

# Report 2017



Institut Català  
de Recerca de l'Aigua  
Instituto Catalán  
de Investigación del Agua  
Catalan Institute  
for Water Research









# Report 2017

**This new proposed Directive on the quality of water for human consumption shall protect human health from any adverse effects of any contamination of water intended for human consumption and should promote as well the universal access of such water in all EU. (Drinking Water Directive)**



# Institut Català de Recerca de l'Aigua

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# 01 Presentation





**Welcome,**

**I am pleased to present the 2017 Activities Report of the Catalan Institute for Water Research-ICRA Foundation.**

ICRA has continued to grow in terms of projects throughout 2017. Its commitment to European and international projects has had some good results. Of the presented proposals, three projects have been awarded (one LIFE two Horizon2020). In the national projects section, six R&D&I projects, four Juan de la Cierva grants for the incorporation of post-doctorate researchers, and three pre-doctorate FI grants have been obtained. During 2017, ICRA has managed €1.9M in European, national and transfer projects.

In May 2017, ICRA began a strategic internal project, Framework Directive Project, financed with its own resources. This project aims to respond to some of the questions raised from the application of current water legislation. The main objective of the project is the acquisition of knowledge on priority substances and new contaminants emerging in water bodies in Catalonia, to be able to provide new tools to improve their chemical state. This project has involved a close working relationship with researchers at the Spanish Scientific Research Council, (Sea Science

Institute, Environmental Diagnostics and Water Studies Institute), as well as collaboration with the Catalan Water Agency, providing the samples for study.

In terms of activities, ICRA has attended national and international conferences and workshops, actively presenting the results of projects and studies. Part of its activity has also been addressing the non-scientific community, taking part in seminars and discussion groups.

To conclude, I would like to thank all ICRA personnel for their commitment, as without their work and enthusiasm ICRA would not be possible.

I hope you find it an interesting read.

Yours faithfully,

**Damià Barceló**  
**Director**

A blurred background image of a laboratory with a microscope in the foreground. A semi-transparent blue rectangle is overlaid on the image, containing the text '02 Organisation' in white.

# 02 Organisation



A blurred background image of a microscope, with a blue semi-transparent overlay on the left side.

## **In 2017, 110 people contributed to ICRA's R&D&i activities**

**81 Research personnel**

**19 Management / Administration personnel**

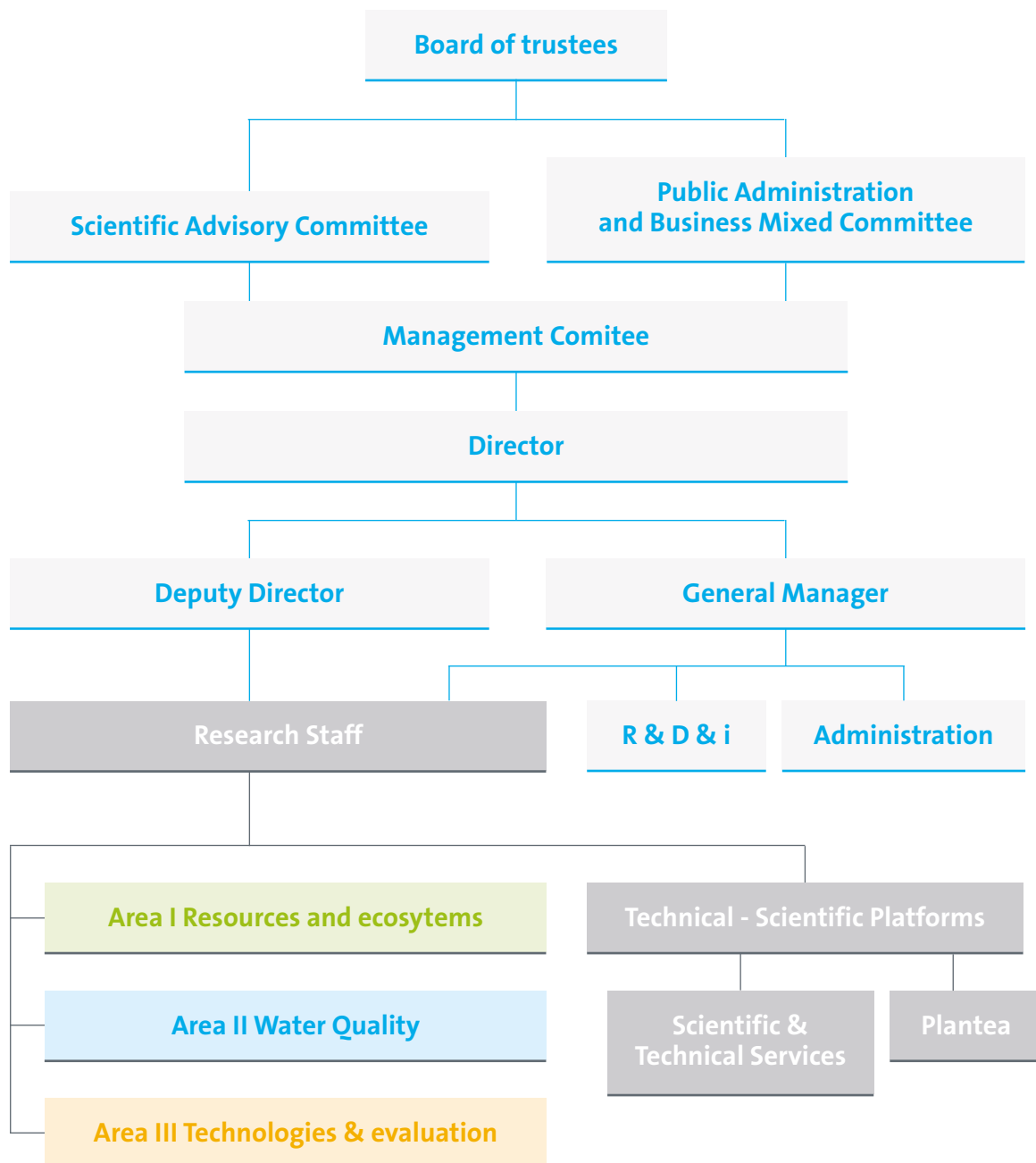
**3 R&D&i personnel**

**7 Framework Directive Project personnel**

# Board of trustees

The Board of Trustees is ICRA's highest governing body. The trustees are the Catalan Regional Government's Ministry of Business and Knowledge (DECO), the Catalan Water Agency (ACA) and the University of Girona (UdG).

In 2017, the ICRA Board of Trustees has met twice. An extraordinary session was held on 24/3/2017 to discuss and make decisions on the acquisition of the H2O building. The annual general meeting was held on 22/5/2017 to make decisions about operations for the year.





# Members

## CHAIR

**Jordi Baiget i Cantons** (until October)  
Minister for Business and Knowledge  
Ministry of Business and Knowledge  
Regional Government of Catalonia

**Santi Vila i Vicente** (until 27th of October)  
Minister for Business and Knowledge  
Ministry of Business and Knowledge  
Regional Government of Catalonia

**Minister of the Regional Government of Catalonia competent in research matters (exofficio member): vacant** [Senate Chair Agreement of 27 October 2017, publishing the Senate Plenary Session Agreement approving the measures required by the Government, under the aegis of article 155 of the Constitution.].

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## DEPUTY CHAIR

**Sergi Bonet** (until November)  
Rector  
University of Girona

**Joaquim Salvi** (from December)  
Rector  
University of Girona

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## TRUSTEE SECRETARY

**Lluís Rovira**  
Director of CERCA (Catalan Research Centres)  
General Directorate of Research  
Ministry of Business and Knowledge  
Regional Government of Catalonia

## NON-TRUSTEE DEPUTY SECRETARY

**Josep M. Alcoberro**  
Legal Department of CERCA (Catalan Research Centres)  
Ministry of Business and Knowledge  
Regional Government of Catalonia

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## MEMBERS

**Arcadi Navarro**  
Secretary for Universities and Research  
Secretariat for Universities and Research  
Ministry of Economy and Knowledge  
Regional Government of Catalonia

**Francesc Ramon Subirada**  
Managing Director of Research  
General Directorate of Research  
Ministry of Economy and Knowledge  
Regional Government of Catalonia

**Anna Albar**  
Managing Director  
Science and Technology Park  
University of Girona

**Ramon Moreno** (until November)  
Vice-Rector of Planning, Innovation and Enterprise  
University of Girona

**Josep Calbó** (from December)  
Vice-Rector of Strategic Projects  
University of Girona

**Jordi Agustí**  
Director of the Catalan Water Agency  
Catalan Water Agency  
Ministry of Territory and Sustainability  
Regional Government of Catalonia

# Committees

## Scientific advisory committee

The **Scientific Advisory Committee** is appointed by the Board of Trustees and comprises an unspecified number of scientists of acknowledged repute and expertise in the field of water and all other related areas of science. This Committee's membership represents the ICRA's different priority areas of research. One of its most significant tasks is to ensure the quality of the research carried out at the

ICRA. Accordingly, it acts as an advisory body for all issues relating to the scientific activities submitted for its consideration, and, when requested, it will also act as an evaluating body for these activities.

This year, the Scientific Advisory Committee has not been convened as its sessions are held every two years. The next meeting is scheduled for spring 2018.



**Bernd Bilitewski**

**Chair of the Scientific Advisory Committee.** General Commissioner for Foreign Affairs. Head of the Institute for Waste and Pollutant Management, Dresden University of Technology (DE)



**Clifford Dahm**

Emeritus Professor of Department of Biology, University of New Mexico, Albuquerque (USA)



**Gustaf Olsson**

Emeritus Professor of Industrial Automation, Department of Industrial Electrical Engineering and Automation (IEA), Lund University, Lund (SE)



**Inmaculada Ortiz Uribe**

Head of the research group in Advanced Separation Processes. Faculty member of the Department of Chemical Engineering and Inorganic Chemistry, University of Cantabria, Santander (ES)



**Edward Furlong**

Head of the Methods Research & Development Program, National Water Quality Laboratory, US Geological Survey, Denver Federal Center, Denver, CO (USA)



**Amadeo Rodríguez Fernández-Alba**

Head of the European Reference Laboratory for Pesticides. Faculty member of the Department of Hydrogeology and Analytic Chemistry, University of Almería, Almería (ES)



**Jeanne Garric**

Director of the Ecotoxicology Laboratory, Aquatic Ecosystems Biology Unit, Department of Water Quality and Pollution Prevention, IRISTEA (FR)





### **Emilio Custodio Gimena**

Emeritus Professor of the Department of Geotechnical Engineering and Geosciences, Groundwater Research Team of the Polytechnic University of Catalunya, Barcelona (ES). Correspondent member of the Royal Spanish Academy of Sciences. President of the Advisory Committee of the Fundación Centro Internacional de Hidrología Subterránea (FCIHS)



### **Georg Teutsch**

Scientific Managing Director of the Helmholtz - Centre for Environmental Research (UFZ) at Leipzig, Germany (DE), Full Professor in Hydrogeology at the same centre, Member of the National Committee for Global Change Research, Member of the German Commission on Water Research



### **Jörg Overmann**

Director of the Leibniz-Institute German Collection of Microorganisms and Cell Cultures (DSMZ) and Head of the Department Microbial Ecology and Diversity Research, Leibniz, Germany (DE)



### **Peter-Dietrich Hansen**

Director of the Department of Ecological Impact Research and Ecotoxicology, Berlin Institute of Technology (BIT), Germany (DE)



### **Maria Reis**

Full Professor in Environmental Biotechnology, Department of Chemistry, Sciences and Technology Faculty, University Nova of Lisbon (UNL), Portugal (PT)



### **Peter Vanrolleghem**

Holder of the Canada Research Chair on Water Quality Modeling (modelEAU) and Professor of the Department of Civil Engineering and Water Engineering, Université Laval, Quebec, Canada (CA)



### **Paola Verlicchi**

Professor in Environmental and Sanitary Engineering, Engineering Faculty, Department of Engineering, University of Ferrara, Italy (IT)



### **Susan D. Richardson**

Arthur Sease Williams Professor of Chemistry, Department of Chemistry & Biochemistry, University of South Carolina (USA)



### **Stan Gregory**

Emeritus Professor, Department of Fisheries & Wildlife, Oregon State University (USA)

## Public administration and business mixed committee

The Public Administration and Business Mixed Committee is the body for business participation in the Foundation. It may be consulted by the Board of Trustees and by the Director, and may issue recommendations for guidance.

**The functions of the Public Administration and Business Mixed Committee are:**

- Assist in detecting industry needs and making specific proposals
- Identify attractive technology development opportunities

- Promote participation in joint research projects and facilitate access of the Foundation to public and private resources
- Assist in the creation of spin-offs
- Participate in activities related to the Foundation objectives

This year, the Public Administration and Business Mixed Committee has not been convened as its sessions are held every two years. The next meeting is scheduled for autumn 2018.



**Xavier Tristán Prat**

Chair of the Business Committee

Acting Manager of the Costa Brava Consortium (CCB) and Head Engineer for Technical Services at the CCB. Member of the Advisory Council for the Sustainable Development of Catalonia (CADS).



**Jaume Carol Pañach**

Managing Director of FLUIDRA. President of the Catalan Water Partnership (CWP), the Catalan Water Cluster and member of the Catalan Sports Cluster Board (INDESCAT).



**del Blanco**

Managing Director of RECIPHARM Paretis S.L.U., the Spanish subsidiary of RECIPHARM AB (Sweden).



**Jorge Juan Malfeito Sánchez**

Director of R&D&I at ACCIONA Agua S.A.



**Sergi Martí Costa**

Managing Director of STENCO, AQUA AMBIENT IBÉRICA and TRAINING INDUSTRIAL.



**Carlos Montero**

Managing Director of CETaqua.



**Antonio Ordóñez**

Director of Research, Development and Innovation - GS INIMA Environment, S.A.



**Valentin Garcia**

Director of Hydraulic Public Works, National and International, at SOIL AGUAS, SOIL Group.

# Departments & Staff



**Damià Barceló**

**DIRECTOR**

Research Professor and Deputy Director of the Institute of Environmental Assessment and Water Studies (IDAEA), of The Spanish National Research Council (CSIC)



**Sergi Sabater**

**DEPUTY DIRECTOR**

Full Professor of Ecology at the University of Girona. Head of ICRA's Resources and Ecosystems Research Area



**Iván Sánchez**

**GENERAL MANAGER**

General Manager



**Olga Corral**

**EXECUTIVE SECRETARY**

Executive Secretary, Director's Office



In 2017, 110 people contributed to ICRA's R&D&I activities

81 Research personnel

19 Management/Administration personnel

3 R&D&I personnel

7 Framework Directive Project personnel



# R&D&i Support services

The General Manager of ICRA is responsible for all the basic services that provide support for R&D&i:

- Administration
- R&D&i Office
- Technical and scientific platforms:
  - Scientific and Technical Services (SCT)
  - PLANTEA



## Administration

In 2017, the active administrative services that performed specific functions within each field of activity were:

- **Human Resources**
- **Purchasing and Procurement (Outsourcing)**
- **Finance and Accounting**
- **Information Technologies**
- **Communication, Image and Promotion**
- **Quality and Environment**
- **General Services**

The **Outsourcing Service** has managed 3 types of contract: services, supplies and construction, with the objective of providing ICRA's 3 research areas and the SCT with both basic and special scientific equipment.

This equipment has been 50% co-financed by the EU's European Regional Development Fund (FEDER) under the Catalan FEDER Operative Program 2007-2013 and it also received funding from MINECO (The Spanish Ministry of Economy and Competitiveness), directly and through the Third Additional Provision (DA3ª) of the Catalan Statute of Autonomy.



From left to right (standing): Ivan Sánchez, David López, Esther Llorens, Pere Royo, Olga Corral, Neus Fabrega. From left to right (front row): Sandra Monleón, Jordi Castellà, Susana Roca, Ruben Diaz

General Manager: **Iván Sánchez**

Executive Secretary, Director's Office: **Olga Corral**

Human Resources Head: **David López**

Eco-Fin Head: **Xavier Frígola** (until October 2017) -  
**Susana Roca**

Accounting and Support to Research: **Antònia Donadeu** (until August 2017) | **Olga Fernandez** (until octubre 2017) | **Silvia Canal** (until Desember 2017)

Administration Technician: **Albert Garcia-Campero** (August to November 2017) | **Estefanía Romero** (November to Desember 2017)

IT: **Rubén Díaz**

Reception: **Pere Royo** | **Sandra Monleon** | **Roser Saez** (until October 2017)

Maintenance: **Ricard Zamora** (until December 2017) **Daniel Molina**

Visiting Students

Administration: **Marc Matas** - Internship Student, IES Montilivi (Girona)

Human Resources: **Ivana Fraixino** - Internship Student, University of Girona | **Sandra Garcia** - Internship Student, University of Girona

## R&D&i Office

### Objectives and activities of the R&D&i Office

The purpose of the R&D&i Office is to enhance the capacity of ICRA to scale research and gain international prestige by attracting external funding and partnerships. Its operational objective is, therefore, to increase the participation of ICRA research groups in nationally and internationally funded research projects of both a basic and applied nature and to increase industry connections through the application of research results.

The Office assists ICRA researchers in the definition and implementation of a strategy for participation in research-grant funding initiatives at local, national and international level. We also offer our researchers full support for calls search and proposal preparation and presentation, as well as advice on all proposal-related financial and legal issues. Finally, we provide full support for the administrative and financial management of successful grants and technology transfer contracts with local and international enterprises.

R&D&i Office Manager: **Jaume Alemany**

European and International Project Officer:  
**Laura Bertolini**

Project Manager: **Rina Weltner**



From left to right: Laura Bertolini, Rina Weltner, Jaume Alemany, Arnau Mullol

In 2017, ICRA presented or participated in 15 European proposals totalling almost 10M. So far we have received notice of three H2020 (one Marie Curie Skłodowska Action Individual Fellowship, and two H2020 Societal Challenge collaborative projects) and one LIFE proposal funded for a total of 1.2M. At the moment, the Office is managing a total of 13 international projects among which is the ERC Starting ELECTRON4WATER that proposes a pioneering, chemical-free water purification technology through a three-dimensional (3D) nanoelectrochemical system equipped with low-cost reduced grapheme oxide (RGO)-based electrodes.

At national level, in 2017, the Office has taken care of 16 research projects funded by the Spanish National Funding Agency and Spanish Ministry of Economy and Competitiveness (AEI-MINECO), 14 fellowship grants (10 funded by AEI-MINECO and four by the Catalan Agency for Management of Universities and Research Grants -AGAUR) and six networking projects funded by AEI-MIECO and other institutions. In 2017, a total of 11 proposals were submitted for funding, currently six have been awarded in 2018 for a global amount of €0.81M, five proposals are still pending resolution. In addition, 11 proposals for personnel grants were submitted in 2017 but are still pending resolution.

With regard to Knowledge and Technology Transfer (KTT), a total of nine collaborative contracts were signed with private companies and public entities for a global amount of €0.15M.

A European patent application was submitted to the European Patent Office. This invention is shared with the University of Girona and relates to an improvement on membrane bioreactor performance for water and wastewater treatment.

For 2018, our aim is to work intensively with international consortia in order to prepare at least 20 European/international proposals, especially in the light of the new initiatives that will be launched next year. Apart from H2020 calls, we will be working to actively participate in the WATER JPI and the new Partnership on Research and Innovation in the Mediterranean Area (PRIMA) calls to be published at the beginning of 2018. We have brilliant and very motivated young and senior researchers that will apply for ERC Grants and Marie Curie Individual Fellowships. ICRA will also participate either as

coordinator or participant in the next calls issued by the ENI CBC MED and by water/climate related ERANET Initiatives, such as ERANETMED and ERA4CS.

ICRA is very actively involved in collaborations with national and international research and technological partners, contributing to the drafts of strategic implementation plans and future calls related to different European initiatives in the field of water science. ICRA joined the Water supply and sanitation Technology Platform (WssTP) initiated by the European Commission in 2004 to promote coordination and collaboration of Research and Technology Development in the water industry.

ICRA also participates in four COST actions: NETworkingLAkeobservatories in Europe (NETLAKE), Conceiving Wastewater Treatment in 2020. Energetic, environmental and economic challenges (Water 2020), new and emerging challenges and opportunities in wastewater reuse (NEREUS) and Science and Management of Intermittent Rivers and Ephemeral Streams (SMIRES).

In 2017, the Office appointed an administrative officer to give extra support in the complexities of grant applications and project administration; we are delighted to welcome Rina Weltner to the team.

## Technical and scientific platforms

Since one of the objectives of ICRA is to transfer knowledge and to provide practical solutions, the Scientific and Technical Services (STS) provide analytical services and PLANTEA for scaling up processes to pilot plant scale.

In 2017, the technical and scientific platforms have been consolidated to provide a quality scientific and technical support service to researchers.

The STS has also carried out continuous training and specialization of technicians.

### Platform (PLANTEA)

- Scientific and technical services (SCT)
- Water science and technologies research platform (PLANTEA)



## SCIENTIFIC AND TECHNICAL SERVICES (STS)

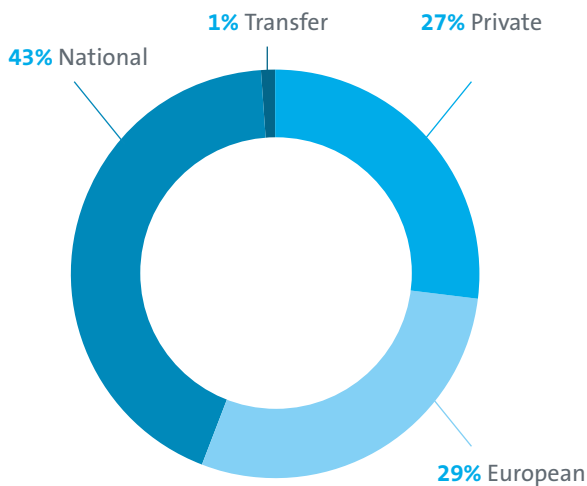
The ICRA Scientific and Technical Services (SCT) have been consolidated as a specialist analysis and technical advisory platform for the different area of action of the centre. The framework of action covers different research projects of the institute as well as collaboration with external bodies.

Throughout 2017, the actions carried out by the SCT have mainly focussed on providing consolidated services and the optimisation and validation of methodologies in response to legislative and research requirements. Participation and results arising from the SCT work has enabled the publication of articles in scientific magazines of international renown as well as the awarding of new research projects.

Apart from the commitments linked to the different aspects of research, the expertise of the SCT has resulted in the organisation of educational workshops and training of technical personnel.

### Technology transfer

The transfer of technological knowledge in 2017 reflects an increase in income compared to the previous year. The next figure shows the distribution of the origin of funds of financial entities, detecting a significant increase in resources originating from external bodies.



ICRA Head of SCT: **Sara Insa**

ICRA Head of SCT: **Marta Villagrasa**

Technicians: **Olga Montojo | Alex Sánchez  
Natàlia Serón**

Visiting students

**Isabel Arenas** - Internship Student IES  
Montilivi (Girona)

**Eloi Grabulosa** - Internship Student  
University of Girona



From left to right (standing): Olga Montojo, Marta Villagrasa, Isabel Arenas. From left to right (front row): Àlex Sánchez, Natalia Serón, Sara Insa

## WATER SCIENCE AND TECHNOLOGIES RESEARCH PLATFORM (PLANTEA)

**The Catalan Institute for Water Research (ICRA) is the home of the Water Science and Technologies Research Platform (PLANTEA).**

The Water Science and Technologies Research Platform (PLANTEA) is a space where research and industrial development projects can be carried out with pilot plants of different sizes (up to semi-industrial scale).

These pilot plants make it possible to carry out research projects on advanced treatment of both wastewater and treated water or water

that can be made potable, and on projects for monitoring, eliminating and evaluating the effects of contaminants in water, as well as studies that require large-scale equipment.

This facility has been 50% co-financed by the EU's European Regional Development Fund (FEDER) under the Catalan FEDER Operative Program 2007-2013 and also received funding from MINECO (Spanish Ministry of Economy and Competitiveness), directly, and through the Third Additional Provision (DA3<sup>a</sup>) of the Catalan Statute of Autonomy.

### Scientific-technical platforms

The PLANTEA test platform currently provides ICRA with benchmark facilities for carrying out two different aims:

- The study of wastewater transport and treatment systems in conditions as similar as possible to the real world (pilot plants).
- The study of the response of fluvial ecosystems in different conditions thanks to the installation of an experimental stream facility (ESF).
- An artificial aquatic mesocosm ecosystem that makes it possible to carry out studies on exposing organisms such as mussels and/or fish to chemical contaminants.



### Wastewater treatment pilot plants

We currently have several pilot plants in operation in the PLANTEA platform to mimic real wastewater transport and treatment systems. There are two pilot scale sewer systems simulating two rising mains from a sewer network, which are being operated to study the biochemical transformations occurring in these systems. Most detrimental compounds produced during wastewater transport originate in the anaerobic zones of the

sewer networks, the rising mains. The two most detrimental compounds produced are hydrogen sulphide, responsible for bad odours and toxic at certain concentrations, and methane, which is the most important greenhouse gas today, after carbon dioxide. These sewer pilot plants make possible the study of chemical and microbiological transformations in these parts of the sewer networks, which are very difficult to access in

real facilities. These installations, which are the first of their kind in Europe, allow the researchers to investigate why and how these detrimental products form during wastewater transport and how their formation can be prevented.

In 2017, we have been expanding our research in sewer networks towards exploring the fate of micropollutants occurring in sewers during the transport of wastewater. This has also been linked with the study of the presence of antibiotic resistance genes in sewers, which has not been reported so far in the literature. These activities are part of ongoing project funded by the Spanish Government that started in 2016 (SEWAGENE).

On the other hand, several sequencing batch reactors (SBR) are also currently being operated to study different biological processes involved in the removal of contaminants in wastewater treatment plants. Part of the research in 2017 has focused on establishing a link between nitrification and the removal of micropollutants such as endocrine disrupting compounds. Also, another topic of research has been the study of N<sub>2</sub>O emissions during nitrification and the effect that seasonal variations have on these emissions. This research is conducted within the project REACH funded by the Spanish Government which aims to assess the effect of seasonal variations on GHG emissions on the whole urban wastewater cycle. This project will finish in 2018.

During 2017, the WATINTECH project funded by the EU via JPI WATERWORKS has continued. This project proposes the combination of different decentralised treatment approaches for sewage

and urban run-off to recover water, energy and valuable chemicals. Within the scope of this project, an anaerobic lab-scale membrane bioreactor (AnMBR) has been operated to assess the amount of biogas production treating concentrated wastewater from a forward osmosis unit receiving raw sewage. The effect of temperature changes on this system has been evaluated.

Finally, as part of an ICRA funded strategic research initiative, Marc Sauchelli carried out his research on the transport of micropollutants through novel thin film composite forward osmosis membranes in flat sheet membrane filtration cells. He studied diffusion of micropollutants as a function of the ionic strength of feed and draw solutions automatically controlling draw concentration. This fundamental research contributes to assessing the performance of novel forward osmosis configurations.

All these installations are fully monitored and controlled by different PLC systems connected to an SCADA program, allowing real-time control of the processes occurring in each of the pilot plants. This is possible thanks to the numerous monitoring systems in the PLANTEA installations such as dissolved oxygen, pH, redox, nitrate, dissolved N<sub>2</sub>O and hydrogen sulfide sensors, as well as online gas analyzers for N<sub>2</sub>O and nitric oxide (NO) monitoring connected to the SCADA system.

Finally, the PLANTEA laboratory has a direct connection to a sewage pumping station that collects the wastewater originating in the local neighbourhoods. This greatly facilitates the use of real wastewater for the experiments conducted in the PLANTEA pilot plants.

### **The Experimental Streams Facility makes it possible to simulate the response of fluvial ecosystems to different environmental conditions.**

Throughout 2017, four experiments have been carried out in the Experimental Streams Facility (ESF) (Table 1). At the beginning of the year, a study was done on the effects of water treatment effluent on the functioning of the fluvial ecosystem. For this purpose, 24 artificial channels were exposed to an increasing concentration of contamination (100%, 86%, 72%, 56%, 14%, 29% 14%, 0% of water treatment plant effluent). Exposure lasted 32 days

and they were then subject to a recovery period with clean water for 23 more days. Different functional variables were measured, such as the degradation of alder leaves, the metabolism of the ecosystem, enzymatic activities or the capacity of biofilm to retain phosphorus. The effects on the bacteria community of the fine sediment and rocks was also evaluated. Special emphasis was put on the ecologically most relevant microbial groups (for example, those that



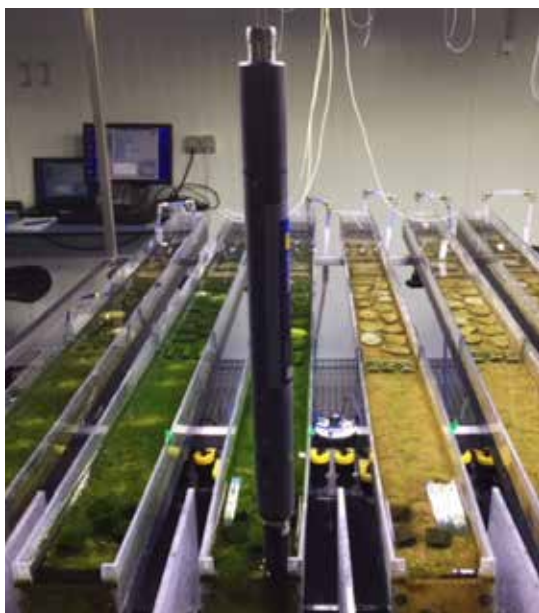
take part in processes such as photosynthesis, the nitrogen cycle or methanogenesis).

In the second study, the interactive effect of two ecological stress factors related to climate change was studied (drought and temperature) as well as one chemical one (a realistic mix of pesticides). The objective was to evaluate the individual and interactive impacts on a full-factor model in the short and long-term. To do this, 24 artificial streams were used with three replicas for treatment. The structure of the biofilms community was assessed through sequencing with Illumina-Miseq of the genetic marker 16S rDNA, as well as of the main functional groups using quantitative PCR. The respiration, primary production and photosynthetic activity of the community was also assessed.

The third study aimed to verify the effect of overflows of unitary collector systems on the fluvial ecosystem, and more specifically, on greenhouse gas emissions. So, the effect of the spillage of untreated wastewater on canals exposed to three concentrations of water treatment plant effluent water was verified (0, 45 and 90%) to represent the typical conditions that could occur in semi-

arid river systems such as the Mediterranean system. The colonisation lasted 24 days, then they were exposed for 49 days to the different water treatment plant effluent concentrations and for 24-48 hours an influent load shock was carried out. The dissolved oxygen (photograph 1) and N<sub>2</sub>O (typical greenhouse effect gas) were monitored throughout the experiment as well as assessing the functioning of the biofilm community using the analysis of the photosynthetic activity, the production of chlorophyll-a, and pigments.

The objective of the fourth experiment was to study the bioaccumulation of contaminants, and their transfer between trophic levels. This experiment was done in parallel with the third experiment, but with spherical crystallisers (see photograph 2). The contaminants used were Triclosan and nanoparticles of C60-type carbon, and the biological compartments where the bioaccumulation was quantified were biofilm, and freshwater snails (*Radix* sp). For this purpose, the biofilm was colonised for 33 days, using 12 crystallisers with 20 units of freshwater snails which were exposed to the contaminants for 30 days (control, Triclosan, C60, Triclosan+C60).



Photograph 1. Experimental streams subject to two wastewater dilutions (0% in the three on the right and 45% in the three on the left), and probes to measure the dissolved oxygen.



Photograph 2. Glass microcosms used in the fourth experiment.

Date	Project	Stressors	Participants	Main results
19/01/2017 to 30/03/2017	<b>GLOBAQUA</b>	<ul style="list-style-type: none"> <li>Water treatments effluent</li> <li>Drought</li> </ul>	V Acuña O Pereda F Romero L Sabater S Sabater M Casellas	<ul style="list-style-type: none"> <li>Control of non-linear responses.</li> <li>Little effect regarding large bacterial groups. Significant interaction between drought and chemical pollution from WWTP effluents.</li> </ul>
01/07/2017 to 30/09/2017	<b>GLOBAQUA</b>	<ul style="list-style-type: none"> <li>Water treatment increase</li> <li>Drought</li> <li>Pesticides</li> </ul>	F Romero V Acuña S Sabater M Casellas A Freixa J López	<ul style="list-style-type: none"> <li>Main type of interaction: ANTAGONISM.</li> <li>Significant interaction between exposure time and stressors.</li> </ul>
06/10/2017 to 22/12/2017	<b>REACH</b>	<ul style="list-style-type: none"> <li>Water treatment effluent</li> <li>Water treatment influent</li> </ul>	V Acuña O Gutiérrez M Pijuan I Corominas J Cesar S Busquets Z Bao M Casellas	<ul style="list-style-type: none"> <li>Main type of interaction: ANTAGONISM.</li> <li>Significant interaction between exposure time and stressors.</li> </ul>
12/12/2017 to 19/02/2018	<b>NanoTransfer</b>	<ul style="list-style-type: none"> <li>Triclosan C60 nanoparticles</li> </ul>	J César A Freixa L Helena J Sanchís S Sabater V Acuña S Rodríguez M Farré M Casellas	<ul style="list-style-type: none"> <li>No survival effects vs. breathing.</li> <li>The snails' scraping activity is greater with C60 nanoparticles (7 days)</li> <li>Reproduction (day 21): Number of eggs laid less with only exposure to C60 nanoparticles</li> </ul>

Table 1. Date, project, experiment, stressors, participants, and main results of the fourth experiments carried out in 2017 at the ESF.

## Artificial aquatic ecosystem

An artificial aquatic ecosystem is set up within the ICRA facilities consisting of two aquarium systems of 400 L each, which can be used to recirculate salt and fresh water.

The system is equipped with protein skimmers, biological and chemical filtration, temperature control and aeration, simulating the characteristics of marine and freshwater environments. The mesocosm is thus available to perform research studies where aquatic organisms such as mussels and/or fish are exposed to chemical contaminants to

study the impact of environmental pollution on these organisms and evaluate the possible implications for human consumption.

In 2017, various experiments were performed as part of the European SEA-on-a-CHIP project to study the impact of a selected antibiotic (sulfamethoxazole), in aquatic organisms (marine mussels) by evaluating the bioaccumulation and clearance of the antibiotic and different ecotoxicological parameters such as, the metabolomic response of the bivalves, and changes in enzymatic activities among others.

# Framework directive project

## Framework Directive Project: Strategic project on knowledge acquisition of the obligations from the Water Framework Directive.

Since the publication of the Water Framework Director, the European Commission has been adopting and publishing new legislation and requirements for incorporation into the follow up and monitoring programmes for the assessment of the state of water masses, for some of which there is not enough solid or verified knowledge in our country.

ICRA started work on the strategic **Framework Directive Project** to respond to some of the questions raised in the application of current legislation on water matters. The main objective of the project is the acquisition of knowledge about priority substances and new emerging contaminants in water masses in Catalonia, to provide new tools for the improvement of their chemical state.

To attain this objective, four specific objectives are defined:

- Assessment of the chemical state of water masses in Catalonia from the analysis of different compounds (“new generation” pesticides, priority substances, dangerous and preferential priorities, organic compounds and heavy metals) in different arrays (continental water, seawater, sediments and biota) in representative samples, with particular attention to those compounds of difficult detection in the mid-range quality thresholds (NQA) established by legislation, and compounds detected in sediments and water arrays for which it is necessary to establish environmental quality standards comparable and/or in addition to the

NQAs established in the water array in accordance with current legislation.

- Development and set up of new analytical methods for chloroalkanes and for some other emerging compounds or transformation products identified as relevant, including the establishment of a detection threshold.
- Risk assessment of the chemical compounds in Daphnia, fish and algae.
- Provide a framework for the analysis of the chemical state of surface and groundwater, scientifically verified and applicable to the management.

The project began at the end of May 2017 in conjunction with IDAEA-CSIC, ICM-CSIC and ACA, and will finish at the end of April 2018. In 2017, some of the analytical methods were developed and implemented and 85.5% of the samples to be analysed, from a planned total of 1086 samples from around Catalonia, were taken and received at the laboratory for analysis.

### Seven ICRA members participate in the project

One project manager: **Esther Llorens**

Six research technicians: **Isabel Arenas | Vittoria Barbieri | Cristina Bosch | Manuel Garcia | Berta Sala | Ivan Vallejo**







## HR Excellence in research award

In December 2015, the Institut Català de Recerca de l'Aigua (ICRA) received the “HR Excellence in Research” award from the European Commission.

This award and its logo recognizes that ICRA endorses the policies and practices of *The Human Resources Strategy for Researchers (HRS4R)*, established by the European Commission to implement principles of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers (Charter & Code).

The implementation process started in October 2014 when the HRS4R Work Group was created. After performing a gap analysis and a self-assessment in accordance with the results of the analysis obtained, a 2015-2017 Action Plan was produced.

ICRA has adopted this 2015-2017 Action Plan in agreement with HRS4R and the principles of the

Charter and Code of the European Commission, focusing on key areas for change and further development.

ICRA has worked on the implementation and development of actions arising from the Action Plan 2015-2017.

Work is also being done on integration of the OTM-R Policy (Open, Transparent and Merit-based Recruitment of Researchers) into ICRA's HR Policy.

At the end of 2017, the self-assessment and a new action plan will be carried out for the next 3 years.



HR EXCELLENCE IN RESEARCH

## Equality gender plan

According to Organic Law 3/2007 of 22 March, on effective equality between women and men, with the aim of establishing and developing policies that integrate equal treatment and opportunities between women and men, ICRA and the Permanent Committee on Equality have executed the Equality Gender Plan.

The Permanent Committee on Equality is a multidisciplinary team composed of 4 people from

different areas and groups of ICRA. Questions or concerns on this matter can be addressed to the Permanent Committee.

Permanent Committee on Equality: **Marta Villagrasa, José L. Balcazar, Olga Corral and David López.**

A person wearing blue nitrile gloves is holding a pipette and a microcentrifuge tube in a laboratory setting. The background is a blurred laboratory bench with various glassware and equipment. The text '03 Research areas' is overlaid on a blue semi-transparent rectangle.

# 03 Research areas

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ICRA's Research Plan is structured in three main research areas, each with a mission and a vision aligned with those of ICRA. ICRA's areas and respective lines of research are as follows:



## Area I Resources and Ecosystems

### LINES

- AI 1** Hydrological Processes
- AI 2** Lacustrine and Reservoir Systems
- AI 3** Fluvial Systems
- AI 4** Modelling of Ecosystems and Basins

## Area II Water Quality

### LINES

- AII 1** Chemical Contamination of Water Bodies
- AII 2** Contaminants in Wastewater
- AII 3** Quality and Microbial Diversity
- AII 4** Ecotoxicological Response of Biota to Contaminants

## Area III Technologies and Evaluation

### LINES

- AIII 1** Water Supply and Advanced Treatment
- AIII 2** Wastewater Treatment, Reuse and Resource Recovery
- AIII 3** Modelling and Management Systems
- AIII 4** Unit Operations







# AI

## Resources and ecosystems

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The lines of research of the Resources and Ecosystems area are:

### LINES

**AI 1** Hydrological Processes

**AI 2** Lacustrine and Reservoir Systems

**AI 3** Fluvial Systems

**AI 4** Modelling of Ecosystems and Basins





## 22 researchers in the area

1 research professor (UdG associated) and group leader  
**Sergi Sabater**

1 research professor (UdL associated)  
**Ramon J. Batalla**

1 research professor (UdG associated)  
**Josep Mas-Pla**

2 research scientists  
**Vicenç Acuña | Rafael Marcé**

1 postdoc researcher  
**Mercè Boy**

1 postdoc researcher  
**Francesco Bregoli**

1 postdoc researcher  
**Núria Catalán**

1 postdoc researcher  
**Anna Freixa**

1 postdoc researcher  
**Ada Pastor**

1 postdoc researcher  
**Albert Herrero**

1 postdoc researcher  
**Xisca Timoner**

1 postdoc researcher  
**Dídac Jordà**

1 postdoc researcher  
**Julio Cesar Lopez**

3 predoctoral students  
**Miriam Colls | Ferran Romero | Elias Munthali**

5 research technicians  
**Maria Casellas | Carmen Gutierrez | Carme Font  
Lena Portell | Samia Salomón**



# Resources and ecosystems

The activities of the ICRA Resources and Ecosystems Area have developed through projects reaching their conclusion, the arrival of other new projects and activities with companies and public bodies.

New postdocs joined the area team on the topics of river and stream ecology (4), as well as some graduate students working towards their PhDs. Foreign students from Italy have also conducted their research in the area during 2017.

We continued researching the sustainable use of water resources in the face of global change with ENDESA, as well as with other institutions, resulting in both applied and scientific products. In particular, the results of the HIDSOS-IV project has completed the setup of a monitoring network in the Pyrenees.

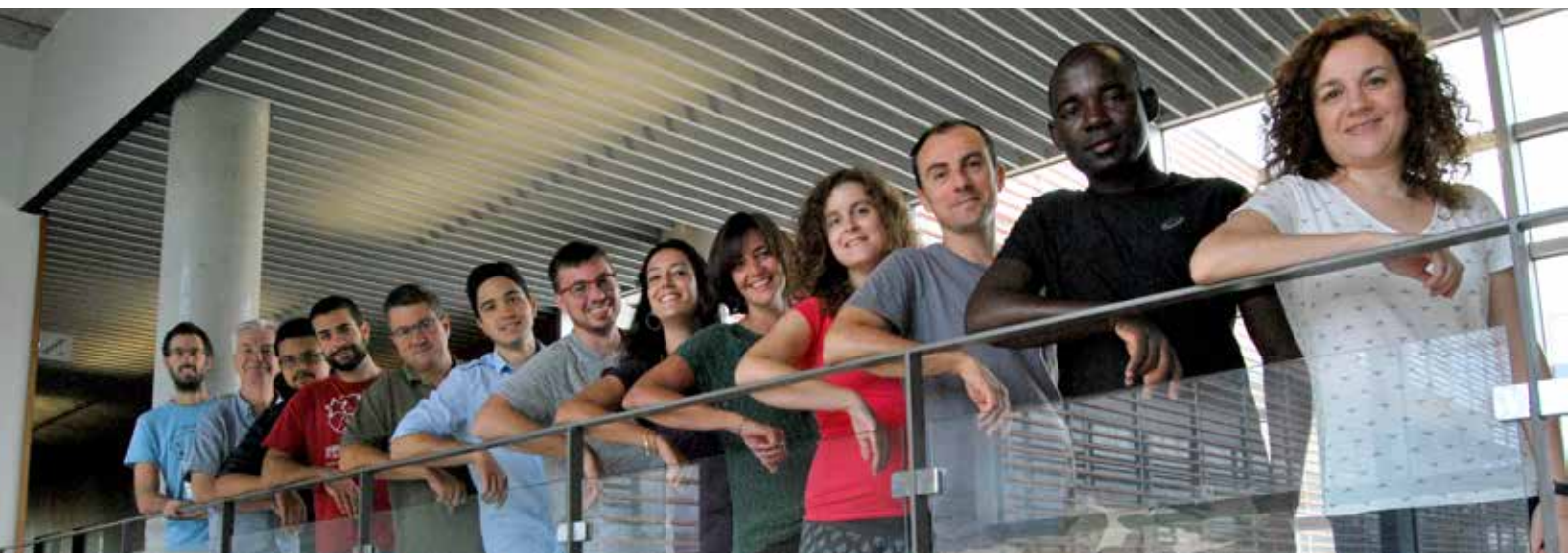
The GLOBAQUA project has concentrated the effort of the different research lines of the area as well as others from ICRA, providing the basis for a common research arena and interdisciplinary work. Results are summarized in the following sections of this report.

National projects such as CARBONET, REMEDIATION and FREEDOM have triggered intense research related to water intermittency, carbon dynamics and hydrogeological dynamics. These projects have

provided interesting insights on river ecosystems and hydrological basin dynamics, and water resources quality from a perspective of global change.

All these projects have resulted in a larger understanding on the effects of climate change on hydrological systems, whether surface water or groundwater. They depict and describe the complex relationships between stream intermittency and biodiversity, including the effect of emerging pollutants as ecological stressors. Interpretation of the results are focused to assess managing strategies for such complex systems.

The JPI-Water PERSIST has ended in 2017 having depicted the processes that control antibiotic occurrence and their fate in groundwater, and why monitoring for quality status must be concerned by the high spatial and temporal heterogeneity shown by field data. This project also considers their influence on microbial communities, and their effect on the resistome as an additional environmental issue of consideration and relevance.



From left to right: Dídac Jordà, Sergi Sabater, Juan David González, Ferran Romero, Josep Mas-Pla, Daniel Mercado, Jordi- René Mor, Míriam Colls, Carmen Gutiérrez, Carme Font, Julio Cesar López, Elias Munthali, Elisabet Tornés.





AI

## 1 Hydrological Processes

The team has continued the modelling tasks relating to hydrology and sediment transport in the river Noguera Pallaresa within the frame of the Research Contract 'Sustainability of Water Resources under Global Change' HIDSOS-IV funded by ENDESA SA. The setup of a monitoring network for flow and sediment transport has been completed in the Noguera Pallaresa river sub-basins. The obtained data is key to the calibration and validation of the TETIS model results, which will eventually lead to the implementation of global change scenarios in this large representative basin of the Southern Pyrenees. Results were published as a research paper in the *Journal of Soils and Sediments*. In addition, river monitoring has been extended to the regular sampling of water for the characterization of the nutrient load of the flows. A nitrates measurement sensor is being calibrated to obtain continuous data series in the field.

The team has also continued its involvement in the GLOBAQUA Project. Besides the compilation of the flow and sediment transport database for the Ebro river basin (with the ultimate objective of assessing how sediment transport regime is affected by changes in land use and climate change), the results of which were published in the *Science of The Total*

*Environment* journal in 2016, further work on the dynamics of sediment-laden persistent pollutants were pursued. Data from field strategy to analyse the dynamics of sediment-laden traditional and emergent contaminants in the ca. 10,000 Km<sup>2</sup> River Cinca basin (affected by long-term pollution) was analysed in collaboration with the Environmental Chemistry Group at the IDAEA-CSIC. A flood was monitored and historical sediment samples were processed to determine the concentrations of different pollutants within the fine sediment transported in suspension by the river. Results have been submitted to *Science of the Total Environment* for publication.

Also, as part of GLOBAQUA and as a transversal task with MARS project, an analysis of multi stressor effects on biological quality elements in the River Ebro has been done. A statistical analysis was performed to relate different abiotic variables to biological indicators that describe the ecological status of water bodies. This work was carried out in collaboration with RIUS research group (University of Lleida), Munich University and Joint Research Centre. The results of this study have been published in *Science of the Total Environment*.

## 2 Lacustrine and Reservoir Systems

During 2017 the activities of this research line focused on understanding the carbon cycle in Mediterranean reservoirs and weirs, and on defining the effect of global changes on the water quality of these storage systems.

These objectives have been addressed in coordination with the research lines AI3 (Fluvial systems) and AI4 (Modelling of ecosystems and basins), continuing the activities started with the former project CARBONET. Currently, the project REMEDIATION is investigating the origin of the carbon evaded from the river network in detail. We are investigating the role of lentic ecosystems on carbon cycling in an integrated perspective, taking into account their place in river networks and their interactions with the rest of environments.

During 2017, we finished activities of the project FREEDOM (Resolving the dissolved organic matter degradability dilemma in freshwater ecosystems), an EXPLORA project funded by MINECO, which aim to test innovative ideas at the edge of the knowledge.

In 2017 we started two international projects related to the connection between climate and water quality in lakes and reservoirs. On one hand, since September 2017 we coordinate the JPI Climate ERA4CS project WATExR ("Integration

of climate seasonal prediction and ecosystem impact modeling for an efficient adaptation of water resources management to increasing climate extreme events"), devoted to the use of seasonal prediction for anticipating the threats of climatic extreme events on water quality. On the other hand, we participate in the MSMC-ITN action MANTEL ("Management of climatic extreme events in lakes and reservoirs for the protection of Ecosystem Services"), focused on understanding the impact of climatic extreme events on the ecological functioning of lakes and reservoirs, and the consequences for the ecosystem services we obtain from them.

We have also been involved in the COST action SMIREs ("Science and Management of Intermittent Rivers and Ephemeral Streams"), contributing our knowledge on C emissions from dry habitats in the river network. Finally, we contribute to the CYTED network IBEPECOR, devoted to the assessment of the ecological status of waterbodies in Latin America.

Finally, within the GLOBAQUA project, we have built a river network model for the entire Earth, able to simulate the consumption, treatment, and river decay of emerging contaminants in the whole river network.



## 3 Fluvial Systems

During this reporting period, we have pursued our research lines on the effects of flow intermittency on the stream biota and biogeochemistry (i), integration of ecosystem services in freshwater ecosystems management (ii), and effects and fate of emerging contaminants in freshwater ecosystems (iii).

Most of the research regarding the effects of flow intermittency on freshwater ecosystems has been carried out within the framework of the GLOBAQUA project (603629-ENV-2013-6.2.1), as well as the FUNSTREAM project (MINECO, CGL2014-58760-C3-3R) and the SMIRES COST Action (CA15113). Within the GLOBAQUA project, we have explored the response of algae and invertebrate communities in 11 Mediterranean streams which received treated or untreated urban sewage (Impact sites, I), whose composition and morphological anomalies were compared to upstream unaffected (Control, C) sites. The impact sites had high concentrations of ammonium, phosphorus, and pharmaceutical compounds (antibiotics, analgesics, and anti-inflammatories), particularly in those receiving untreated sewage. Impact sites had a higher proportion of teratological diatom forms as well as a prevalence of diatom taxa tolerant to pollution. The differences in the diatom assemblage composition between the C and I sites were the largest when they received untreated sewage inputs and the sites had low dilution capacity, where the diatom assemblage was composed by a few pollution-tolerant species. The invertebrate richness also decreased at the impact sites, but their abundance and total biomass increased because of the wastewater inputs (mostly ammonia and toxic pharmaceuticals). These results indicated that the Mediterranean river systems facing hydrological stress are highly sensitive to chemical contamination, leading to the homogenization of their biological communities.

The FUNSTREAM project aims to understand the effects of the increasing frequency and duration of non-flow events in stream ecosystems. Within this project we have completed the field survey encompassing 55 sites and analyzed all the hydrologic and functional data, being the first publication with data from these sites about to be submitted. Regarding the SMIRES COST Action, we

are leading one of the working groups of the action entitled eco-hydrology and ecosystem services. The first publication of the COST action is on the design of environmental flows in temporary streams, and is also about to be submitted.

The research line on the integration of ecosystem services in water management has continued in 2017, when we focused our effort on the calibration of basin-scale models for selected ecosystem services (water provisioning, water purification, and erosion control). After the calibration, we have been assessing the effects of global change scenarios on the above-mentioned services, and we plan to submit the associated publication early 2018.

Finally, we have also pursued our research on both effects and fate of emerging contaminants in freshwater ecosystems, mainly in the GLOBAQUA and NANOTRANSFER projects. Regarding GLOBAQUA, we have performed 2 experiments assessing the effects of multiple stressors on freshwater ecosystems, one using microcosms and 5 different stressors, and one using mesocosms and only 2 different stressors. The first experiment has been recently published, whereas the second is about to be submitted. We have also been working on the fate of emerging contaminants, in close collaboration with research lines I.4 and III.3. Specifically, we have completed and published a manuscript on a coupled wastewater treatment plant-river, dealing with uncertainty in the sampling design. The NANOTRANSFER project aims to understand the effects of carbon nanomaterials, solely or in combination with other contaminants, on the biofilms. We have completed and published a review on the effects of carbon nanomaterials on freshwater organisms, and also performed a microcosms experiment assessing the interaction between these nanomaterials and other emerging contaminants such as Triclosan to be published shortly.



## 4 Modelling of Ecosystems and Basins

Research activity has been focused on two main lines: first, the analysis of antibiotic data in groundwater linked to the goals of the JPI-PERSIST project and its relationship with microbial communities and the occurrence of antibiotic resistant genes (ARG); second, the study of the hydrogeological dynamics of coastal wetlands and their dependence on groundwater inputs as a task of the MINECO project REMEDIATION.

The first line has involved the analysis of the spatial and temporal distribution of antibiotics, mainly of veterinary origin, in groundwater, specifically at the Baix Fluvià aquifer. Geostatistical techniques have shown the spatial variability of their occurrence. These issues raise the question of the sample representativeness in a limited field campaign oriented at assessing the quality of groundwater resources. Temporal variation has shown that antibiotic occurrence is not continuous in time in most of the monthly sampled wells, adding a new source of uncertainty about the interpretation of the data. Moreover, geochemical characteristics of these molecules in groundwater (i.e., adsorption, degradation, etc.) have been considered and modelled for distinct scenarios, showing the influence of their geochemical behavior in their fate and identification within the aquifer. Finally, their reactive transport along the unsaturated zone has been modelled to assess a field experiment involving distinct types of manure and slurry in an experimental field site, and the final effects on the transit time, and on soil and

groundwater quality impact.

The antibiotic effect on microbial genetics is also a goal of the PERSIST project, and has been developed in collaboration with ICRA Water Quality area. Results show a clear effect on the ARG of the microbiome, yet its link to the hydrogeological dynamics of the Baix Fluvià is unclear. The association between agricultural activity (i.e., nitrate occurrence) and microbiome has also been studied in the Osona region, strengthening a potential new line on microbial hydrogeology at ICRA.

The hydrogeological study of coastal wetlands has been developed as a task of the REMEDIATION project in collaboration with research groups at UdG who assess the restoration of La Pletera wetland, in the Baix Ter area. The hydrological behavior includes modeling of the mixing processes occurring in the ponds (rainwater, groundwater, and seawater as end-members), and specifically the nitrogen dynamics and denitrification processes. The evaluation of such environments is paramount to determine wetland water quality and restoration actions success.

This research line collaborates with Università di Pavia (Italy; project INTEGRON) to model groundwater dynamics in some sub-basins of the Po River with the aim of reproducing nitrate fate and transport in an agricultural area with local hydrogeological singularities (*fontanili*).

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### Technology Transfer

**MAS-PLA, J.** Study of the hydrogeological environment of Santa Coloma de Farners in relation with urban supply. Commissioned and financed by the Santa Coloma de Farners Town Council, December 2016 – February 2017.

**MAS-PLA, J.** Hydrogeological study of the Vacarisses municipal district: proposal for new groundwater intakes. Commissioned and financed by the Vacarisses Town Council 2016-2017.

**SABATER, S., BATALLA, R.J.**, Sustainability of water resources under global change (HIDSOS-IV). Commissioned by ENDESA. 2017.



## AI- PhD dissertations

**GEMMA PIQUÉ** (University of Lleida). “Analysis of hydrosedimentary processes and impacts affecting river basins and channels”. Supervised by Ramon J. Batalla and Sergi Sabater. Unanimously summa cum laude.

**JOAN PERE CASAS-RUIZ** (University of Girona). “Controls on the dynamics of riverine dissolved organic matter: Insights from a Mediterranean river network”. Unanimously summa cum laude.

## Visiting Scientists

**ALO LAAS** – Visiting Scientist of Estonian University of Life Sciences – (October-December 2017)

**TRICIA LIGHT** – Visiting Scientist of Fullbright – (September-December 2017)

**JORDI RENE MOR ROY** – PhD Student of Fundacio Bosch i Gimpera (FBG) (January-December 2017)

**JAVIER RODRIGUEZ BARRIOS** - Visiting Scientist of University of Magdalena – (October-November 2017)

**ELISABETH TORNES BES** – Visiting Scientist of University of Girona – (January-December 2017)

## Visiting Students

**MARINA GUTIERREZ PULPEIRA** – Internship Student of University of Girona – (January-April 2017)

**JOAN LLUC MARTÍ** – Internship Student of IES Vidreres – (July 2017)

**NATALIA MIGNORANCE** – Internship Student of University of Girona (February-December 2017)

**ARIANNA MUSACCHIO** – Internship Student of Università Degli Studi Di Pavia (October-December 2017)

**SAMIA SALOMON** – Internship Student of University of Girona – (March-September 2017)

**JORDI SUQUET MASÓ** – Internship Student of University of Girona – (March-June 2017)

## AI – Stays Abroad

**CATALAN, N.**, - NUPEM/UFJR at Macaé, Brazil, 2 weeks. Workshop on global lateral carbon flushes, contribution to the priming project led by Dr. Bertrand Guenet.

**CATALAN, N.**, Uppsala University Sweden: 1 week in March and 1 week in December for developing the project WRT “Organic matter persistence in lakes: testing the link between water residence time and microbial function” and contributing to the KAWater project – “Inland waters in the global carbon cycle” (PI: L. Tranvik).

**CATALAN, N.** Switzerland (EPFL and EAWAG): 1 week in May, contributing to the NUDREM project – “Resilience of aquatic ecosystems in the face of nutrient loading: ecological and evolutionary dimensions” led by Piet Spaak and Blake Mathews.

**MAS-PLA, J.** Università di Pavia, Dipartimento de Scienze della Terra o dell’Ambiente (5-9th February 2017). Contributing to the INTEGRON project, led by Dr. Elisa Sacchi. Exchange through the Erasmus+ programme.

**BATALLA, R.J.** Universidad Austral of Chile. Faculty of Forestry and Natural Resources (03/10/2017-17/12/2017). Research undertaken within the framework of the Project ‘Morphological impacts in rivers affected by volcanic eruptions. Chaiten and Calbuco: Similar disturbance but different evolution? (PIROFLUV)’ led by Dr. Andrés Iroumé. National Committee for Scientific and Technological Research - CONICYT. Ministry for Education. Government of Chile.

A background image showing several glass test tubes and a flask containing a yellow liquid, set against a blurred laboratory setting.

# All Water Quality area

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The Water Quality area lines of research are:

**LINES**

- All 1** Chemical Contamination of Water Bodies
- All 2** Contaminants in Wastewater
- All 3** Quality and Microbial Diversity
- All 4** Ecotoxicological Response of Biota to Contaminants

## 29 researchers in the area

1 ICREA research professor and group leader  
**Mira Petrovic**

1 research professor (CSIC associated)  
**Damià Barceló**

1 research professor (UdG associated)  
**Carles Borrego**

1 research scientist  
**José Luis Balcázar**

1 research scientist (Ramon y Cajal)  
**Sara Rodríguez-Mozaz**

1 research scientist (Ramon y Cajal and ERC)  
**Jelena Radjenovic**

1 research scientist (Ramon y Cajal and IIF)  
**Maria Jose Farre**

1 research scientist (IIF)  
**Meritxell Gros**

7 postdoc researchers  
**Cristina Avila | Itziar Lukenberri | Lucia Helena Moreiro  
M. Eugenia Valdés | Erdem Irtem | Rocio Inés Bonansea**

10 predoctoral students  
**Mira Celic | Sergi Compte | Lucia Gusmaroli Adrian Jaen  
Maja Kuzmanovic | Ladislav Mandaric | Albert Serra | Jessica Subirats  
Yaroslav Verkh | Jose M. Albahaca**

3 research technicians  
**Saulo Varella | Nuria Caceres | Mireia Fillol**

1 RDI technician  
**Miyako Nitta**



# Water Quality area

Research in the Water Quality area follows three main lines of investigation, namely:

i) Chemical contamination of water bodies, ii) Pollution in wastewater, and iii) Effects of chemical and environmental stressors of aquatic microbial communities. Main results and activities of these three research lines carried out in 2017 are summarized below.



From left to right (standing): José L. Balcazar, Mira Petrovic, Meritxell Gros, Mira Celic, Carles Borrego, Lucia Helena Santos, Adrian Jaen, Sara Rodriguez, Damià Barceló. From left to right (front row): Núria Caceres, Maria José Farré, Pablo Gago, Lucia Gusmaroli, Albert Serra

All

## 1 Chemical Contamination of Water Bodies

During 2017 the main activities of this line in the framework of different projects have been the following:

**Evaluation of alternative treatment strategies for the elimination of emerging pollutants from wastewater.**

*Fungi, algae and bacteria degrading pharmaceuticals. Hospital effluents treatment by fungi (H2PHARMA). Ministry for the Economy and Competitiveness (MINECO)-CTM2013-48545-C2-2-R*

This project proposes the development of a treatment process for hospital wastewater using lignolytic fungi, which possess a powerful non-specific enzymatic system capable of degrading a wide range of xenobiotic compounds. The performance of other biodegrading microorganisms such as algae is also evaluated within the project.

During 2017 we have tested the efficiency of these treatment technologies regarding the removal of pharmaceuticals in urban hospital wastewater. The

generation of transformation products from target pollutants along the treatment processes and their potential environmental impact were also assessed.

These systems open up the possibility of reuse by industry or agriculture of effluent treated with these alternative treatments.

### **Presence and impact of antibiotics in the environment. Antibiotic resistance.**

#### ***Stopping Antibiotic Resistance Evolution (StARE). JPIW2013-089-C02-02***

The main objective of the project is to provide information about the presence of antibiotics, antibiotic resistance genes (ARG) and antibiotic-resistant bacteria (ARB) during wastewater treatment and to evaluate the removal efficiency of advanced treatment technologies. During 2017 we performed an evaluation of monitoring of final effluent of urban wastewater treatment plants from different European regions in the previous sampling campaigns, (March and October 2015 and March and October 2016). These regions are characterized by different patterns of antibiotic consumption and resistance occurrence giving a wide overview of ARB&G. In addition, part of the efforts were devoted to the identification of the critical factors in wastewater treatment linked to ARB&G. In this line, ICRA has performed specific studies in pilot wetlands facilities, in photocatalytic systems, both at laboratory and at full-scale and in chlorination studies.

The creation of the first Europe-wide dataset on the prevalence of AR (foreseen in the project), will help to develop effective guidelines to be implemented or added in the future to the existing common legislations related to water (*i.e.* the DWD (98/83/ECC), the WFD (2000/60/EC) or the Waste Water Directive).

### **Bioaccumulation of emerging pollutants in aquatic organisms from marine and freshwater ecosystems. Impact on public health**

#### ***Priority Environmental Contaminants in seafood: safety assessment, impact and public perception (ECsafeSEAFOOD) FP7-KBBE-2012-6-singlestage (311820)***

The overall objective of the ECsafeSEAFOOD project

is to study the presence of non-regulated priority contaminants in seafood and to evaluate their impact on public health through food safety issues.

During 2017 ICRA collaborated in the elaboration of a database with relevant information required for risk assessment gathered from literature and national monitoring programs as well as in the evaluation of the occurrence data of emerging pollutants (pharmaceuticals and EDCs) in commercial seafood samples from all over the world. ICRA also participated in the study of climate change impact in the uptake and metabolization of marine emerging pollutants by seafood, and evaluated the bioaccessibility of these contaminants by human consumers.

#### ***Real Time monitoring of SEA contaminants by an autonomous lab-on-a-chip biosensor (SEA-on-a-CHIP). FP7 Ocean 2013 (614168)***

The SEA-on-a-CHIP project aims for the development and implementation of automatic sensors operated by remote control in seawater. ICRA partners participated in the sensor prototype testing at ICRA mesocosms facilities, adapted to mimic seawater conditions under controlled conditions.

ICRA also participated in the characterization of contaminated sites in aquaculture facilities by determining the levels of pharmaceuticals and endocrine disruptors in mussels collected in the most relevant fish and shellfish production areas in Europe.

#### ***Study of occurrence and fate of disinfection byproducts and their precursors in drinking and recycled water***

During 2017, the project N-DBP: Evaluation of disinfection by-products containing nitrogen and its precursors in drinking water in the Mediterranean basin, funded by the European Union within the Marie Skłodowska-Curie Research Program was completed. Also at the end of the year, it was announced that MINECO has financed a new project on this subject within the call for the State R&D&I Programme aimed at Challenges in Society. The new project aims to develop innovative methodologies to measure NDMA precursors (CTM2017-85335-R: How to predict and minimize NDMA formation in drinking and recycled water with advanced analytical techniques).

## 2 Contaminants in Wastewater

In 2017, the main activities of this research line were:

### Study of transport, distribution and fate of wastewater-derived emerging contaminants

The group was involved in the FP7 project **GLOBAQUA** that focuses on water scarcity issues in the European context by studying the occurrence, distribution and transport of wastewater-derived contaminants in the aquatic environment. The analysis of selected emerging contaminants in two Mediterranean rivers (Ebro in Spain and Evrotas in Greece), one continental river (Sava, transnational river) and one Alpine river (Adige, Italy) aims to improve understanding of occurrence patterns and their spatial variability linked to the contamination sources and land uses, as well as the variability associated with river hydrology and environmental variables affecting contaminants attenuation and their distribution in the water and sediment. The impact and occurrence of wastewater- (treated and untreated) derived pharmaceutically active compounds (PhACs) have been investigated in small, rural and effluent-dominated tributaries of the lower Ebro River located in North-Eastern Spain (Catalonia). In streams with direct discharge of untreated wastewater the predominant effect of stream flow and consequently dilution factor was observed on the concentration levels of

detected PhACs that combined with the absence of wastewater treatment plants (WWTP) resulted in 12 times higher concentrations than at sites impacted by treated wastewater. Non-steroidal anti-inflammatory drugs (NSAIDs) were the most ubiquitous compounds, in terms of both individual concentration and frequency of detection. However, concentration levels of detected PhACs were dependent on the hydraulic travel time and distance from the discharge point and related with the in-stream attenuation.

The group was also involved in national project **TRANSFORMCOAST**, aimed at performing an integrated study of the fate, behavior, and river transport of emerging contaminants in estuaries, wetlands and coastal waters. Specifically the main objective is to evaluate and characterize chemical contamination coming from discharges of WWTP effluents to estuarine and coastal areas in the Ebro Delta region and to identify the most relevant contaminants. Levels of PhACs detected in waste, river, canals, lagoons and sea water indicate that they are widespread pollutants along the Ebro Delta. The compounds, coming from WWTP discharges, and reaching the sea were from several therapeutical groups: analgesics/anti-inflammatories (such as acetaminophen, ibuprofen, salicylic acid, phenazone),  $\beta$ -blocking agents (atenolol, sotalol), antihypertensives (ibersartan, valsartan), X-ray





agent iopromide) and antihelmintic thiabendazole), while the compounds most widely detected in sediments were diclofenac, bezafibrate, ranitidine, ibuprofen, erythromycin, and chloramphenicol.

### Evaluation of treatment performance through comprehensive characterization of dissolved organic matter in wastewater

Within the framework of the H2020 MSC ITN-EID project **TreatREC**, we have developed a non-targeted approach for the analysis of wastewater using liquid chromatography-high resolution mass spectrometry (LC-HRMS) data. The monitoring of the dissolved organic matter (DOM) in wastewater is based on a limited number of concentration measurements of select DOM fractions or micro-contaminants to determine the removal efficiency in a wastewater treatment. Current methods do not necessarily reflect the true performance with regard to environmental and public health risk, especially for complex treatment technologies that generate transformation- and by-products. The data analysis approach was applied to a real wastewater system with a secondary biological treatment and a tertiary treatment consisting of a sand filtration, UV-treatment, and chlorination. The application of this approach allowed us to identify significant changes in the organic matter during the treatment of wastewater. In particular, the secondary treatment removed 67% of influent features while 24% of new features appeared. A decline of large molecules (>450 Da) and an increase in the unsaturation of the effluent organic matter was observed. The demonstrated approach is a step towards a more comprehensive monitoring of DOM in wastewater and contributes to the understanding of the current treatment technologies. Furthermore, it allows shifting of the reactive targeted monitoring approach to a proactive non-targeted one, where the bulk wastewater DOM is considered and not select priority substances.

### Fate of contaminants in nanoengineered water treatment systems

Research conducted at ICRA in the scope of ERC Starting Grant project **ELECTRON4WATER** of Dr. Jelena Radjenovic (initiated in May, 2017) sits at the interface of electrochemistry and nanotechnology and is focused on the development of nano-

engineered electrochemical systems for water and wastewater treatment, capable of eliminating persistent, toxic and carcinogenic chemicals from water in an energy-efficient way. In the first eight months of the project, we have equipped laboratory for electrode material synthesis and modification, and are now able to design and produce nanostructured coatings using various methods (e.g., hydrothermal, thermal, chemical, electrochemical). We are currently developing applications of nanoelectrochemical systems for an efficient removal of nitrate from drinking and groundwater. Also, we are designing novel anode materials for complete removal of persistent perfluoroalkyl substances (PFASs). PFASs are known to be very persistent to degradation by known advanced water/wastewater treatment methods (including advanced oxidation processes), but could be completely degraded by a direct electron transfer in a nanoelectrochemical system.

### Environmental risks of organic fertilizers reuse in agriculture

This research line started with the **Beatriu de Pinós** project (2015-2017) of Dr. Meritxell Gros and will continue within the framework of the H2020-MSCA-IF project **RESOURCE** (2017-2019). Research conducted at ICRA in 2017 focused on: i) assessing the environmental risks associated with animal manure reuse in agriculture, specifically on the potential spread of emerging organic pollutants (i.e. pharmaceuticals and antibiotics) to soils and groundwater and ii) evaluating the performance of novel and conventional on-site manure treatment techniques, as suitable nutrient recycling systems, by assessing the reduction of pharmaceuticals and antibiotic resistance genes (ARGs) in waste to be reused as fertilizer to arable land. Through comprehensive field monitoring studies, we were able to identify the most persistent organic pollutants that would accumulate in top soil layers and the mobile substances that would eventually leach to groundwater bodies. In addition, we also evaluated the retardation and natural attenuation processes to which these substances are subjected when being transported along the soil column. Conventional manure treatments, such as anaerobic digestion and composting, showed moderate pharmaceuticals and ARGs reduction, while better performances were observed with advanced treatment techniques (i.e. reverse osmosis).

## 3 Quality and Microbial Diversity

In 2017, our research has been focused on assessing the impact of anthropogenic activities on the diversity, abundance and dissemination of antibiotic resistance genes (ARGs) in both natural and man-made systems. Particularly:

### Rivers receiving wastewater discharges

By using a combination of quantitative PCR (qPCR), targeted amplicon sequencing and metagenomic approaches we have been able to study variation in the abundance and diversity of ARGs and bacterial communities in surface waters and groundwater receiving raw and treated wastewater discharges. These activities have been conducted in the framework of different research projects funded by the Spanish government through the Water JPI pilot call “Emerging Water Contaminants – Anthropogenic Pathogens and Pollutants” and the European 7<sup>th</sup> Framework Programme.

#### **Project TRACE: Tracking and assessing the Risk from Antibiotic Resistance Genes using Chip technology in surface water Ecosystems (JPIW2013-129).**

TRACE started in September 2014 and ended on December 2017. Our main task within the TRACE consortium was to characterize the aquatic resistome in three European rivers receiving wastewater discharges, namely: the Ter river in Spain (Girona), the Saale river in Germany (Jena) and the Tiber and Arnone rivers in Italy (Rome). Overall, our results pointed to a great effect of wastewater treatment plant effluents on the river resistome (i.e. the pool of ARGs in a given community) and the river mobilome (i.e. the pool of genes related to mobile genetic elements (MGEs) in the community, e.g. integron and viral integrases, transposases, insertion sequences, among others). Despite the effects being different depending on the studied river, some ARGs such as *sul1* (conferring resistance to sulphonamides), *qnrS* (conferring reduced susceptibility to fluoroquinolones) and *ermB* (conferring resistance to macrolides) were prevalent in all systems. Particularly in the Ter river, WWTP effluents not only caused a significant increment in the abundance of ARGs within the riverine bacterial community but also on the relative

amount of MGEs, thus favoring the potential capacity of cells to disseminate their genes. In the Ter, effluent discharges also caused an increment in the abundance of antibiotic-resistant *Escherichia coli* downstream from WWTP in comparison to values obtained from upstream samples. This investigation allowed the development of a risk-assessment model to estimate the risk to humans of being exposed to antibiotic-resistant (AR) *E. coli* through drinking water and the effects of different drinking water treatments on its abundance. Our group also collaborated in identifying the ARGs to be included in the first version of the DNA chip and in the characterization of reference samples to carry out its “proof-of-concept”.

On 7-9<sup>th</sup> December, 2016, members of our team participated in the final meeting of the TRACE project, held in Jena, Germany. For two days, members from the consortia presented their results and discussed future collaborations in relation to research calls launched by the EU.

#### **Project PERSIST: Persistence and fate of emerging contaminants and multi-resistant bacteria in a continuum of surface water groundwater from the laboratory scale to the regional scale (Ref. JPIW2013-118).**

The PERSIST project also ended in December 2017 and its main goals were to determine the occurrence and persistence of emerging pollutants and multidrug-resistant bacteria in both groundwater and surface waters. Our group collaborated by investigating the abundance of several ARGs encoding resistance to the main antibiotic families used to treat human and animal infections (e.g. beta-lactams, fluoroquinolones, tetracyclines, sulphonamides, and macrolides) in different groundwater wells and surface water samples collected seasonally in the Fluvià River basin (Catalonia, NE Spain). Our findings suggested a major influence of surface water as a source of pollutants coming from urban wastewater and lixiviates from agricultural fields fertilized with animal manure. The prevalence of gene *intl1*, which is known to be a proxy for anthropogenic pollution, in all groundwater wells agrees with the influence of human-derived activities (wastewater



transport, agricultural practices, cattle farming) on groundwater microbiota and the abundance and diversity of ARGs.

**Project GLOBAQUA: Managing the effects of multiple stressors on aquatic ecosystems under water scarcity (ENV-2013-603629).**

During 2017, we have continued our tasks relating to the effect of chemical stressors on streambed microbial communities. Our research concluded in a paper published in *Molecular Ecology* (Subirats et al., Mol. Ecol. 26:5567–5581, DOI: 10.1111/mec.14288) where we compared the effects of raw vs. treated wastewater on the relative abundance of ARGs and potential bacterial pathogens in streambed biofilm bacterial communities. In this work we determined that the effects of wastewater discharges were especially clear in epilithic biofilms, which showed a higher contribution of wastewater-associated bacteria and ARGs than in biofilms grown on sand particles (epipsammic). Overall, our research indicated that microorganisms released by wastewater effluents, including some species closely related to well-known human and animal pathogens, may persist in the streambed contributing to maintaining a diverse resistance gene pool. In biofilms, the selection pressure exerted by antibiotic pollution and the close contact between cells favor the maintenance and spread of resistance genes, including those encoding resistance to last-resort antibiotics. Our results expand the usefulness of epilithic biofilms

as biosensors of wastewater discharges on the prevalence of antibiotic resistance in surface waters.

In the framework of the same project, we tried to disentangle the effects of pharmaceutical compounds and nutrients, which are usually discharged together by WWTP effluents, and their potential interaction on the dissemination of antibiotic resistance in aquatic bacterial communities. This study was conducted in the indoor Experimental Streams Facility of the ICRA under highly-controlled conditions and treatments, which combined different nutrient concentrations and the presence/absence of emerging contaminants. Interestingly, we detected an increase in the relative abundance of *sul1* and *int11* genes only in bacterial communities exposed to emerging contaminants and, more remarkably, this increase was higher in those communities receiving the higher dose of nutrients. Indeed, none of the treatments caused a significant change on the composition of bacterial communities suggesting that the measured enrichment in *sul1* and *int11* genes was due to their dissemination under the combined pressure exerted by nutrients and emerging contaminants. To the best of our knowledge, this is the first study demonstrating the contribution of nutrients on the maintenance and spread of ARGs in streambed biofilms under controlled conditions. Our findings thus suggested a synergistic effect of emerging contaminants and nutrients on the spread of ARGs, which can have important consequences in the environment assuming that sewage and



treated wastewater effluents release nutrients together with a myriad of pharmaceutically active compounds, including antibiotics.

### **Man-made environments: the sewer resistome**

We are involved in the multidisciplinary project **SEWAGENE (Accumulation, spread and removal of antibiotic resistance in sewer systems, Ref. CTM2016-75653-R)**, which was funded in 2016 by the Spanish Ministry of Economy and Competitiveness. SEWAGENE aims to investigate to what extent the chemical treatments used to mitigate noxious sulfide and methane emissions from sewers stimulate the spread of antibiotic resistance among sewage microbes and, specially, if they are effective in their removal.

In the framework of SEWAGENE we first conducted a study in a real sewer to assess the abundance of ARGs and potential bacterial pathogens in sewage and in sewer biofilms by collecting samples at the inlet and outlet sections of a pressurized sewer pipe. Remarkably, significant differences in the relative abundance of gene *int11* and genes conferring resistance to fluoroquinolones (*qnrS*), sulfonamides (*sul1* and *sul2*) and betalactams (*bla<sub>TEM</sub>*) were only measured between inlet and outlet biofilm samples whereas no difference were observed for the flowing sewage. Composition of bacterial communities also showed spatial differences in biofilms and a higher prevalence of Operational Taxonomic Units (OTUs) with high sequence identity ( $\geq 98\%$ ) to well-known human pathogens was observed in biofilms collected at the inlet pipe section. Our results highlight the role of sewer biofilms as source and sink of antibiotic-resistant bacteria and ARGs and

pave the road for a more detailed study on how the above-mentioned chemical treatments affect this resistance reservoir.

In a second stage of the project, we evaluated the effects of oxidative chemical treatments (i.e. addition of Nitrate and free nitrous acid) on the abundance of ARGs, MGEs and antibiotic resistant bacteria. These manipulative experiments are conducted in a lab-scale bioreactor plant that mimics the functioning of a real sewer. Our first controlled experiment pointed to an increase in the number of antibiotic-resistant coliforms and *E. coli* in biofilms subjected to Nitrate treatment (i.e. oxidative stress). These results from cultivation-based analysis will be complemented in brief with results on the abundance of ARGs and MGEs obtained from metagenomic approaches. Also, we are investigating whether or not these oxidative treatments would trigger a stress response in sewer bacteria that lead to an increase in the mobilization of ARGs through transduction, conjugation or transformation mechanisms.



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## **Technology Transfer**

During 2017, continuation of the collaboration with Canal de Isabel II was negotiated with a new project to analyze N-nitrosodimethylamine (NDMA) in drinking water. The group continues with a successful collaboration with Thermo Scientific company developing methodologies for the analysis of NDMA with the latest equipment (GC-Orbitrap and TSQ 9000™ GC).

## All PhD dissertations

**MIREIA FILLOL HOMES**, Insights into the distribution and ecological role of members of the archaeal Phylum Bathyarchaeota. From the global to the local scale. (23/03/2017). Supervisors: Carles Borrego, University of Girona.

**BOZO ZONJA**, Identification and fate of known and unknown transformation products of pharmaceuticals in the aquatic system. 2017. Supervisors: Mira Petrovic, Sandra Perez, University of Barcelona.

**ALI FARHAT**, Electrochemical oxidation of recalcitrant organic compounds using electrogenerated sulfate-based oxidizing agent. 2017. Supervisors: Jelena Radjenovic, Stephan Tait, Jurg Keller. The University of Queensland.

**EMMA THOMPSON BREWSTER**, Electrodialysis for the recovery of nutrients from wastewater. 2017. Supervisors: Damien Batstone, Chirag Mehta, Jelena Radjenovic. The University of Queensland.

**YIFENG XU**, Biodegradation of selected pharmaceuticals by an enriched nitrifying sludge. 2017. Supervisors: Bing-Jie Nie, Jelena Radjenovic, Zhiguo Yuan. The University of Queensland.

## Visiting Scientists

**PROF. EWA KORZENIEWSKA** – Visiting Scientist of University of Warmia and Mazury (Poland) – (November 2017)

**PROF. MONIKA HARNISZ** – Visiting Scientist of University of Warmia and Mazury (Poland) – (November 2017)

**DR. KIMBERLY HAGEMAN** – Visiting Scientist of University of Otago (New Zealand) (March-April 2017)

**PROF. DR. JUAN FRANCISCO FACETTI** – Visiting Scientist of Universidad Nacional de Asunción (Paraguay) – (September 2017)

**DR. MARTINA MARIA MASTRANGELO** – Visiting Scientist of Universidad De Buenos Aires (Argentina) – (June-July 2017)

**GIUSEPPE VENUTO** – Visiting Scientist of Sapienza University di Roma (Italy) – (April-May 2017)

**DIANA NARA RIBEIRO DE SOUSA** – Visiting Scientist of University Federal Of Sao Carlos (May 2017)

## Visiting Students

**ADRIANA OSIŃSKA** – Internship student of University of Warmia and Mazury (Poland) (June-July 2017)

**NATALIA ZAWROTNA** – Internship student of University of Warmia and Mazury (Poland) (June-July 2017)

**MIRIAM CONDEMINAS RODRIGUEZ** – Internship student of ACER (July 2017)

**EVA DARNES CROS** – Internship student of IES Pla Estany (July 2017)

**KLAUDIA GABRIELA FILA** – Internship student of Maria Curie-Skłodowska University (July-September 2017)

**GUILLEM ANDREU GARCIA MARTINEZ** – Internship student of University of Girona (UdG) (November-December 2017)

**POL GOMA MAS** – Internship student of University of Girona (UdG) (November-December 2017)

**NOELIA LOPEZ VIDAL** – Internship student of University of Girona (UdG) (February-June 2017)

**MARILIA MOURA DE SALES PUPO** – Internship student of TIRADENTES UNIVERSITY (November-December 2017)

## All – Stays Abroad

**MS. JESSICA SUBIRATS MEDINA**

Host: Dr. Gianluca Corno, National Research Council of Italy, Italy

“Effects of WWTP effluents and antibiotics on the composition of natural bacterial communities and their associated resistome”

Short Term Scientific Mission supported by NEREUS Cost Action

February-May 2017



# AIII

## Technologies and evaluation

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The Technologies and Evaluation area lines of research are:

### LINES

- AIII 1** Water Supply and Advanced Treatment
- AIII 2** Wastewater Treatment, Reuse and Resource Recovery
- AIII 3** Modelling and Management Systems
- AIII 4** Unit Operations







## 25 researchers in the area

1 research professor (UdG associated) and group leader  
**Ignasi Rodríguez-Roda**

1 research professor (UdG associated)  
**Joaquim Comas**

1 ICREA research professor  
**Wolfgang Gernjak**

1 research scientist  
**Maite Pijuan**

1 research scientist (Ramon y Cajal)  
**Gianluigi Buttiglieri**

1 research scientist (Ramon y Cajal)  
**Lluís Corominas**

5 postdoc researchers  
**Oriol Gutiérrez**  
**Mehlika Ayla Kiser**  
**Mark Santana**  
**Soraya Zahedi**  
**Inmaculada Velo**

7 predoctoral students  
**Federico Ferrari**  
**Pau Gimeno**  
**Elissavet Kassotaki**  
**Anna Ribera**  
**Marc Sauchelli**  
**Natalia Sergienko**  
**Lucia Gusmaroli**

7 research technicians  
**Elena Aran**  
**Marc Balcells**  
**Lluís Bosch**  
**Silvia Busquets**  
**Felix Hill**  
**Adrià Riu**

# Technologies and evaluation

This year the Technologies and Evaluation area has intensified its multidisciplinary collaboration with large European consortia that lead the paradigm change in water management of cities and tourist areas, with the incorporation of circular economy concepts and the application of low-cost solutions inspired in nature that facilitate the recovery, production and local use of resources, benefitting citizens and the integration of the most vulnerable sectors of society.

Work has been done with various proposals, always starting from the needs and opportunities identified by the Town Councils of Lloret, Sant Feliu de Llobregat, Girona, Barcelona, etc. and the competent authorities (Costa Brava Consortium, Mixed Waters Business, Metropolitan Area of Barcelona, etc.), and the result of this effort has been the attainment of European financing Horizon2020 for research and to deliver demonstrative actions over the next five years within the framework of the EdiCitNet and Hydrousa projects.

From the transfer perspective, collaboration has continued with businesses and authorities from the water sector, mainly at an urban level, on matters in which the area has acknowledged expertise. In this sense, work has been done to prevent bad odours and corrosion in collection tanks, monitor spills in unitary collective systems, optimise the integrated management of the urban water cycle, develop systems to help with decision-making, assess various conventional and advanced water treatment systems, or optimise biological treatment systems for wastewater. Our participation in working groups and governing bodies of different business and academic associations has been significant, as well as on national and international water platforms led by the private sector.

Finally, as well as maintaining the activity on existing lines that have enabled us to cover the whole urban water cycle, from a process and control perspective, a complementary line has had a strong beginning relating to the development of electro-chemical systems for different applications, especially on the use of low-cost porous carbon nano materials, which increase the efficiency of electro-chemical systems and increase the speed of redox microbial reactions when working with hybrid bioprocesses. Commencement of this promising field of work has been possible thanks to European support via a Marie Curie IIF Grant ELECTRO-HOSPITAL (PIIF-GA-2013-623041) and an ERC Starting Grant ELECTRON4WATER (714177). This line of research is led by Dr. Jelena Radjenovic, and at this initial stage has the support of postdoc Dr. Erdem Irtem and doctoral student José Miguel Albahaca Oliva.

The results of research, development and innovation of the area, guaranteed by the relevant indicators set out herein, have enabled us to request recognition for the first time as a consolidated research group from the Regional Government of Catalonia, which has just been favourably decided and with financing (ICRA-TECH - 2017 SGR 1318), and which shall enable us to continue expanding in quantity and quality to provide a better service to society and to the productive sector of the country.



From left to right (standing): Miriam Sonnenfeld, Ruggero Rapisarda, Laia Bocanegra, Nevena Milcic, Immaculada Velo, Anna Valls, Elissavet Kassotaky, Joaquim Comas, Nuria Caceres, Ignasi Rodríguez-Roda, Gianluigi Buttiglieri, Natalia Sergienko, Silvia Busquets, Jelena Radjenovic, Maite Pijuan, Wolfgang Gernjak, Oriol Gutiérrez. From left to right (front row): José M. Albahaca, Zhiyuan Bao, Luca Sbardella, Gabrijela Bilos, Lluís Corominas, Giannis Florjan, Silvia Moravic, Nikoletta Tsiarta, Federico Ferrari, Erdem Irtem



AIII

# 1 Water Supply and Advanced Treatment

The activities can be grouped under two overarching themes:

- **Novel processes and treatment trains**
- **Water quality management**

The first of these themes studies novel processes and combinations including chemical oxidation, membranes and/or biofiltration.

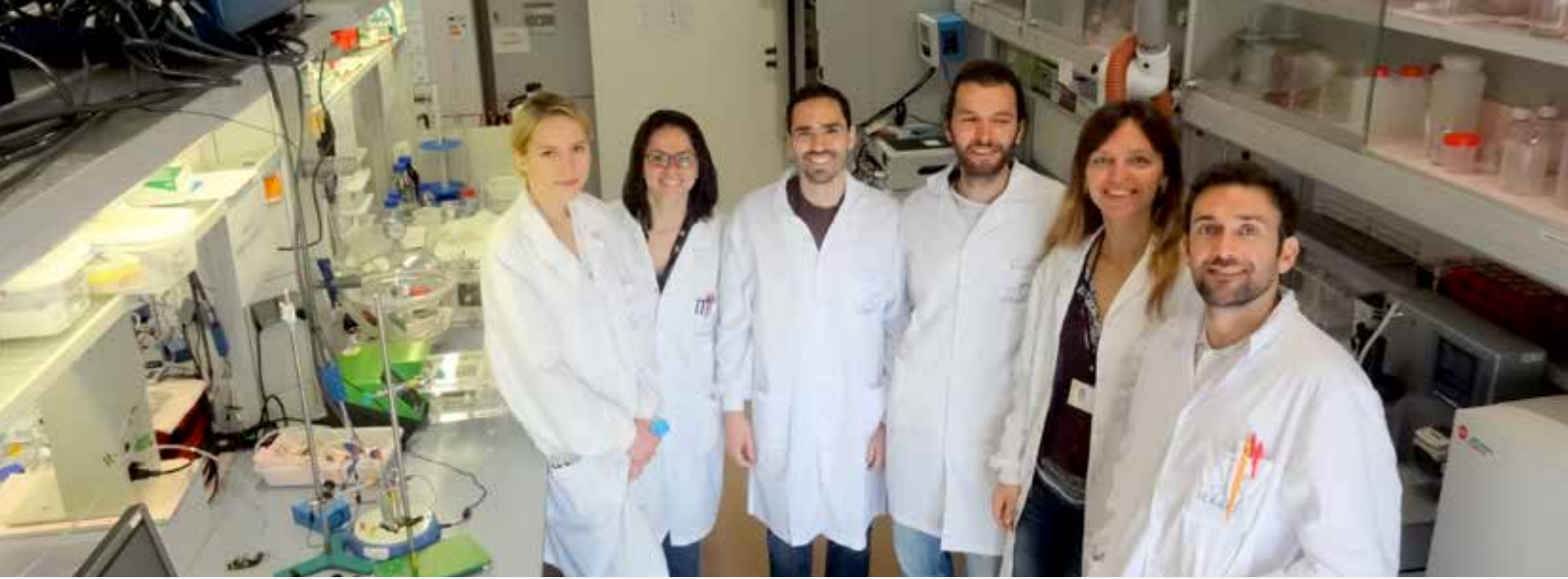
In 2017, specific research activities on novel processes included research on transport phenomena of organics, including trace organic contaminants, in forward osmosis processes. The research focused on the role of the impact of the draw solute and reverse solute flux in these processes, conducted in the scope of the PhD thesis of Marc Sauchelli. Furthermore, Marc Sauchelli also commenced investigating fouling phenomena, specifically studying the question of what operational parameters govern the properties of organic fouling in forward and reverse osmosis processes, namely pressure and transmembrane flux.

We also investigated novel process configurations for UV based Advanced Oxidation Processes. Specifically, post-doctoral fellow Inmaculada Velo Gala investigated the impact of using alternative oxidants such as hypochlorite or persulphate compared to the commonly used hydrogen peroxide, all within the Triceratops MINECO Retos program. Such oxidants

have some distinct advantages, with the two principal aims of the research being to reduce energy consumption when using conventional irradiation sources (low and medium pressure mercury lamps), but also to gain knowledge on the chemistry of the process for the development of novel reactor concepts based on the use of UV LEDs. A PhD is being carried out in collaboration with Wetsus in the Netherlands, where PhD student Nimmy George Kovoov (principal supervisor, Wolfgang Gernjak, ICRA) aims to develop novel AOPs making use of the 185nm and the 254nm component simultaneously emitted by low pressure mercury lamps. Besides targeting an understanding of the chemistry of the process, this PhD project has a strong emphasis on computational fluid design modelling and reactor design as well.

The water quality and supply management aspects within the research line include a strategic co-operation with the company *s::can Messtechnik GmbH* from Austria and its Spanish daughter company *s::can Iberia S.L.* In 2017, Mireia Plà Castellana commenced an Industrial Doctorate co-funded by the Regional Government of Catalonia to work on chemometric methods for enabling contaminant detection using optical spectroscopic sensors. Other activities include collaborations on developing algorithms for mixing of sources in complex water supplies with the University of Girona.





Research team working on ERC-STG ELECTRON4WATER.

AIII

## 2 Wastewater treatment, reuse and resource recovery

Research conducted under this line aims to improve current technologies and develop novel tools for treating wastewater and reusing it in centralized and decentralized systems. Achieving better treatment performance, recovering energy and nutrients and reducing detrimental emissions including organic micropollutants are the goals of this line. The experimental approach ranges from fundamental to applied research, with most of the projects involving strong involvement and participation by industry partners and water utilities.

The main activities focus on the following themes:

- **Minimising the carbon footprint and detrimental emissions of the urban wastewater system as a whole (sewers, wastewater treatment plants and receiving water bodies)**
- **Energy recovery from domestic wastewater treatment**
- **Monitoring organic micropollutants in the environment and biodegradation/removal by means of several treatment technologies**
- **Integration of innovative technologies to achieve an optimal and safe closed water cycle in tourist facilities**

The dynamic carbon footprint of a full scale biological reactor was assessed during a half-year monitoring campaign. A novel multihood gas collection system was used to continuously collect and analyze direct emissions of methane and nitrous oxide emitted from different locations in the biological compartment of Girona WWTP. This data together with the energy consumption allowed us to determine the dynamic carbon footprint of the biological compartment of the treatment plant. This research is funded by the Spanish Government through the project REaCH and was part of the PhD thesis of Anna Ribera, who defended it in December. Also within this project, experiments were conducted in the river experimental facilities located in the PLANTEA laboratories. The effect of the addition of WWTP effluent into a river in terms of greenhouse gas emissions was investigated, showing a correlation between the amount of WWTP effluent added into a river and the potential emissions of nitrous oxide.

The second block of activities conducted during 2017 focused on enhancing energy recovery from wastewater treatment by improving methane production during anaerobic digestion of wastewater. This research is funded by the EU WaterWorks call (Water JPI) via the WATINTECH project. Within this project, ICRA is investigating how to improve methane production during anaerobic treatment of concentrated wastewater

coming from a forward osmosis process via an anaerobic membrane bioreactor. This work is part of the PhD thesis of Federico Ferrari.

In the scope of JPI Water WATINTECH project, we are developing an electrochemical treatment unit for efficient oxidation and removal of sulfide from wastewater. Hydrogen sulfide ( $H_2S$ ) is formed by the biological reduction of sulfates and the decomposition of organic material. Despite being present at relatively low concentrations in wastewater, sulfide represents a major problem for municipal wastewater systems as it is toxic, corrosive, and odorous. Sulfide is often formed in high concentrations during anaerobic digestion processes, where sulfate-reducing bacteria compete with methanogens and decrease the yield and quality of the produced biogas. Research conducted at ICRA is focused on the use of nanostructured, porous anodes capable of selective oxidation of sulfide to sulfur, which allows its separation from the wastewater/digestate without changing the wastewater composition or affecting the microbial community in anaerobic digestion. This work is conducted in the scope of the PhD thesis of Natalia Sergienko.

During 2017, research on the removal of organic micropollutants (pharmaceutical and endocrine disrupting compounds) has been focused on expanding knowledge of their removal/biodegradation mechanisms using different mixed microbial cultures (nitrifiers, heterotrophic bacteria, anammox, facultative anaerobes, etc.) in the framework of the PhD thesis of Elissavet Kassotaki and Lucia Gusmaroli. The tests conducted consider not only the parent compounds but also their transformation products, which is important to determine their real elimination. On the other hand, within the framework of TreatRec and micropollutants removal, the research fellow Luca Sbardella has worked out the results from a biological activated carbon filter and has started sulfate radical-based oxidation experiments.

The fourth research topic within this line focuses on treatment technologies for water reuse. The integration of innovative technologies to achieve a closed water cycle in a tourist installation was pursued within the framework of a European demonstration project (demEAUmed with ICRA as project scientific coordinator) which was completed in June 2017 with the support of the post-doctoral

fellows Mark Santana and Alessio Cibati. After previous trials at the PLANTEA laboratories at ICRA, a semi-industrial scale low energy requirement membrane bioreactor (Smart Air MBR) was operated in the Hotel Samba, Lloret de Mar for greywater and wastewater treatment. This technology was tested in comparison and in combination with other demEAUmed treatment technologies (in particular with an hydroponic wetland technology for greywater treatment) under the supervision of ICRA, both at experimental and simulation level including centralized/decentralized scenarios, technology scaling up, energy requirements, etc.

Following the achieved expertise on water reuse (in particular the completed demEAUmed project) and nutrients recovery, the line is expanding its activities towards the circular economy concept with funded projects awarded at the end of the 2017, which will be executed during the period 2018-2022. In particular the H2020 project HYDROUSA “Demonstration of water loops with innovative regenerative business models for the Mediterranean region” has been funded (PI: Gianluigi Buttiglieri, €10M total funded budget, €474,300 for ICRA, coordinated by the National Technical University of Athens). This project (2018-2022) will provide innovative, nature-based, water management solutions for Mediterranean islands and coastal areas for wastewater treatment and nutrient recovery, supplying fresh water from non-conventional water sources. It will establish the water-energy-food-employment nexus creating jobs, boosting the economy and making sure that the community and stakeholders are engaged.

Moreover, the project CLEaN-TOUR (2018-2020) “Circular economy to facilitate urban water reuse in a touristic city: centralized or decentralized?” funded by the Spanish Government will be conducted in collaboration with the AIII3 line. The aim is to demonstrate the safety of regenerated water for irrigation and other uses thus making a step towards circular economy in touristic regions. It will analyze centralized systems and decentralized systems (segregating different types of water) to address: (i) the elimination of microcontaminants and some pathogens, (ii) the evaluation of possible risks of water reuse, and (iii) the difficulties of selecting the most suitable scenario (centralized or decentralized) with innovative treatment technologies such as osmotic membrane bioreactors and hydroponic technologies.

## 3 Modeling and Management Systems

The main focus is on the development of tools and methodologies to support urban water systems (UWS) management. Line III.3 seeks for the integration of subsystems (e.g. sewer systems, wastewater treatment plants and receiving water bodies) and the integration of criteria (technical, environmental, economical and social) to help urban water practitioners make more qualified decisions.

The main activities focus on the following three themes:

- **Integrated management of urban wastewater systems**
- **Maintenance and upgrade of urban wastewater systems**
- **Multi-criteria decision making**

Regarding the integrated management of urban wastewater systems and rivers, research conducted during 2017 contributed to understanding how global change is influencing water quality in urban wastewater systems (UWWS). An integrated monitoring and modeling study was conducted by Ignasi Aymerich in a coupled wastewater and river system, with the aim of evaluating the impact of WWTP discharges as well as the impact of future urbanization and climate change scenarios. The most relevant aspect of this research was the harmonization not only in terms of subsystems model complexity but also in terms of data availability. We concluded that interventions are required in the mid-term for the UWWS of Puigcerdà to adapt to global change. A link has been made with line AIII2 to efficiently run the REaCH project on measuring GHG emissions in sewers, WWTPs and rivers.

With regards to the upgrade of urban wastewater systems, Pau Gimeno studied how to better allocate economic resources for optimizing the upgrade of WWTPs for the reduction of microcontaminants in rivers at a catchment level. The proper quantification of uncertainty revealed that model uncertainty greatly influences the decisions that river basin authorities must make to reduce the microcontaminant loads released by WWTPs into rivers. In addition, we discussed research priorities

to help reduce model uncertainty and thereby make more appropriate decisions. This research also allowed us to conclude that investments for UWWS upgrading are highly sensitive to the selection of environmental quality standards (EQSs) for microcontaminants and that there is a balance between EQS selection and investment that needs to be considered in decision-making.

With regards to the maintenance of urban wastewater systems, the project GESTOR is ongoing. During 2017, a device for monitoring combined sewer overflows has been installed, the method for detection of infiltration/exfiltration based on distributed temperature sensing has been designed and sensors have been installed for the determination of corrosion-lifetime of sewer pipes. The Project GESTOR is the starting point of the PhD thesis of Silvia Busquets. Within this topic, Pau Juan Garcia initiated a research study in the field of resilience. A critical review of studies that deal with resilience in the wastewater treatment sector was conducted with a special focus on understanding how they addressed the key elements for assessing resilience, such as stressors, system properties, metrics and interventions to increase resilience. This work is the seed to propose a resilience framework for wastewater treatment. Also, Pau Juan is doing research in cooperation with inCTRL Solutions Inc. to validate the dynamic aeration supply models in the software platform SIMBA# using data collected from the WWTP of Girona. The model was used to evaluate different alternatives to minimize aeration consumption while maintaining effluent water quality.

The third theme aims at developing multi-criteria decision support systems (DSS) for complex UWS-related decision-making. Line III.3 is involved in the development of DSS for several purposes in wastewater management. During 2017, Mark Santana focused on finishing the DSS for the demEAUmed project for the selection of technologies for decentralized water reclamation in hotels. A cooperation continued with the International Water Association and GIZ to release the second version of the ECAM tool, a platform for utilities to monitor their GHG emissions and energy use (Lluís Bosch). A



DSS for the JPI Watintech project is being developed to identify the most adequate dynamic integration of decentralized technologies for rain water harvesting and the recovery of water-energy added-value products from sewer mining. Finally, Adrià Riu developed a DSS for the selection of the most adequate treatment technology for nitrate removal in groundwater, in cooperation with the Catalan Water Agency (ACA) and Catalan Water Partnership.

Built on the expertise of multicriteria DSS development, the III.3 line, in collaboration with the Resources and Ecosystems area, is expanding its activities towards the planning of smart and sustainable cities thanks to the H2020 EdiCitNet project awarded in December 2017. EdiCitNet

“Integrating Edible City Solutions for social resilient and sustainably productive cities” (PI: Joaquim Comas, €12.3M total funded budget, €386,030 for ICRA, coordinated by the Technical University of Berlin) will be executed from September 2018 to September 2023. This project will demonstrate cost-effectiveness and economic viability of the systemic use of nature-based solutions for urban food production (edible city solutions) as a major step towards more sustainable, resilient and socially just cities. It will require a paradigm shift towards re-use oriented management of water, energy and nutrients in cities. ICRA will be leading the development of the toolbox for edible city solutions learning and implementation.

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## Technologies and Evaluation area Technology Transfer

Project CIATEC (México). Environmental assessment of Bioturbosine production. Dr Joaquim Comas.

### AllI – PhD dissertations

**ANNA RIBERA.** Greenhouse gas emissions from wastewater treatment processes: identifying triggering factors at laboratory and full-scale systems”, Supervised by Dr. Maite Pijuan and Dr. Oriol Gutiérrez, University of Girona

### Visiting Scientists

**YULI EKOWATI** – Visiting Scientist of UNESCO-IHE – (January-February 2017)

**PAU JUAN GRACIA** – Visiting Scientist of Atkins Global – (January-June 2017)

**LUCA SBARDELLA** – Visiting Scientist of Aquafin – (January-July 2017)

### Visiting Students

**MARIAN ALIAS POZO** – Internship Student of University of Girona (UdG) – (January-February 2017)

**ZHIYUAN BAO** – Internship Student of Beijing Forestry University – (January-December 2017)

**MACIA BARDES JOLONCH** – Internship Student of University of Girona (UdG) – (March-July 2017)

**ALBERT DARNES BALDRICH** – Internship Student of University of Girona (UdG) – (January-July 2017)

**SERGI DOMINGUEZ MARTIN** - Internship Student of University of Girona (UdG) – (November-December 2017)

**MIQUEL ESTELRICH BESTARD** – Internship Student of University of Girona (UdG) – (March-September 2017)

**GERARD FERRER ARTIGAS** – Internship Student of University of Girona (UdG) – (July-August 2017)

**SALVATORE MIDULLA** – Internship Student of Università Degli Studi Di Palermo – (January-February 2017)

**GIUSEPPE PELLEGRINO** – Internship Student of Università Degli Studi Di Catania – (March-July 2017)

**MATEO SPINELLO** – Internship Student of Università Politecnica Delle Marche – (March-July 2017)

### AllI – Stays Abroad

**LLUÍS COROMINAS** was on a research stay at INRA (Institut National Recherche Agronomique), France, between October 2017 and March 2018.



# 04

## Publications & congresses



**Total publications:  
140**



# SCI Publications

## (Science Citation Index 2016)

(Publications Ordered alphabetically)

A. Mizukawa, D. Molins-Delgado, J.C. Rodríguez, C.V. Scapulatempo, S. Díaz-Cruz and D. Barceló. "Sediments as a sink for UV filters and benzotriazoles: the case study of Upper Iguazu watershed, Curitiba (Brazil)". *Environ. Sci. Pollut. Res.*, 24 (2017), 18284-18294. IF=2.741, Q1.

A. Rodríguez, A. Margareto, T. Robledo-Mahon, E. Aranda, S. Díaz-Cruz, J. González-López, D. Barceló and R. Vahala. "Performance and bacterial community structure of a granular autotrophic nitrogen removal bioreactor amended with high antibiotic concentrations". *Chemical Engineering Journal*, 325 (2017), 257-269. IF=1.745, Q1.

A. Rodríguez-Sánchez, A. Margareto, T. Robledo-Mahon, E. Aranda, S. Díaz-Cruz, J. González-López, D. Barceló, R. Vahala and A. González-Martínez. "Performance and bacterial community structure of a granular autotrophic nitrogen removal bioreactor amended with high antibiotic concentration". *Chemical Engineering Journal*, 325 (2017), 257-269. IF=6.216, Q1.

Acuña V., Hunter M., Ruhí A. 2017. **Managing temporary streams and rivers as unique rather than second-class ecosystems.** *Biological Conservation*, 211: 12-19. IF = 4.022, Q1.

Aguilera, R., Sabater, S., Marcé, R. 2017. **A methodological framework for characterizing the spatiotemporal variability of river water-quality patterns using dynamic factor analysis.** *Journal of Environmental Informatics* DOI: 10.3808/jei.201600333. IF =5.56, Q1.

Andrea Hom-Díaz, Adrián Jaén-Gil, Iris Bello-Laserna, Sara Rodríguez-Mozaz, Teresa Vicent, Damià Barceló, Paqui Blánquez. **Performance of a microalgal photobioreactor treating toilet wastewater: Pharmaceutically active compound removal and biomass harvesting (2017)** *Science of The Total Environment*, 592, 1-11. IF=4.9, Q1.

Anglés M., Folch A., Oms O., Maestro E., Mas-Pla J. 2017. **Stratigraphic and structural controls on groundwater flow in an outcropping fossil fan delta: the case of Sant Llorenç del Munt range (NE Spain).** *Hydrogeology Journal*, 25(8), 2467-2487. DOI: 10.1007/s10040-017-1618-9. IF=2.109, Q1.

Anticó, E., Cot, S., Ribó, A., Rodríguez-Roda, I., Fontàs, C. **Survey of heavy metal contamination in water sources in the municipality of Torola, El Salvador, through in situ sorbent extraction.** *Water* (Switzerland), 9 (11), art. no. 877. IF=1.832, Q2.

Atanasova, N., Dalmau, M., Comas, J., Poch, M., Rodríguez-Roda, I., Buttiglieri, G. **Optimized MBR for greywater reuse systems in hotel facilities.** *Journal of Environmental Management*, 193, pp. 503-511. IF=4.010, Q1.

Auguet, O., M. Pijuan, C.M. Borrego, S. Rodríguez-Mozaz, X. Triadó-Margarit, S. Varela Della Giustina, O. Gutiérrez (2017) **Sewers as potential reservoirs of antibiotic resistance.** *Science of the Total Environment* 605-606: 1047-1054. DOI: 10.1016/j.scitotenv.2017.06.153. IF=4.9, Q1.

Aymerich I., Acuña V., Ort C., Rodríguez-Roda I., Corominas Ll. 2017. **Fate of organic microcontaminants in wastewater treatment and river systems: An uncertainty assessment in view of sampling strategy, and compound consumption rate and degradability.** *Water Research* 125: 152-161. IF = 6.942, Q1.

Badia-Fabregat, M., D. Lucas, T. Tuomivirta, H. Fritze, T. Pennanen, S. Rodríguez-Mozaz, D. Barceló, G. Caminal and T. Vicent. 2017. **Study of the effect of the bacterial and fungal communities present in real wastewater effluents on the performance of fungal treatments.** *Science of the Total Environment* 579: 366-377. IF=4.9, Q1.

Batalla, R.J.; Iroumé, A.; Hernández, M.; Llana, M.; Mazzorana, B.; Vericat, D. 2017. **Recent geomorphological evolution of a natural river channel in a Mediterranean Chilean basin.** *Geomorphology*, 303: 322-337. IF: 2.958, Q1.

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- Catalán, N., J.P. Casas-Ruiz, D. von Schiller, L. Proia, B. Obrador, E. Zwirnmann, and R. Marcé. 2017. **Biodegradation kinetics of dissolved organic matter chromatographic fractions in an intermittent river.** *Journal of Geophysical Research - Biogeosciences* 122: 131–144. DOI:10.1002/2016JG003512. IF = 3.39 Q1.
- Čelić, M., Insa, S., Škrbić, B., Petrović, M., **Development of a sensitive and robust on-line dual column liquid chromatography – tandem mass spectrometry method for the analysis of natural and synthetic estrogens and their conjugates in river water and wastewater.** *Analytical and Bioanalytical Chemistry* 409(23) (2017) 5427-5440 IF= 3.431; Q1.
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- Lekunberri, I., J.L. Balcázar and C.M. Borrego (2017) **Detection and quantification of the plasmid-mediated mcr-1 gene conferring colistin resistance in wastewater.** *Internat. J. Antimicrob. Agents.* 50(6): 734-736. DOI: 10.1016/j.ijantimicag.2017.08.018. IF=4.302, Q1.
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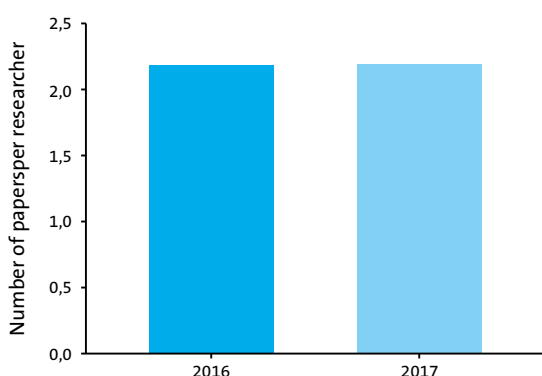
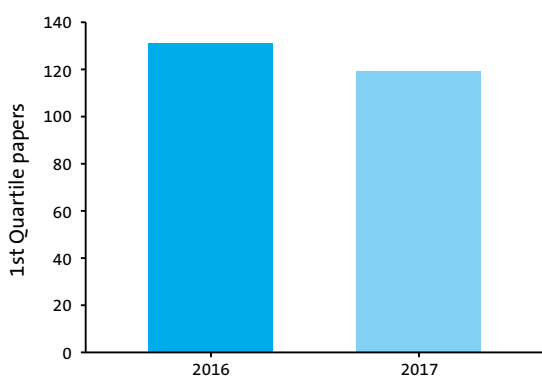
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Balcázar J.L. Member of the Editorial Board. **Environmental Science and Pollution Research** (Springer, Germany). 2016 to present.

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Barceló, D. Associate Editor. **Environment International** (Elsevier, The Netherlands) 2009 to present.

Barceló, D. Associate Editor. **Trends in Analytical Chemistry** (Elsevier, The Netherlands) 1993 to present.

Barceló, D. Co-Editor. **Handbook of Environmental Chemistry**, book series (Springer-Verlag, Germany) 2007 to present.

Barceló, D. Co-Editor-in-chief. **Science of the total Environment** (Elsevier, The Netherlands) 2012 to present.

Barceló, D. Editor. **Wilson & Wilson Comprehensive Analytical Chemistry**, book series (Elsevier, The Netherlands) 1997 to present.

Barceló, D. Member of the Editorial Board. **Analytical and Bioanalytical Chemistry** (Springer Verlag, Germany) 2002 to present.

G. Buttiglieri is member of the scientific committee of the journal **"Ingegneria dell'Ambiente (IDA)"**.

J. Comas is member of the **Editorial Board of the open access journal Global Challenges: Water.**

Ll. Corominas is member of the editorial board of the journal **water practice and technology from the International Water Association Publishing.**

M. Pijuan is member of the editorial board of the journal **Nature Scientific Reports.**

Petrovic, M. Editor-in-chief. **TRAC – Trends in Environmental Analytical Chemistry** (Elsevier, The Netherlands) 2014 to present.

Petrovic, M. Member of the Editorial Board. *Environmental Nanotechnology, Monitoring & Management* (Elsevier, The Netherlands) 2014 to present.

Rafael Marcé, Associate Editor of *Limnetica*.

Rodriguez-Mozaz, S. Guest Editor. *Food and Chemical Toxicology* (Elsevier, The Netherlands) Special issue "European seafood safety" 2016.

Sergi Sabater, Editorial Board Member of *The Science of the Total Environment*; Editorial Board Member of *Acta Biológica Colombiana*; Associate Editor of *Freshwater Science* (specialty section of Frontiers in Environmental Science).

Vicenç Acuña, Associate Editor of *Aquatic Sciences*.

# Presentation at congresses

## Oral presentations

Acuña, Vicenç. **Temporary waterways, current management challenges and promising solutions.** 2017. Invited seminar *Universitat Rovira I Virgili*.

Acuña, Vicenç. **Dissecting the dry phase of temporary waterways: components, effects, ongoing alterations and mitigation measures.** 2017. Invited seminar *Eawag*.

Acuña, Vicenç. **Threats and opportunities of integrating ecosystem services in nature management.** 2017. Symposium of *European Freshwater Sciences X (SEFS)*.

Catalán, Núria. **"Aquatic priming effect: looking for the mechanisms behind non-additive interactions of organic matter XVI Congresso Brasileiro de Limnologia,** July 2017, Rio de Janeiro, Brazil."

Catalán, Núria. **Controls on the reactivity of organic carbon across inland waters.** November 2017. *Institute Pierre Laplace- Laboratoire des Sciences du Climat et l'Environnement (LSCE),* France.

Catalán, Núria. **Dissolved organic matter reactivity across aquatic ecosystems and scales.** *Biogeomon,* August 2017, Czech Republic.

Catalán, Núria. **DOM reactivity across inland waters.** *Dept. Ecologia, Universitat de Barcelona,* October 2017.

D. Barceló, B.Zonja, M.Lopez de Alda. **Smart target method development for detection of antiviral compounds in aqueous environmental samples based on suspect screening and HRMS.** *253rd American Chemical Society National Meeting and Exposition. Division of Environmental Chemistry.* April 2017. San Francisco, CA, USA.

D. Barceló, M Farré, M. Petrovic, MJ Lopez de Alda. **LC-MS-MS Analysis of Emerging Contaminants (EDCs, PPCPs and PFCs) and Nanomaterials in the environment.** *Pittcon 2017.* March 2017. Chicago, Illinois, USA.

D. Barceló. **Cambio climatico y sus efectos en la cantidad y calidad de agua.** *V Jornadas de la Gestión del Ciclo Integral del Agua y Medio Ambiente. Empleo de aguas regeneradas en el sureste español.* February 2017. Murcia.

D. Barceló. **Climate change, water scarcity, emerging contaminants and other stressors.** *EMEC 18.* November 2017. Porto, Portugal.

D. Barceló. **Contaminantes emergentes en el medio acuático: riesgos y soluciones.** *XV Congreso Español/ IV Congreso Iberoamericano de Salud Ambiental.* June 2017. Zaragoza.

D. Barceló. **Ecotoxicological Risk of Pollutants in Iberian Rivers.** *SETAC 38th Annual Meeting in North America.* November 2017. Minneapolis, MN, US.

D. Barceló. **Emerging contaminants and other stressors in European river waters under water scarcity: the Globaqua project.** *Annual meeting 2017. Universite de Lyon.* April 2017. Lyon, Francia.

D. Barceló. **Emerging contaminants: risk and challenges for water quality in Iberian river basins and plant uptake. Solutions with advanced treatment technologies.** *Workshop on Technologies for Monitoring and Treatment of Contaminants of Emerging Concern.* November 2017. Universidad Rey J Carlos, Madrid.

D. Barceló. **HRMS Approaches for Detection of Pharmaceuticals and their Transformation Products in Real-World Water Samples. 13th Annual LC-MS/MS Workshop on Environmental and Food Safety.** June 2017. Bufalo, USA.

D. Barceló. **Single and Mixture Toxicity of TiO<sub>2</sub>, Organic UV-Filters and Parabens. SETAC 38th Annual Meeting in North America.** November 2017. Minneanapolis, MN, US.

D. Barceló. **Smart suspect screening and related HRMS approaches for detection of Pharmaceuticals and their transformation products in real-world water samples. SMMAP 2017.** October 2017. Disneyland Paris, Francia.

D. Barceló. **The EU Globaqua Project on multiple stressors in rivers under water scarcity and global change:a reconnaissance study of emerging contaminants. International Conference on Advances in Energy Ssystems and Environmental Engineering (ASEE17).** July 2017. Wroclaw, Poland.

D. Barceló. **The EU Globaqua Project on multiple stressors in rivers under water scarcity and global change:a reconnaissance study of emerging contaminants. International Summit Forum on Engineering Science abd Technology.** August 2017. Beijing, China.

D. Barceló. **The EU Globaqua Project on multiple stressors in rivers under water scarcity and global change:a reconnaissance study of emerging contaminants. The 5th Busan Global Water Forum.** September 2017. Busan, Corea del Sur.

D. Barceló. **The EU Globaqua Project on multiple stressors in rivers under water scarcity and global change:a reconnaissance study of emerging contaminants. VII ENQAmb, Encontro Nacional de Quimica Ambiental.** October 2017. Curitiba, PR, Brasil.

D. Barceló. **Uso a cromatografia a liquido acoplada a espectrometria de massas de alta resolucao (HPLC-HRMS) para a deteccao de farmacos e eseus productos de degradaco em amostras de agua. 57 Congresso Brasileiro de Quimica.** October 2017. Gramado, RS, Brasil.

G. Buttiglieri, I. Rodriguez-Roda, I. demEAUmed project - closing the water cycle. **REUCITY workshop:**

**Circular water management in touristic facilities.** Lloret de Mar (Spain), 19th May 2017. Invited presentation.

G. Buttiglieri. **Water quality: state of the art.** Invited interview to the **"11th Science week"**, Barcelona (Spain), 27th May 2017.

Gianluigi Buttiglieri, chair of the **session 3.2.2 on Further WW treatment technologies. 10th Micropol & Ecohazard Conference 2017**, Vienna (Austria), 17th-20th September 2017.

Gianluigi Buttiglieri, chair of the session on **Chemical Engineering. 2nd international conference on Chemical and Biochemical Engineering**, Gran Canaria (Spain), 24th-26th July 2017.

J. Comas, **"¿Pueden los Biorreactores de membrana osmóticos ser una solución competitiva para la reutilización de agua?". FACS technical workshop on application of membrane technologies in the urban water cycle**, Castellón de la Plana (Spain), December 14-15th 2017. Invited presentation.

J. Comas, **"Bioreactores de membrana osmóticos para la reutilización de aguas". Membrane Bioreactors workshop**, Barcelona (Spain), June 14th 2017. Invited presentation.

J. Comas, chair of the session **"Let's have some fun: promote your closed-loop technology!"**. **REUCITY workshop: Circular water management in touristic facilities.** Lloret de Mar (Spain), 19th May 2017.

J. Comas, chair of the session **"Membrane pre-treatment"**. **Membrane Bioreactors workshop**, Barcelona (Spain), June 14th 2017.

Jurg Keller, Katrin Doederer, Maria José Farré. **Intersection of Potable Reuse Treatment Objectives and DBPs. Disinfection 2100: Linking Engineering, Chemistry, Toxicology and Epidemiology to Reduce Exposure to Toxicity Drivers While Curtailing Pathogens. Gordon Research Conference 30-1.8.2017**, South Hadley, MA, US.

Marcé, Rafael. **"Modeling tools to evaluate the impact of extreme events on reservoir organic carbon, DBP precursors, and water treatment"** **GLEON Conference**, USA, 2017.

Mas-Pla, Josep. “El Tercer Informe sobre el Canvi Climàtic a Catalunya (TICCC) i l’aigua”, *Acte Commemoratiu del Dia Mundial de l’Aigua organitzades per l’Institut de Recerca de l’Aigua*, Universitat de Barcelona. Facultat de Ciències de la Terra, UB, 22 de març de 2017.

Mas-Pla, Josep. **Nitrates and antibiotics in surface water and groundwater: Experiences in Catalonia.** *Università di Pavia*, Itàlia. Intercanvi Erasmus+. 7 de febrer de 2017.

Mas-Pla, Josep. **Presencia y transporte de antibióticos en agua subterránea: el caso del acuífero aluvial del Baix Fluvià (Girona).** *Instituto Geológico y Minero de España (IGME)*, 15 Novembre 2017.

Mas-Pla, Josep. **Recursos hidrològics i canvi climàtic: conclusions del Tercer Informe del canvi Climàtic a Catalunya**, a la *90a Sessió Monogràfica del Consell per a l’Ús Sostenible de l’Aigua*, Agència Catalana de l’Aigua, 22 de febrer de 2017.

Petrovic, M, Verkh, Y., Celic, M., **High Resolution Mass Spectrometry Profiling of Dissolved Organic Matter in Environmental and Processed Water**, *Pittcon 2017*, March 2017, Chicago, USA.

Sabater, Sergi. “Efectos del cambio global sobre los ecosistemas fluviales. Elementos, implicaciones y desafíos”. *Inaugural conference at the 14th Congress of the Chilean Society of Limnology*. Puerto Montt, Chile. 22nd October 2017.

Sabater, Sergi. “Effects of water scarcity and human occupation on river eutrophication.” In: *International Workshop on eutrophication: synthesis of knowledge*. InEE - CNRS – Paris, France 18th – 20th April 2017.

Sabater, Sergi. “Els ecosistemes aquàtics continentals”. *Jornades de Presentació del TICCC per al món local*. Manresa. 30th October 2017.

Sabater, Sergi. **Multiple stressors managed under water scarcity: the Ebro River case study.** Presentation at the webinar “*MARS eConference on the Future of Water Management in Europe*”, 19-20 September 2017.

Sara Rodriguez-Mozaz. **Contaminants ambientals emergents en peix. Riscos emergents en els productes**

*del mar*. 5th July 2017. Institut d’Estudis Catalans, Barcelona.

Sara Rodriguez-Mozaz. **Evaluation of conventional and alternative (fungal) treatment of hospital and urban wastewater in the removal of antibiotics and antibiotic resistance genes.** *Antimicrobial Resistance: Meeting the Challenge*. 24th November 2017. London (UK)

## Patents / Pilot plants

**Patente Española:** ES2490065

**Título:** *Sistema de monitorización de desbordamientos en redes de tuberías.*

**Fecha de solicitud:** 27/02/2013 - Fecha de concesión: 09/06/2015.

**Titular:** Fundació Institut Català de Recerca de l’aigua (ICRA).

**Inventores:** Oriol Gutierrez García-Moreno; Lluís Corominas Tabares; Vicenç Acuña Salazar.

**European patent application:** EP16382307. (Requested)

**Title:** *Method for operating a membrane bioreactor of a water treatment system and corresponding membrane bioreactor and water treatment system.*

**Holder:** University of Girona and the Catalan Institute for Water Research (ICRA).

**Inventors:** Blandin, Gaetan, Rodríguez-Roda Layret, Ignasi, Comas i Matas, Joaquim.





# 05 Projects

## Resources and ecosystems research area

<b>Project</b>	<b>Transferencia de nanomateriales de carbono en el medio ambiente acuático (ERA-NET_NanoTransfer)</b>
<b>Funding agency</b>	Ministerio de Ciencia e Innovación
<b>Duration</b>	2015 - 2018
<b>Coordinator</b>	Esteban Abad (IDAEA-CSIC)
<b>Leader researcher</b>	Sergi Sabater
<b>Amount for ICRA</b>	€ 90.000

<b>Project</b>	<b>Ecosistemas fluviales temporales y cambio global: efectos sobre la estructura y función del ecosistema (FUNSTREAM)</b>
<b>Funding agency</b>	Ministerio de Economía y Competitividad (MINECO). (CGL2014-58760-C3-3-R)
<b>Duration</b>	2015 - 2017
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Sergi Sabater
<b>Amount for ICRA</b>	€ 108.900

<b>Project</b>	<b>Managing the effects of multiple stressors on aquatic ecosystems under water scarcity (GLOBAQUA)</b>
<b>Funding agency</b>	European Commission FP7-ENV-2013 (603629)
<b>Duration</b>	2014 - 2019
<b>Coordinator</b>	Consejo Superior de Investigaciones Científicas (CSIC)
<b>Leader researcher</b>	Sergi Sabater
<b>Amount for ICRA</b>	€ 637.550

<b>Project</b>	<b>Science and Management of Intermittent Rivers and Ephemeral Streams (COST_SMIREs)</b>
<b>Funding agency</b>	European Union – Cost Action
<b>Duration</b>	2015 - 2020
<b>Coordinator</b>	Institut National de Recherche en sciences et technologies pour l'environnement et l'agriculture (IRSTEA).
<b>Leader researcher</b>	Vicenç Acuña Salazar
<b>Amount for ICRA</b>	€ 0

<b>Project</b>	<b>Estrategias de descontaminación de recursos hídricos basadas en la optimización de procesos de atenuación natural (REMEDIATION)</b>
<b>Funding agency</b>	Ministerio de Economía y Competitividad (MINECO). (CGL2014-57215-C4-2-R)
<b>Duration</b>	2015 - 2018
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Josep Mas-Pla
<b>Amount for ICRA</b>	€ 84.700

<b>Project</b>	<b>Management of Climatic Extreme Events in Lakes Reservoirs for the Protection of Ecosystem Services (MANTEL)</b>
<b>Funding agency</b>	European Commission H2020-MSCA-ITN-2016 (722518)
<b>Duration</b>	2017 - 2020
<b>Coordinator</b>	Centre for Freshwater and Environmental Studies (IRL)
<b>Leader researcher</b>	Rafael Marce Romero
<b>Amount for ICRA</b>	€ 247.872,96

<b>Project</b>	<b>Integration of climate seasonal prediction and ecosystem impact modeling for an efficient adaptation of water resources management to increasing climate extreme events (ERA4CS_WATExR)</b>
<b>Funding agency</b>	MINECO
<b>Duration</b>	2017 - 2020
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Rafael Marce Romero
<b>Amount for ICRA</b>	€ 148.000

<b>Project</b>	<b>Resolviendo el dilema de la degradabilidad de la materia organica disuelta en los ecosistemas de agua dulce (FREEDOM)</b>
<b>Funding agency</b>	MINECO
<b>Duration</b>	2015 - 2017
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Rafael Marce Romero
<b>Amount for ICRA</b>	€ 72.600

<b>Project</b>	<b>Persistence and fate of emerging contaminants and multi-resistant bacteria in a continuum of surface water groundwater from the laboratory scale to the regional scale (JPI-Water_2013_PERSIST)</b>
<b>Funding agency</b>	MINECO
<b>Duration</b>	2014 - 2017
<b>Coordinator</b>	Universitat de Nîmes
<b>Leader researcher</b>	Josep Mas Pla
<b>Amount for ICRA</b>	€ 136.000

<b>Project</b>	<b>Balanç hídric, teledetecció i canvi climàtic: Control amb dades de camp i de teledetecció dels necessitats hídriques dels conreus de secà (vinya, olivera) en escenaris futurs d'escassetat d'aigua (CMI_Josep Mas Pla)</b>
<b>Funding agency</b>	INSTITUCIO PÚBLICA
<b>Duration</b>	2015 - 2017
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Josep Mas Pla
<b>Amount for ICRA</b>	€ 10.000

<b>Project</b>	<b>Climate Alert Smart System for Sustainable Water and Agriculture (ERA4CS_CLIMALERT)</b>
<b>Funding agency</b>	MINECO
<b>Duration</b>	2017 - 2020
<b>Coordinator</b>	University of Minho
<b>Leader researcher</b>	Sergi Sabater
<b>Amount for ICRA</b>	€ 97.445

<b>Project</b>	<b>Lagos menguantes y la remobilización de un sumidero de carbono milenario: impactos pasados, presentes y futuros en el carbono atmosférico (Eulnv_DRYSSINK)</b>
<b>Funding agency</b>	MINECO
<b>Duration</b>	2017 - 2018
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Rafael Marce Romero
<b>Amount for ICRA</b>	€ 3.815

## Water quality research area

<b>Project</b>	<b>Acumulación, dispersión y eliminación de resistencias a antibióticos en colectores de agua residual (SEWAGENE-16)</b>
<b>Funding agency</b>	Ministerio de Economía y Competitividad (MINECO) and FEDER
<b>Duration</b>	2016 - 2019
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Carles Borrego Moré
<b>Amount for ICRA</b>	€ 154.880

<b>Project</b>	<b>Hongos, algas y bacterias en la degradación de fármacos. Depuración de efluentes de hospital por hongos (H2PHARMA)</b>
<b>Funding agency</b>	Ministerio de Economía y Competitividad (MINECO). (CTM2013-48545-C2-2-R)
<b>Duration</b>	2014 - 2017
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Sara Rodríguez-Mozaz
<b>Amount for ICRA</b>	€ 114.950

<b>Project</b>	<b>Priority Environmental Contaminants in seafood: safety assessment, impact and public perception (ECsafeSEAFOOD)</b>
<b>Funding agency</b>	European Commission FP7-KBBE-2012 (311820)
<b>Duration</b>	2013 - 2017
<b>Coordinator</b>	Antonio Marqués, Instituto de Investigação das pescas e do Mar (IPIMAR), Portugal
<b>Leader researcher</b>	Damià Barceló
<b>Amount for ICRA</b>	€ 274.067

<b>Project</b>	<b>Real time monitoring of SEA contaminants by an autonomous lab-on-a-chip biosensor (SEA-on-a-CHIP)</b>
<b>Funding agency</b>	European Union - FP7 OCEAN 2013 (614168)
<b>Duration</b>	2013 - 2017
<b>Coordinator</b>	Institut de Diagnòstic Ambiental i Estudis de l'Aigua (IDAEA- Consejo Superior de Investigaciones Científicas-CSIC)
<b>Leader researcher</b>	Sara Rodríguez
<b>Amount for ICRA</b>	€ 179.152

<b>Project</b>	<b>New and emerging challenges and opportunities in wastewater reuse (NEREUS)</b>
<b>Funding agency</b>	European Union – COST Action - ES1403
<b>Duration</b>	2014 - 2018
<b>Coordinator</b>	University of Cyprus
<b>Leader researcher</b>	Sara Rodríguez-Mozaz
<b>Amount for ICRA</b>	€ 0

<b>Project</b>	<b>Estudio de la transformación de los contaminantes emergentes en las aguas residuales y ecosistemas fluviales y costeros (TRANSFORMCOAST)</b>
<b>Funding agency</b>	Ministerio de Economía y Competitividad (MINECO). (CGL2014-56530-C4-4-R)
<b>Duration</b>	2015 - 2017
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Mira Petrovic
<b>Amount for ICRA</b>	€ 108.900



<b>Project</b>	<b>Interdisciplinary concepts for municipal wastewater treatment and resource recovery. Tackling future challenges (TreatRec)</b>
<b>Funding agency</b>	European Commission H2020-MSCA-ITN -2014 (642904)
<b>Duration</b>	2015 - 2018
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Mira Petrovic
<b>Amount for ICRA</b>	€ 495.745

<b>Project</b>	<b>Tracking and assessing the Risk from Antibiotic resistant genes using Chip technology in surface water Ecosystems (JPI-Water_2013_TRACE)</b>
<b>Funding agency</b>	MINECO
<b>Duration</b>	2014 - 2017
<b>Coordinator</b>	Leibniz Institute of Photonic Technology, Jena, D
<b>Leader researcher</b>	Carles Borrego More
<b>Amount for ICRA</b>	€ 150.000

<b>Project</b>	<b>Assessment of nitrogen containing disinfection by-products and their precursors in drinking waters of the Mediterranean Basin (N-DBPs)</b>
<b>Funding agency</b>	European Commission FP7-PEOPLE-2013-IIF (623711)
<b>Duration</b>	2014 - 2017
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Maria Jose Farre Olalla
<b>Amount for ICRA</b>	€ 173.370,6

<b>Project</b>	<b>Stopping Antibiotic Resistance Evolution (JPI-Water_2013_StARE)</b>
<b>Funding agency</b>	MINECO
<b>Duration</b>	2014 - 2017
<b>Coordinator</b>	Universidade de Oporto, Portugal
<b>Leader researcher</b>	Sara Rodriguez Mozaz
<b>Amount for ICRA</b>	€ 115.000

<b>Project</b>	<b>Groundwater quality assessment in areas with intensive livestock: is manure recycling a major source of pollution and dissemination of antibiotic resistance genes?" (RESOURCE)</b>
<b>Funding agency</b>	European Commission H2020-MSCA-IF-2016 (750104)
<b>Duration</b>	2017 - 2019
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Meritxell Gros, Supervisor Mira Petrovic
<b>Amount for ICRA</b>	€ 170.121,6

<b>Project</b>	<b>Grups de recerca consolidats (GRC) - Institut Català de Recerca de l'Aigua – ICRA (SGR2014-16)</b>
<b>Funding agency</b>	AGAUR
<b>Duration</b>	2014 - 2017
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Damià Barcelo Culleres
<b>Amount for ICRA</b>	€ 63.000

## Technologies and evaluation research area

<b>Project</b>	Demonstrating integrated innovative technologies for an optimal and safe closed water cycle in Mediterranean tourist facilities (demEAUmed)
<b>Funding agency</b>	European Commission FP7-ENV-2013-Water-Inno-Demo (619116)
<b>Duration</b>	2014 - 2017
<b>Coordinator</b>	LEITAT (Technological Center), Terrassa, Barcelona, Spain
<b>Leader researcher</b>	Ignasi Rodríguez-Roda
<b>Amount for ICRA</b>	€ 422.732

<b>Project</b>	Tecnologías eficientes para la eliminación de contaminantes de preocupación emergente, contenidos en Directiva 2013/39/CE o de riesgo significativo según Directiva 2008/105/CE (TRICERATOPS)
<b>Funding agency</b>	Ministerio de Economía y Competitividad (MINECO)
<b>Duration</b>	2016 - 2018
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Wolfgang Gernjak
<b>Amount for ICRA</b>	€ 175.420

<b>Project</b>	Demonstration of innovative solutions for Reuse of water, Recovery of valuables and Resource efficiency in urban wastewater treatment (R3-Water)
<b>Funding agency</b>	European Commission FP7-ENV-2013-Water-Inno-Demo (619093)
<b>Duration</b>	2014 - 2017
<b>Coordinator</b>	IVL, SVENSKA MILJOEINTITUTET AB, Sweden
<b>Leader researcher</b>	Lluís Corominas
<b>Amount for ICRA</b>	€ 272.800

<b>Project</b>	Resiliencia de los sistemas de saneamiento a desafíos emergentes: de la generación de conocimiento a la mejora de la gestión integrada (ReACH)
<b>Funding agency</b>	Ministerio de Economía y Competitividad (MINECO)
<b>Duration</b>	2016 - 2018
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Lluís Corominas Tabares
<b>Amount for ICRA</b>	€ 123.420

<b>Project</b>	Smart decentralized water management through a dynamic integration of technologies (JPI_Water2014_WATINTECH)
<b>Funding agency</b>	Ministerio de Economía y Competitividad (MINECO)
<b>Duration</b>	2016 - 2019
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Ignasi Rodríguez-Roda Layret
<b>Amount for ICRA</b>	€ 220.000

<b>Project</b>	Action Group del Water European Innovation Partnership (IEP): Real Time Water Quality Monitoring (RTWQM)
<b>Funding agency</b>	European Union - EIP Action Groups
<b>Duration</b>	2015 - 2017
<b>Coordinator</b>	ADASA
<b>Leader researcher</b>	Lluís Corominas Tabares
<b>Amount for ICRA</b>	€ 0

<b>Project</b>	<b>Three-dimensional nanoelectrochemical systems based on low-cost reduced graphene oxide: the next generation of water treatment systems (ELECTRON4WATER)</b>
<b>Funding agency</b>	European Commission ERC-2016-STG (714177)
<b>Duration</b>	2017 - 2022
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Jelena Radjenovic
<b>Amount for ICRA</b>	€ 1.493.733,12

<b>Project</b>	<b>Mision tecnologica a india en el sector de las tecnologias del agua</b>
<b>Funding agency</b>	MINECO
<b>Duration</b>	2017
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Ignasi Rodriguez Roda Layret
<b>Amount for ICRA</b>	€ 1.560

<b>Project</b>	<b>Desarrollo de una herramienta avanzada de Gestión preventiva y para la Eficiencia de recursos hídricos en infraestructuras de Saneamiento uRbano (GESTOR)</b>
<b>Funding agency</b>	European Commission
<b>Duration</b>	2016 - 2019
<b>Coordinator</b>	Sociedad Fomento Agrícola Castellonense SA (FACSA)
<b>Leader researcher</b>	Oriol Gutierrez Garcia Moreno
<b>Amount for ICRA</b>	€ 221.445,48

<b>Project</b>	<b>ARC-Grant-WGE_Toxic metal removal from wastewater sludge</b>
<b>Funding agency</b>	INSTITUCIÓN PÚBLICA
<b>Duration</b>	2017 - 2019
<b>Coordinator</b>	Australian Research Council
<b>Leader researcher</b>	Wolfgang Gernjak
<b>Amount for ICRA</b>	€ 0

<b>Project</b>	<b>Estudio preparatrio de proyecto I+D: NITRATES-SAD-CLOUD</b>
<b>Funding agency</b>	MINETUR
<b>Duration</b>	2017 - 2018
<b>Coordinator</b>	CWP
<b>Leader researcher</b>	Joaquim Comas Matas
<b>Amount for ICRA</b>	€ 3.007

# ICRA

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<b>Project</b>	Institut Català de Recerca de l'Aigua - Tecnologies i avaluació del cicle integral de l'aigua (ICRA-TECH) – Grups de recerca consolidats (GRC) (SGR2017-19)
<b>Funding agency</b>	AGAUR
<b>Duration</b>	2017 - 2019
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Ignasi Rodriguez Roda Layret
<b>Amount for ICRA</b>	€ 36.000

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<b>Project</b>	Institut Català de Recerca de l'Aigua - Qualitat, dinàmica i funció dels ecosistemes aquàtics continentals (ICRA-ENV) – Grups de recerca consolidats (GRC) (SGR2017-19)
<b>Funding agency</b>	AGAUR
<b>Duration</b>	2017 - 2019
<b>Coordinator</b>	ICRA
<b>Leader researcher</b>	Mira Petrovic
<b>Amount for ICRA</b>	€ 60.216

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**European Commission**

Horizon 2020  
European Union funding  
for Research & Innovation







# 06 Contracts





**Total amount (2017):  
212.161,38 €**



## Resources and ecosystems research area

<b>Contract</b>	<b>Sostenibilidad de Recursos Hídricos Bajo el Cambio Global - HIDSOS IV (HIDSOS-IV)</b>
<b>Contracting Entity</b>	ENDESA
<b>Duration</b>	2016 - 2018
<b>Leader researcher</b>	Sergi Sabater Cortes

<b>Contract</b>	<b>Estudi hidrogeològic per ubicar una nova captació al municipi de Vacarisses</b>
<b>Contracting Entity</b>	Ajuntament de Vacarisses
<b>Duration</b>	2017
<b>Leader researcher</b>	Josep Mas Pla

<b>Contract</b>	<b>Estudi de l'entorn hidrogeològic de Santa Coloma de Farners</b>
<b>Contracting Entity</b>	Ajuntament de Santa Coloma de Farners
<b>Duration</b>	2017
<b>Leader researcher</b>	Josep Mas Pla

## Water quality research area

<b>Contract</b>	<b>Análisis de microcontaminantes farmacéuticos en aguas residuales (CIGAT_SeMPAC)</b>
<b>Contracting Entity</b>	CETaqua Galicia
<b>Duration</b>	2016 - 2017
<b>Leader researcher</b>	Mira Petrovic

<b>Contract</b>	<b>Realització d'anàlisis d'antibiotics and pharmaceutical compounds (multi-residue analysis)</b>
<b>Contracting Entity</b>	ITALPOLLINA
<b>Duration</b>	2017
<b>Leader researcher</b>	Meritxell Gros Calvo

<b>Contract</b>	<b>Los fármacos como contaminantes prioritarios: efectos toxicológicos, ambientales y riesgos para la salud humana (URJCI_Salud)</b>
<b>Contracting Entity</b>	Universidad Rey Juan Carlos I
<b>Duration</b>	2016 - 2017
<b>Leader researcher</b>	Sara Rodriguez Mozaz





## Tecnologies an evaluation reserach area

<b>Contract</b>	<b>Sustainable and Low Energy Wastewater treatment for Warm Climates (LIFE CELSIUS)</b>
<b>Contracting Entity</b>	ACCIONA AGUA S.A.U.
<b>Duration</b>	2017 - 2018
<b>Leader researcher</b>	Maite Pijuan Vilalta

<b>Contract</b>	<b>Contrato de prestación de servicios técnicos especializados. Roquetas de Mar</b>
<b>Contracting Entity</b>	CETaqua
<b>Duration</b>	2016 - 2018
<b>Leader researcher</b>	Oriol Gutierrez Garcia Moreno

<b>Contract</b>	<b>Contrato de prestación de servicios técnicos especializados. Castelldefels</b>
<b>Contracting Entity</b>	CETaqua
<b>Duration</b>	2016 - 2018
<b>Leader researcher</b>	Oriol Gutierrez Garcia Moreno

<b>Contract</b>	<b>IWA Consulting Services Energy and Carbon Assessment and Monitoring Tool for Water and Wastewater Utilities for Climate Mitigation</b>
<b>Contracting Entity</b>	IWA The Internationa Water Association
<b>Duration</b>	2016 - 2017
<b>Leader researcher</b>	Lluís Corominas Tabares

<b>Contract</b>	<b>Sustentabilidad y Análisis de Ciclo de Vida de Bioturbosina</b>
<b>Contracting Entity</b>	CIATEC
<b>Duration</b>	2017
<b>Leader researcher</b>	Joaquim Comas Matas

## Scientific and technical services

<b>Contract</b>	<b>Determinació de paràmetres físico-químics de qualitat d'aigua (SORELLO)</b>
<b>Contracting Entity</b>	SORELLO, S.L.
<b>Duration</b>	2014 - 2018
<b>Leader researcher</b>	Sara Insa





A close-up photograph of a person wearing white gloves using a pipette to dispense a blue liquid into a petri dish. The petri dish has a grid pattern with numbers. The background shows a laboratory setting with test tubes in a rack. A large blue semi-transparent overlay covers the middle of the image, containing the text '07 Agreements' in white.

# 07 Agreements

**01/01/2017 ITALPOLLINA, SPA**

Scientific collaboration agreement with ITALPOLLINA s.p.A (Italy) for the analysis of samples, for the determination of 40 veterinary pharmaceutical and antibiotic compounds. Commissioned by the company ITALPOLLINA, an organic fertilizer producer.

**01/03/2017 CERCA**

Collaboration framework agreement that regulates the participation of ICRA as a collaboration centre in the Ginjol Programme, the purpose of which is to offer collaborator centres support in protection, valuation and marketing policies for their research results.

**23/03/2017 SCAN IBERIA - UDG**

The purpose of the agreement is to establish the collaboration regime between the parties for the employment of a doctoral student within the framework of the Industrial Doctorate Plan. The industrial doctorate and research project shall be entitled "Development of Chemometric Tools for the Detection of Different Compounds and Development of new indices in the water matrices".

**24/03/2017 WETSUS**

Scientific cooperation agreement with the European centre of excellence WETSUS (Holland) for the improvement of the chain of knowledge in the Water Technology area.

**14/06/2017 UFZ**

Addenda to the collaboration agreement with the Center for Environmental Research (Leipzig) for the installation of a CO<sub>2</sub> sensor on the ICRA platform at Boadella (record number 438) to extend it until 31/05/2019.

**19/04/2017 Federal University of Rio Grande- Brazil**

Framework collaboration agreement with the Federal University of Rio Grande- Brazil (FURG), to establish the general aspects of cooperation on matters of research, knowledge transfer, researcher stays and dissemination of integral water cycle and water resource management.

**25/09/2017 University of Girona**

Addenda to agreement 483, relating to the conditions regarding the Industrial Doctorate. Signed by UdG, S::CAN and ICRA.

**16/10/2017 University of Zagreb**

Scientific collaboration agreement with the University of Zagreb (UKF)- Croatia for the execution of the project "Emerging contaminants in freshwaters: deciphering impact on aquatic macroinvertebrate metabolic response and ecosystem transfer" led by Dr. Ana Previsic.

**12/12/2017 ICREA**

Appendix to the collaboration agreement with ICREA, relating to the incorporation of Dr. Jelena Radjenovic into ICRA from 1 January 2018.

**19/12/2017 CSIC**

Framework collaboration agreement with the Spanish National Research Agency (CSIC). The purpose of this agreement is to establish the general framework of collaboration to carry out activities for the execution of projects, studies, consultancy, cooperation with personnel training programmes, research personnel exchange and all those activities deemed to be of common interest.



# 08

## Other dissemination activities



**One of the foundational objectives of ICRA is promotion of activities that contributes to boosting research in water sciences and technologies. ICRA has been present in above 100 activities in 2017.**



20/01/2017

## Freshwaters in the Sun: how drying and damming in semiarid regions may shape global carbon cycle feedbacks

University of Girona, Faculty of Science (Auditorium)

Dr. Rafael Marcé of the Resources and Ecosystems Area gave this seminar on how carbon emissions are affected by the sediments of these systems, and the implications for the global carbon cycle.

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25/01/2017

## ECsafeSEAFOOD Project: Seafood Safety new findings and innovation challenges international Stakeholder event and open science conference

Royal Flemish Academy of Science and the Arts (KVAB), Brussels, Belgium

Within the framework of the European project SEAFOOD SAFETY, ICRA has organised Seafood Safety: New Finding & Innovation Challenges.

This is a unique event which marks the end of the European Union-funded ECsafeSEAFOOD research project.

ECsafeSEAFOOD assessed food safety issues related to non-regulated contaminants present in seafood as a result of environmental contamination. Its results play an important role in ensuring consumer confidence and addressing public concern in relation to availability of safe and high-quality food.

ECsafeSEAFOOD's results are of particular interest to national and international policy makers in the fields of food safety, environment and public health, food safety authorities, the seafood industry and consumer organisations. The event therefore includes a dedicated half-day International Stakeholder Event addressing these stakeholder groups. Following the International Stakeholder Event, a one and a half day Open Science Conference will focus on presenting the latest scientific data on ECsafeSEAFOOD topics to a broad audience.

01/02/2017

## Researchers from ICRA together with the UdG, UB and CEAB (CSIC) take part in the drafting of the Third Report on Climate Change in Catalonia

Catalonia, Spain

The Regional Government of Catalonia has presented the Third Report on Climate Change in Catalonia (TICCC) which is an exhaustive collection of scientific research on this matter existing in Catalonia, the result of the participation of 140 authors and 40 copy editors from the main universities and research centres in the country.

With a clear public service vocation and of an independent nature from a scientific perspective, the document describes the main evidence for climate change in Catalonia and formulates strategic recommendations, drawn up by the authors in the various chapters, to reduce greenhouse gas emissions and adapt natural and man-made systems to climate change effects.

Chapter 10 of the report on "Continent aquatic ecosystems", has included the participation of the following ICRA researchers: Sergi Sabater, Vicente Acuña, Ramón J Batalla, Carlos Borrego and Rafael Marcé, together with researchers from the UdG, UB and CEAB (CSIC).

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15/02/2017

## ICRA receives a visit from Eva Naszály, Trade and Economic Attaché of Hungary

ICRA

Mrs. Naszály, on behalf of the Hungarian government, met yesterday with representatives from the different areas, interested in getting to know the research activity being carried out at ICRA and exploring synergies and possible future collaborations. During the meeting, Mrs. Naszály presented the Hungarian water sector and governmental policies on this matter, as well as delivering the conclusions of the Water Summit held in Budapest in 2016.

16/02/2017

### 5<sup>th</sup> Environment and Integral Water Cycle Management Workshop

Catholic University of Murcia (UCAM)

Dr. Damià Barceló, Director and Head of the Water Quality Area, gave a seminar on the problem of emerging contaminants and how they affect water quality.

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15/03/2017

### TreatRec Advanced Technology Course 4

ICRA

The fourth Advanced Training Course within the TreatRec project took place again in Girona, Spain. During the 15<sup>th</sup> and 16<sup>th</sup> March, the fellows and PhD students from the University of Girona enjoyed an intensive course on modelling assessment and decision support tools oriented to water and wastewater systems.

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16/03/2017

### Emerging Contaminants: Risk and Challenges for Water Quality and Plant Uptake. Solutions using advanced treatment technologies in Europe. A lecture by Prof. Damià Barceló

King Saud University, Riyadh

Professor Damià Barceló gave a lecture entitled “Emerging Contaminants: Risk and Challenges for Water Quality and Plant Uptake. Solutions using advanced treatment technologies in Europe” at the King Saud University in Riyadh on 21<sup>st</sup> February.

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22/03/2017

### JPO 2017 - ICRA opens its doors to High School graduate and Advanced Vocational Training students coinciding with World Water Day

ICRA

This year, once again, to explain the research

activities carried out at the Catalan Water Research Agency, ICRA has designed an open day enabling visitors to understand the research relating to the integral water cycle. Beginning with the state of the River Onyar, often cited for the frequent impact to which it is subjected, we propose an itinerary following the different aspects of study carried out in the centre.

This is a unique opportunity to verify the close relationship between the environment and research and of the need for interaction between different scientific disciplines to answer complex questions.

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22/03/2017

### 2<sup>nd</sup> Water Conference in Catalonia – Water as a sustainable resource

Barcelona, Spain

Dr. Ignasi Rodríguez-Roda from the Technology and Assessment Area of ICRA, participates as a speaker at the 2<sup>nd</sup> Water Conference in Catalonia with the presentation “R+D+I potential in water in Catalonia” reflecting on the main R+D+I structures (and water structures) in Catalonia, the economic sector of water in Catalonia in figures, the innovative water ecosystem in Catalonia, the scope of R+D+I in Catalonia and, finally, R+D+I indicators in Catalonia.

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22/03/2017

### The Third Report on Climate Change in Catalonia (TICCC) and water

Aula Magna – Faculty of Earth Sciences, University of Barcelona

The UN commemorates World Water Day in March every year. For this reason, Dr. Josep Mas-Pla from the Resources and Ecosystems Area of ICRA participates in the traditional act organised by the Catalan Institute for Water Research, of the University of Barcelona, on the Third Report on Climate Change in Catalonia (TICCC) and water.

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23/03/2017

### Defensa Tesis: Insights into the distribution and ecological role of members of the archaeal Phylum Bathyarchaeota. From the global to the local scale

Aula Magna – Faculty of Science, University of Girona

Mireia Fillol Homs

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23/03/2017

### Interview on betevé with Damià Barceló on water as a scarce resource for World Water Day

Damià Barceló, Director of the Catalan Institute for Water Research (ICRA) and Research Professor at IDAEA-CSIC, was interviewed yesterday on the programme “Verd primera” on betevé to talk about water as a scarce resource for World Water Day. Under the slogan, “Why wastewater?” the aim was to reflect and raise awareness among citizens of this fragile and vulnerable element, water, which is essential to guarantee the quality and sustainability of the environment on our planet and the well-being of people.

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28/03/2017

### Technical workshop on the results of the ECsafeSEAFOOD project

Barcelona, Spain

ECsafeSEAFOOD, coordinated by ICRA, is a European project on the priority environmental contaminants on sea products in which their safety, impact and public perception have been assessed. The project, in which 17 European institutions take part, began in 2013 and has ended in 2017.

The main objective of the workshop is to deliver the final results of ECsafeSEAFOOD. It shall discuss the emerging sea toxins in fish and aquaculture products and the presence of emerging environmental contaminants in fish and seafood. The development of biosensors for sea toxins and FishChoice, a new online tool to assess fish and seafood consumption risks, shall also be discussed.

02/04/2017

### 253<sup>rd</sup> American Chemical Society NATIONAL MEETING & EXPOSITION Advanced Materials, Technologies, Systems & Processes

San Francisco, California

Dr. Damià Barceló, Director of ICRA and member of the International Scientific Committee of the American Chemical Society, took part in these scientific workshops.

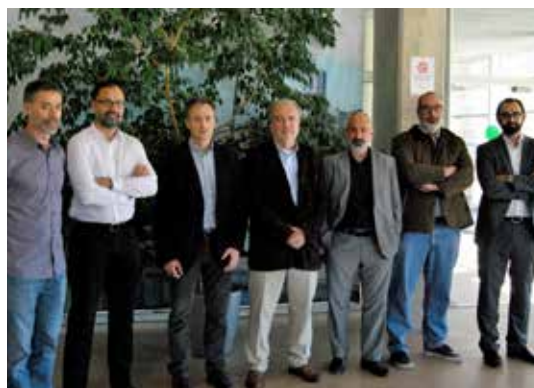
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04/04/2017

### ICRA receives a visit from the CWP Governing Body

ICRA

On 29<sup>th</sup> March, the Governing Body of the Catalan Water Partnership, met at ICRA. Taking advantage of the meeting, as has been done on other occasions, the member visited the ICRA installations.



27/04/2017

### Technological Innovation Forum

Terrassa

ICRA participated in the Technological Innovation forum that the CWP organised at his LEITAT headquarters in Terrassa, to promote the transfer of knowledge and networking around the most relevant R+D and technological innovations for the sustainable use of water in Catalonia.

03/05/2017

### **ICRA participated with a presentation in the Analysis Workshop on the efficiency and effectiveness of nitrate treatment and decontamination systems in contaminated groundwater**

Geological and Cartographic Institute of Catalonia, Barcelona

Dr. Josep Mas-Pla of the Resources and Ecosystems Area of ICRA gave his presentation on the presence of nitrogen compounds (especially nitrates) being, today, one of the main problems that affect the quality of groundwater. The excess of nitrates in the environment causes bad conditions in 41% of groundwater masses in Catalonia, and makes it very difficult to supply small and medium-sized town centres in rural areas.

During this workshop, the Catalan Water Agency, together with the Water Cluster, the Catalan Water Partnership, supervised by the University of Barcelona, the University of Girona and the Catalan Institute for Water Research (ICRA), and with the assistance of the Department of Health of the Regional Government of Catalonia, has analysed various denitrification treatments that have been installed in Catalonia over the last few years, to alleviate the effects of excess nitrates in the use of water. The use of different technologies has been implemented to deal with the water supply problem in town centres without viable alternatives, and have enabled analysis of the efficiency of these systems. In Catalonia, up to 23 town centres have been identified where water denitrification systems have been installed, which have enabled, once their performance has been evaluated, the analysis of the viability of applied technologies and the cost-effectiveness analysis of these measures.

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04/05/2017

### **Integral Water Management Training-Project of La Seu d'Urgell – Ripollès**

La Seu d'Urgell, Ripollès

On 26<sup>th</sup> April and 4<sup>th</sup> May, ICRA took part in the training sessions for the Alt Urgell and Ripollès municipalities, organised by the CWP on matters of water treatment and management aimed at

representatives of public authorities, town councils and personnel connected with the management of water in these municipalities.

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07/05/2017

### **SETAC Europe 27<sup>th</sup> Annual Meeting: Environmental Quality Through Transdisciplinary Collaboration**

Brussels, Belgium

ICRA was present at the SETAC Europe Annual Meeting 2017 in Brussels with Dr. Damià Barceló. The general meeting topic was “Environmental quality through transdisciplinary collaboration”. This meeting was a meeting point for scientists, sector businesses, representatives of civil society in general, which enabled the creation of inter-transdisciplinary collaboration networks.

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08/05/2017

### **ACA and the Catalan Water Partnership analyse the systems and technologies for the treatment and decontamination of nitrates in groundwater**

The Catalan Water Agency (ACA) and the Catalan Water Partnership (CWA) organised a workshop aimed at analysing the decontamination and treatment systems of nitrates in groundwater. The CWP, with the supervision of experts from the **Catalan Institute for Water Research (ICRA)**, the universities of Barcelona and Girona, as well as a working group of some twenty research centres and businesses, and the ACA have worked throughout the last year on the study of efficiency and effectiveness of the various available technologies. The event included the participation of experts from the Department of Health and businesses specialising in new technologies for denitrification treatments, as well as Town Councils affected by this problem.

The event served to analyse the current situation on the contamination through excess nitrates in groundwater in Catalonia, considered the main environmental problem that affects the quality of



water masses in the country, specifically 69% of groundwater and also 57% of surface water.

These workshops, therefore, became an opportunity to share knowledge and verify the existence of new technologies for decontamination, new solutions that have to be a reference to the local entities when solving contamination situations in supply water due to an excess of nitrates, and also to avail oneself, if appropriate, on the ACA financial aid to improve the water supply of local entities.

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18/05/2017

### DemEAUmed Final Conference

Barcelona, Spain

Researchers from the Technology and Assessment Area, responsible for this project at ICRA, presented the results, benefits and opportunities of the management technologies in water management and recycling. With the participation of Suez Environnement, CTM, the University of Girona, IVL, Robinson, the Hotels Guild of Barcelona, Melia Hotels International, the African Africa Fund, CEDEX, The Joint Research Centre and the rest of the partners.

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19/05/2017

### Thesis defence: Analysis of hydro-sedimentary processes and impacts affecting river basins and channels. PhD Gemma Pi-qué (Resources and Ecosystems Area)

Lleida Auditorium – Higher Technical School of Agricultural Engineering

Thesis supervised by: Dr. Ramon Batalla (ICRA-University of Lleida) and Dr. Sergi Sabater (ICRA).

This PhD thesis studies hydro-sedimentary dynamics in Mediterranean rivers, both in 'natural' and in dammed rivers. For this purpose, a multi-temporal and spatial research was carried out, including field measurements in representative river reaches, data analysis at basin scale, and experiments in artificial streams. The hydrological alteration downstream from dams was documented at different temporal

scales, and results showed a notable change in the magnitude and frequency of floods. Regarding sediments, a severe deficit was observed below dams, a fact that facilitates the establishment of biofilm which, in turn, favours river bed stabilisation. Moreover, the study shows how high sediment generation influences the in-channel storage and the river sediment budget, thus regulating the sediment input in reservoirs. The thesis examines the effects of a suit of human activities on fluvial processes and how these alter rivers' bio-physical interactions, and emphasise the need of continuous monitoring of all these processes to achieve a sound management of fluvial ecosystems

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25/05/2017

### ICRA receives the visit of representatives from the Université Gaston Berger-Senegal, MON3 Foundation and Solidaria Foundation - UB

ICRA

ICRA received a visit of the members of the project Projet GERHYD "Contribution to the lasting management of water resources of Sant Louis (Senegal)" in the framework of the exchange programme envisaged by the organisers. Among others, the purpose of this visit was to have meetings with key figures in the research and water cycle in the scope of Catalan water.

Dr. Ignasi Rodriguez-Roda, head of the Technologies and Assessment Area, received the visitors and showed them and explained what ICRA is and its area of research.



27/05/2017

## ICRA participates in the 11<sup>th</sup> Science Fair

Barcelona

Dr. Gianluigi Buttiglieri of the Technologies and Assessment Area of ICRA, took part this Saturday 27<sup>th</sup> May in the presentations organised in the framework of the 11<sup>th</sup> Science Fair, organised by the Culture Institute, Barcelona City Council, in the section: FACE TO FACE WITH THE ENVIRONMENT.

In pairs, various experts analysed the state of the art of aspects such as the exploitation of resources, sustainable and healthy cities, global change, biodiversity or social, political and economic repercussions of environmental problems.



31/05/2017

## Doctoral thesis defence: Controls on the dynamics of riverine dissolved organic matter: insights from a Mediterranean river network

### PhD Joan Pere Casas Ruiz (Resources and Ecosystems Area)

Auditorium Jaume Casademont building, Science and Technology Park of the UdG

Thesis supervised by Dr. Rafael Marcé (ICRA) and Dr. Pilar López (University of Barcelona).

31/05/2017

## CERCA Conference 2017

Delegation of the Government before the EU in Brussels

Dr. Ignasi Rodriguez-Roda of the Technologies and Assessment Area took part in this conference organised by ICERCA on behalf of ICRA.

Fostering excellence in research for the benefit of society Wednesday, 31 May 2107 CERCA agglutinates 41 top performing centres, in all scientific disciplines, publishing over 4.000 WoS papers per year, hosting over 117 European Research Council grantees, with an annual budget of €400M, most of it from competitive and private funds. The Centre for Genomic Regulation (CRG), ICFO the Institute of Photonic Sciences, or IDIBAPS, the research institute of the Hospital Clinic in Barcelona, CREI Research Centre in International Economy, are among our most prestigious research centres. Our aim for the CERCA Conference 2017 is to give and insight into the successful achievements of the Catalan Centers and to have an open dialogue about the challenges the innovation policies faces in the near future. The event is organized by CERCA Institute, created with the purpose to ensure that the Catalan research centers system is properly developed; to encourage synergies, coordination between centers and strategic cooperation; to improve the positioning, visibility and impact of the research carried out and to facilitate communication between public and private agents.

04/06/2017

## 65<sup>th</sup> ASMS Conference American Society for Mass Spectrometry

Indianapolis – USA

ICRA was present at the annual meeting of the American Society for Mass Spectrometry with its Director, Damià Barceló.

05/06/2017

### ICRA took part in the REUCITY project workshop on the circular management of water in touristic facilities

Lloret de Mar

Dr. Gianluigi Buttiglieri of the Technologies and Assessment Area of ICRA presented the demEAUmed project in which more than 30 people took part in the workshop “Circular water management in touristic facilities” held on 19<sup>th</sup> May in the Catalan town of Lloret de Mar, on the Costa Brava. Organised by the LEQUIA research group of the University of Girona, the event brought together researchers, water company managers, technology suppliers, public authority technicians and tourist establishment managers. All extensively debated the viability of the circular management of water in the tourist sector.

Participants had the opportunity to see the technologies developed by the REUCITY and demEAUmed projects.

18/06/2017

### ICCE 2017: 16<sup>th</sup> International Conference on Chemistry and the Environment

Oslo – Norway

The researchers of the ICRA Quality Area actively took part in the “16<sup>th</sup> International Conference on Chemistry and the Environment in 2017” organised by The Norwegian Chemical Society (NKS).



07/06/2017

### How scientists are looking to nature to solve our environmental problems

Damià Barceló, Director of the ICRA and co-editor in chief of Elsevier journal Science of the Total Environment, put the collection of articles “How science can build a sustainable future” in Elsevier for World Environment Day, held on 5<sup>th</sup> June.

19/06/2017

### River Basins- International Conference on Monitoring, Modelling and Management of River Basins

TU Wien, Vienna

ICRA researchers of the Resources and Ecosystems Area have been present in this conference presenting their research studies.

09/06/2017

### Workshop: Beyond water

Manel Xifra Boada Auditorium - Narcís Monturiol building, UdG

As a member of the UdG Campus, ICRA took part in the “Beyond water” workshop, organised by the UdG Water Campus, the purpose of which is to break with the daily dynamic that water management supposes for companies, authorities, institutions and research centres.

26/06/2017

### NRR Korea Natural Resources and Economic Research Institute visit

ICRA

ICRA received a visit from researchers from the Korea Natural Resource and Economic Research Institute (NRR). Dr. Jisung Kim, Researcher Scientist and Dr. Jieun Park, Researcher Scientist. Interested in our research, the organisation and organisational structure of ICRA.

29/06/2017

### **FORUM Young Talents of Catalonia 2017. Water and Energy link**

Sweden Pavilion of Berga

ICRA took part for the second consecutive year in this forum organised by Berga Town Council. On this occasion, Dr. Barceló participated in the inaugural event with the conference “*Climate change: impact on the quantity and quality of water and their energy resources*”.

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05/07/2017

### **Emerging risks in sea products. 9<sup>th</sup> Workshop on Food Chain Risk Assessment**

Catalan Studies Institute, Sala Prat de la Riba, Barcelona

Dr. Sara Rodríguez of the ICRA Quality Area participates in the 9<sup>th</sup> Workshop on Food Chain Risk Assessment, organised by the Catalan Food Safety Agency and the Catalan Association of Food Science-IEC with the conference “*Emerging contaminants in fish*”.

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13/07/2017

### **Students from Youth Research Campus - UdG visit ICRA**

ICRA

The students taking part in the 10<sup>th</sup> Youth Research Campus organised annually by the University of Girona, visited the ICRA installations within the framework of the activities organised by the University of Girona.

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13/07/2017

### **CWP working groups: Re-use of water, sectors (touristic, food, etc.)**

Sant Cugat del Vallès, Barcelona

On 13<sup>th</sup> July, ICRA took part in the creative session on potential regenerated water projects in Sant

Cugat del Vallès organised by the CWP, to promote innovative activities relating to this challenge that facilitate participation in possible European or national R+D projects of a demonstrative nature in the next few years. The session had more than twenty participants, representatives from more than 15 entities in the water sector and was moderated by the CWP.

This activity was framed within the aim of Sant Cugat Town Council and SOREA (water management entity) to contribute to making this good, water, a more sustainable resource, promoting a more efficient use. From the ideas arising from the session, the possible initiatives and proposals for R+D projects or innovative activities shall be worked on.

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17/07/2017

### **Training course on Modelling for freshwater related ecosystem services - GLOBAQUA Project**

ICRA

The 4<sup>th</sup> GLOBAQUA course was organized by the Catalan Institute for Water Research (ICRA) within the framework of GLOBAQUA. The 4<sup>th</sup> course was titled “Training course on modeling of freshwater related ecosystem services”, and introduced the basic principles of modeling of freshwater-related ecosystem services. The overall goal of the workshop was that the participants can co-develop their own case-study modeling exercises during the workshop with the help of the lecturers. To ensure co-development of the case-studies, the mornings were devoted to theory sessions to introduce the basics of ecosystem services, modeling, and modeling of socio-environmental systems; whereas the afternoons were devoted to the implementation of the learned concepts into the individual case-studies. This stepwise approach ensured that participants assimilated the basics of modeling of freshwater-related ecosystem services in coupled socio-environmental systems.

For this course, the target groups were researchers at any stage in their professional career, as well as water managers interested in the modeling of freshwater-related ecosystem services in coupled socio-environmental systems. There were 9 participants in the



course, attending from 5 different countries. Among those, 4 were from GLOBAQUA, and 1 from MARS.

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07/09/2017

### **The 5<sup>th</sup> Busan Global Water Forum - International Conference on Assessment and Control of Emerging Micropollutants in Water: Asian Experiences**

Busan, South Korea

Damià Barceló participates as a guest in the Busan Global Water Forum meeting organised by the ICWEM where he gave the conference “*The EU Globaqua Project on Multiple Stressors in Rivers under Water Scarcity and Global Change. A Reconnaissance Study of Emerging Contaminants*”.



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25/09/2017

### **COST SMIRES TRAINING SCHOOL: Biogeochemistry in intermittent streams: techniques and concepts**

Caldes de malavella, Girona, Spain

The SMIRES organised the first Training School focused on biogeochemistry in intermittent streams, with great emphasis on the aspects of drought and effects on the ecosystem.

In these workshops, Dr. Rafael Marcé from the Resources and Ecosystems Area of ICRA took part, among others.

10/10/2017

### **Technological Mission in India**

New Delhi, India

From 10-14<sup>th</sup> October, Dr. Ignasi Rodriguez-Roda, head of the Technologies and Assessment Area of ICRA took part in a mission of technological prospective in the area of water technologies that the CWP co-organised in India (New Delhi) to facilitate the participation in the next R+D session between the EU and India, co-organised together with the CDTI (Ministry of Economy, Industry and Competitiveness). This mission coincided with the celebration of India WaterWeek and had the main objective of promoting the exchange of ideas to generate future R+D projects in collaboration. In the mission a total of 7 entities took part, three of which are entities associated with the CWP and has enabled a programme of technical visits and working meetings to be held with institutions such as the Ministry responsible for water in the country, large water management companies and engineering companies (WAPCOS, Triveni Engineering, etc.) or the main research centres of India in Water such as the Indian Institute of Technology or TERI, among others. Similarly, the CWP, CREATECH 360º, ICRA and APLICAT have held conferences within the framework of the 5<sup>th</sup> Indian Water Week.



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16/10/2017

### **Kick-off of WATExR**

ICRA

WATExR is a project financed under the auspices of

ERA4CS JPI-Climate, and, for three years, shall study the possibility of predicting the effect of extreme events (storms, droughts, etc.) on the quality of water in lakes and reservoirs, using seasonal climate prediction tools. During the kick-off, 24 researchers and water managers from 8 countries took part in an environment of co-development to begin designing the impact prediction tools for extreme events in 8 study cases contemplated within the project.

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19/10/2017

### Conversation with ICRA Director, Damià Barceló, on Tv Girona

Dr. Damià Barceló, took part in the programme “L’Entrevista” on TVGirona, in which they covered different aspects relating to the quality of water, the situation of the UdG Science Park, among others. Although the main topic of the interview was the h-index 100 achieved by Dr. Barceló.

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08/11/2017

### Presentation of the demEAUmed project at Ecomondo

Italy - Rimini Expo Centre

The Dr. Gianluigi Buttiglieri of the Technologies and Assessment Area of ICRA presented the demEAUmed project on desalination and alternative water resources, water reuse and multiple use to reduce the water footprint at a city or basin scale.

Organized by: Marche Polytechnic University, University of Verona, IRSA-CNR, Utilitalia, Confagricoltura, Italian Higher Institute for Health (ISS), EU WssTP, IWA Italia and Ecomondo Technical Scientific Committee

Water scarcity is already a serious problem in 11% of the EU territory and it is expected that the territory facing water scarcity problems will grow to 30% in 2030. Apart from the availability of water, our water quality will also be affected as a result of seawater intrusion in coastal aquifers, faster dissolved oxygen depletion because of higher water temperatures, and higher content of pollutants that flow into water bodies following extreme rain events. The water-

smart society of the future needs to reduce its impact on our natural water. The availability of “multiple waters” to complement fresh water sources is the key enabling strategy towards this target and the delivery of the circular economy in the water sector. The workshop will present and raise awareness about EU and national strategies like the Innovation Deal to address water reuse from municipal wastewater treatment, the seawater desalination, the water efficiency and reuse in buildings and other ready-to-market on-site and decentralized solutions.



09/11/2017

### Globaqua workshop: A reconnaissance of trace organic compounds and metals in globaqua river basins: effects on ecosystems and risk assessment.

Barcelona, Spain

The Water Studies and Environmental Diagnosis Institute-CSIC, as a coordinator of the GLOBAQUA project, organised the Workshop **A reconnaissance of trace organic compounds and metals in globaqua river basins: effects on ecosystems and risk assessment**. In which the results of the aforementioned project were presented. During these workshops, attended by around 50 researchers from around Europe, synergies were built with other projects related with water quality in the EU and with interest groups. The workshop was focused on chemical stimulants, under biological quality, multiple stressors, chemical exposure linked with the risks and modeling, monitoring and management, main interests of the GLOBAQUA project.

10/11/2017

## University of Warmia and Mazury visit-Poland

ICRA

ICRA has received a visit from two researchers from the Environmental Microbiology Department of the University of Warmia and Mazury in Poland, Dr. Monika Harnisz and Dr. Ewa Korzeniewska.

During the visit, working meetings were held with Dr. Carles Borrego and Dr. José L. Balcazar, from the Water Quality Area (Microbiological Diversity and Quality) to find joint working lines for future collaborations.

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14/11/2017

## International networking with British Water

Denmark

Dr. Ignasi Rodriguez-Roda, on behalf of ICRA, attended the international networking activity as a speaker, which the CWP organised with the participation of representatives of the Water Cluster of Denmark, Sweden and British Water, as well as entities associated with British Water. This activity was framed within the BSR project, funded by ACCIO, with the Water Clusters of Denmark, Sweden and Lithuania, and at the same time, represented the first joint activity with British Water.

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27/11/2017

## ICRA participates in the Antimicrobial Resistance Conference symposium

London, UK

Dr. Sara Rodriguez-Mozaz from the Water Quality Area of ICRA, took part on 23<sup>rd</sup> and 24<sup>th</sup> November in the 3<sup>rd</sup> Antimicrobial Resistance Conference, a symposium organised by the Society for Applied Microbiology with the collaboration of the Academy of Pharmaceutical Sciences and the Royal Society of Chemistry. With the speech *“Evaluation of conventional and alternative (fungal) treatment of hospital and urban wastewater in the removal of antibiotics and antibiotic resistance genes”*.

29/11/2017

## Interview with Josep Mas-Pla, Senior Researcher at ICRA: “The increase in the scarcity of water in the Pyrenees will affect the whole country”

The Sostenible journal of the Barcelona Provincial Government extensively interviewed Dr. Josep Mas-Pla covering aspects such as climate change, the 2021-2050 scenarios, regions of Catalonia with scarcity of water and water resources.

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01/12/2017

## KTT Workshop: The role of technological transfer in ICRA

ICRA Event Hall

The ICRA KTT Committee with the collaboration of the Research, Development and Innovation Office of ICRA organised a workshop in which Mr. Xavier Amores of the CWP also took part.

During the workshop, the current situation of ICRA regarding the Transfer was presented, and the most administrative side, the most general vision and the experience of researchers in the creation of the Spin-Off.

The workshop ended with an open debate in which the Committee Chair, Dr. Wolfgang Gernak, gathered together the different proposals.



04/12/2017

## EU-ITN Aquacity project preparation

ICRA

On 4<sup>th</sup> and 5<sup>th</sup> December 2017, 10 researchers met at ICRA, representing seven European research and higher education institutions, to prepare a European project for the Horizon 2020 programme, specifically an Innovative Training Network for the Marie Skłodowska Curie Actions ITN 2018 call. This is a research project but also training for professionals on water cycle management within the framework of the circular economy paradigm. The project, which as well as academic and research institutions, also includes authorities, businesses and associations from all over Europe, proposes a multidisciplinary research and training programme on the matter of closing water management cycles, in other words, on the recovery and re-use of water resources – water, energy and nutrients. The project not only focuses on technological aspects of how to recover and re-use resources, but aims to be very interdisciplinary, also addressing the economic, social and legislative aspects necessary to promote this transition towards a circular economy in the cities and thus be able to optimise water management in cities. Over these two days, all the scientific and practical matters of the proposal were discussed.

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11/12/2017

## Euroregion Workshop Catalonia – Balearic Islands and Occitania

Barcelona

Dr. Ignasi Rodríguez-Roda from the Technology and Assessment Area of ICRA took part as a speaker at the workshop organised by ACA, with representatives from the governments of the Balearic Islands and Occitania, to exchange experiences and find common challenges in water management to enable joint lines of work to be set.

15/12/2017

## Thesis defence: Greenhouse gas emissions from wastewater treatment processes: identifying triggering factors at laboratory and full-scale systems. PhD Student Anna Ribera

ICRA

This week Anna Ribera, PhD Student from the Technologies and Assessment Area defended her thesis “Greenhouse gas emissions from wastewater treatment processes: identifying triggering factors at laboratory and full-scale systems”, supervised by Dr. Maite Pijuan and Dr. Oriol Gutiérrez.

The panel formed by Ramon Barat, Polytechnic University of Valencia, Mathieu Sperandio, INSA-Toulouse and Manel Poch, University of Girona, awarded her a pass summa cum laude.

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19/12/2017

## CERCA awards the Pioneer Award 2017 to Ibrahim Erdem Irtem, ICRA researcher

Barcelona

Yesterday, the CERCA Institution held the Pioneer Awards ceremony 2017. Among the winners this year is Dr. Ibrahim Erdem Irtem, a researcher at the Catalan Institute for Water Research (ICRA), for his research project: “Production of Solar Fuels by Photoelectrochemical Conversion of Carbon Dioxide” carried out at the Catalan Energy Research Institute (IREC).

The Pioneer awards recognise those researchers of CERCA centres who have presented their doctoral thesis over the last 12 months, with a clear vocation to commence or strengthen some technology or product that could be of industrial or commercial interest, or that could significantly contribute to the development of public policies.

The jury has valued the originality, the high degree of interest, the applicability and the value of the cooperation with the company of Dr. Ibrahim Erdem Irtem’s doctoral thesis and has defined it as a sustainable project of maximum impact on circular economy.



In the fourth edition of these awards, a total of thirty researchers (16 men and 14 women) have taken part from fifteen CERCA centres. By fields, 8 science projects, 14 medical and health science projects, 7 engineering projects and one humanities and social sciences project have been presented.

The other award winners have been: Jordi Hernández Ribera from the Genome Regulation Centre (CRG), Elena Martínez García from the Vall d'Hebron Research Institute (VHIR), Daniel Massó Vallés from the Vall d'Hebron Oncology Institute (VHIO) and Maria Valls Margarit from the Catalan Bioengineering Institute (IBEC).



## SEMINARS organized by ICRA as part of the science dissemination programme

02/02/2017

### Seminar: Conceptualizing riparian zone hydrological and biogeochemical controls in boreal headwaters: the Swedish perspective

ICRA

Dr. José J.L. Ledesma, Postdoctoral Researcher in Catchment Biogeochemistry and Modelling, Swedish University of Agricultural Sciences

Abstract: Jose's interests include the modelling and

understanding of solute dynamics, processes, and transformations from soils to catchment-landscape scales and how forestry and climate impact these functions. He is especially interested in organic carbon dynamics and implications for its global cycle and drinking water supply. He has also worked with base cations, silicon, sulfate, nutrients, and metals. Hydrological modelling is an additional interest. He is familiar with the models INCA (for carbon, nitrogen, and mercury), PERSiST (rainfall-runoff model), and HBV (rainfall-runoff model).

08/03/2017

### Seminar: Gender and science

ICRA

Ada Pastor, Postdoc Researcher, Resources and Ecosystems Area. Abstract: Over the last few years, articles have begun to appear that show the participation of women in teaching and research work is still far from being proportional to that of men, particularly in the highest professional levels.

This seminar shall present the work done by the Gender and Science group of the Iberian Association of Limnology (AIL), which assesses the situation of women in the field of limnology on the Iberian peninsula. This study analysed the representation of women throughout the professional stages, their participation as speakers in plenary sessions and in authoring articles.

Finally, some of the reasons for the current situation shall be debated, as well as which future directives are necessary to reduce gender barriers in this field.

07/04/2017

### Seminar: Targeting inter-sectoral trade-offs: which water and marine research agenda for evidence-based policy making?

ICRA

Giovanni Bidoglio, Joint Research Centre, European Commission, Ispra, Italy

Abstract: EU policies need to be tailored to different water resources and places, and governance responses must adapt to changing circumstances. To this end, decision makers and water managers increasingly need a wide range of scientific expertise in an accessible and concise manner. Science-to-policy interface in the water domain has so far relied extensively on the supply of sectoral evidence. Researchers need now to pay more attention to the demand for cross-sectoral evidence. Reducing disparities and enhancing access to water services is indeed a multi-goal optimization process accounting for the sectoral integration of water-food-energy and the association to health, poverty, education and equity. Based on the JRC research, this seminar will make the case for an integration of different research domains, e.g. hydrology, chemical and nutrient pollution, ecosystem services and biodiversity, watershed assessments, remote sensing, and agriculture, fishery and energy management to support the implementation of EU Directives, initiatives and development assistance policies in the field of water and marine resources. In this context, harvesting of distributed knowledge through networking with European research institutions is at the heart of the JRC strategy for science-based policy support

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19/04/2017

### Seminar: Developing Models for Predicting Pesticide Vapor Drift & Exposure to Honey Bees

ICRA

Dr. Kimberly Hageman, Associate Professor, Department of Chemistry University of Otago, New Zealand.

Abstract: Chemistry is so much a part of our lives, sometimes we don't even notice it! It's at the heart of cooking and eating, breathing and seeing, the clothes we wear and the materials we use to construct our environment.

While studying Chemistry at Otago, you'll look at how chemicals interact with each other, with light and with the environment; how to synthesise novel materials and measure trace amounts of pollutants.

Research interests in the Chemistry Department include: Nanotechnology and marine chemistry, the development of smart polymers and anti-cancer drugs.

Chemistry enables change in our world - in medicine, technology and the environment.

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27/04/2017

### Seminar: Analysis of ERC grants: why do they give them, who obtains them, and what are the projects like

ICRA

Miquel Angel Rodriguez Arias, Fundraiser and Project Manager at the Technological and Physical Oceanography Department of ICM.

Abstract: ERC grants are considered one of the hardest research funding calls to obtain. The award, however, is succulent. Generous funding over a long period of time and a seal of excellence that enables researchers that obtain them to enter the European elites. In this seminar we shall get to know the criteria of the European Research Council to awarding these grants to research of excellence. We shall analyse their specificity and try to understand the true key to success in obtaining them. It is commonly thought that the key is the researcher's CV, but in this seminar we shall try to show that although it is an important factor, it is not the most relevant. We shall also find out how beyond individual talent, the scientific sociopolitics of the country and the institution where the researcher works can also be key elements to success.



11/05/2017

### Seminar: Cytometry in water analysis - Thermo Fisher Life Technology

ICRA

Laura Arranz Calpe, Thermo Fisher Life Technology

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16/05/2017

### Seminar: Playing Lego at the nanoscale: Nanoparticles as building blocks for hierarchical structures

ICRA

Pablo Guardia. Catalonia Energy Research Institute (IREC) and Catalan Institute of Nanoscience and Nanotechnology (ICN2).

Abstract: Nanoscience has deeply explored the synthesis of nanoparticles (NPs) and their application in devices. However, a current limitation of nanotechnology is the low performance of NPs due to a poor control over the synthesis or when integrating them into a real prototype. Producing or assembling NPs into more complex hierarchical structures has become a novel strategy to overcome such limitations. Here, four different hierarchical structures that boost the performances of NPs by exploiting them as building blocks are presented. For instance, iron ferrite NPs show promising applications in medicine but a precise control over the synthesis is required to produce them with outstanding magnetic performances. Assembling them into dimers or magnetic nanobeads leads to a significant improvement of the heating performance or the relaxation time for cancer cell hyperthermia and MRI imaging. Another technologically relevant material is indium sulfide which shows promising applications in catalysis. Integration of indium sulfide NPs into thin-films leads to a drop in the photocatalytic activity which can be restored by assembling them into porous thin-films. Indeed, surface structure is a key parameter that becomes crucial in many applications. For instance, the production of anisotropic structures of ceria NPs with a precise control over the shape and its use in 3D aerogels increases the performance for gas purification. All the above examples represent the use of NPs as the next generation of building blocks for the development of novel structures.

23/05/2017

### Seminar: Portable Optical Biosensors as the Next Diagnostics Generation for Environmental Protection

ICRA

Dr. Laura M. Lechuga, Nanobiosensors and Bioanalytical Applications Group Catalan Institute of Nanoscience and Nanotechnology (ICN2) CSIC, The Barcelona Institute of Science and Technology and CIBER - BBN - Barcelona (Spain)

Abstract: The need to monitor and detect biological elements, related to human and environment health in a fast and reliable way, is one of the challenges faced by humanity at the dawn of the 21<sup>st</sup> century. Tests done nowadays in laboratories (as ELISA, PCRs, cell cultures, etc.) are slow (from several hours to days) and expensive. Modern diagnostics is demanding novel analytical tools that could enable quick, accurate, sensitive, reliable and cost-effective results so that appropriate treatments can be implemented in time, leading to improved outcomes. Such portable point-of-care (POC) devices, able to deliver instant diagnostics, could become a reality soon thanks to the last advances in nanobiosensors, lab-on-a-chip, wireless and portable technologies which promise to surpass the existing challenges, opening the door to a global diagnostics access.

The driving force of our research is to achieve such ultrasensitive platforms for POC label-free analysis using nanophotonic technologies and custom-designed biofunctionalization protocols, accomplishing the requirements of disposability and portability. We are using innovative designs of nanophotonic biosensors based on silicon photonics technology (nanointerferometers) and full microfluidics lab-on-chip integration. We employ dedicated biofunctionalization routes of the biological receptors (as proteins or genomic strands) ensuring selectivity, life-cycle, non-fouling properties and reusability.

Moreover, we have demonstrated the applicability of our biosensor technology for real-life requests, mainly for clinical diagnostics (i.e. early cancer diagnostics), and for environmental control, with extremely sensitivity and selectivity, of marine pollutants directly using untreated sea water, microbiological infections and toxins.

20/06/2017

### **Seminar: using science to manage functional environmental flows in California's regulated river systems**

ICRA

Sara Yarnell, PhD, Research Hydrologist, Center for Watershed Sciences - University of California, Davis

Abstract: Building on previous environmental flow discussions and a growing recognition that hydrogeomorphic processes are inherent in the ecological functionality and biodiversity of riverscapes, this research proposes a functional-flows approach to managing heavily modified rivers. The approach focuses on retaining specific process-based components of the hydrograph, or functional flows, rather than attempting to mimic the full natural flow regime. Key functional components include wet-season initiation flows, peak magnitude flows, recession flows, dry-season low flows, and interannual variability. We illustrate the importance of each key functional flow using examples from western US rivers with seasonably predictable flow regimes. To maximize the functionality of these flows, connectivity to morphologically diverse overbank areas must be enhanced in both space and time, and consideration must be given to the sediment-transport regime. The work includes guiding principles for developing functional flows or incorporating functional flows into existing environmental flow frameworks.

27/06/2017

### **Seminar: Nanomaterials for water pollutant monitoring and remediation. Dr. Ernest Mendoza, General Manager, Astrea Materials**

ICRA

Ernest Mendoza, General Manager, Astrea Materials

Abstract: He holds a PhD in Physics from the University of Barcelona and served as a Physics professor for the Polytechnic University of Catalonia (UPC) from 2010 to 2014. He joined UPC to lead the Applied Nanomaterials Group at the Centre de Recerca en Nanoenginyeria. He has been a visiting

researcher at the Institut Catala de Nanotecnologia (Spain), University of Surrey (UK), Centre de Recherche sur les Tres Basses Temperatures (France) and the Institut de Ciencia de Materials de Barcelona (Spain). He has over 60 publications, 1405 citations and an impact factor of 23. He has participated in 27 research projects, being Principal Investigator (PI) in 12 of them. He has further improved his business acumen by completing a Management Programme at IESE Business School in 2014.

17/07/2017

### **Seminar: Sludge-Drying Lagoons: A Potential Significant Methane Source in Wastewater Treatment Plants**

ICRA

Dr. Liu Ye, School of Chemical Engineering at The University of Queensland

15/09/2017

### **Seminar: Environmental challenges currently studied in Paraguay**

ICRA

Dr. Juan Francisco Facetti, Chemical and Environment Laboratory

22/09/2017

### **Seminar: In-situ non-destructive Biofouling monitoring in membrane filtration Systems**

ICRA

Luca Fortunato, King Abdullah University, Saudi Arabia





# 09 Awards



## **CERCA awarded the Pioneer Award 2017**

To Ibrahim Erdem Irtem, ICRA researcher. (19/12/2017)

## **Best poster award at ICA 2017**

Québec, Canada. Turning passive data into knowledge - a review of wastewater treatment monitoring techniques II. **Corominas, M. Garrido-Baserba, K. Villez, G. Olsson, U. Cortés, M. Poch**



A blurred background image of a laboratory setting featuring a microscope on the left and several test tubes in a rack on the right. A large, semi-transparent blue rectangle is overlaid on the center of the image, containing the text.

# 10

## Financing

#### Contribution of the Regional Government of Catalonia

<b>Ministry of Business and Knowledge (DECO)</b>	1,812,000 €
<b>Catalan Water Agency (ACA)</b>	400,000 €
Competitive projects	
<b>Regional Government of Catalonia</b>	93,557.08 €
<b>Ministry of Economy and Competitiveness</b>	928,126.85 €
<b>European Union</b>	642,520.90 €
Transfer projects	235,876.27 €
Financial income	193,934.25 €
Other income	4,946.95 €
<b>TOTAL INCOME</b>	<b>4,310,962.30 €</b>



A hand wearing a blue nitrile glove is holding a glass petri dish containing a white, granular substance. The petri dish is resting on a white surface, likely a laboratory bench. The background is a bright, out-of-focus white. A semi-transparent blue rectangular overlay covers the central part of the image, containing the text.

# 11

## ICRA in the news & press



The activity of communicating the work that has been done both to the scientific community and to society in general over the last year resulted in 288 news items appearing in the media (115 repercussions in the press, 36 in digital format, 3 on radio stations and 1 on TV).

ICRA has also committed to social networks over this last year. On Twitter (@icrawater) it now has 203 more followers, reaching 626 followers in December 2017, a total of 258 mentions and 5457 visits to its profile.

During 2017, ICRA uploaded to its Youtube channel a self-created video with the following title: “Presentació de la herramienta innowatt dentro del proyecto R3Water” that achieved 134 views.

A total of 6 videos were shared and obtained a total of 211 views.

Two others topics were added to the list, to the 6 already existing.

- **Contaminants emergents: 2 videos**
- **Aigua i canvi climàtic: 1 video**
- **“The drops of Damià Barceló”: 5 videos**
- **Projectes de recerca ICRA: 3 videos**
- **L'ICRA als mitjans de comunicació: 4 videos**
- **Ens agrada: 4 videos**
- **Dia Mundial de l'Aigua 2016: 3 videos**
- **Conferències ICRA: 1 video**

REPORTAJE

Agua, fuente de debate

El 71% de la superficie terrestre está cubierta de agua pero solo el 2% es dulce, ahora su conservación centra el análisis

EMANA DE LOS MANANTIALES, discurre por las arterias de las urbes y tarda minutos en llegar a la boca. El agua protagoniza la Semana de la Sostenibilidad que se celebra en Lleida del 20 al 26 de abril.

Garantizar la disponibilidad de agua y su gestión sostenible así como el acceso para todos la población figura como el Objetivo número 6 del Desarrollo Sostenible, entre los 17 que existen para transformar nuestro mundo. En este sentido, la Semana de la Sostenibilidad, impulsada por el Consell de Medi Ambient de la Universitat de Lleida (UdL), analiza estos diez factores como la escasez de recursos hídricos, la mala calidad del agua y el acceso inadecuado y su influencia negativa en la seguridad alimentaria. Los foros se celebran estos días a través de actividades y conferencias que ofrecen técnicas, discursos de la UdL y expertos en la materia como el profesor Wolfgang Gemlik, profesor de la Universidad de Garmisch-Partenkirchen.

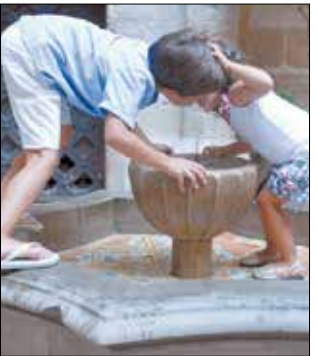


FOTO: Selma Garcia / En la Semana de la Sostenibilidad analizan el consumo de agua embotellada

CLAVES

AGUA POTABLE. Entre 1990 y 2015 la proporción de la población mundial que utiliza mejores fuentes de agua potable aumentó del 70% al 91%. OBJETIVO 2030. La ONU establece que lograr el acceso equitativo al agua potable, a un precio asequible para todos para el año 2030. SANEAMIENTO. Se persigue el objetivo de lograr el acceso equitativo a servicios de saneamiento e higiene adecuados para todos y poner fin a la defecación al aire libre, prestando especial atención a las necesidades de las personas en situaciones vulnerables. CONTAMINACIÓN. Entre los retos figura mejorar la calidad del agua mediante la reducción de la contaminación, la eliminación del vertimiento y la reducción al mínimo de la desarga de materiales y productos químicos peligrosos. ECOSISTEMAS. Inocuos, montañosos, humedales, ríos, acuíferos y lagos, deben ser restaurados.

Respecto a la concienciación sobre la escasez del agua, la ONU calcula que aproximadamente el 70% del agua extraída de ríos, lagos y acuíferos se utiliza para regar, aunque en ocasiones, "al riego se le convierten en cambios hacia prácticas que hacen mejor uso del agua como la implementación del riego por goteo", comenta Gemlik. El organismo internacional apunta que entre 1990 y 2015, la proporción de la población mundial que utiliza mejores fuentes de agua potable aumentó del 70% al 91%, y Gemlik advierte que la calidad de agua en el consumo doméstico puede tener un efecto negativo sobre la salud "y no es adecuada". Sin embargo, el experto sostiene que en los países desarrollados existen multitud de razones para confiar en la seguridad del agua abastecida tanto por los sistemas centralizados suministrando el agua de grifo como el agua embotellada.

En este sentido, la ONU recordó el Día Mundial del Agua, que se celebra el 22 de marzo, que todavía existen más de 663 millones de personas que viven sin suministro de agua potable cerca de casa, lo que les obliga a pasar horas haciendo cola o trasladándose a fuentes lejanas, ello dentro de un contexto de cambio climático, que reduce la disponibilidad de agua dulce. Gemlik apunta que la situación en los países en desarrollo es "totalmente diferente" ya que la calidad de agua frecuentemente no es segura para el consumo ni muchos lugares "representa una importante causa para la ocurrencia de enfermedades severas".

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Advertisement for 'El imán de la Virgen del Pilar' featuring a religious image and text about a pilgrimage. Includes a 'GRATIS' offer and a '12 años' anniversary logo.

ESTUDIO CIENTÍFICO

Los peces del Ebro, con altos niveles de contaminación

Los investigadores hallan gran cantidad de un compuesto químico prohibido. Las especies analizadas son truchas, anguilas, siluros y carpas. El Ebro sufre una contaminación similar a la de otros ríos europeos.

Los peces de los ríos europeos, incluida la cuenca del Ebro, aún muestran niveles altos de PHEB, un contaminante prohibido. Los investigadores hallan gran cantidad de un compuesto químico prohibido. Las especies analizadas son truchas, anguilas, siluros y carpas. El Ebro sufre una contaminación similar a la de otros ríos europeos.

seguía PRESERVA AL 43%, RIESGO DE FUEGO

Los embalses de la Cuenca Hidrográfica del Ebro acumulan el 43% de su capacidad, con 2.071 hectómetros cúbicos de los 7.829 que pueden albergar en total. El riesgo de incendio en la zona es alto.

COMPARENCIA EN LAS CORTES

La ley de función pública se debatirá con sindicatos

El Gobierno de Aragón no la presentará si no hay consenso. El director general de la Función Pública y Calidad de los Servicios Públicos de Aragón, Juan Carlos...

La ley de función pública se debatirá con sindicatos

El director general de la Función Pública y Calidad de los Servicios Públicos de Aragón, Juan Carlos...

El director general de la Función Pública y Calidad de los Servicios Públicos de Aragón, Juan Carlos...

El director general de la Función Pública y Calidad de los Servicios Públicos de Aragón, Juan Carlos...

El director general de la Función Pública y Calidad de los Servicios Públicos de Aragón, Juan Carlos...

El director general de la Función Pública y Calidad de los Servicios Públicos de Aragón, Juan Carlos...

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El director general de la Función Pública y Calidad de los Servicios Públicos de Aragón, Juan Carlos...

El director general de la Función Pública y Calidad de los Servicios Públicos de Aragón, Juan Carlos...

Advertisement for 'El día de la independencia' featuring a portrait of a man and text about a historical event. Includes a 'SECRETO' logo.

Advertisement for 'CLÍNICA CHELA IMPLANTOLOGIA' featuring a portrait of a woman and text about dental services. Includes a '1990€' price tag.

SELVA Comarques Gironnes 17

Acord per obrir dos nous nous lluny de la riera de Santa Coloma

L'Ajuntament i l'ACA es basen en un estudi de l'ICRA i buscaran aigua a prop de Santa Coloma Residential. Els receradors veuen improbable que hi hagi fluor al subsol.

La frase. L'Ajuntament de Santa Coloma de Querquern i l'Agència Catalana de l'Aigua (ACA) han acordat obrir dos nous pous per abastir la riera de Santa Coloma Residential. Els receradors veuen improbable que hi hagi fluor al subsol.

La xifra. 70 metres de profunditat és el nivell que proposa l'ICRA per als dos nous pous que s'obriran a prop de Santa Coloma Residential.

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# Press releases

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<https://press.clipmedia.cat/notas/icra-obre-les-portes-als-estudiants-de-batxillerat-en-el-dia-mundial-de-laigua/>

19/07/2017

**ICRA successfully implements the InnoWatt technology for the control of energy expenditure in wastewater treatment plants**

<https://press.clipmedia.cat/notas/licra-implementa-amb-exit-la-tecnologia-innowatt-per-al-control-de-la-despesa-energetica-en-les-depuradores-daigua/>

**ICRA successfully implements the InnoWatt technology for the control of energy expenditure in wastewater treatment plants**

<https://press.clipmedia.cat/notas/el-icra-implementa-con-exito-la-tecnologia-innowatt-para-el-control-del-gasto-energetico-en-las-estaciones-depuradoras-de-aguas-residuales/>

09/10/2017

**Damià Barceló, ICRA Director, obtains the h-index 100, putting him in the ranking of the most cited scientists in the world for the quality and quantity of his research**

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**[www.icra.cat](http://www.icra.cat)**

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