

Annual Report 2019 Cetaqua Barcelona

# Research Collaboration Thinking forward

**CETAQUA**  
WATER TECHNOLOGY CENTRE



UNIVERSITAT POLITÈCNICA  
DE CATALUNYA  
BARCELONATECH



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CETAQUA  
BARCELONA

# Opening messages



# Carlos Montero

## General Manager of Cetaqua



**“Reflection, transformation and action. Three words that perfectly summarize Cetaqua's activities in 2019”.**

Reflection, transformation and action. Three words that perfectly summarize Cetaqua's activities in 2019.

We have reflected on Cetaqua's role in our environment, evaluating our contribution, looking for ways to be more agile and providing the maximum value for society and the environment. We have projected ourselves into the future, answering the questions of where we want to go and how we want to contribute to improve our planet's most valuable resource: water. Cetaqua has reached maturity and recognition in its sector. More importantly, we've achieved a continuous exchange of knowledge and results with users who can use this to generate environmental results.

When considering our future, we once again had the privilege of receiving support from the scientific-technical council, held at the UPC Barcelona Tech's Diagonal Besòs Campus. I'd like to thank to all the counsellors and give a warm welcome to the new members. The topic chosen for the session, critical infrastructure management, proved to be particularly relevant because of the terrible events that followed: Storm Gloria and the COVID-19 pandemic. Cetaqua has

contributed by giving support and generating smart, innovative responses to these emergencies.

The growing trend toward digital transformation presents a unique opportunity for Cetaqua. We have been working for years to digitalize the sector, generating results and co-creating the digital ecosystem along with very diverse actors. We bring something unique to the table: a hybrid vision of water knowledge and digital skills. This combination generates the kind of innovation that can lead to large-scale change. Our role in the digital world is in applying the latest knowledge available, defining use cases that increase efficiency, making risk-minimizing operational improvements and proposing new models for our relationships with citizens. It is gratifying to see how the team continues to increase its digital skills, which naturally spread among a very diverse group to enrich the knowledge of the whole foundation.

Cetaqua's partnership model places us at an advantage, since we have the latest knowledge and know the needs of the industry and society. This leads us to action. On the one hand, launching initiatives that put what we've

learned into practice in fields like sustainability (Sustainability Partners) or complex water treatment processes (Water Treatment Laboratory). On the other hand, implementing two of the most emblematic H2020 projects in the water field: B-Water Smart means constructing the first Reuse Living Lab in Spain, and PathoCert means leading in water quality and safety, a permanent line of work at AGBAR that has been key in the extraordinary management of the health crisis.

I do not want to miss the chance to express my gratitude to the whole team of people who work and collaborate with Cetaqua. They are the leaders of our transformation and have succeeded in turning new initiatives into tangible results. I'd also like to thank Aigües de Barcelona, a joint water cycle venture that has reaffirmed itself as a symbol of efficient and transparent management, as well as the UPC and the CSIC for their strong support of innovation and our model of collaboration.

I hope you will find this report interesting.

# Ciril Rozman

## Chair of Cetaqua's board of trustees



**“These alliances have been Cetaqua's strength since its creation in 2007”.**

We are completing this report as the world faces the devastating effects of a pandemic that took many of us by surprise. The terrible loss of human life and weakening of the economic sector have put us in a historically difficult time. In trying times, when we're faced with the types of challenges we see now, Humanity knows from experience that we can only generate the conditions for recovery through compromise. Therefore, it is urgent for us to build new alliances together and strengthen the existing ones.

These alliances have been Cetaqua's strength since its creation in 2007. Uniting forces from different players (university, administration, business) for technological development and the application of knowledge creates a model of success that is even more meaningful in circumstances like these.

Rather than sudden ground-breaking solutions, our way out of this crisis will involve accelerating trends that already exist in the world. These include the fight against inequality caused by globalization, the commitment to digitalization and artificial intelligence, telework and, of course, mitigating the effects of climate change and making an imperative commitment to implementing circular economy models.

Cetaqua is an important player in this AGBAR transformation strategy. We draw on lengthy and meaningful climate change research experience, with the aim of studying its impact on water resources and the water sector. This enables progress as we search for adaptive and resilient solutions. Furthermore, the present and the future require us to offer new solutions that increase resilience in the face of climate change and improve the preservation and recovery of water resources, all by applying circular economy models.

I would like to conclude by emphasising Cetaqua's firm commitment to achieving all these objectives, which draws on the combined expertise of entities like Aigües de Barcelona, the Spanish National Research Council (CSIC) and the Universitat Politècnica de Catalunya (UPC). Only through collaboration among all social actors will the sector be able to continue responding to the great challenges we face as a society.

# Rosa María Menéndez López

President of the Spanish National Research Council (CSIC)



**“Collaborative research as part of common project to improve our society through sustainable development”.**

As in years past, Cetaqua's innovative work would not be possible without the continued support and promotion of the Spanish National Research Council (CSIC). One of the CSIC's missions is to promote scientific and technological research for the advancement of knowledge and economic development. This mission is fully aligned with Cetaqua's activities to develop alternatives that ensure water cycle sustainability and efficiency. This work, in turn, falls within the framework of one of the sustainable development objectives included in 2030 Agenda, to which we have all committed.

This year, Cetaqua, in its various centres in Barcelona, Galicia, Andalusia and Chile, has undertaken many projects with enormous importance and repercussions in their respective environments. This includes the promotion of reclaimed water in the Gavà Circular of Barcelona; the development, exhibition and transfer of waste water treatment systems in the CIGAT Mixed Unit in Galicia; participation in the PISCIA platform for service integration in Andalusia; or the study of the glacial contribution and extreme hydrometeorological events response capacity in the Maipo River in Chile. These are just a few

examples of all the activities and contributions. We should make special mention of efforts made in projects that include innovative technologies for the on-site drinking water analysis or the recovery of nutrients and other waste water products for subsequent reuse in different production sectors, which make a tangible and effective contribution to a circular economy.

As President of the CSIC, I would like to take this opportunity to thank all the partners for their commitment and dedication, which has allowed us to achieve so many ambitious goals this year through collaborative research as part of common project to improve our society through sustainable development.

# Francesc Torres

## Rector of the Universitat Politècnica de Catalunya (UPC)



**“The only way we can  
confront these challenges  
is with research”.**

On 7 May 2019, the UPC approved a student initiative declaring a State of Climate Emergency and calling for the prioritization of measures that would place the UPC at the forefront of sustainable society efforts.

Months later, in mid-January, we experienced the devastating effects of Storm Gloria. The force of the water caused unprecedented loss of human lives, the destruction of numerous unique infrastructures, as well as many economic losses, not to mention the destruction of precious natural ecosystems such as the Ebro Delta, which will take time to recover. As experts tell us, the current climate changes will cause such episodes of serious storms and floods to alternate with episodes of extreme drought, along with associated human, economic and social costs.

The only way we can confront these challenges is with research. Research provides us with the knowledge we need to find the best technological solutions for mitigating and/or reversing these effects of climate change. As we've seen, water is a key element in this.

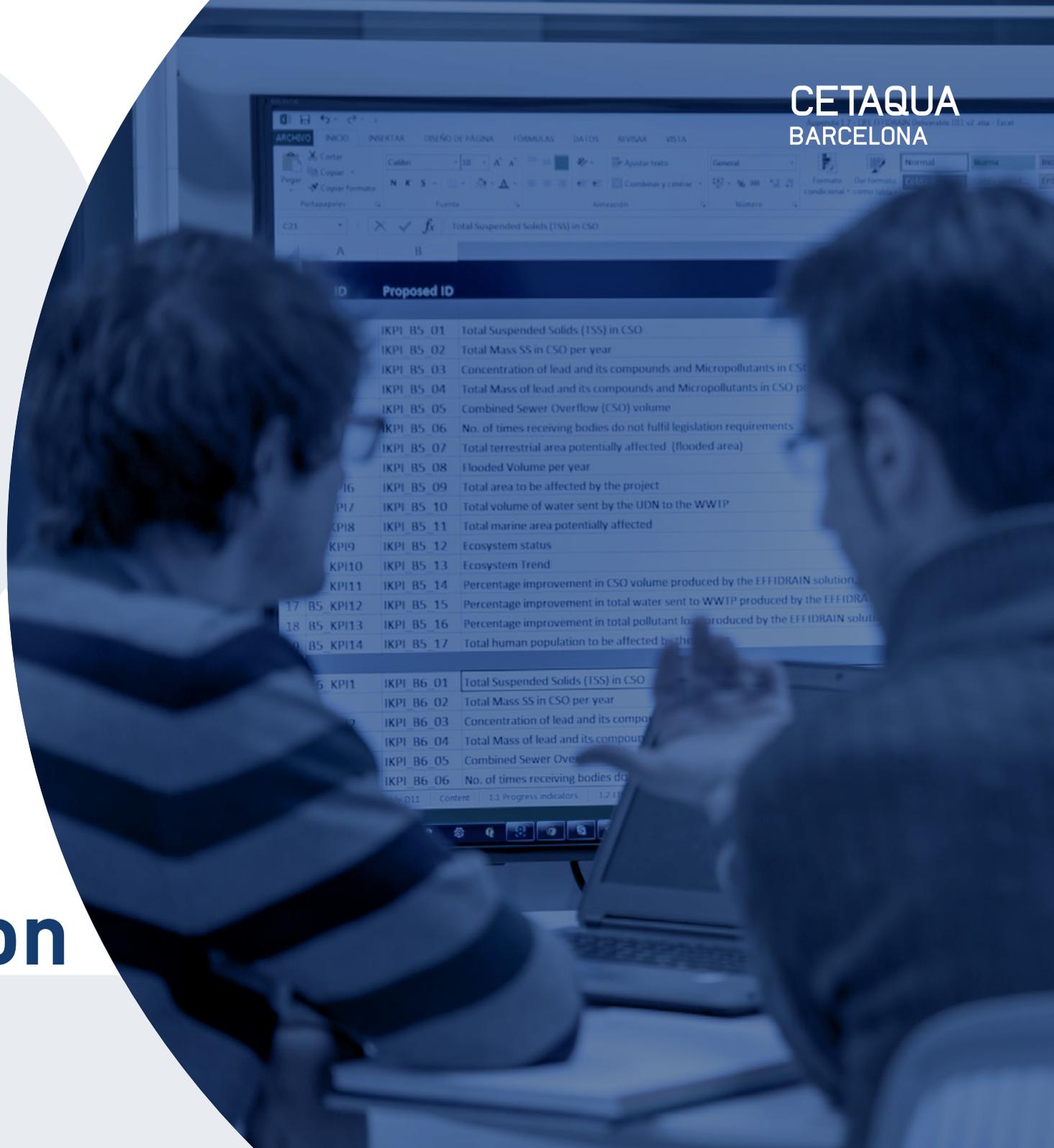
Cetaqua has undertaken well-aimed research projects focused on the production and regeneration of water resources, the management of waste water and the reuse of by-products.

At the Barcelona centre in particular, where UPC is involved, the research projects are focused on using anaerobic digestion in waste water treatment plants to recover nutrients, nitrogen and phosphorus for their reuse in the agricultural environment; as well as obtaining renewable gas from the biogas generated in the treatment plant. In other words, this whole set of actions is totally aligned with the energy transition, which we at the UPC consider a priority.

Some of its research projects also highlight its commitment to the region. A good example is managed aquifer recharge, consisting of injecting pre-potable water, which has been used in the Llobregat Delta aquifers to increase groundwater sustainability.

All these actions, which are fully in line with our social commitment as a leading technological university, allow us to use research, to respond together to the challenges that our society asks of us, specifically in the fight against climate change. Without a doubt, one of the things this fight requires is efficient resource management, particularly of water. Working together with Cetaqua, we can move toward a better world.

# Collaboration model



ID	Proposed ID	
	IKPI B5 01	Total Suspended Solids (TSS) in CSO
	IKPI B5 02	Total Mass SS in CSO per year
	IKPI B5 03	Concentration of lead and its compounds and Micropollutants in CSO
	IKPI B5 04	Total Mass of lead and its compounds and Micropollutants in CSO per year
	IKPI B5 05	Combined Sewer Overflow (CSO) volume
	IKPI B5 06	No. of times receiving bodies do not fulfil legislation requirements
	IKPI B5 07	Total terrestrial area potentially affected (flooded area)
	IKPI B5 08	Flooded Volume per year
	IKPI B5 09	Total area to be affected by the project
	IKPI B5 10	Total volume of water sent by the UDN to the WWTP
	IKPI B5 11	Total marine area potentially affected
	IKPI B5 12	Ecosystem status
	IKPI B5 13	Ecosystem Trend
	IKPI B5 14	Percentage improvement in CSO volume produced by the EFFIDRAIN solution
17 B5	KPI12 IKPI B5 15	Percentage improvement in total water sent to WWTP produced by the EFFIDRAIN solution
18 B5	KPI13 IKPI B5 16	Percentage improvement in total pollutant load produced by the EFFIDRAIN solution
19 B5	KPI14 IKPI B5 17	Total human population to be affected by the project
20 B5	KPI11 IKPI B6 01	Total Suspended Solids (TSS) in CSO
	IKPI B6 02	Total Mass SS in CSO per year
	IKPI B6 03	Concentration of lead and its compounds
	IKPI B6 04	Total Mass of lead and its compounds
	IKPI B6 05	Combined Sewer Overflow (CSO) volume
	IKPI B6 06	No. of times receiving bodies do not fulfil legislation requirements

# We are a cutting-edge model of public-private partnership for research and innovation

We are a foundation created in 2007 by Aigües de Barcelona, the Universitat Politècnica de Catalunya (UPC) and the Spanish National Research Council (CSIC). Our public-private partnership model was created to guarantee water cycle sustainability and efficiency, considering the regional needs.

The model has established itself as a benchmark for the application of academic knowledge to water and the environment, by creating products and services that benefit society. The model has subsequently been applied in other Cetaqua centres, which are independent but share strategies and work in collaboration.

# The board of trustees, the governing body

The board of trustees is our main governing body and includes the members who created the foundation. The board is responsible for defining the strategy, creating annual plans and budgets, approving key research lines and activities, and supervising financial management.

## It's formed by:



The public-private company Aigües de Barcelona, Empresa Metropolitana de Gestió del Cicle Integral de l'Aigua, manages integral water cycle services and supplies water to more than 3 million people who live in Barcelona and its metropolitan area.



The Universitat Politècnica de Catalunya (UPC) is a public higher education and research institution, specializing in the fields of engineering, architecture and science. UPC's essential role in the transformation of society is based on its creativity and commitment to the environment, research, teaching and knowledge transfer.



The Spanish National Research Council (CSIC) is the top public institution devoted to research in Spain and the third largest in Europe. Its fundamental objective is to conduct and promote research for the benefit of scientific and technological progress and it is therefore open to collaboration with Spanish and foreign institutions.



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**Ciril Rozman**  
AGBAR



Deputy chairperson  
**Francesc Torres**  
UPC



Secretary  
**José Mª de Paz**  
AGBAR



Trustee  
**Manuel Cermerón**  
AGBAR



Trustee  
**Rosina López-Alonso Fandiño**  
CSIC

In October 2019, we welcomed Rosina López-Alonso Fandiño to Cetaqua's board of trustees as CSIC representative. We thank **Víctor Ramón Velasco** for his collaboration in previous years.

# The scientific-technical council, research strategy advisor

Cetaqua Barcelona is advised by the scientific-technical council (STC), appointed by the board of trustees and periodically renewed.

Its functions are:

- To provide guidance on research policies and propose new topics for research and technological development.
- To provide technical advice on the research programmes to be carried out and guidance on funding opportunities.
- To assess the business needs raised.



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UPC



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Aigües de Barcelona



Deputy chairperson 2  
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IREC



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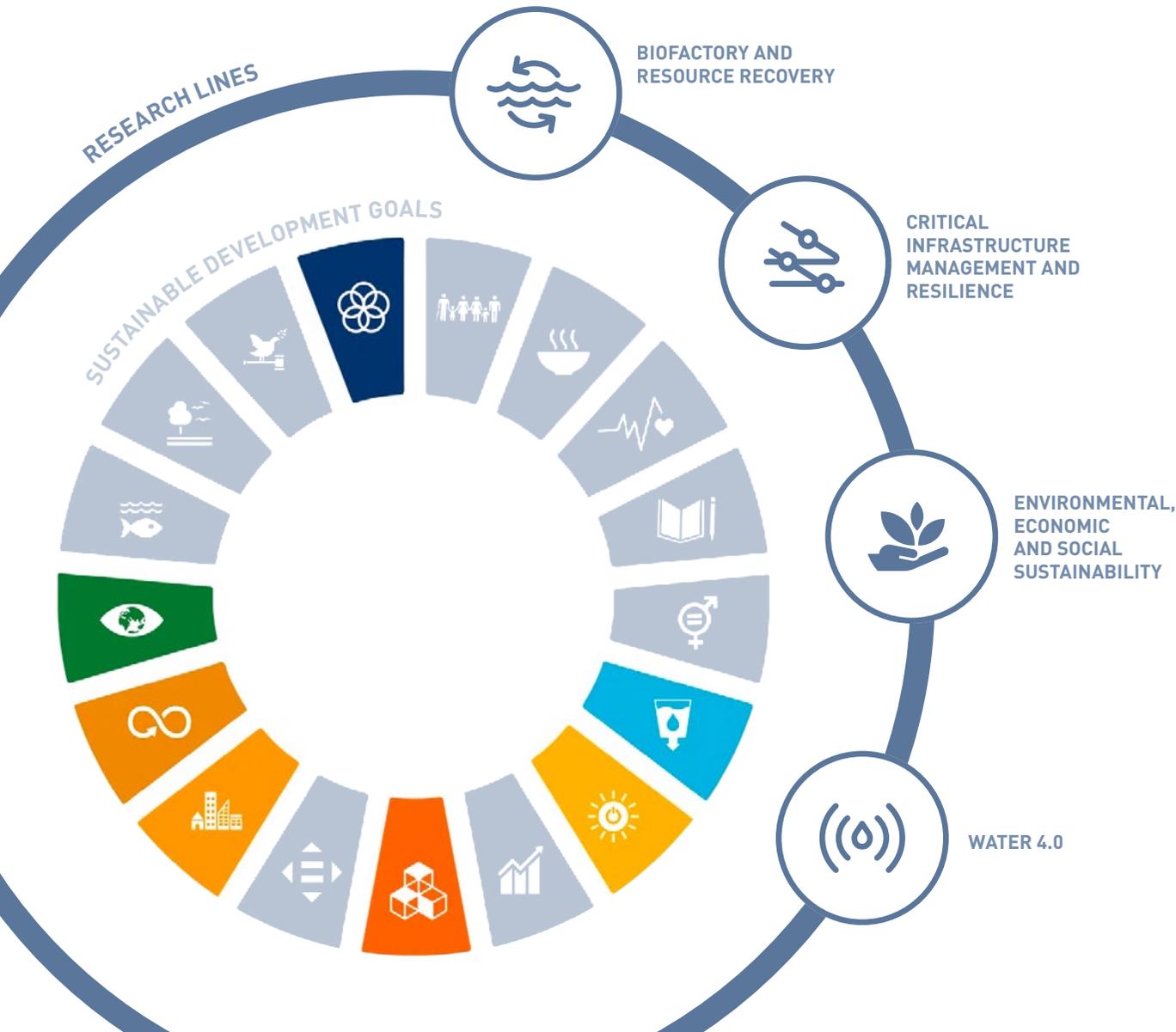
**This year, the STC focused on discussing the management of critical infrastructures. The meeting took place at the UPC's Diagonal Besòs Campus, where participants also had the opportunity to visit the chemical engineering laboratory and the Barcelona Research Centre in Multiscale Science and Engineering.**

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Our  
research



# Our vision for a sustainable future



The current climate emergency demands sustainability and following the United Nations' Sustainable Development Goals to protect the planet.

At Cetaqua, we work to respond to this need through our research lines. Through technology, innovation and new management models, we provide solutions that steer water cycle processes toward a circular economy.

This vision of water and the resources involved in water processes, as well as the action it leads to, envision a future that can only be sustainable, in terms of technical, economic, social and environmental sustainability.

- 
-  Clean water and sanitation
  -  Affordable and clean energy
  -  Industry, innovation and infrastructure
  -  Sustainable cities and communities
  -  Responsible consumption and production
  -  Climate action
  -  Partnerships for the goals
-



# Biofactory and resource recovery

**Solutions to transform treatment plants into biofactories: efficient facilities to obtain water, energy and materials.**

## Challenges

We are working on a paradigm shift, applying the circular economy concept to water treatment, developing processes and technologies that transform treatment plants into biofactories. The goal is to maximize the value of resources by promoting an energy-neutral model, which contributes to achieving zero waste and includes the elimination of emerging contaminants and microplastics. Therefore, we promote the recovery and reuse of resources during reclaimed water production processes and treatment of urban and industrial waste water and other waste flow.

## Priority lines of research

- Effective and efficient treatments for urban and industrial waste water, and treatments for the production of drinking water and reclaimed water.
- Treatments for emerging contaminants and microplastics.
- Recovery of energy and material resources from urban and industrial waste flows.



## Recovery of nutrients from waste water for subsequent reuse

We promote the circular economy through projects that seek to recover nutrients from waste water to produce biofertilizers.

We have developed an innovative treatment train that allows nitrogen recovery from waste water in the form of ammonium salts, by adsorption with zeolites and separation by membrane contactors, as well as phosphorus in the form of struvite by crystallization. These technologies are being tested within the framework of the LIFE ENRICH and DIGESTAKE projects.

In LIFE ENRICH these products are mixed to use the most suitable fertilizers for selected crops such as lettuce, tomato, broccoli, wheat and beans. In the DI-

GESTAKE project, a mineral waste is used as a source of magnesium for struvite precipitation in the crystallizer. The LIFE ENRICH project is co-financed by the European programme LIFE and DIGESTAKE is co-financed by the European Regional Development Fund in the framework of the Catalonia ERDF Operational Programme 2014-2020.

### Project

*Enhanced Nitrogen and phosphorus Recovery from wastewater and Integration in the value Chain (LIFE ENRICH)*

### Partners

Emuasa, UPC, UPV, IRTA, Aquatec, Aigües del Segarra Garrigues (ASG)

### Duration

September 2017 - May 2021

### Coordinator

Cetaqua Barcelona



# Critical infrastructure management and resilience

Management and optimization solutions for urban water cycle infrastructures in the face of natural or intentional events.

## Challenges

Natural events (caused by climate change or deterioration of infrastructures) and intentional events can affect the infrastructures of the urban water cycle.

To minimize risks and optimize asset management, we develop resilient systems and solutions focused on crisis event management. We work on methodologies that predict, detect and manage critical situations, and on investment planning systems focused on reducing future impacts and protecting both people and the environment.

## Priority lines of research

- Advanced control of water quality and its impact on consumers and the environment.
- Monitoring, automation and process control.
- Intelligent and resilient operations and asset management.



## H2020 STOP-IT: monitoring, automation and process control to protect critical water infrastructure

This project aims to provide tools for water operators to evaluate, simulate, detect and manage potential physical facility intrusions or cyberattacks.

In 2019, an evaluation of several online sensors for the rapid detection of chemical and microbiological contamination in drinking water was completed, resulting in a set of recommendations for the selection and use of sensors in the distribution network. Furthermore, an operator support tool has been developed for the Aigües de Barcelona distribution network, which recommends the interventions to be carried out to recover service affected by breakdowns or construction in the shortest time possible, while optimising operating costs.

### Project

*Strategic, Tactical, Operational Protection of water Infrastructure against cyber-physical Threats (STOP-IT)*

### Partners

Cetaqua Barcelona, Aigües de Barcelona, Aplicatzia Software House, ATOS, Bergen kommune, Berliner Wasserbetriebe, BWB, DeWatergroep, Emasagra, Eurecat, Hessenwasser, ICCS, IWW, KWR, Mekorot, Mnemonic, Oslo kommune Vann, OYLO, PNO Innovation, RISA, Technion, Worldsensing, WssTP

### Coordinator

June 2017 - June 2021

### Coordinador

SINTEF

# Environmental, economic and social sustainability

Solutions that ensure sustainable development and the well-being of citizens.

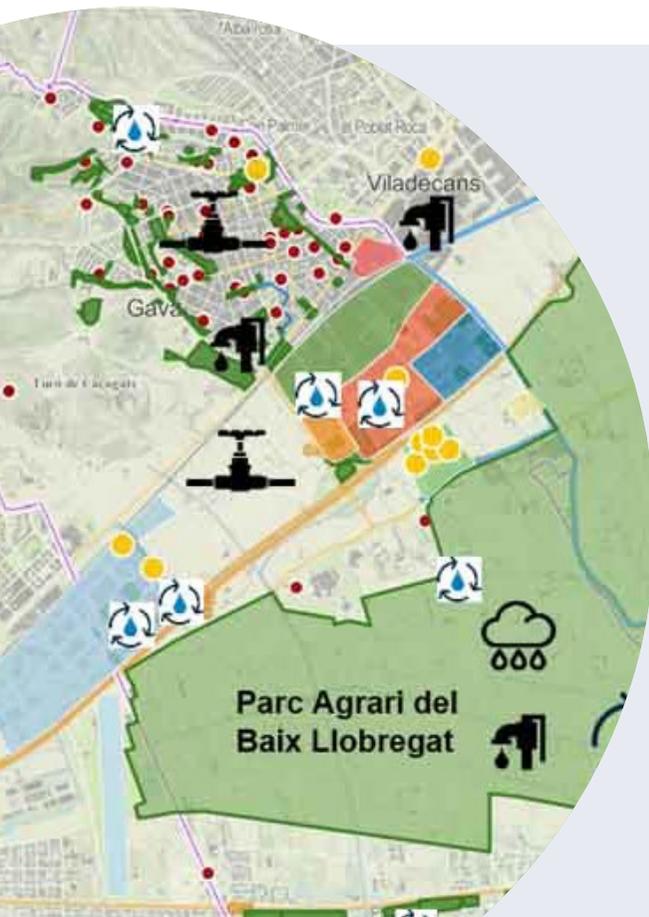
## Challenges

The context of climate emergency forces us to focus on a circular economy, which is necessary to reduce the pressure on resources, improve the life cycle and contribute to waste recovery and recycling.

To this end, we develop methodologies, tools, strategies, plans and management models that ensure sustainable development when applied to regions and companies, including being environmentally aware, economically viable and focused on benefiting society.

## Priority lines of research

- Design and implementation of circular economy models in companies and regions.
- Management of environmental and socio-economic impacts and risks.
- Demand management and water economics.
- Evaluation of benefits associated with biodiversity and the natural environment.



## Gavà Circular, a regional circular economy model from diagnosis to design and implementation

In 2019, 3 of the 10 circularity measures we identified were implemented to apply the circular economy model in Gavà. Specifically, the use of regenerated water (for industrial and urban use) was promoted, new models of industrial waste management were proposed, and a collaborative energy management service was set up. For the latter, we have identified a potential average economic savings of 10% in the energy bills of participating companies and effectuated a 28% savings in the energy bills of one of them. A framework of indicators has been proposed as a next step, to monitor the municipality's progress toward a circular economy.

### Project

Gavà Circular

### Partners

Aigües de Barcelona, Ajuntament de Gavà

### Duration

December 2018 - June 2020

### Coordinator

Cetaqua Barcelona

# Water 4.0

## Artificial intelligence for the water cycle and sustainability.

### Challenges

Artificial intelligence and state-of-the-art digital technologies are completely transforming the management of natural resources. Acquiring, processing and correctly analysing large volumes of data allows us to find new answers to the great challenges of the water cycle and to make productive and environmental processes more efficient and sustainable.

We use artificial intelligence and state-of-the-art software architectures to develop digital services that improve decision-making in multiple operating environments: from monitoring and predicting events that affect water quality to optimizing network efficiency and asset life cycles.

### Priority lines of research

- Machine Learning for the characterization and prediction of events related to water quality and network operation.
- Deep Learning and computer visualization applications in the integral water cycle and environmental management.
- Processing of satellite images and generation of advanced environmental indicators.



### Industrialization of algorithms for the optimization of membrane cleaning operations through machine learning techniques

This solution analyses the operation data and recommends, in real time, the necessary cleaning operations for the optimization of ultrafiltration membranes. The algorithm was tested for 6 months in one of the water treatment plants in Macao, operated by Macao Water (SUEZ Group), which has one of the largest ultrafiltration treatments in the world.

The project has allowed us to understand the plant's needs and broaden stakeholders' requirements for this type of solution, thanks to the development of a front-end environment that facilitates the interpretation of key indicators for monitoring operations.

**Project**  
Optimization of ultrafiltration cleaning operations

**Partners**  
Macao Water, SUEZ

**Duration**  
January 2019 - December 2019

**Coordinator**  
Cetaqua Barcelona

# Innovation and transfer with Aigües de Barcelona

We are the vehicle that allows Aigües de Barcelona to satisfy much of the research and innovation required to orient the processes of the integral water cycle towards a circular economy, while covering the needs of water users and looking to the future.

We develop solutions that are applied directly to the infrastructures of Aigües de Barcelona. In addition, thanks to case studies in European projects at its facilities and the organization of events participated in by partners and other European entities, we have worked together to position the Barcelona area as one of Europe's top knowledge hubs in the water field.

## Some examples of projects in direct collaboration with Aigües de Barcelona:



H2020 STOP-IT: Strategic, tactical and operational protection of water infrastructure against potential cyber-physical hazards.



RIS3CAT REGIREU: Innovative water reclamation and risk management technologies that overcome technical barriers to waste water reuse.



AQUAPRINT: Tool for calculating the carbon footprint and water footprint of the urban water cycle. This calculator is the result of the Carboweb and Hidroweb projects.

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**Talent,  
knowledge  
and technology**



# A network of talent and scientific platforms to generate high-impact results

**We detect new technologies and provide expert opinions**

## **Talent**

Cetaqua Barcelona attracts talent. We've created a high-level scientific ecosystem made up of the people who work in the centre itself and people from internationally prestigious research centres and universities with whom we share projects.

## **Knowledge and scientific platforms**

We support the implementation of the results from our research. Therefore, based on the knowledge acquired in the projects, we offer companies and territories services that promote sustainability.

These services sometimes require the use of scientific platforms such as laboratories, pilot facilities and prototypes that reproduce urban and industrial real use conditions.

# We attract talent and encourage diversity



**58**  
**people** — ♀ ♂  
49% 51%

└ 15 PhDs and  
2 PhDs students

└ 4 Scientific  
Technical Advisors



Dra. Montserrat Termes



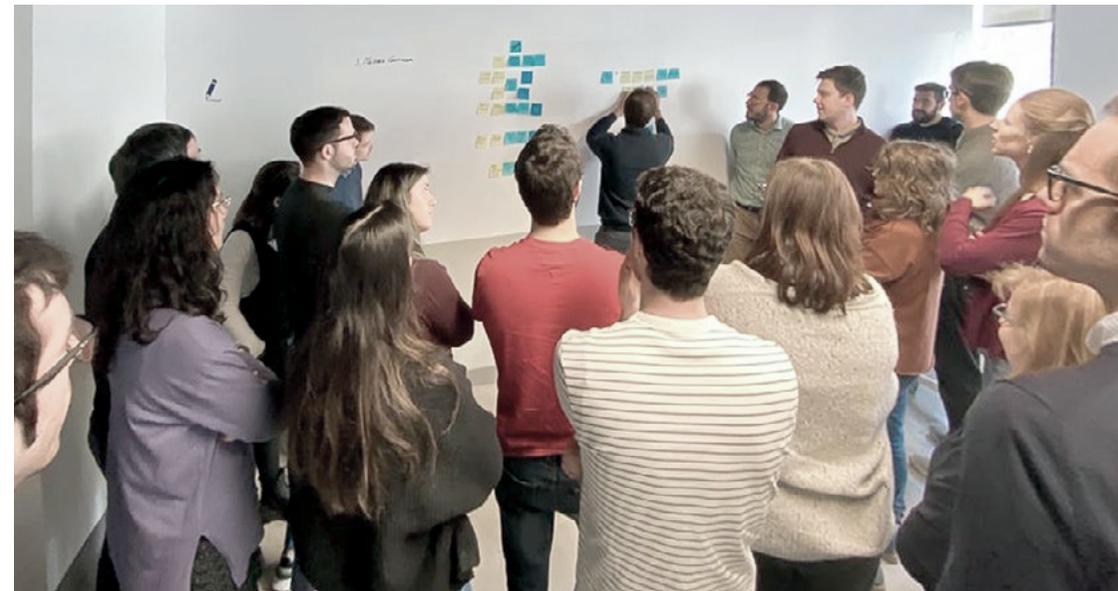
Dr. José Luis Cortina  
Dr. Manuel Gómez



Dra. Gabriela Cembrano

At Cetaqua Barcelona we believe people are the key to achieving objectives. We promote equal opportunities by creating inclusive environments that encourage respect and diversity. These are not just corporate values, but fundamental principles for the development of society.

Similarly, we are committed to quality education. On the one hand, promoting the incorporation of people with specialized training, including those who are pursuing or already hold a doctorate; and on the other, favouring the exchange of knowledge with local universities through the Scientific Technical Advisor position.



# We apply the knowledge from our research

Technological development and the application of knowledge are indispensable elements when addressing the major challenges associated with a climate emergency context. Therefore, we offer companies and regions services that allow them to apply them to real systems, based on the results obtained in the research projects.

## We apply our research...

### We evaluate urban water solutions

Design, validation, optimization and adaptation of treatment plants for the production of drinking water, urban waste water treatment and regeneration for reuse:

- Prototype tests on a laboratory and semi-industrial scale to validate different types of real water.
- Operational analysis and strategy development to control treatments and infrastructure, including reclaimed water networks.
- Solutions for the recovery and reuse of by-products.

### We evaluate industrial water solutions

Laboratory tests to evaluate the feasibility of treatments for complex industrial water to reach the necessary discharge limit or to promote reuse within industry.

Benchmarking of technologies and technical support in order to recommend the best solutions in terms of efficiency, cost and environmental footprint.

Obtaining design parameters for the implementation of full-scale treatment trains.

### We evaluate sensor solutions

Comparison and validation of sensors to simulate real and extreme conditions on a controlled platform and in the field.



### We implement circular economy models in regions and organizations

Through Sustainability Partners, we offer administrations and companies circularity diagnostics and action plans so they can implement a model aligned with Sustainable Development Goals.



## ... Through the use of experimental platforms



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**We bring  
knowledge  
closer to society**



# We share our results

**So that the results we generate have a real impact, we work on the dissemination and communication of the R&D&I we conduct, seeking out and selecting the most appropriate and efficient channels for each type of message.**

## **We organize dissemination events**

At Cetaqua Barcelona we organize events and workshops to share the progress and results of the projects we coordinate or participate in. We facilitate meetings between experts and stakeholders, where representatives from the academic world, public organizations and companies take part. In this way, we create opportunities that accelerate knowledge transfer, generate conversation and enable networking for future collaborations.

## **We participate actively in congresses**

Sharing the advances in our research with our peers in other organisations and countries, as well as with audiences interested in our fields of work, is a way of consolidating our technological centre as a point of reference in the sector of water and the environment.

## **We publish in scientific journals**

The publication of our results in major peer-reviewed journals places us in the realms of science and technology in the international scientific community and shows our expertise in our main lines of research.

**03 Cetaqua events**

**42 Congress contributions**

**09 Scientific publications**

\*Consult full lists of contributions to congresses and scientific publications of 2019 in the section "Appendices"

# We organize dissemination events

The events that Cetaqua Barcelona organizes with the collaboration of other entities, promote the transmission of our knowledge to society, administrations, universities and technological centres, among others.

In 2019, this effort resulted in more than 80 attendees at the 3 events and workshops where we presented our research, along with other participating entities.



## CyberSecureWater: Workshop on cybersecurity in critical water sector infrastructure.

Barcelona, 28 May 2019.

Promoted by the European Water Supply and Sanitation Technology Platform (Water Europe) and the European Alliance for the Internet of Things Innovation (AIOTI) and co-organized by Cetaqua. At this workshop, we discussed the importance of water operators sharing information to prevent cyber-attacks on critical infrastructure. Experts from EURECAT, SUEZ, CESICAT (Information Security Centre of Catalonia), Tecnalia/ECSO, Darco Tech and FMIC (Facility Management for Critical Infrastructures) participated.



## LIFE EFFIDRAIN project final workshop: Presentation of results.

Barcelona, 4 June 2019.

A European project led by Cetaqua, in collaboration with Aquatec, Aquambiente (both SUEZ Group) and the CSIC, in which we developed technologies for real-time coordinated control of drainage networks and waste water treatment plants, in order to prevent flooding and contamination of receiving waters in periods of intense rain.



## EsAgua Network round table: Strategic partnerships for sustainable water use.

Madrid, 11 December 2019.

It aimed to promote sustainable water use within the framework of COP25, and to raise awareness of the importance of indicators like hydrological and water footprints. DNV-GL, Nutreco, ICL Iberia and SUEZ participated, sharing their experiences.

# We participate actively in congresses

In 2019 we participated in 42 national and international congresses and fairs related to our activity, with oral and poster presentations. Among these participations, we highlight 4 contributions to congresses organized by the International Water

Association (IWA) on diverse topics, from the recovery and reuse of water and resources, to the digital transformation in water management, including sewage processes and networks and the relationship between the microbiology of water and health.



## **16th IWA Leading Edge Conference on Water and Wastewater Technologies.** Edinburgh, 10 June.

“Copper recovery from mining waste water: pilot scale validation”.

## **International Water Association (IWA) Water Reuse Conference 2019.** Berlin, 20 June.

- “Water Reuse Hubs as enablers of water reuse implementation”.
- “Advanced RO for water reuse and brine concentration in Copper Smelter effluents”.

## **3rd IWA Resource Recovery Conference.**

Venice, 8 September.

“Nitrogen up-concentration from mainline and side-stream effluent in WWTPs for fertilizer valorization”.

## **ECCA (European Climate Change Adaptation Conference).** Lisbon, 28 and 29 May.

Cetaqua co-organized this conference (as partners of the RESCCUE project), which had more than 1,200 attendees. In addition, we contributed with 4 papers and a poster, explaining our experience in terms of adaptability to the problems posed by climate change, as well as in issues of prevention and reduction of risks caused by external phenomena. Specifically, regarding resilience modelling during floods, the potential socio-economic impacts that these may cause and, finally, the strategies for climate change adaptation and their prioritisation as a solution to this problem.

# We publish in scientific journals

In 2019 we published 9 articles in peer-reviewed scientific journals related to the fields of water, environment, chemical engineering, health and energy.

This includes publications in leading high-impact journals such as *Renewable Energy* and *Science of The Total Environment*.



## **Synthetic Natural Gas Production from Biogas in a Waste Water Treatment Plant.**

J. Guilera, T. Andreu, N. Basset, T. Boeltken, F. Timm, I. Mallol, J.R. Morante (2019). *Renewable Energy*, 146, p. 1301-1308. DOI: 10.1016/j.renene.2019.07.044



## **Techno-Economic Evaluation and Comparison of PAC-MBR and Ozonation-UV Revamping for Organic Micro-Pollutants Removal from Urban Reclaimed Wastewater.**

C. Echevarría, C. Valderrama, J.L. Cortina, I. Martín, M. Arnaldos, X. Bernat, A. De la Cal, M.R. Boleda, A. Vega, A. Teuler, E. Castellví (2019). *Science of the Total Environment*, 671, p. 288-298. DOI: 10.1016/j.scitotenv.2019.03.365

# We participate in initiatives that promote scientific careers



We promote STEM (Science, Technology, Engineering and Mathematics) education by encouraging dialogue between Cetaqua's researchers and younger generations. We actively participate in ini-

tiatives such as ESCOLAB and the Science Festival organised by the Barcelona City Council, as well as the Exporecerca Jove fair organised by MAGMA [Association for the Promotion of Youth Research].



## Introducing Cetaqua to students through ESCOLAB

We want to promote scientific careers with knowledge and experience. Therefore, we offer secondary school students the opportunity to learn about what a technology centre is, its functions, our research fields, and their approach (based on sustainable development goals and current science) before they make one of the most important decisions: choosing a degree they want to pursue.



## Participating as judges in the Exporecerca Jove

We encourage younger generations' research by exchanging experiences and knowledge. As part of the jury, we grade the work presented at the fair with the goals of advising, promoting improvement and motivating students to continue working on what they are passionate about.



## Attending the 13th edition of the Science Festival

We brought scientific and technological knowledge closer together by participating in different conferences to explain our research to younger generations. In this initiative, promoted by the Barcelona City Council, one of Cetaqua Barcelona's researchers explained the innovative concept of the biofactory and how it can turn waste water into a source of resources.

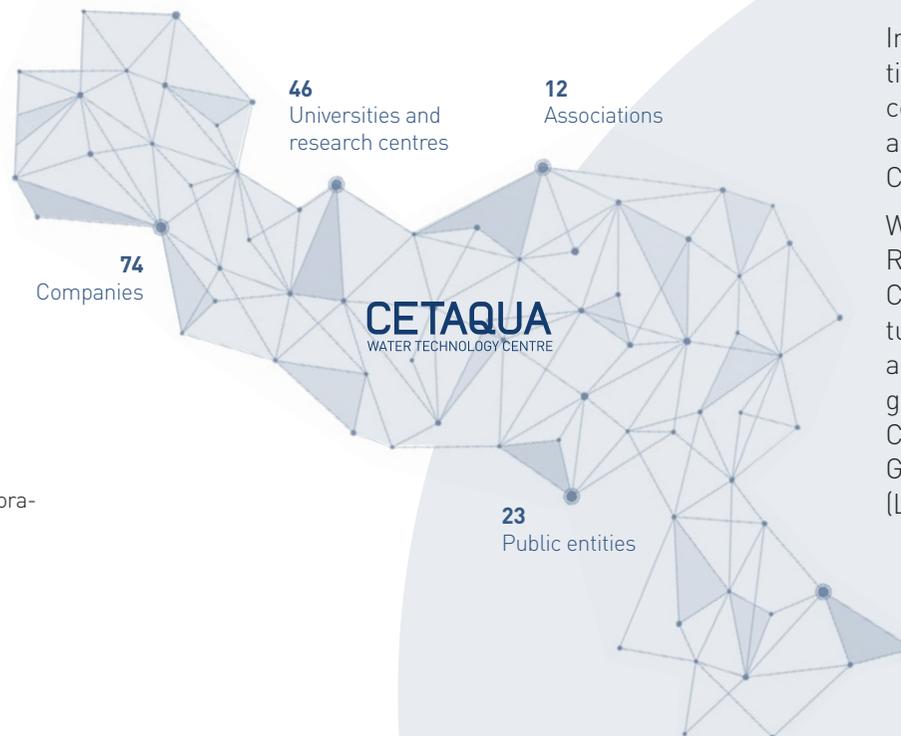
CETAQUA  
BARCELONA

**Partnerships  
to achieve goals**



# Collaboration network

**As a result of our collaboration network with universities, research centres, companies, public entities and associations, this year we have taken part in over 70 projects, 22 of them publicly funded, of which 9 fell within the framework of European Commission programmes.**



\*Consult the full list of 2019 projects and collaborations in the "Appendices" section.

## The scientific rigour of universities and research centres

Working with well-known institutions assures us of the scientific basis for the solutions proposed.

## Solutions applied to the real economy

The vision of companies from different sectors (water, energy, waste, agriculture, etc.) helps us to detect opportunities and translate them into viable and sustainable solutions (for both regions and organizations) from a social, economic and environmental point of view, adapting them to society's current and future needs.

## The value of public-private partnerships

Continuously involving public entities helps us ensure that the solutions we propose respond to real societal challenges, ensuring that they can be carried out within current and future regional contexts and regulatory frameworks.

## The influence and positioning of associations

Participation in national and international associations puts us in touch with new trends, potential collaborations and promotes the exchange of knowledge.

In 2019 we collaborated with several Catalan universities (UB, UAB, UPC, URV, UdG and UdL) and research centres in Catalonia, including leading centres such as the BSC (Barcelona Supercomputing Center), the CVC (Computer Vision Centre) or EURECAT.

We have also collaborated with leading European R&D&I organizations, such as IWW (IWW Water Centre, Germany), KWR (Watercycle Research Institute, Netherlands), SINTEF (Foundation for Industrial and Technical Research, Norway), NTNU (Norwegian University of Science and Technology, Norway), CERTH (Centre for Research and Technology-Hellas, Greece), Exeter University (United Kingdom) or LNEC (Laboratório Nacional de Engenharia Civil, Portugal).

# EsAgua, Spain's innovative water footprint network



EsAgua is an outstanding initiative of Cetaqua in the field of sustainable development and the first water footprint network in Spain. With it, we contribute to the promotion of responsible consumption and production methods.

This tool arises from the growing demand for information on the water footprints of organizations, processes and products, to raise society's awareness of the concept through the web, social networks and conferences.

This year, Cetaqua actively participated in the promotion of information on the water footprint in EsAgua's webinar cycle (which has included a total of 4 online seminars) and in international conferences, like COP25, to share the importance of water and hydrological footprints as indicators of sustainability and to recognize the power of strategic alliances to meet development objectives.

**35**  
participating  
organisations

More than **700** participants  
to 4 open seminars on the  
sustainable use of water

EsAgua is currently sponsored by the Water Footprint Network and DNV-GL, and has 35 participating entities.



Promoted by



El modelo Cetaqua se ha aplicado también en otros centros en Galicia, Andalucía y Chile que siguen la misma estructura, comparten estrategia y trabajan en colaboración



Chile	Galicia	Andalucía	Barcelona

Cetaqua Barcelona	Cetaqua Galicia	Cetaqua Andalucía	Cetaqua Chile
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Research.  
Collaboration.  
Thinking forward.

CETAQUA  
CENTRO TECNOLÓGICO DEL AGUA

# Appendices

# Annual accounts 2019

## Income statement

Private funding	2.402.180 €
Public funding	957.319 €
Donations	2.613.328 €
<b>Total income</b>	<b>5.972.827 €</b>
Expenditure on projects	4.749.565 €
Expenditure on structures	1.223.262 €
<b>Total expenditure</b>	<b>5.972.827 €</b>

## Balance sheet

Non-current assets	448.140 €
Current assets	3.769.750 €
<b>Assets</b>	<b>4.217.890 €</b>
Net equality	1.609.156 €
Liabilities	2.608.734 €
<b>Net equality and liabilities</b>	<b>4.217.890 €</b>

# List of projects 2019

Title	Start date	End date	Funding entity	Cetaqua's role	Total budget	Cetaqua's budget
Analytic validation of pump sensors	9/12/19	25/9/20	Aigües de Barcelona	Coordinator	47.970 €	39.970 €
Operation and advanced asset management	1/3/18	31/3/21	ACCÍÓ	Partner	2.226.169 €	56.350 €
Artificial Intelligence for Zero Leak (phase 1)	1/10/19	31/12/19	SUEZ	Partner	82.000 €	25.000 €
Advanced Operation of Urban Drainage Systems	1/12/18	30/8/20	SUEZ	Partner	995.617 €	96.900 €
AT-Networks operation and management assistance	1/5/19	31/8/19	SUEZ	Coordinator	25.455 €	25.455 €
Bringing INnovation to onGOing water management – A better future under climate change	1/6/15	1/11/19	European Comission	Third Party	7.822.425 €	43.754 €
Online analysers for microbial sanitary risks control at SJD DWTP	6/11/19	30/11/20	Aigües de Barcelona	Coordinator	192.214 €	192.214 €
Condition Assessment Data Analysis Models	28/5/18	30/9/19	SUEZ	Coordinator	87.000 €	87.000 €
Implementation of improved methodologies for calculating the carbon footprint at Carboweb	1/10/19	31/3/20	Aigües de Barcelona	Coordinator	30.394 €	30.394 €
Connected Operator – Phase 2	2/2/18	31/5/19	SUEZ	Partner	250.000 €	25.000 €
Synthetic Fuels	1/9/16	31/12/19	ACCÍÓ	Partner	2.696.244 €	575.643 €
Characterization and proposal for the recovery of sludge and sand generated in wastewater treatment plants in Aigües de Barcelona	1/10/18	30/9/19	Aigües de Barcelona	Coordinator	51.277 €	51.277 €
DIAMOX, Element Six Electrooxidation with Diamond	1/8/18	30/4/20	SUEZ	Partner	204.905 €	85.534 €
Recovery and valorisation of urban digestate resources within the framework of the circular economy	4/5/18	31/3/21	ACCÍÓ	Partner	2.114.979 €	340.070 €
Industrial Doctorate UdG	16/2/17	16/2/20	AGAUR	Coordinator	78.352 €	66.000 €
Determination of Origins in Water Mixtures	2/7/18	31/10/20	Aigües de Barcelona	Coordinator	136.027 €	136.027 €
<i>Electrochlorination from brines for in-situ hypochlorite production</i>	25/3/19	15/7/19	SUEZ	Coordinator	65.800 €	65.800 €
Evaluation of multiparametric sensors for distribution networks	11/2/19	31/1/20	Aigües de Barcelona	Coordinator	161.811 €	161.811 €
Study of the efficiency of the methodology used for the planning of drainage in points of stagnant water	16/9/19	15/2/20	Aigües de Barcelona	Coordinator	58.373 €	58.373 €
Circular Gavà: Heading towards the implementation of circular opportunities in the territory	15/9/18	31/7/20	Aigües de Barcelona and Ajuntament de Gavà	Coordinator	84.506 €	84.506 €
Green Urban Actions for Resilient fire Defence of the Interface Area	14/1/19	1/2/22	European Comission	Partner	5.494.755 €	103.492 €
Development of Water Footprint web tool in the Urban Water Cycle for Aigües de Barcelona	3/12/18	31/1/20	Aigües de Barcelona	Coordinator	42.302 €	42.302 €
Improving PRedictions and management of hydrological EXtremes	1/10/15	1/10/20	European Comission	Partner	7.996.850 €	180.460 €
Intervention Management Support Tool (GooglePipes – Optimatics application) (Phase 1)	4/2/19	31/1/20	SUEZ	Coordinator	39.933 €	39.933 €

Title	Start date	End date	Funding entity	Cetaqua's role	Total budget	Cetaqua's budget
Agricultural pond detection through satellite images	7/10/19	2/12/19	Aigües de Barcelona	Coordinator	3.070 €	3.070 €
Efficient Integrated Real-time Control in Urban Drainage and Wastewater Treatment Plants for Environmental Protection	1/10/15	1/7/19	European Comission	Coordinator	2.170.801 €	699.296 €
Enhanced Nitrogen and phosphorus Recovery from wastewater and Integration in the value Chain	1/9/17	31/5/21	European Comission	Coordinator	2.786.531 €	866.783 €
New water solutions for the mining industry: towards minimum liquid discharge and by-product recovery	1/10/18	1/3/23	European Comission	Coordinator	1.812.708 €	1.035.531 €
Reducing the pressure of fish canneries on the marine environment with novel effluent treatment and ecosystem monitoring	16/7/15	31/1/20	European Comission	Partner	1.721.873 €	268.588 €
Low Input Sustainable Agriculture	1/3/18	31/3/21	ACC1Ó	Partner	2.169.487 €	250.766 €
Enhancing the Lifecycle of RO Membranes	6/9/18	1/11/20	SUEZ	Partner	78.600 €	33.300 €
Modelling of a 2D electro-coagulation and 3D electro-oxidation processes	1/3/19	15/10/19	SUEZ	Coordinator	29.200 €	29.200 €
Predictive models and demand management (MODEM) - RIS3CAT - package 4	2/4/18	31/12/20	ACC1Ó	Partner	2.060.000 €	117.000 €
Network data quality enhancement by automatic queries to the land registry office	21/10/19	14/12/19	Aigües de Barcelona	Coordinator	2.300 €	2.300 €
Analysis and integration of opportunistic field inspection into degradation models	4/11/19	29/11/19	SUEZ	Coordinator	6.000 €	6.000 €
Condition Assessment Model applied to Singapore cast iron network (2nd Phase)	1/1/19	31/7/19	SUEZ	Partner	40.000 €	40.000 €
DI Nitrogen Recovery	4/4/18	4/4/21	AGAUR	Coordinator	66.000 €	66.000 €
Systematic optimization of the operation and maintenance of the membrane processes in DWTP SJD	13/4/18	15/7/19	Aigües de Barcelona	Coordinator	264.880 €	264.880 €
Evaluation and proposal for the optimization of the elimination and recovery of nutrients (N&P) in the Baix Llobregat WWTP and WRS	1/6/19	10/4/20	Aigües de Barcelona	Coordinator	101.412 €	101.412 €
Customization of services to improve the customer experience	1/3/18	31/12/20	ACC1Ó	Coordinator	1.512.522 €	176.595 €
Industrialization of a data-driven predictive cleaning model for drainage network - Ph1	1/10/19	30/5/20	Aigües de Barcelona	Coordinator	116.000 €	116.000 €
Sample pre-treatment systems for online analysers of SJD DWTP	16/9/19	16/11/20	Aigües de Barcelona	Coordinator	172.845 €	172.845 €
Selection and evaluation of pre-treatments for the Sant Joan Despí DWTP	1/3/19	31/5/20	Aigües de Barcelona	Coordinator	181.700 €	181.700 €
Risk Assessment through Data Analytics Models	1/1/19	30/6/19	SUEZ	Partner	90.000 €	45.000 €
Recovery of Effluent Discharge for Sustainable Copper Processing in Europe	1/11/16	30/6/20	European Comission	Partner	1.182.213 €	179.649 €
Health Risk Management in reclaimed water	31/3/18	31/3/21	ACC1Ó	Partner	427.479 €	122.225 €
Reverse osmosis membranes rejuvenation	31/7/19	31/3/20	SUEZ	Coordinator	70.500 €	68.000 €
RESCCUE - RESilience to cope with Climate Change in Urban arEas - a multisectoral approach focusing on water	1/5/16	1/5/21	European Comission	Partner	8.023.343 €	934.625 €
Normalization module for Reverse Osmosis Data Streams	1/11/19	31/3/20	SUEZ	Coordinator	24.500 €	24.500 €
Security and cyber-security solutions in utilities for critical infrastructure protection	1/3/18	1/3/21	ACC1Ó	Partner	1.257.329 €	101.034 €
Network sensorization and inspection	1/3/18	31/12/20	ACC1Ó	Partner	2.491.766 €	259.966 €

Title	Start date	End date	Funding entity	Cetaqua's role	Total budget	Cetaqua's budget
AI-Enabled Computer Vision system for Health & Safety monitoring in plants	7/6/19	31/7/19	SUEZ	Coordinator	20.000 €	20.000 €
Shower Power	21/11/19	31/12/19	Aigües de Barcelona	Coordinator	2.992 €	3.000 €
Optimization of biological treatment deodorization at Besós WWTP	3/6/19	20/12/19	Aigües de Barcelona	Coordinator	59.488 €	59.488 €
Study of the determinants of demand, customer segmentation and demand forecasts. Case of Aguas Andinas	1/7/18	31/5/19	Cetaqua Chile	Coordinator	39.298 €	39.298 €
SOP Study of Deterioration of Drinking Water Transport and Distribution Networks	1/12/19	31/10/20	Aguas Andinas	Coordinator	280.000 €	25.992 €
Joint use of water resources on the Costa del Sol through geographical information systems and modelling	1/10/18	31/1/19	Cetaqua Andalucía	Coordinator	8.976 €	8.976 €
Event detection and determination of trihalomethane formation potential in SJD DWTP by online spectrometry	1/4/18	27/12/19	Aigües de Barcelona	Coordinator	301.151 €	301.151 €
Technical support for pilot-scale tests for treatment of reverse osmosis brines	22/7/19	31/5/20	SUEZ	Partner	72.000 €	72.000 €
Strategic, Tactical, Operational Protection of water Infrastructure against cyber-physical Threats	1/6/17	1/6/21	European Comission	Partner	9.616.525 €	453.375 €
Development of tools to support the implementation and management of reuse	16/9/19	31/7/22	ACA	Partner	321.727 €	88.033 €
Industrialization of a real-time algorithm for optimization of UF cleaning operations	1/1/19	31/3/20	SUEZ	Coordinator	114.166 €	114.166 €
Pilot testing of UFENIX service	1/7/19	31/1/20	SUEZ	Coordinator	40.000 €	40.000 €
Technological surveillance of online sensors	17/9/18	30/9/20	Aigües de Barcelona	Coordinator	47.049 €	47.049 €
RIM3: Reduction and Integrated Multisource Management of Macro and Micropollutants Phase 3	1/2/19	23/4/19	SUEZ	Partner	842.000 €	5.000 €
Innovative new service in sewer management using Computer Vision technology	2/2/18	31/12/19	SUEZ	Coordinator	150.000 €	150.000 €
Asset Management - Sewer Cleaning – Phase 3	19/11/18	31/7/19	SUEZ	Coordinator	25.000 €	25.000 €
Integrated modelling for better WWTP and sewer efficiency	19/1/18	20/1/20	SUEZ	Partner	331.000 €	25.000 €

# List of participations in congresses 2019

**Naiara Sáenz.** "Huella hídrica como indicador de sostenibilidad en agricultura y frente al desperdicio alimentario". Huellas ambientales para una agricultura sostenible. Elche, Spain. (31 January 2019)

**Miquel Sàrrias, Rafael Giménez.** "Aplicaciones de Computer Vision en el ciclo del agua". III Fórum De Innovación del Sector del Agua, Catalan Water Partnership. Barcelona, Spain. (7 March 2019)

**Montserrat Termes Rifé.** "Dynamic water prices for promoting a sustainable and efficient use". First European Forum on Regulation of Water services. Rome, Italy (12 March 2019)

**Montserrat Termes Rifé.** "Aceptación social de los proyectos de regeneración". III Congreso de Amigos del Agua: Evolución de los usos: reutilización, economía circular y nuevas tecnologías. Barcelona, Spain. (20 March 2019)

**María José Amores.** "Huella Hídrica: Indicador para la gestión sostenible del agua". Jornada del Club de Agua Subterránea. Madrid, Spain. (21 March 2019)

**Eduardo Martínez-Gomariz, María Guerrero-Hidalga,** Beniamino Russo, Daniel Yubero, **Manuel Gómez,** Salvador Castán. "Desarrollo y validación de curvas de daño y estanqueidad para la estimación de daños por inundaciones en zonas urbanas españolas". JIA 2019: VI Jornadas de Ingeniería del Agua. Toledo, Spain. (22 March 2019)

Beniamino Russo, **Marc Velasco, Eduardo Martínez-Gomariz,** José Luís Domínguez, Daniel Sánchez, Ares Gabàs, Andoni Gonzalez. "Evaluación de la resiliencia de los servicios urbanos frente a episodios de inundación en Barcelona. El Proyecto RESCCUE". JIA 2019: VI Jornadas de Ingeniería del Agua. Toledo, Spain. (22 March 2019)

Luca Locatelli, Beniamino Russo, **María Guerrero-Hidalga,** María Luísa Forcadell, Josep Montes, **Eduardo Martínez-Gomariz,** Montse Martínez. "Evaluación de los impactos generados por las Descargas de Sistemas de Saneamiento (DSS) en la ciudad de Badalona. El proyecto BINGO". JIA 2019: VI Jornadas de Ingeniería del Agua. Toledo, Spain. (22 March 2019)

**Eduardo Martínez-Gomariz,** Beniamino Russo, **Manuel Gómez, Luca Locatelli,** Montse Martínez, Josep Montes. "Evaluación del riesgo asociado a inundaciones pluviales para la ciudad de Badalona en un contexto de cambio climático. El proyecto BINGO". JIA 2019: VI Jornadas de Ingeniería del Agua. Toledo, Spain. (22 March 2019)

**María Guerrero-Hidalga, Eduardo Martínez-Gomariz, Montse Termes,** Beniamino Russo, **Manuel Gómez.** "Metodología para la estimación de daños indirectos causados por inundaciones". JIA 2019: VI Jornadas de Ingeniería del Agua. Toledo, Spain. (22 March 2019)

Belén Galofré, **Sonia Fernández,** Miquel Paraira. "Avances de la microbiología clínica a la microbiología ambiental". XXXV Congreso de AEAS. Valencia, Spain. (27 March 2019)

**Laurent Pouget.** "Gestión del agua en comunidades de regantes". Jornada de transferencia la aplicación de técnicas en agricultura de precisión. Lleida, Spain. (24 April 2019)

**María José Amores, Marina Isasa.** "Ecocirc Territori". Market Place 2019. Barberà del Vallès, Spain. (7 May 2019).

**María Jose Amores, Núria Basset, Clàudia Puigdomènech.** "Ecocirc Territorio-Cosin-Regireau" Jornada Intercomunidades en Economía Circular: Hacia dónde va el R+D en economía circular. Barcelona, Spain. (10 May 2019)

**Adriana Lucía Romero, Carmen Ovejero,** Sergio Beltrán, Alain Castro, Josep Gassó, Beatriz Reguera. "MemBoostGyV: Herramienta avanzada de monitorización online de la filtración en el BRM de la EDAR Gavà-Viladecans". VII Jornada BRM - BRM 2019. Barcelona, Spain. (16 May 2019).

Beniamino Russo, David Sunyer, Luca Locatelli, **Eduardo Martínez-Gomariz,** José Luis Domínguez, Miguel Pardo, Ares Gabàs, Maria do Céu Almeida, Maria Telhado, Iñes Candido, José Saldanha Matos, Barry

Evans, John Stevens, Rob Henderson, Marc Velasco. "Integrated modelling to analyse flooding resilience. The RESCCUE project". ECCA 2019: European Climate Change Adaptation conference. Lisbon, Portugal. (28 May 2019)

**Eduardo Martínez-Gomariz,** Salvador Vela, Beniamino Russo, Manuel Gómez, Aurea Plumed. "Flood Resilience of solid waste management in RESCCUE Project." ECCA 2019: European Climate Change Adaptation conference. Lisbon, Portugal. (28 May 2019)

**Eduardo Martínez-Gomariz,** Luca Locatelli, Beniamino Russo, Montse Martínez. "Socio-economic potential impacts of climate change due to urban pluvial floods in Badalona (Spain). The BINGO Project". ECCA 2019: European Climate Change Adaptation conference. Lisbon, Portugal. (29 May 2019)

**Eduardo Martínez-Gomariz,** Salvador Vela, **Desirée Marin.** "The RESCCUE approach for the effectiveness assessment of climate-related adaptation strategies in urban areas". ECCA 2019: European Climate Change Adaptation conference. Lisbon, Portugal. (29 May 2019)

**María Guerrero Hidalgo, Eduardo Martínez-Gomáriz, Montserrat Termes.** "The RESCCUE approach for strategies prioritization of climate-related adaptation strategies in urban areas". ECCA 2019: European Climate Change Adaptation conference. Lisbon, Portugal. (29 May 2019)

**Marina Arnaldos, Josep Manzano, Sara Monasterio, Xavier Bernat,** Yolanda Aguilera, Javier Carrillo. "Copper recovery from

mining waste water: pilot scale validation". 16th IWA Leading Edge Conference on Water and Wastewater Technologies. Edinburgh, United Kingdom. (10 June 2019)

**Carlos Echevarría**, Isabel Gutierrez-Prada, **Ignacio Martín**, **David Baquero**, **Marina Arnauldos**, **Teresa Alvariño**. "La integración de sistemas biológicos y tecnologías avanzadas de tratamiento para la eliminación de microcontaminantes orgánicos". Simposio Novedar: Presencia y eliminación de microcontaminantes en agua. Santiago, Spain. (13 June 2019)

**Carlos Echevarria**, **Marina Arnauldos**, **Xavier Bernat**, **Montserrat Termes**. "Water Reuse Hubs as enablers of water reuse implementation". IWA Water Reuse 2019. Berlin, Germany. (20 June 2019)

**Ignacio Martín**, **Carlos Echevarria**, **Jesús Salinero**, **Marina Arnauldos**, **Xavier Bernat**, Alberto Mejía Pérez, Irene Ruiz Oria, Guillermo Ríos Ransanz. "Advanced RO for water reuse and brine concentration in Copper Smelter effluents". IWA Water Reuse 2019. Berlin, Germany. (20 June 2019)

María A. Ruvira, Lidia Rodrigo-Torres, M. Carmen Macián, David R. Arahal, María J Pujalte, Belén Galofré, Gemma Saucedo, Carles Vilaró, **Sonia Fernández**, **David Baquero**, Anicet R. Blanch, Francisco Lucena, Cristina García-Aljaro, Laura Sala-Comorera, Daniel Toribio, Rosa Aznar. "La "Drinking Water Library", una historia de éxito en la identificación de cepas bacterianas presentes en aguas de consumo mediante MALDI-TOF MS". XX-VII Congreso Nacional de Microbiología 2019. Málaga, Spain. (2 July 2019)

**Bernat Joseph Duran**, **Jordi Meseguer**, **Gabriela Cembrano**. "Integrated Sewer Network and WWTP Real-Time Control". 9th International Conference on Sewer Processes and Networks (SPN9). Aalborg, Denmark. (27 August 2019)

**Lucia Alexandra Popartan**, Irina Velicu, **María José Amores**, Manel Poch. "Re-imagining the socio-hydraulic city: the case of Barcelona (2015-2019)". Royal Geographical Society Annual International Conference 2019. London, England. (28 August 2019)

**David Baquero**, **Laurent Pouget**, **Susana González**, Stefan Platikanov, Marta Ganzer, Jordi Martín. "Early event detection and prediction tools for surface drinking water catchment protection". International Conference Smarter Catchment Monitoring Cleaner Water. London, England. (4 September 2019)

**Álvaro Mayor**, Silvia López, Gabriel Lopez, Lucía Prieto, Alicia Gadea, César Valderrama, **José Luís Cortina**, Irene Mozo. "Nitrogen up-concentration from mainline and sidestream effluent in WWTPs for fertilizer valorization". 3rd IWA Resource Recovery Conference. Venice, Italy. (8 September 2019)

Beate Hambsch, Michael Hügler, Claudia Stange, **Clàudia Puigdomenech**, Ruben Juarez, Gemma Saucedo, María José Arnedo, Janis Eglitis, Robert Pitchers, Marlene Mark Jensen, Hans-Jørgen Albrechtsen. "Molecular methods for pathogen detection in drinking water treatment". 20th International Symposium on Health Related Water Microbiology. Vienna, Austria. (16 September 2019)

Congcong Sun, Bernat Joseph-Duran, **Gabriela Cembrano**, Vicenç Puig, **Jordi Meseguer**. "A Feedback Simulation Procedure for Real-time Control of Urban Drainage Systems". 1st IFAC Workshop on Control Methods for Water Resource Systems (CMWRS 2019). Delft, Holland. (19 September 2019)

**Maria José Amores**. "¿Como y por qué hemos de hacer el cálculo de la huella Hídrica? Huella Hídrica/agua y Economía Circular en organizaciones y territorios. Granollers, Spain. (25 September 2019)

**Maria José Amores**, **Marina Isasa**. "Creando modelos de valor a través de la Economía Circular en territorios". Jornada Efiagua. Valencia, Spain. (1 October 2019).

**Filippo Alfonso Baldaro**, **Montserrat Termes Rifé**. "An international view on water regulated markets: comparison between centralized regulation and decentralized regulation models". IWA Economics and Statistics Specialist Group workshop, in GSPP conference - Water Forum. Nur-Sultan (Astana), Kazakhstan. (12 October 2019)

**Susana González**, **David Baquero**, Isabel Gutiérrez. "Contaminantes emergentes: problemática, monitorización y soluciones para su eliminación en aguas residuales". XXIII Congreso chileno de ingeniería sanitaria y ambiental. Santiago de Chile, Chile. (16 October 2019)

**Núria Basset**, **Paula Gómez**, Andrés Donoso-Bravo, Jordi Guilera, Teresa Andreu, Ignasi Mallo, Marisa Latorre. "Proyecto COSIN, hacia el gas renova-

ble y el almacenamiento químico de la energía en depuradoras". XXIII Congreso chileno de ingeniería sanitaria y ambiental. Santiago de Chile, Chile. (16 October 2019)

Carmen Lacoma, Yago Lorenzo, Diego Olivares, **Mario Ruiz**, Luís Felipe Salazar, Alejandra Sepulveda. "Cálculo de Huella de Agua e Hídrica. Caso Aguas Andinas, Aguas Cordillera y Aguas Manquehue". XXIII Congreso chileno de ingeniería sanitaria y ambiental. Santiago de Chile, Chile. (16 October 2019)

**Montserrat Termes Rifé**, **Mª José Amores**, **Marina Isasa**. "How Achieving Circular Economy in Cities through Resource Flow Analysis?". Asociación Ciencia Regional. Castelló, Spain. (20 October 2019).

**Miquel Sàrrias Montón**. "Utilización de los datos Copernicus en la gestión del agua". VI Jornadas de ingeniería del agua. Toledo, Spain. (24 October 2019)

**Maria José Amores**. "To accelerate the transition to a circular economy model in regions and organizations" Smart City Expo. Barcelona, Spain. (19 November 2019)

**Desirée Marín**. "Experiencias de economía circular en territorios y empresas". Black Green Friday. Sant Cugat, Spain. (29 November 2019)

**Mario Ruiz Mateo**. "Guardian. Del proyecto a la ejecución." III Jornada de Economía Circular – Riba-Roja de Túria. Riba-Roja, Spain. (19 December 2019)

# List of scientific publications 2019

L. Romero, C. Sun, R. Guasch, B. J. Duran, **Jordi Meseguer, Gabriela Cembrano, V. Puig** (2019). "A Feedback Simulation Procedure for Real-time Control of Urban Drainage Systems". ScienceDirect - IFAC- PapersOnLine. DOI: 10.1016/j.ifacol.2019.11.016

**Miquel Sàrrias, Laurent Pouget** (2019). "Utilización de los datos Copernicus en la gestión del agua". Revista Ingeniería del agua. <https://www.hidralab.com:4430/jia2019/wp-content/uploads/2019/10/R099.pdf>

**Eduardo Martínez Gomariz, María Guerrero Hidalgo, Manuel Gómez Valentín, B. Russo, S. Castán** (2019). "Desarrollo y aplicación de curvas de daño y estanqueidad para la estimación del impacto económico de las inundaciones en zonas urbanas españolas". Revista Ingeniería del agua. DOI: 10.4995/ia.2019.12137

**Eduardo Martínez Gomariz, B. Russo, Manuel Gómez Valentín, A. Plumed** (2019). "An approach to the modelling of stability of waste containers during urban flooding". Journal of Flood Risk Management. DOI: 10.1111/jfr3.12558

J. Guilera, T. Andreu, **Núria Basset, T. Boeltken, T. Friedemann, I. Mallol, J. R. Morante** (2019). "Synthetic natural gas production from biogas in a waste water treatment plant". Renewable Energy. DOI: 10.1016/j.renene.2019.07.044

M. J. Gunnarsdottir, S. M. Gardarsson, M. J. Figueras, **Clàudia Puigdomènech, R. Juárez, G. Saucedo, M. J. Arnedo, R. Santos, S. Monteiro, L. Avery, E. Pagaling, R. Allan, C. Abel, J. Eglitis, B. Hamsch, M. Hügler, A. Rajkovic, N. Smigici, P. Hunter** (2019). "Water safety plan enhancements with improved drinking water quality detection techniques". Science of The Total Environment. DOI: 10.1016/j.scitotenv.2019.134185

**Carlos Echevarría, C. Valderrama, José Luis Cortina, Ignacio Martín, Marina Arnaldos, Xavier Bernat, A. De la Cal, M. R. Boleda, A. Vega, A. Teuler, E. Castellví** (2019). "Techno-economic evaluation and comparison of PAC-MBR and ozonation-UV revamping for organic micro-pollutants removal from urban reclaimed wastewater". Science of the Total Environment. 671, pp. 318-326. DOI: 10.1016/j.scitotenv.2019.03.365

S. Platikanov, **David Baquero, Susana González, J. Martín-Alonso, M. Paraira, José Luis Cortina, R. Tauler** (2019). "Chemometric analysis for river water quality assessment at the intake of drinking water treatment plants". Science of the Total Environment. 667, pp. 552-562. DOI: 10.1016/j.scitotenv.2019.02.423

I. Sancho, S. Lopez-Palau, N. Arespacochaga, **José Luis Cortina** (2019). "New concepts on carbon redirection in wastewater treatment plants: A review". Science of the Total Environment. 647, pp. 1373-1384. DOI: 10.1016/j.scitotenv.2018.08.070

# List of collaborations 2019

## Universities and research centres

### Cetaqua Technology Centres

CETAQUA  
GALICIA

CETAQUA  
ANDALUCÍA

CETAQUA  
CHILE

### Universities and other R&D&I centres



## Associations and public entities

### Associations



### Public entities



## Private companies



# We're carbon neutral

As part of our commitment to the environment, we offset the CO<sub>2</sub> we generate to combat global warming.

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# Research Collaboration Thinking forward

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