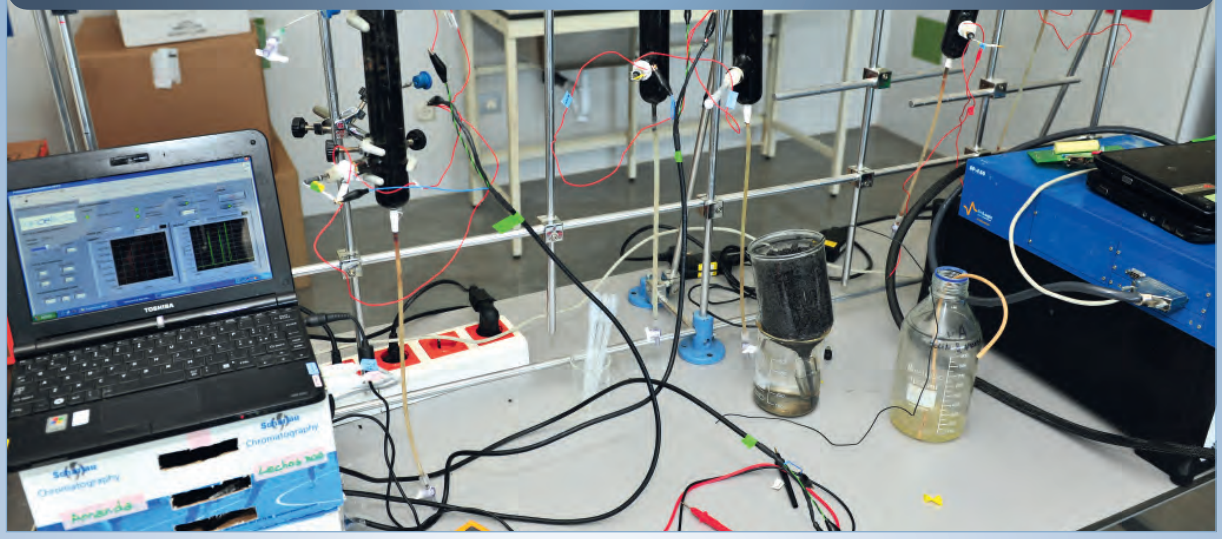
Guillermo Vaquero Quintana
Research Support

Raúl Jerónimo Pradana Yuste
Research Support



Blanca Huidobro López
Predoctoral Research

Bioe



bioe
biotechnology for a sustainable sustainable environment

Our research group is fully devoted to merge microbial, electrochemical and engineering tools to restore polluted environments (soil and water) by exploring the world behind the microbial electrochemical technologies (MET).

Our activities are divided into:

- Physiology and biochemistry of microbial electrogenesis
- Environmental microbial electrogenesis
- Microbial electrogenesis and bioengineering

http://bioelectrogenesis.es/

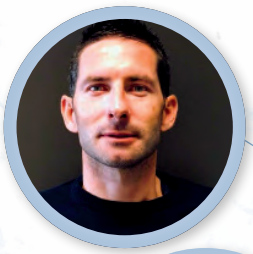
Dr. Karina Boltes Espínola
Associated Researcher

Dr. Abraham Esteve Núñez
Main Researcher

Dr. Pau Ródenas Motos
Researcher

Dr. Juan Manuel Ortiz Díaz-Guerra
Researcher

Dr. Raúl Berenguer Betrián
Associated Researcher



Dr. Antonio Berná Galiano
Researcher

Dr. Arantxa Aguirre Sierra
Associated Researcher

Bioe

Belén Barroeta
Science Communicator

Amanda Prado de Nicolás
Associated Predoctoral Researcher

Mario Jiménez Conde
Associated Predoctoral Researcher

Marina Ramírez Moreno
Predoctoral Researcher

Colin Wardman
Predoctoral Researcher

Lorena Peñacoba Antona
Associated Predoctoral Researcher

Eduardo Noriega Primo
Predoctoral Researcher

Carlos Manchón Vállegas
Predoctoral Researcher

Biological and Advanced oxidation technologies

Developing wastewater treatment focused on degradation of xenobiotic compunds by chemical or biological processes. This includes the development of methods for assessing the toxicity or emerging pollutants

- Ozonization
- Fenton and Photo-Fenton processes
- Photocatalysis
- Biological (aerobic and anaerobic) processes in reactors of different configurations and biostimulation of microorganisms for in-situ biodegradation

Dr. Pedro León García
Associated Researcher

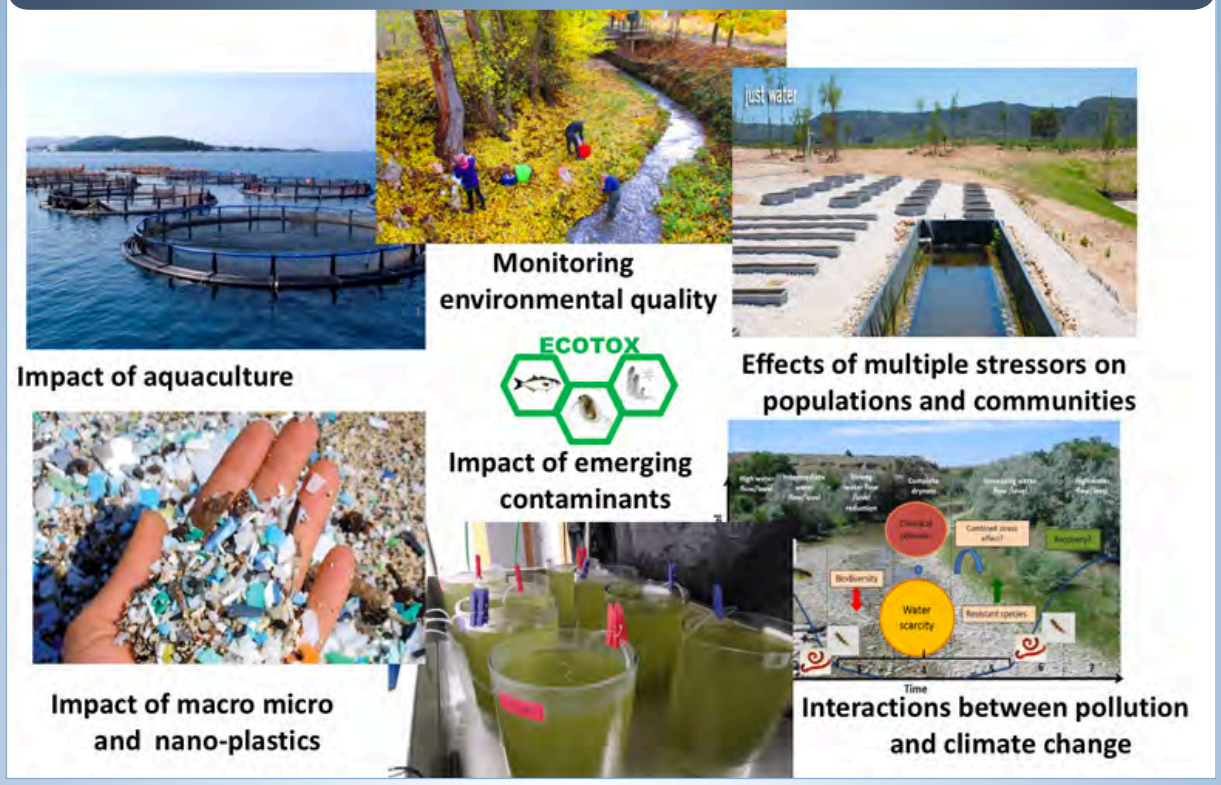
Dr. Alice Luminita Petre
Associated Researcher

Biological and Advanced oxidation technologies

Dr. Roberto Rosal García
Associated Researcher

Dr. José Antonio Perdigón Melón
Associated Researcher

Ecotoxicology



Assessment of the risks for ecosystems determined by contaminants and their interactions with the environment, taking into account the vulnerability of individuals, populations and communities to chemical and non-chemical stressors

- Assessing exposure to contaminants through environmental monitoring and predictive exposure models
- Assessing effects trough toxicity tests with aquatic organisms at the individual, population and community level (using microcosms and mesocosms)
- Developing modelling approaches to predict effects at the individual, population and community level
- Assessing ecological quality trough monitoring of invertebrates and other biological indicators
- Characterising ecological risks combining effect and exposure assessments

Prof. Marco Vighi
Main Researcher

Dr. Andreu Rico Artero
Researcher

Dr. Alba Arenas Sánchez
Researcher

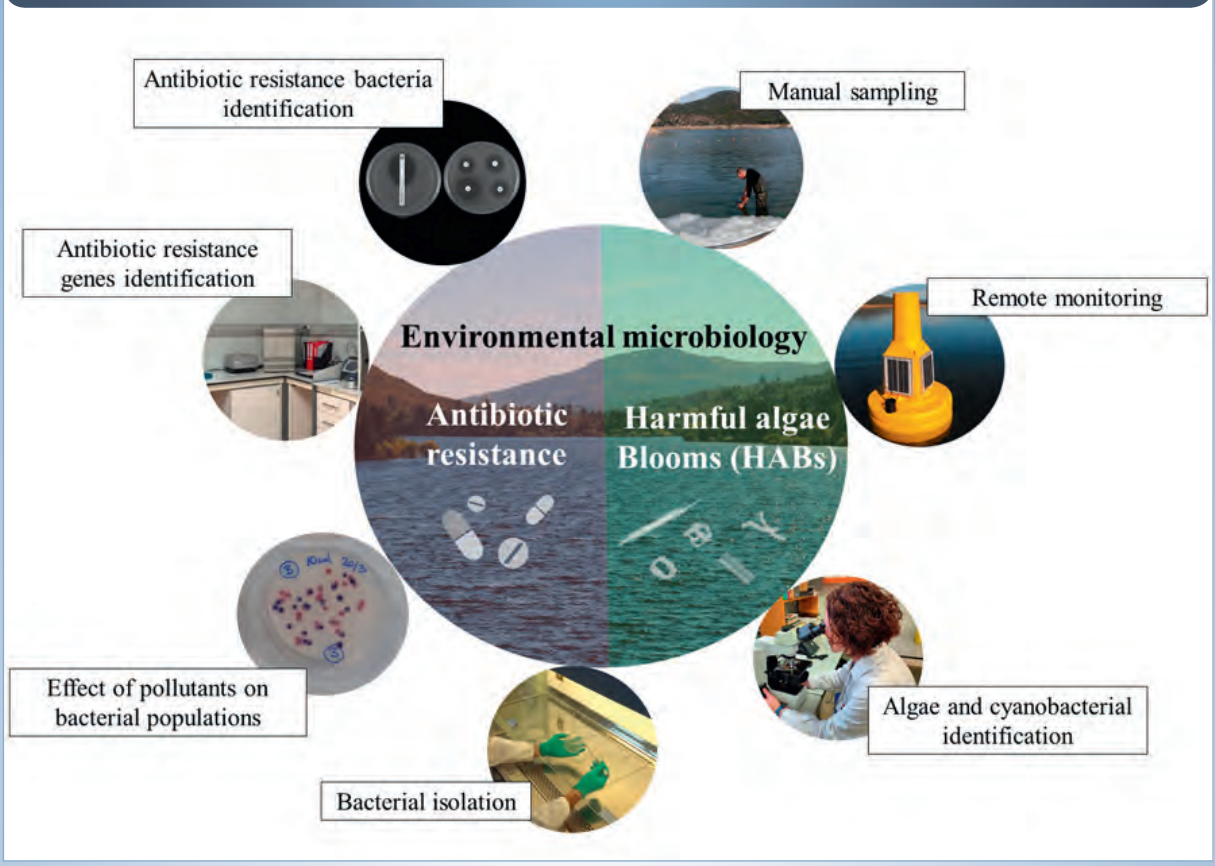
Ecotoxicology

Theresa Schell
Predoctoral Researcher

Francesco Polazzo
Predoctoral Researcher

Raquel Dafouz Ramírez
Research Support

Microbial contamination and Cyanobacteria



The group focused their R&D activities to offer technology-based solutions to Water-based industries in relation to Cyanobacterial Harmful Algal Blooms.

- Designing monitoring programs for the development of toxic cyanobacteria blooms in reservoirs.
- Developing technology for the specific and sensitive detection of microcystins in water.
- Developing technology for the efficient and low-cost removal of microcystins during water treatment using biofilms.

On the other hand, impact of pollutants (pesticides, antibiotics and biocides) on microorganisms and antibiotic resistance in water environments is being studied.

- Potential effect of pollutants on bacterial populations
- Detection (finding and/or discovery) of antibiotic resistant bacteria (ARB) and resistance genes (ARG)
- Fitness cost linked to the acquisition of antibiotic resistance
- Resistance gene transfer and the role of pollutants

Dr. Francisco Carreño Conde
Associated Researcher

Dr. María Blanca Sánchez
Researcher

Dr. Jesús Morón López
Research Support

Ángel G. Pompa Pernía
Research Support

Microbial contamination and Cyanobacteria

Lorena Martínez García
Research Support

Borja Fernández Retuerto
Predoctoral Researcher

Economic and institutional analysis

Analysis of the design and implementation of economic policy instruments for sustainable water management

- Individual & collective economic behaviour in relation to water
- Economic policy instruments-EPIs (pricing mechanisms, markets of tradable permits, risk-management schemes and cooperation-based mechanisms)

Integrated water resources management: economic dimensions

- Environmental & natural resources economics
- Climate change adaptation (CCA) and Disaster risk reduction (DRR)
- Nexus approach (water-energy-food-biodiversity-climate)
- Hydro-economic modelling & analysis & prioritisation of water investments.
- Regulatory impact assessment (RIA) and links between environmental policy & macroeconomic performance
- Cost-benefit analysis (CBA), Cost-effectiveness analysis (CEA), Cost-recovery analysis, New decision-making theories
- Integrated assessment frameworks (i.e. social-ecological modelling) and economic valuation of ecosystem services
- Economic regulation of the urban water cycle

Economic regulation of the urban water cycle

Water Governance

Dr. Alberto del Villar García
Associated Researcher

Dr. Carlos Mario Gómez Gómez
Main Researcher

Gonzalo Delacámara Andrés
Researcher

Economic and institutional analysis

Marta Rodríguez
Research Support

Marta Arenas Romasanta
Research Support

Asya Amran Marhubi
Research Support

Water and energy

Exploring the potential of integrating solar photovoltaic technologies in water treatment processes to solve the problem of safe drinking water access and/or wastewater treatment.

- Photovoltaic-photochemical hybrid solar systems
- Clean water sensors for solar disinfection

On the other hand, a low cost system based on open source tools for the monitoring of photovoltaic systems, specifying in autonomous photovoltaic systems, with a reliability and accuracy that comply with existing regulations is being developing.

Dr. Marta Vivar García
Associated Researcher

Dr. Manuel Fuentes Conde
Associated Researcher

Dr. Natalia Pichel Mira
Research

Water and energy

Ascensión López Vargas
Research support

laboratory staff

Francisco Martínez Serrano
Laboratory Technician

Dr. Leonor Nozal Martínez
Quality and Laboratories Management / Laboratory responsible

Carolina Guillén Fuentes
Laboratory Technician

Amaya Romero Salas
Laboratory Technician

Covadonga Alonso Alonso
Laboratory Technician

Dr. María Isabel López Heras
Laboratory Technician

Dr. Laura Cherta Cucala
Laboratory Technician

Simón Monllor Alcaraz
Laboratory Technician

Manuel Mínguez Calzada
Laboratory Technician

Dr. Alberto Blanco González
Research support

Diego Parra Robles
Laboratory Technician

Beatriz Peinado Rodríguez
Laboratory Technician

Noelia C. Peral Romero
Research support

management area and administration

Rafael Irastorza Vaca
General Manager

Mari Luz Barquilla Crespo
Economic Manager

Dr. Juana Sanz García
R&D Manager

José Ángel Gómez Martín
R&D Technical support

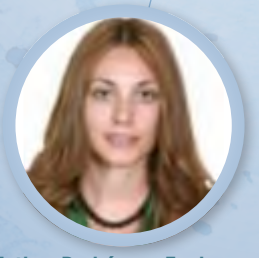
Gloria Rubio Sánchez
R&D Technical support

Celia Barral Nieto
Technician in Economic and Administration

Angélica Manguán García
R&D Technical support

Carolina Merino Ajenjo
Technician in Economic and Administration

Josefa Simón Recio
Secretary



Esther Rodríguez Espinosa
Technical of economic management

Research results and knowledge dissemination

Research results

1. Scientific Papers

1.1 Articles in journals

1. **Al Shail, K.; Ordóñez, J. and Khayet, M. (2019)**
Use of an analytical hierarchy process for the selection of adequate desalination technologies for Spain and the Gulf Cooperation Council.
Desalination and water treatment, 146. pp. 98-106.

2. **Arenas, A.; López-Heras, I.; Nozal, L.; Vighi, M. and Rico, A. (2019)**
Effects of increased temperature, drought and an insecticide on freshwater zooplankton communities.
Environmental Toxicology and Chemistry, 38 (2). pp. 396-411. ISSN 0730-7268.

3. **Arenas, A.; Rico, A.; Rivas, D.; Blanco, A.; García-Doncel, P.; Romero-Salas, A.; Nozal, L. and Vighi, M. (2019)**
Identification of contaminants of concern in the upper Tagus river basin (central Spain). Part 2: Spatio-temporal analysis and ecological risk assessment.
Science of The Total Environment (667). pp. 222-233. ISSN 0048-9697.

4. **Arribas, P.; García-Payo, M.C.; Khayet, M. and Gil, L. (2019)**
Heat-treated optimized polysulfone electrospun nanofibrous membranes for high performance wastewater microfiltration.
Separation and Purification Technology, 226. pp. 323-336. ISSN 13835866.

5. **Barbosa, A.L.; Martín, B.; Hermoso, V.; Arévalo-Torres, J.; Barbière, J.; Martínez-López, J.; Domisch, S.; Langhans, S.; Balbi, S.; Villa, F.; Delacámara, G.; Teixeira, H.; Nogueira, A.; Lillebø, A.; Gil-Jiménez, Y.; McDonald, H. and Iglesias-Campos, A. (2019)**
Cost-effective restoration and conservation planning in Green and Blue Infrastructure designs. A case study on the Intercontinental Biosphere Reserve of the Mediterranean: Andalusia (Spain) – Morocco.
Science of The Total Environment, 652. pp. 1463-1473. ISSN 00489697.

6. **Bernardini, A.; Cuesta, T.; Tomás, A.; Bengoechea, J. A.; Martínez, J. L. and Sánchez, M.B. (2019)**
The intrinsic resistome of Klebsiella pneumoniae.
International Journal of Antimicrobial Agents, 53 (1). pp. 29-33. ISSN 09248579.

7. **Blanco, A.; De Bustamante, I. and Pascual, J.A. (2019)**
Using old cartography for the inventory of a forgotten heritage: The hydraulic heritage of the Community of Madrid.
Science of The Total Environment, 655. pp. 314-328. ISSN 0048-9697.

8. **Calatayud-Vernich, P.; Calatayud, F.; Simó, E.; Pascual, J.A. and Picó, Y. (2019)**
A two-year monitoring of pesticide hazard in-hive: High honey bee mortality rates during insecticide poisoning episodes in apiaries located near agricultural settings.
Chemosphere, 232. pp. 471-480. ISSN 00456535.

9. Carreño, F. and De Mata, M. (2019)
Flood Monitoring Based on the Study of Sentinel-1 SAR Images: The Ebro River Case Study.
Water, 11 (12). p. 2454. ISSN 2073-4441.

10. Chakraborty, S.; Mruthunjayappa, M.H.; Aruchamy, K.; Singh, N.; Prasad, K.; Kalpana, D.; Ghosh, D.; Nataraj, S.K. and Mondal, D. (2019)
Facile Process for Metallizing DNA in a Multitasking Deep Eutectic Solvent for Ecofriendly C–C Coupling Reaction and Nitrobenzene Reduction.
ACS Sustainable Chemistry & Engineering, 7 (16). pp. 14225-14235. ISSN 2168-0485.

11. Das, R. and Khayet, M. (2019)
Nanotechnology Based Platforms for Efficient Water Desalination.
Desalination, 451. p. 1. ISSN 00119164.

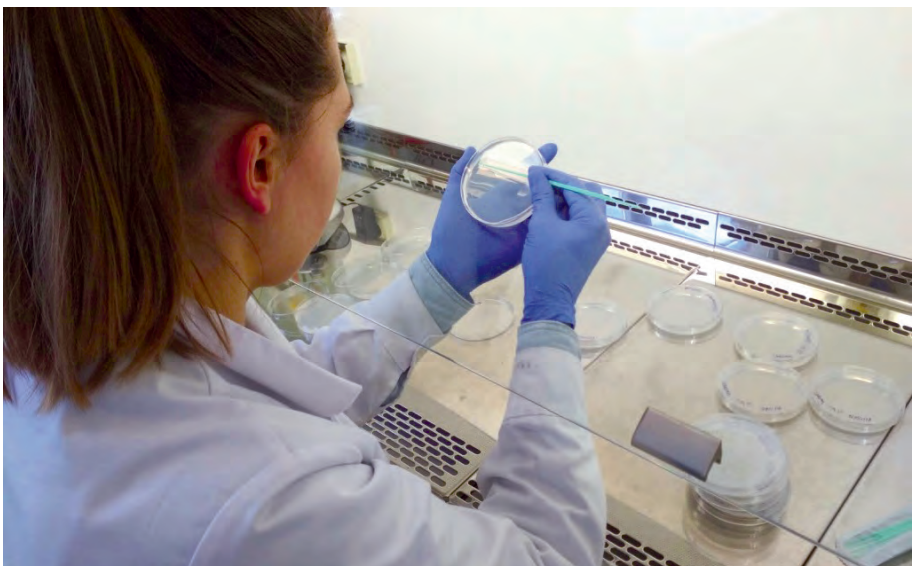
12. Di Lorenzo, T.; Castaño, A.; Di Marzio, W.D.; García-Doncel, P.; Nozal, L.; Galassi, D.M.P. and Iepure, S. (2019)
The role of freshwater copepods in the environmental risk assessment of caffeine and propranolol mixtures in the surface water bodies of Spain.
Chemosphere, 220. pp. 227-236. ISSN 00456535.

13. Füeg, M.; Borjas, Z.; Estévez-Canales, M.; Esteve-Núñez, A.; Pobelov, I.; Broekmann, P. and Kuzume, A. (2019)
Interfacial electron transfer between Geobacter sulfurreducens and gold electrodes via carboxylate-alkanethiol linkers: Effects of the linker length.
Bioelectrochemistry, 126. pp. 130-136. ISSN 1567-5394.

14. García-Pacheco, R.; Landaburu, J.; Lejarazu-Larrañaga, A.; Rodríguez-Sáez, L.; Molina, S.; Ransome, T. and García-Calvo, E. (2019)
Free chlorine exposure dose (ppm·h) and its impact on RO membranes ageing and recycling potential.
Desalination, 457. pp. 133-143. ISSN 00119164.

15. Grisoni, F.; Consonni, V. and Vighi, M. (2019)
Acceptable-by-design QSARs to predict the dietary biomagnification of organic chemicals in fish.
Integrated Environmental Assessment and Management, 15 (1). pp. 51-63. ISSN 15513777.

16. Halanur M., M.; Chakraborty, S.; Aruchamy, K.; Ghosh, D.; Singh, N.; Prasad, K.; Kalpana, D.; Nataraj, S.K. and Mondal, D. (2019)
Engineering Fe-doped highly oxygenated solvothermal carbon from glucose-based eutectic system as active microcleaner and efficient carbocatalyst.
Journal of Materials Chemistry A, 7 (9). pp. 4988-4997. ISSN 2050-7488.



17. **Jafary, T.; Wan Daud, W.R.; Ghasemi, M.; Abu Bakar, M.H.; Sedighi, M.; Kim, B.H.; Carmona, A.; Jahim, J.M. and Ismail, M. (2019)**
Clean hydrogen production in a full biological microbial electrolysis cell.
International Journal of Hydrogen Energy, 44 (58). pp. 30524-30531. ISSN 03603199.

18. **Karner, K.; Cord, A.F.; Hagemann, N.; Hernández, N.; Holzkämper, A.; Jeangros, B.; Lienhoop, N.; Nitsch, H.; Rivas, D.; Schmid, E.; Schulp, C.J.E.; Strauch, M.; van der Zanden, E.H.; Volk, M.; Willaarts, B.; Zarrineh, N. and Schönhart, M. (2019)**
Developing stakeholder-driven scenarios on land sharing and land sparing – Insights from five European case studies.
Journal of Environmental Management, 241. pp. 488-500. ISSN 03014797.

19. **Khayet, M.; Essalhi, M.; Qtaishat, M.R. and Matsuura, T. (2019)**
Robust surface modified polyetherimide hollow fiber membrane for long-term desalination by membrane distillation.
Desalination, 466. pp. 107-117. ISSN 00119164.

20. **Khayet, M.; García-Payo, M.C. and Matsuura, T. (2019)**
Superhydrophobic nanofibers electrospun by surface segregating fluorinated amphiphilic additive for membrane distillation.
Journal of Membrane Science, 588. p. 117215. ISSN 03767388.

21. **Lago, M.; Boteler, B.; Rouillard, J.; Abhold, K.; Jähnig, S.; Iglesias-Campos, A.; Delacámara, G.; Piet, G.; Hein, T.; Nogueira, A.; Lillebø, A.; Strosser, P.; Robinson, L.; De Wever, A.; O´Higgins, T.; Schlüter, M.; Török, L.; Reichert, P.; van Ham, C.; Villa, F. and McDonald, H (2019)**
Introducing the H2020 AQUACROSS project: Knowledge, Assessment, and Management for AQUAtic Biodiversity and Ecosystem Services aCROSS EU policies.
Science of The Total Environment, 652. pp. 320-329. ISSN 00489697.

22. **Langhans, S.; Domisch, S.; Balbi, S.; Delacámara, G.; Hermoso, V.; Kuemmerlen, M.; Martin, R.; Martínez-López, J.; Vermeiren, P.; Villa, F. and Jähnig, S. (2019)**
Combining eight research areas to foster the uptake of ecosystem-based management in fresh waters.
Aquatic Conservation: Marine and Freshwater Ecosystems, 29 (7). pp. 1161-1173. ISSN 10527613.

23. **Laqbaqbi, M.; García-Payo, M.C.; Khayet, M.; El Kharraz, J. and Chaouch, M. (2019)**
Application of direct contact membrane distillation for textile wastewater treatment and fouling study.
Separation and Purification Technology, 209. pp. 815-825. ISSN 13835866.

24. **Lejarazu-Larrañaga, A.; Zhao, Y.; Molina, S.; García-Calvo, E. and Van der Bruggen, B. (2019)**
Alternating current enhanced deposition of a monovalent selective coating for anion exchange membranes with antifouling properties.
Separation and Purification Technology, 229 (115807). ISSN 13835866.

25. **Lillebø, A.; Teixeira, H.; Morgado, M.; Martínez-López, J.; Marhubi, A.; Delacámara, G.; Strosser, P. and Nogueira, A. (2019)**
Ecosystem-based management planning across aquatic realms at the Ria de Aveiro Natura 2000 territory.
Science of The Total Environment, 650 (2). pp. 1898-1912. ISSN 00489697.

26. **López-Vargas, A.; Fuentes, M. and Vivar, M. (2019)**
Evaluation of Long-Term Performance of a Solar Home System (SHS) Monitoring System on Harsh Environments.
Sensors, 19 (24). p. 5462. ISSN 1424-8220.

27. **López-Vargas, A.; Fuentes, M. and Vivar, M. (2019)**
IoT application for real-time monitoring of Solar Home Systems based on ArduinoTM with 3G connectivity.
IEEE Sensors Journal, 19 (2). pp. 679-691. ISSN 1530-437X.

28. **López-Vargas, A.; Fuentes, M.; Vivar, M. and Muñoz-Rodríguez, F.J. (2019)**
Low-cost datalogger intended for remote monitoring of solar photovoltaic stand-alone systems based on ArduinoTM.
IEEE Sensors Journal, 19 (11). pp. 4308-4320. ISSN 1530-437X.

29. **Manohara, H.M.; Aruchamy, K.; Chakraborty, S.; Radha, N.; Nidhi, M.R.; Ghosh, D.; Nataraj, S.K. and Mondal, D. (2019)**
Sustainable Water Purification Using Engineered Solvothermal Carbon Based Membrane Derived from a Eutectic System.
ACS Sustainable Chemistry & Engineering, 7 (11). pp. 10143-10153. ISSN 2168-0485.

30. **Martínez-Graña, A.M.; Goy, J.L.; González-Delgado, J.A.; Cruz, R.; Sanz, J.M.; Cimarra, C. and De Bustamante, I. (2019)**
3D Virtual Itinerary in the Geological Heritage from Natural Areas in Salamanca-Ávila-Cáceres, Spain.
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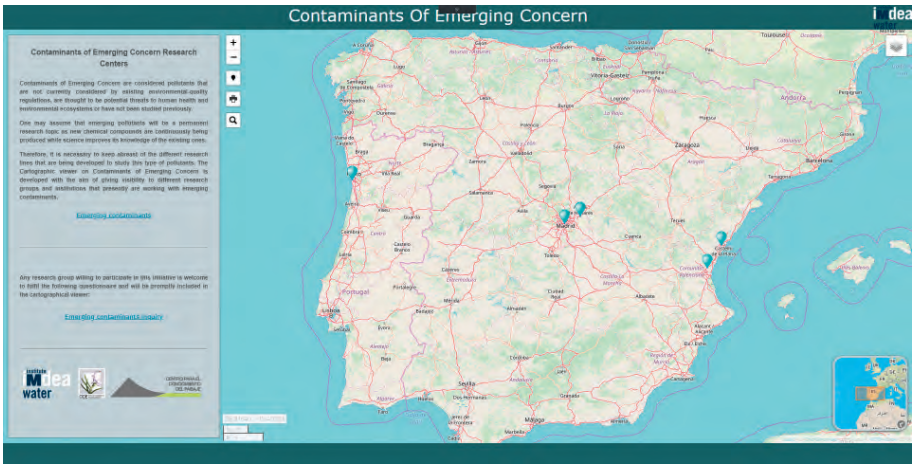

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4. Lectures

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2. **Candela, L.**
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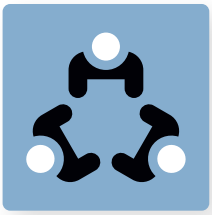

5. Round tables and experts panels

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2. Candela, L.
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3. Candela L.
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We Are Water Foundation and iAgua. Madrid. 04/04/2019.

33. Esteve-Núñez
Estrategias de electrobiorremediación minimizando el suministro de reactivos químicos y energía. Proyecto H2020 ELECTRA.
Technical Conference LIFE-Answer: "Retos y oportunidades en la reutilización del agua y la recuperación de nutrientes: soluciones innovadoras". Sesión "Soluciones eco-innovadoras para la recuperación de energía y productos de valor añadido del agua residual". Agencia del Agua de Castilla-La Mancha. Toledo. 21/03/2019.

34. Esteve-Núñez
Why MET play a key role in the water-energy nexus.
International Workshop "Bioelectrochemical Systems: Key Technologies in the Water-Energy Nexus". Terrassa (Barcelona). 11/04/2019.

35. Esteve-Núñez
Chair of the Special Session 12: Electroactive bacteria based treatment.
WETPOL 2019 (8th International Symposium on Wetland Pollutant Dynamics and Control). Aarhus University, Denmark. 17 - 21/06/2019.

36. Esteve-Núñez
Developing Nature Based Solutions and Ecological Engineering core skills.
NBS Workshop. Organized by: School of Water, Energy and Environment. Cranfield University, United Kingdom. 27/11/2019.

37. García Calvo, E.
Chair of Session Environmental & Sustainable Chemical Engineering.
3rd International Congress of Chemical Engineering. ANQUE-ICCE3. Santander. 19 - 21/07/2019.

38. García Calvo, E.
IV Taller participativo Plan Nacional de Depuración, Saneamiento, Ahorro, Eficiencia y Reutilización (Plan DSEAR).
Organized by D.G. del Agua del Ministerio para la Transición Ecológica. EU-Water Innovation Conference 2019. Zaragoza. 11/12/2019.

39. García Calvo, E.
Solidaridad intergeneracional y cambio climático. Retos de los servicios de abastecimiento y saneamiento.
Organized by AEAS. Congreso de los Diputados. Madrid. 27/11/2019.

40. Ortiz, J.M.
Desalinización microbiana para la producción de agua potable con bajo consumo energético. Proyecto H2020 MIDES
Technical Conference LIFE-Answer: "Retos y oportunidades en la reutilización del agua y la recuperación de nutrientes: soluciones innovadoras". Sesión "Soluciones eco-innovadoras para la recuperación de energía y productos de valor añadido del agua residual". Agencia del Agua de Castilla-La Mancha. Toledo. 21/03/2019.

41. Vighi, M.
Can we demystify machine learning for environmental chemistry and toxicology?
SETAC Europe 29th Annual Meeting. Helsinki, Finland. 26 - 30/05/2019.

6. Participation in Scientific Committees

1. Advisor to the DG Environment (Clean Water Unit). **Delacámara, G.**

2. Committee: CTN 318 "RIEGOS". Ministerio de Agricultura, Pesca y Alimentación. Ministerio para la Transición Ecológica. International Standard Organization (ISO). **De Bustamante, I.** and **Martínez, V.**

3. Consultant to United Nations agencies and programs (ONU Agua, UNESCO, FAO, OMS-OPS, PNUD, CEPAL), World Bank Group (World Bank, IFC, 2030 Water Resources Group), BID... **Delacámara, G.**

4. European Parlament advisor on climate change. **Delacámara, G.**

5. External Science Advisory Council (ESAC) de KWR Watercycle Research Institute. Netherlands. **Delacámara, G.**

6. International Society for Microbial Electrochemistry and Technology ISMET. Members of the editorial committee. **Barroeta, B.** and **Esteve-Núñez.**

7. Jury for Premios a la Gestión Sostenible del Agua 2019 (VI Edición). Observatorio del Agua de la Fundación Botín. 20/09/2019. **Delacámara, G.**

8. Leader of the Vision Task on "Value of Water" of Water Europe Platform (formerly WssTP - Water supply and sanitation Technology Platform). **Delacámara, G.**

9. Mirror group of Spain, Mission Assembly on Healthy Oceans. Seas, Coastal and Inland Waters, EU Horizon Europe Programme, DG RTD - DG for Research and Innovation. **Delacámara, G.**

10. Mission Assembly on Healthy Oceans. Seas, Coastal and Inland Waters, EU Horizon Europe Programme, DG RTD - DG for Research and Innovation, European Commission. **Delacámara G.**

11. Organization Committee. 46th IAH Congress. Málaga. 22 - 27/09/2019. **De Bustamante, I.**

12. Organization Committee. Workshop REMTAVARES: "Technological Solutions for Wastewater Reuse and Sludge Valorization". Universidad de Alcalá. Madrid. 21/11/2019. **Barroeta, B.** and **Esteve-Núñez.**

13. President of the Tree Committee de ISMET (International Society for Microbial Electrochemistry and Technology). **Esteve-Núñez.**

14. Scientific Committee. 46th IAH Congress. Málaga. 22 - 27/09/2019. **Candela, L.**

15. Scientific Committee. Congreso Nacional del Agua - Innovación y Sostenibilidad. Universidad de Alicante. Orihuela, Alicante. 21 - 22/02/2019. **García Calvo, E.**

16. Scientific Committee. International Conference-Training Water-Energy-Climate 2019 (WEC-2019). Hammamet (Túnez) 07-12/10/2019. **Candela, L.**

17. Scientific Committee. Red de Excelencia "Aplicaciones Medioambientales y Energéticas de la Tecnología Electroquímica-ES3TECH". **Ortiz, J.M.**

18. Scientific Committee. WETPOL 2019 (8th International Symposium on Wetland Pollutant Dynamics and Control). Aarhus University (Denmark). 17 - 21/06/2019. **Esteve-Núñez.**

19. Scientific Committee. Workshop REMTAVARES: "Technological Solutions for Wastewater Reuse and Sludge Valorization". Universidad de Alcalá. Madrid. 21/11/2019. **Boltes, K.**

20. Scientific Committee. X Congreso Iberoamericano de Educación Científica. Enseñanza y Aprendizaje de las Ciencias en Debate. Montevideo (Uruguay). 25 - 27/03/ 2019. De **Bustamante, I.**

21. Scientific Committee. XIV Jornadas de Investigación de la Zona No Saturada (ZNS). **Martínez, V.**

22. Scientific-technical Committee for Sustainability and Climate Change of the Community of Madrid. **García Calvo, E.**

23. Scientific reviewer for Fondazione Cassa di Risparmio di Padova e Rovigo (Italia). **Candela, L.**

24. Scientific reviewer for Qatar Science Foundation (Catar). **Candela, L.**

25. Special Advisory Board. International Desalination Association (IDA). **Delacámara G.**

26. Water Economics Forum. Academic Director and spokesman. **Delacámara, G.**

27. Water Governance Initiative, OCDE. **Delacámara, G.**

28. Working group of Emerging Compounds. Supply and Sanitation Technology Platform – WssTP. **Martínez, V.**

7. Oral Communications

1. Aguirre, A., Salas, J.J., Berná, A., Manchón, C., Esteve, A.
Treating wastewater from small communities with VERTICAL FLOW electrochemical-assisted wetlands (METlands®).
WETPOL 2019 (8th International Symposium on Wetland Pollutant Dynamics and Control). Aarhus University (Dinamarca). 17 - 21/06/2019.

2. Arenas, A., Rico, A., Dolédec, S., Vighi, M.
Does water scarcity influence the impact of anthropogenic stress on aquatic invertebrate assemblages?
SETAC Europe 29th Annual Meeting. Helsinki (Finlandia). 26 - 30/05/2019.

3. Manchón, C.
Microbial electrochemical biosensors for monitoring wastewater treatment plants in real time.
Workshop REMTAVARES: "Technological Solutions for Wastewater Reuse and Sludge Valorization". Universidad de Alcalá. Madrid. 21/11/2019.

4. Martínez, V., Hernández, J.A., Meffe, R., De Santiago, A., López, M.I., Alonso, C., Huidobro, B., Nozal, L., De Bustamante, I.
Amended vegetation filters: a new nature based solution to treat wastewater, increase groundwater resources, recover nutrients and produce biomass.
AQUACONSOIL 2019 - Sustainable Use and Management of Soil, Sediment and Water Resources 15th International Conference. Amberes (Bélgica). 20 - 24/05/2019.

5. **Martínez, V., Huidobro, B., Meffe, R., López, M.I., Pradana, R., Hernández, J.A., De Santiago, A., Teijón, G., Alonso, C., Nozal, L., De Bustamante, I.**
Amended vegetation filters to remove pharmaceuticals from wastewater.
2nd International Conference on Risk Assessment of Pharmaceuticals in the Environment (ICRAPHE). Barcelona. 28 - 29/11/2019.

6. **Martínez, V., Meffe, R., López, M.I., Hernández, J.A., Alonso, C., Huidobro, B., De Santiago, A., Martín, I., Teijón, G., Pradana, R., De Bustamante, I., Nozal, L., Leal, M., Carreño, F., Lillo, J., Salas, J.J.**
Atenuación de contaminantes de preocupación emergente y microorganismos patógenos en la zona no saturada: filtros verdes y efecto de enmiendas.
XIV Jornadas de Investigación de la Zona No Saturada (ZNS). Madrid. 29 - 30/10/2019.

7. **Matthies, M., Solomon, K., Vighi, M., Gilman, A., Tarazona, J.**
The Origin and Evolution of Assessment Criteria for PBT Chemicals and POPs.
SETAC Europe 29th Annual Meeting. Helsinki (Finlandia). 26 - 30/05/2019.

8. **Meffe, R., De Santiago, A., Teijón, G., Martínez, V., Hernández, J.A., Alonso, C., López, M.I., Nozal, L., De Bustamante, I.**
Fate of pharmaceuticals in soil-crop systems in a Mediterranean suburban agricultural area.
2nd International Conference on Risk Assessment of Pharmaceuticals in the Environment (ICRAPHE). Barcelona. 28 - 29/11/2019.

9. **Meffe, R., De Santiago, A., Teijón, G., Martínez, V., Hernández, J.A., López, M.I., Alonso, C., De Bustamante, I.**
Pharmaceuticals, trace metals and metalloids in the surface water used for crop irrigation: natural attenuation or risk to health?
AQUACONSOIL 2019 - Sustainable Use and Management of Soil, Sediment and Water Resources 15th International Conference. Amberes (Bélgica). 20 - 24/05/2019.

10. **Morón, J., Carreño, F.**
Monitorización en tiempo real y a remoto de algas y cianobacterias en el embalse de As Conchas. Primeros resultados del Proyecto CianoAlert.
2º Congreso Iberoamericano de Cianotoxinas y 6º Congreso Ibérico de Cianotoxinas (CIC2019). Universidad de Murcia. 3 - 5/07/2019.

11. **Morón, J., Molina, S.**
Recycled-Membrane Biofilm Reactors based on end-of-life reverse osmosis membranes as a novel low-cost alternative for microcystins removal.
7th International Conference on Sustainable Solid Waste Management. National Technical University of Athens. Heraklion, Creta (Grecia). 26 - 29/06/2019.

12. **Ortiz de Lejarazu, A., Molina, S., Ortiz J.M., Navarro, R., García Calvo, E.**
Preparation of ion exchange membranes by using end-of-life reverse osmosis membranes and application in electrodialysis.
First International Young Researchers Symposium on Applications of Electrochemical Technology (IYRS-AET), en el marco del 3rd International Congress of Chemical Engineering. ANQUE-ICCE3. Santander. 19 - 21/07/2019.

13. **Ortiz, J.M.**
Biotechnology and ion exchange membranes: low-energy microbial desalination for sustainable water production.
3rd International Congress of Chemical Engineering. ANQUE-ICCE3. Santander. 19 - 21/07/2019.

14. **Peñacoba, L., Gómez, M., Esteve-Núñez.**
Methodological Proposal for the Optimal Location of New Metlands® Construction.
WETPOL 2019 (8th International Symposium on Wetland Pollutant Dynamics and Control). Aarhus University (Dinamarca). 17 - 21/06/2019.

15. **Prado, A.**
METland: A new generation of hybrid bioelectrochemical wetlands outperform standard wetlands for treating wastewater.

Workshop REMTAVARES: "Technological Solutions for Wastewater Reuse and Sludge Valorization". Universidad de Alcalá. Madrid. 21/11/2019.

16. **Prado, A., Ramírez, C., Arias, C., Esteve-Núñez.**
A Novel Device To Increase The Electron Sink In Metlands.
WETPOL 2019 (8th International Symposium on Wetland Pollutant Dynamics and Control). Aarhus University (Dinamarca). 17 - 21/06/2019.

17. **Ramírez, M.**
Influence of inaccesible porosity of activated expanded graphite electrodes on the electroactivity of geobacter sulfurreducens.
Workshop REMTAVARES: "Technological Solutions for Wastewater Reuse and Sludge Valorization". UAH. Madrid. 21/11/2019.

18. **Rivera, A., Candela, L.**
Challenges for the assessment and management of transboundary aquifers at the global scale.
46th IAH Congress. Málaga. 22 - 27/09/2019.

19. **Rivera, A., Candela, L.**
The need to link groundwater science to social and political sciences for the large transboundary aquifers sustainability.
AGU Chapman Conference: Quest for Sustainability of Heavily Stressed Aquifers at Regional to Global Scales. Valencia. 21 - 24/10/2019.

20. **Rueda, P., Brain, R., Galic, N., Pinto, J.N., Rico, A., Forbes, V.E.**
Using plant functional traits to guide herbicide risk assessments.
SETAC Europe. Helsinki, Finland. 26 – 30/05/2019.

21. **Salehi, N., Vaquero, G., Elorza, F., Candela, L., Sheffield, J., Serrat, A.**
3-D groundwater modelling of Lake Chad Basin: challenges and success of regional scale modelling for a data poor region in Sub-Saharan Africa.
AGU Chapman Conference: Quest for Sustainability of Heavily Stressed Aquifers at Regional to Global Scales. Valencia. 21 - 24/10/2019.

22. **Schell, T., Hurley, R., Rico, A., Nizzetto, L., Vighi, M.**
Assessing relevant MPs sources for freshwater ecosystems in semi-arid areas. 8th Young Environmental Science Meeting (YES 2019).
SETAC Europe SAC. Gante (Bélgica). 05 - 10/02/2019.

23. **Schell, T., Hurley, R., Rico, A., Nizzetto, L., Vighi, M.**
Assessing the relevance of wastewater and agricultural runoff as microplastic sources for freshwater ecosystems: A case study in central Spain.
SETAC Europe 29th Annual Meeting. Helsinki (Finlandia). 26 - 30/05/2019.

24. **Schell, T., Rico, A., Vighi, M.**
Environmental risks of nanoplastics? Defining a size threshold for assessing intake of plastic particles in tissues, organs and cells.
SETAC Europe 29th Annual Meeting. Helsinki (Finlandia). 26 - 30/05/2019.

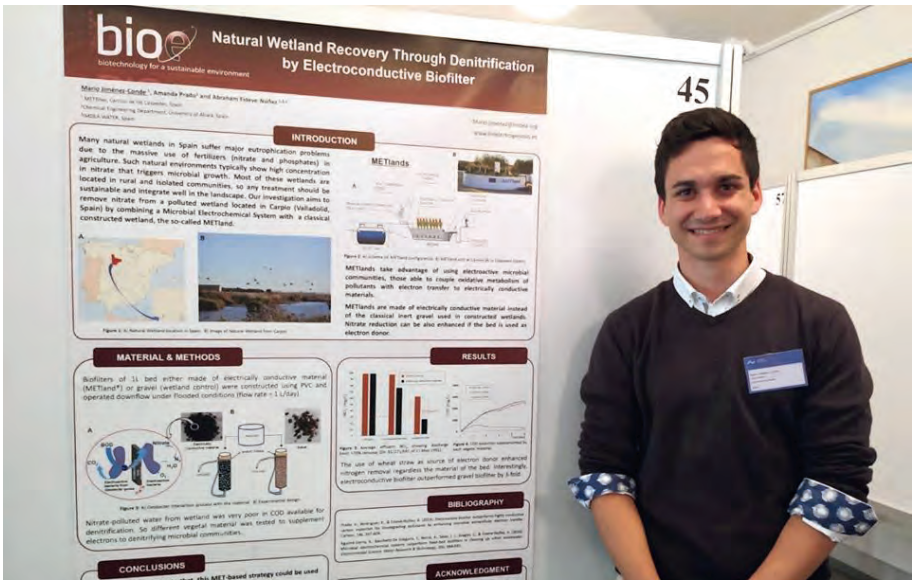
25. **Senán, J.**
Life cycle assessment of semiconservative recycling of end-of-life reverse osmosis to forward osmosis. Issues in system expansion: inventories and allocation factors.
First Mediterranean Symposium (MeSyLCA 2019), en el marco del 3rd International Congress of Chemical Engineering. ANQUE-ICCE3. Santander. 19 - 21/07/2019.

26. **Teijón, G., De Santiago, A., Meffe, R., Martínez, V., Alonso, C., López, M.I., Nozal, L., De Bustamante, I.**
Reutilización indirecta: ¿Atenuación natural o riesgo para la salud? Primeros resultados del proyecto FatePharM.
XIV Jornadas de Investigación de la Zona No Saturada (ZNS). Madrid. 29 - 30/10/2019.

8. Posters

1. **Desrousseaux, A., Mentzel, S., Boxall, A., van den Brink, P.J., Eitzinger, J., Moe, J., Grung, M., Tollefsen, K.E., MacLeod, M., Sobek, A., Rico, A., Vighi, M., van Wezel, A., Dekker, S., Chefetz, B.**
Effects of global change on the emission, fate, effects and risks of chemicals in aquatic ecosystems.
SETAC Europe. Helsinki, Finland. 26 – 30/05/2019.

2. **García, N., Marín, C., Rico, A., González, B., Marín, A.**
Efectos en el biofilm de los principales antibióticos utilizados en acuicultura.
XVII Congreso Nacional de Acuicultura. Cartagena, Spain (In Spanish). Won the Best Poster Award. 7 – 10/05/2019.



3. **González, I., Montes, R., Ares, L., Andreu, V., Bijlsma, L., Fernández-Rubio, J.H., Hernández, F., López, E., Marcé, R.M., Pico, Y., Pocurull, E., Postigo, C., Rico, A., Valcárcel, Y., Benito, J., Rodil, R.**
Estimation of exposure to phthalate plasticizers of the Spanish population using wastewater-based epidemiology.
SETAC Europe. Helsinki, Finland. 26 – 30/05/2019.

4. **González-Gaya, B., Buelow, E., Gaschet, M., Sánchez, M.B., Rico, A.**
Effects of flumequine on the microbiome and resistome of freshwater biofilms.
8th Symposium on Antimicrobial Resistance in Animals and the Environment. Tours, France. 1 – 3/07/2019.

5. **Jiménez, M., Prado, A., Esteve-Núñez.**
Natural wetland recovery through denitrification by electrochemical biofilter.
WETPOL 2019 (8th International Symposium on Wetland Pollutant Dynamics and Control). Aarhus University (Dinamarca). 17 - 21/06/2019.

6. **Pascual, J.A., Belda, R., Iranzo, E.**
Elaboración de inventarios de patrimonio y paisajes culturales para la recuperación y puesta en valor de los recursos locales.
XXI Congreso de la Asociación Española de Geografía. Crisis y espacios de oportunidad. Retos para la Geografía. Valencia. 22 - 25/10/2019.

7. **Pradana, R., Huidobro, B., Martínez, V., De Bustamante, I.**
Vegetation filters to attenuate contaminants of emerging concern and to recharge the underlying aquifer.
46th IAH Congress Malaga 2019. Groundwater management and governance coping with water scarcity. Málaga. 22 - 27/09/2019.

8. **Rivera, A., Candela, L.**
The need to link groundwater science to social and political sciences for the large transboundary aquifers sustainability.
The AGU Chapman conference. Valencia (España), 21-24/10/2019.

9. **Salehi, N., Vaquero, G., Elorza, F., Candela, L., Sheffield, J., Serrat, A.**
Assessment of groundwater natural recharge in difficult environments: A case study at the Lake Chad Basin.
46th IAH Congress. Málaga. 22 - 27/09/2019.

10. **Salehi, N., Vaquero, G., Elorza, F., Lee, J., Candela, L., Serrat, A.**
3-D groundwater modelling of Lake Chad Basin: challenges and success of regional scale modelling for a data poor region in sub-saharan Africa.
The AGU Chapman conference. Valencia (España), 21-24/10/2019.

11. **Schell, T., Martínez, S., Dafouz, R., Hurley, R., Rico, A., Vighi, M.**
Effects of microfibers and tyre debris on freshwater invertebrates.
SETAC Europe 29th Annual Meeting. Helsinki (Finlandia). 26 - 30/05/2019.

12. **Schell, T., Martínez, S., Martín, A.M., Dafouz, R., Rico, A., Vighi, M.**
Ingestion and impacts of tire particles and synthetic fibers on freshwater invertebrates.
SETAC (Society of Environmental Toxicology and Chemistry) North America 40th Annual Meeting. Toronto (Canadá). 3 - 7/11/2019.

13. **Wardman, C., Ródenas, P., Ortiz, J.M., Esteve, A.**
A Custom Workforce: Novel Use of the Gradostat for the Adaptation of Microbes for Microbial Electrochemical Devices.
The 16th IWA Leading Edge Conference on Water and Wastewater Technologies. Edimburgo (Reino Unido). 10 - 14/06/2019.

9. Patents

1. Water disinfection device and method for solar disinfection of water. EP2835622 A1. 13179906.6 Vivar, M.; Fuentes, M. No publication grant. EP2835622A1.

10. Fellowships

Alberto Blanco González
Category: Research support
Fund: Spanish Ministry of Economy, Industry and Competitiveness

Juan Manuel Ortiz Díaz-Guerra
Category: Researcher form National Science Programme "Young Researchers"
Fund: Spanish Ministry of Economy, Industry and Competitiveness

Manuel Mínguez Calzada
Category: Laboratory technician
Fund: Community of Madrid

Ana de Santiago Martín
Category: Researcher from Regional Science Programme "Talent atraction"
Fund: Community of Madrid

Amaia Ortiz de Lejarazu Larrañaga
Category: Predoctoral researcher
Fund: Spanish Ministry of Economy and Competitiveness

Raquel Dafouz Ramírez
Category: Research support
Fund: Community of Madrid

Noelia C. Peral Romero
Category: Laboratory technician
Fund: Community of Madrid

Borja Fernández Retuerto
Category: Predoctoral researcher
Fund: Community of Madrid

Eduardo Noriega Primo
Category: Predoctoral researcher
Fund: Community of Madrid

Nataraj Sanna Kotrappanavar
Category: Researcher from Regional Science Programme "Talent atraction"
Fund: Community of Madrid

Blanca Huidobro López
Category: Predoctoral researcher from National Science Programme "Funds for the training of doctors" FPI
Fund: Spanish Ministry of Science, Innovation and Universities

Marina Ramírez Moreno
Category: Predoctoral researcher
Fund: Community of Madrid.

Silvia Barge Álvarez
Category: Research support
Fund: Spanish Ministry of Science and Innovation.

Lorena Martínez García
Category: Research support
Fund: Spanish Ministry of Science and Innovation.

Helena Ocaña Biedma
Category: Research support
Fund: Spanish Ministry of Science and Innovation.

Luis Simón Monllor Alcaraz
Category: Laboratory technician
Fund: Spanish Ministry of Science and Innovation.

11. Phd Thesis

PhD thesis defended

1. **Georgiana Amariei.** Materiales funcionales nanoestructurados para aplicaciones tecnológicas y biomédicas. Directors: Roberto Rosal García and Pedro León García. (09/04/2019)

2. **David Mostaza.** Estudio de las relaciones entre aguas superficiales y aguas subterráneas de la Masa de Agua Subterránea (MAS) Aluviales: Jarama-Tajuña (030.007). Director: Francisco Carreño Conde. (06/06/2019)

3. **Idoia Martín de Lucía.** Physical and toxicological interactions between anthropogenic pollutants and engineered nanoparticles. Directors: Roberto Rosal García and Francisca Fernández Piñas. (21/06/2019)

4. **Antonio de Lucas.** Concepto, análisis histórico y determinación de excedentes de la cuenca del Tajo: aplicación al trasvase Tajo-Segura. Directors: Irene de Bustamante Gutiérrez and Bernardo López Camacho. (28/06/2019)

5. **Alba Arenas.** Multiple stressors on aquatic ecosystems under Mediterranean conditions. Directors: Andreu Rico and Marco Vighi. (06/09/2019)

6. **Jesús Morón.** Desarrollo de tecnologías biológicas de control de cyano-HABs y eliminación de cianotoxinas. Directora: Serena Molina. (03/10/2019)

7. **Ascensión López Vargas.** Desarrollo de equipos de bajo coste para monitorización de sistemas fotovoltaicos basados en herramientas de open-hardware y código abierto. Directors: Manuel Fuentes Conde and Marta Vivar García. (22/11/2019)

Thesis in progress

1. **Álvaro Pun.** Efecto de contaminantes emergentes en lechos bioelectroquímicos. Directors: Esteve-Núñez and Karina Boltes.

2. **Amaia Ortiz de Lejarazu.** Innovación en el reciclaje de membranas para el tratamiento del agua. Directors: Serena Molina and Juan Manuel Ortiz.

3. **Amanda Prado.** Depuración de aguas residuales mediante el uso de humedales bioeletrogénicos con biochar electroactivo como sustrato biofiltrante. Director: Esteve-Núñez.

4. **Ana María Fernández.** Análisis de las necesidades hídricas en diversas componentes del ecosistema fluvial para la definición de regímenes de caudales ecológicos. Directors: Ángel Udías y Fernando Magdaleno.

5. **Andrés de Deus.** Estrategias 3D de "cableado" redox en bacterias electroactivas para recuperar ambientes contaminados. Director: Esteve-Núñez.

6. **Berta Díez.** Fouling and biofouling resistant membranes for water treatment processes. Director: Roberto Rosal.

7. **Blanca Huidobro.** Desarrollo de un filtro verde enmendado que actúe como tratamiento secundario y terciario. Directors: Irene de Bustamante and Leonor Nozal.

8. **Carlos Edo.** Environmental distribution and fate of microplastics: ageing and effect on the freshwater biota. Directores: Roberto Rosal y Francisca Fernández Piñas.

9. **Colin Wardman.** Tecnologías electroquímicas microbianas aplicadas a la depuración de aguas residuales. Director: Esteve-Núñez.

10. **Cristina Villar.** Biosensores electroactivos. Director: Abraham Esteve.

11. **Felicia Mabel Díaz.** Efecto de contaminantes emergentes sobre procesos anaerobios de tratamiento de agua residual. Directors: Pedro Letón and Karina Boltes.

12. **Fluquer Peña.** El agua subterránea en los sistemas kársticos de la reserva Nor Yauyos Cochas. Directors: Irene de Bustamante and Javier Lillo.

13. **Franceso Polazzo.** Impacts of global change in the vulnerability of aquatic ecosystems to chemical stress. Director: Andreu Rico.

14. **Jacquelyne del Rosio Chagua.** Estudio hidrogeológico, disponibilidad y calidad del agua subterránea en la cuenca Sama, Tacna, Perú. Director: Irene de Bustamante.

15. **Jorge Carlos Delgado.** Análisis de las implicaciones de la viabilidad de reutilización del agua en la edificación. Director: Eloy García Calvo.

16. **Jorge Senán.** Análisis de Ciclo de Vida en la transición a la Economía Circular. Caso de estudio: El reciclaje en la tecnología de membrana. Directors: Eloy García Calvo and Junkal Landaburu.

17. **Juan José Castro.** Ingeniería hidráulica aplicada a la minería romana, estudio del sistema ruina montium. Directors: Irene de Bustamante and Javier Lillo.

18. **Juan Pedro Martín.** Aplicación de índices de calidad a la afección de nitrógeno y metales pesados en el suelo bajo diferentes usos en el área periurbana de Madrid. Directors: Ana de Santiago and Inmaculada Valverde.

19. **José María Campo.** Aplicaciones del avance en el conocimiento del fenómeno del niño y las influencias del cambio climático, en la hidrología operativa en la costa de Ecuador. Director: Ángel Udías.

20. **Laura Rodríguez.** Uso de membranas recicladas de ultrafiltración en biorreactores de membrana para tratamiento de aguas residuales. Directors: Junkal Landaburu and Serena Molina.

21. **Laura Valenzuela.** Photocatalytic nanostructured coatings with antimicrobial and self-cleaning properties. Directors: Roberto Rosal and M.ª Soledad Faraldos.

22. **Lorena Peñacoba.** Diseño y construcción de humedales electrogénicos para la eliminación de contaminantes emergentes en aguas residuales urbanas. Directors: Eloy García Calvo and Esteve-Núñez.

23. Marina Ramírez. Comportamiento electroquímico de celdas de desalinización microbiana a escala laboratorio. Directors: Juan Manuel Ortiz and Esteve-Núñez.

24. Mario Jiménez Conde. Biofiltros electrogénicos con sustratos vegetales para la reducción de nitratos en aguas. Directors: Eloy García Calvo and Esteve-Núñez.

25. Mercedes Echegaray. La gobernanza del agua en España. Directores: Irene de Bustamante y Bernardo López-Camacho.

26. Sara Pelegrin. Planificación hidrológica comparada: España y Reino Unido. Herramienta para cumplir los ODS y cambio climático. Directors: Irene de Bustamante and Bernardo López-Camacho.

27. Sergio Martínez-Campos. Plastic as vectors of microorganism in the aquatic environment. Director: Roberto Rosal.

28. Theresa Schell. Sources, pathways and risk of microplastics in freshwater ecosystems. Director: Andreu Rico.

12. Internships

Student: Michael Peter Füeg
Research: Microbial Electrochemical Technologies
Centre: University of Alcalá
Date: 02/2018-09/2019

Student: Talles Bruno Oliveira dos Anjos
Research: Direct and indirect effects of pesticides and different nutrients scenarios on aquatic macroinvertebrates communities and populations.
Centre: Loblenz-Landau University, Germany
Date: 15/04/2019 – 21/08/2019

Student: Aleksandra Kulić
Research: Erasmus+ training program
Centre: Faculty of Sciences. University of Novi Sad, Serbia
Date: 8-10/07/2019

Student: Jessica Andrade Vilas Boas
Research: Evaluating the effect of multiple stressors on the planktonic community
Centre: Universidad Federal Juiz de Fora, Brazil
Date: 21/08/2019 – 20/02/2020

Student: David Ewusi-Mensah
Research: Microbial electrochemical systems
Centre: University of Hubai, China
Date: 26/08/2019 – 20/01/2020

Student: Roberto Giacchini
Research: Ecotoxicology
Centre: Universidad de Milano-Bicocca
Date: 09/09/2019 – 13/09/2019

Student: Ting Wei
Research: Microbial electrochemical technologies
Centre: Xi'an University of Science and Technology, China
Date: 11/09/2019 – 19/12/2019

Student: MD Tabish Noori
Research: Microbial osmotic desalination with energy and nutrient recovery
Centre: Universidad de Alcalá – Got Energy Talent Program
Date: 19/09/2019 – 18/09/2020

13. RTD activities organization

1. Technical conference Life-Answer: "Retos y oportunidades en la reutilización del agua y la recuperación de nutrientes: soluciones innovadoras". Organized by Project LIFE-Answer Consortium of wich IMDEA Water is a partner. Agencia del Agua de Castilla-La Mancha. Toledo. 21/03/2019.

2. M6 Progress Meeting ELECTRA H2020. Sevilla. 8 y 9/07/2019.

3. Infoday Life ANSWER: "Gestión de vertidos en el marco de la economía circular". Club Mahou. Madrid. 12/11/2019.

4. AquaEnergy Forum 2019. IMDEA Water is a sponsor. Madrid. 21 y 22/11/2019.

14. Institutional Activities

15.1 Awards and Merits

1. Rico, A. Best Poster Award at the XVII National Congress of Aquaculture,7-10th May 2019. *Efectos en el biofilm de los principales antibióticos utilizados en acuicultura.* (García-Bueno ,N., Marín, C., Rico, A., González-Gaya, B., Marín, A.). May 2019.

2. Ortiz, J.M., Landaburu, J., Ramírez, M., Esteve-Núñez, Wardman, C. y Barroeta, B. Prize EIT Climate-KIC: ClimateLaunchpad - Green Business Ideas Competition. *BioForward: New concept of sustainable desalination for low cost drinking water production.* June 2019.

3. Rico, A. 2018 Sustainability Science Best Paper Award. Unpacking factors influencing antimicrobial use in global aquaculture and their implication for management: a review from a systems perspective (Sust Sci 13 (4): 1105-1120). June 2019.

4. Jiménez, M. Best Poster Award. 8th International Symposium on Wetland Pollutant Dynamics and Control (WETPOL 2019). *Natural wetland recovery through denitrification by electrochemical biofilter.* WETPOL 2019 (8th International Symposium on Wetland Pollutant Dynamics and Control). Aarhus University, Denmark. June 2019.

5. Ortiz de Lejarazu, A. Award for the best presentation. First International Young Researchers Symposium on Applications of Electrochemical Technology (IYRS-AET). 3rd International Congress of Chemical Engineering. ANQUE-ICCE3. *Preparation of ion exchange membranes by using end-of-life reverse osmosis membranes and application in electrodialysis.* Santander. June 2019.

6. BioForward team (led by Ortiz, J.M. and integrated by Landaburu, J., Esteve, A., Ramírez, M., Wardman, C. y Barroeta, B.) is the winner of the 2019 Spanish edition of ClimateLaunchpad. *Biotechnology-based water desalination solution with low energy consumption.* AVAESEN. Valencia. October 2019.

7. H2020 iMETland Project video (coordinated by Esteve-Núñez), has been selected as finalist for the Global Innovation Award (Globally Great Video Platform). Prize awarded by the Ministry of Climate Change and Environment of United Arab Emirates. December 2019

8. Rico, A. Exceptional Reviewer recognition in 2018 and 2019 for being part of the Editorial Board of the Journal Environmental Toxicology and Chemistry. Diciembre 2019

9. Ortiz, J.M. Premio del jurado al mejor pitch. Pitch training & Final event. Climate KIC Spain. Fundación Valenciaport. Valencia. 12 y 13/12/2019.

12.2 Other institutional activities

- Member of Research Laboratories Network (REDLAB). http://www.madrimasd.org/Laboratorios/default.asp

- Participation. XIX Science and Innovation Week. Madrid, Spain. 2019

- Participation. X European Researchers' Night. Madrid. Spain. 2019

- Member of Euraxess Service Network. Local Contact Point