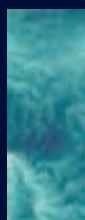


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foreword



Eloy García Calvo

Director, IMDEA water Institute
April 2011

This IMDEA Water Institute report, corresponding to 2010, reflects an important step in the configuration of our centre. As ever in this evolution, our efforts are geared towards flexibility, efficiency, the attraction of talent and multidisciplinary research. Along these lines and with the aforementioned instruments, we are ready to approach the complex issues our society has to deal with in relation to water resources.

In an atmosphere of severe global economic difficulties, we have been fortunate enough to receive funds that enabled the incorporation of 15 new members, 8 of them doctors from 7 different countries, with solid training and experience acquired in universities and research centres of acknowledged prestige. We were also able to acquire equipment for chemical analysis that is a benchmark in the European scope, in addition to completing the geomatics laboratory.

This growth allowed us to continue our activity in European projects (2), CONSOLIDER, CENIT as well as other projects in national and regional initiatives. In addition, we have drafted and applied for new projects, among them a new one granted under the auspices of the 7th FP. Among our projects and activities in collaboration with companies and organisations both public and private, the alliances with organisations like the World Bank or the United Nation (UN) are worthy of note.

Under the Strategic Plan 2008-2011, new research lines were opened up in 2010, notably concerning increased involvement in the membrane technology area, the commitment to increasing activity in biological quality indicators in bodies of water or a group of activities related to geothermal and water in mining.

Although the scientific results expected will come to light in the long term, the 29 articles or 9 book chapters published are worth a mention, in addition to several scientific-technical reports, participation in congresses, in many cases with outstanding lectures or keynote speeches, as well as organising events and publicising water issues.

In the training area we should note our active collaboration in the “Hydrogeology and Water Resources Management” postgraduate programme, involving the elaboration of 14 doctoral theses linked to IMDEA Water and tutoring dozens of final Master course works.

This year, we also received recognition with the seal of excellence in Human Resources Management in Research granted by the EU, or the “IWA prize for innovation in the practical realisation of sustainable urban water management” (in the frame of the “2010 Prizes for Excellence in Sustainable Urban Water Management”).

Finally, we should highlight the fact that this year the foundations were laid for construction of the Institute’s definitive headquarters, which we shall soon be able to enjoy to the full. This rounds off a cycle of growth and paves the way to one of stabilisation.



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overview

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1.1. Presentation

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

IMDEA Water's remit is to guide water problems along the path of research and education; to serve as a fundamental scientific resource and voice of authority on water issues in the region and the country; to prepare students to develop the next generation of leaders in water-related questions; to become a national model as a successful water research centre and provide recognition, visibility and resources to the Institute and the people and organisations involved with it.

1.2. Management structure

The main governing body of IMDEA Water is the Board of Trustees. The Board appoints the Director, who is assisted by the Deputy Director. Both the Director and Deputy Director are assisted by the manager who takes care of the legal, administrative and financial activities of the institute (Figure 1).

A Scientific Council assists the Board of Trustees and Directors in their functions. Council tasks include the selection of researchers and assessing the scientific activities of the researchers and the institute as a whole to ensure research excellence.

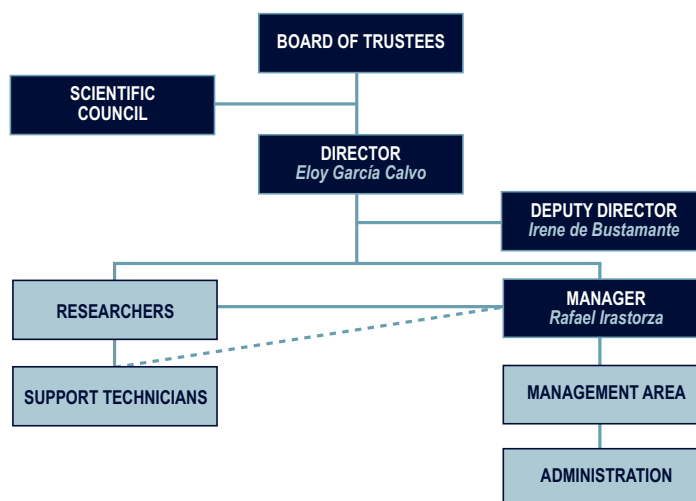


Figure 1. IMDEA Water management structure

1.3. Location

The institute is located in the Science and Technology Park at the University of Alcalá, one of the technology parks recently created by the universities and the Community of Madrid, so that IMDEA Water can benefit from the existing investigative framework and the alliances developed through the proximity to other research, development, and innovation centres. IMDEA Water accounts for an area of 950 m². The site dedicates 50% of its space to laboratories (Photo 1).



Photo 1. Temporary location

1.4. Governing bodies

1.4.1. Board of Trustees

The Foundation is governed and managed by a Board of Trustees comprising a President, a Vice-president, Trustees and a Secretary.

PRESIDENT

Mr. Rafael Fernández Rubio

Dr. in Mining Engineering

Professor Emeritus of Madrid Polytechnic University, Spain

Rey Jaime I Prize for Environmental Protection

Doctor Honoris Causa of University of

Lisbon, Portugal

EX OFFICIO TRUSTEES (REGIONAL GOVERNMENT OF MADRID)

Mrs. Alicia Delibes Liniers

*Regional Government Vice-Secretary for Education, Department of Education. Regional Government of Madrid, Spain
Vicepresident IMDEA-Water Foundation*

Mr. Federico Ramos de Armas

*Director General of Environment Department of Environment, Housing and Territory
Regional Government of Madrid, Spain*

Mr. Jorge Sáinz González

Subdirector General of Research Directorate General of Universities and Research, Department of Education. Regional Government of Madrid, Spain

Mrs. Beatriz Presmanes Arizmendi

Chief of Research Programmes Sub Directorate of Research Directorate General of Universities and Research, Department of Education. Regional Government of Madrid, Spain

ELECTIVE TRUSTEES (INSTITUTIONAL MEMBERS)

Mr. Juan José Vaquero

Full Professor of Organic Chemistry University of Alcalá. Madrid. Spain

Mr. José Aguado Alonso

Full Professor of Chemical Engineering Rey Juan Carlos University. Madrid. Spain

Mr. José Luis Sotelo Sánchez

Full Professor of Chemical Engineering, Complutense University. Madrid. Spain

CIEMAT

Energy, Environment and Technology Research Centre CIEMAT. Madrid. Spain

ELECTIVE TRUSTEES (PRESTIGIOUS SCIENTISTS)

Mr. Avelino González González

Head of Environment Technologies and Pollution Prevention. Research Directorate General-European Commission. Brussels. Belgium

Mr. Marco Vighi

*Department of Environmental Sciences and Territory. Faculty of Mathematical, Physical and Natural Science. University of Milano Bicocca. Italy
Member of the Scientific Committee on Health and Environmental Risk (SCHER) of the European Commission*

Mr. José C. Merchuk

Department of Chemical Engineering and Biotechnology Unit, Engineering Science Faculty. Ben-Gurion University of Negev. Beer Sheva. Israel

ELECTIVE TRUSTEES (EXPERT MEMBERS)

Mr. Manuel Ramón Llamas Madurga

*Director of M. Botín Foundation. Water Observatory. Professor Emeritus. Complutense University. Madrid. Spain
Permanent Member of the Royal Academy of Exact, Physical and Natural Sciences, Madrid. Spain*

Mr. Adriano García-Loygorri

*President of the Social Council. Polytechnic University of Madrid
Permanent Member of the Royal Academy of Exact, Physical and Natural Sciences, Madrid
Polytechnic University. Spain*

ELECTIVE TRUSTEES (COMPANIES)

CANAL DE ISABEL II

Mr. Fernando Arlandis Pérez. Subdirector of Studies, Programmes and Corporate Social Responsibility Spain

SACYR VALLEHERMOSO-VALORIZA AGUA

Mr. Domingo Zarzo Martínez. Technical Director, Murcia. Spain

ASOCIACIÓN DE EMPRESARIOS DEL HENARES (AEDHE)

Mr. Jesús Martín Sanz. President Alcalá de Henares. Madrid. Spain

AQUALIA. INTEGRAL WATER MANAGEMENT

Mr. Enrique Hernández Moreno. Director of Services Management. Madrid. Spain

ELECTIVE TRUSTEES (LOCAL ADMINISTRATION)

MUNICIPALITY OF ALCALÁ DE HENARES

Mr. Juan Jesús Domínguez Picazo. Councillor for Environment, Consumption and Waters, and Deputy Mayor of Alcalá de Henares City Council. Alcalá de Henares. Madrid. Spain

SECRETARY

Mr. Alejandro Blázquez Lidoy

1.4.2. Scientific council

The Scientific Council was constituted as follows:

Mr. Rafael Fernández Rubio

*Dr. in Mining Engineering
Professor Emeritus of Madrid Polytechnic
University. Spain
Rey Jaime I Prize for Environmental
Protection
Doctor Honoris Causa of University
of Lisbon. Portugal*

Mr. Avelino González González

*Head of Environment Technologies
and Pollution Prevention.
Research Directorate General-
European Commission. Brussels.
Belgium*

Mr. Marco Vighi

*Department of Environmental
Sciences and Territory. Faculty of
Mathematical, Physical and Natural
Science. University of Milano
Bicocca. Italy
Member of the Scientific Committee on
Health and Environmental Risk (SCHER)
of the European Commission*

Mr. José C. Merchuck

*Departament of Chemical
Engineering and Biotechnology
Unit, Engineering Science Faculty.
Ben-Gurion University of Negev.
Beer Sheva. Israel*

Mr. M. Ramón Llamas Madurga

*Director of Foundation M. Botín.
Water Observatory
Professor Emeritus. Complutense
University. Madrid. Spain
Permanent Member of the Royal
Academy of Exact, Physical and
Natural Sciences, Madrid. Spain*

Mr. Félix Cristóbal Sánchez

*Highway, Canal and Port Engineer
Canal de Isabel II Administration
Committee. Spain*

Mr. Bo Jansson

Professor Emeritus. Stockholm University

Mr. Emilio Custodio Gimena

*Full Profesor. Polytechnic University of
Catalunya. Spain*

Mr. Paul L Younger

*C.Eng. C.Sci. C.Geol. FGS FICHEM
Pro-Vice-Chancellor (Engagement)
Newcastle University, UK*

Mr. J A Allan

*Department of Geography,
King's College London, The Strand
Centre of Near and Middle Eastern
Studies, School of Oriental and African
Studies, London, UK*


Mr. Domingo Zarzo Martínez

*Technical Director
Murcia. Spain
SACYR VALLEHERMOSO-VALORIZA
AGUA*

Mr. Frank Rogalla

*Director of Innovation and Technology.
Madrid. Spain
AQUALIA. INTEGRAL WATER
MANAGEMENT*





2 active research lines and projects

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2.1. Urban and Industrial Wastewater Treatment

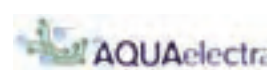
2.1.1. Electricity and Hydrogen Production Bases on Residual Water Bacterial

The main goal of this research proposal is to use *Geobacter* to convert the chemical energy stored in organic matter from wastewater into electricity and hydrogen. One of the most exciting features of this technology is the possibility of harvesting clean energy from waste during its treatment, so the classical methane-generating stage in wastewater treatment could be eliminated.



2.1.2. Wastewater Treatment by microbial bioelectrogenesis process (AQUAELECTRA)

<http://www.aquaelectra.es>



This collaboration project pursues three aims: to develop a natural wastewater purification system by means of bioelectrogenic wetlands; to establish an anaerobic bioelectrogenic treatment system for wastewaters and construct a bioelectrogenic removal system for nutrients (nitrogen). Bioelectrogenesis is a new process whereby determined bacteria can oxidise organic material and directly transfer the electrons generated to a conductive solid surface, such as graphite. This way, it is possible to generate and store clean energy. The use of aerobic microorganisms to remove organic matter from wastewaters is widespread, but entails two of the main problems currently associated with water treatments: the generation of biomass in the form of active sludge and the high energy cost of supplying oxygen to the biological system. The use of microbial anaerobic metabolism in water treatments is proposed as a viable alternative due to the lower biomass yield in these biological processes (less sludge produced) and the possibility of generating biogas (methane) that may be used as fuel for thermal and electrical energy generation. Methane presents the drawback that it is a greenhouse gas, even more toxic than CO₂. In this sense, bioelectrogenesis offers the alternative of replacing methane generation by the production of clean electrical energy in the treatment plan.

2.1.3. Bacterial wiring for energy conversion and bioremediation (BACWIRE)

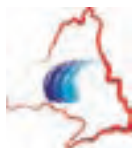
The aim of the project is to develop a new paradigm for the simultaneous cogeneration of energy and bioremediation using electro-active bacteria. A new nano-structured transducer that efficiently connects to these bacteria will be developed, aimed at the production of devices with higher performance across a range of applications including microbial fuel cells, whole cell biosensors and bioreactors.



2.1.4. Water purification through capacitive deionisation (TAPCAP)

The main aim is to study and develop the components of high performance supercapacitors, based on the use of low-cost nanomaterials for use in the deionisation of water with high saline content, or pollutants with heavy metals in solution or any organic species with electrical charge.

The use of these supercapacitors will reduce the amount of energy used compared with traditional water purification systems, since there is an accumulation of electrical charges on the electrodes during deionisation. This energy can be released during the regeneration cycle, which is very simple and efficient, since it would be a procedure similar to the discharge of a capacitor.



2.1.5. Madrid Advanced Wastewater Treatment Network with Non-Biodegradable Pollutants (REMTAVARES) <http://www.remtavares.es/>

REMTAVARES will be the reference point in terms of advanced technologies in wastewater management to ensure sustainable development for the Community of Madrid.

The lines of research that support these technologies are: adsorption, hydrodechlorination, advanced oxidation (Fenton, ozonation and photocatalysis), catalytic wet oxidation and catalytic oxidation in supercritical conditions.

2.1.6. Application of Biological Reduction for the Removal of Sulphate and Other Toxic Metal in Wastewater

Sulphate is one of the most abundant anions in the environment. As a result of numerous industrial activities (paper and textile industries, food production, coal combustion, etc.), the sulphate is discharged into surface waters and groundwater. Its excessive accumulation can lead to damaging consequences due to its harmful effects on human health and other living things.

The purpose of this project is to obtain a device for the removal of sulphate-contaminated wastewater using anaerobic bacteria, generic sulphate reducers (e.g. *Desulfovibrio desulfuricans*) and reducing-reducing bacteria already present in the waters to be treated.

2.2. Reclaimed Water Reuse

2.2.1. Treatment and Reuse of wastewater for sustainable Management (CONSOLIDER-TRAGUA) <http://www.consolider-tragua.com/>

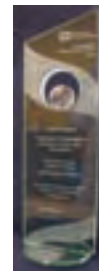
The main objective is to harness the expertise of 24 research groups in different areas to address the reuse of purified wastewater in an integrated manner. To this end, a strong multidisciplinary team with proven research experience was formed. The team carried out a study of the application of water treatments from WWTPs based on advanced technologies. This set the criteria for chemical and biological water quality and for determining their impact on the environment. As with any other sustainability-oriented activities, there are also economic benefits, so the proposals have relevant socio-economic value.

IWA 1st prize: “IWA prize for innovation in the practical realisation of sustainable urban water management” (in the frame of the “2010 Prizes for Excellence in Sustainable Urban Water Management”).

2.2.2. Reuse of Treated Water for Environmental Applications: groundwater recharge using permeable reactive barriers and for energy forestry purposes (REAGUAM)

From the physical environment point of view, this project deals with the study of two different technologies for the reuse of urban waste water for environmental applications under RD 1620/2007: first re-use agricultural techniques (Green Filters species and irrigation for biomass and biofuels) and reuse of surface recharge systems through regeneration by horizontal reactive beds.

The main aim is to develop the applicability of these technologies in environmental applications for small communities. Within this overall goal are the following objectives: a) restoring the treated water, reducing the mobility and bioavailability of unwanted substances present in purified water, and b) achieving an added environmental benefit through reuse in irrigation for generation of biomass crops for energy purposes.





2.2.3. Regeneration of Treated Water by in-Situ Passive Technique: Reuse for Irrigation and Recharge

Current technology allows us to treat any type of water with a high level of quality, regardless of its origin. The main problem is presented by the high-energy consumption required. Extensive treatment technologies for wastewater provide an advantage to treating in a natural environment. This provides the water quality needed to dump water without any impact. However, much more can be done, using this natural ability to provide high-quality water required for use in completely different areas.

The overall project aim is to advance the study of methodologies for the reuse of purified wastewater by irrigation and infiltration through the field, to preserve the quality of groundwater and enhance water resources (reclaimed water).

2.2.4 Wastewater Treatment from Bentonite Sludge

With the Bentonite slurry filter, some water cannot be recycled back into the construction process due to its quality. Problems arise because of sludge flocculation. This means that it must be discharged into the sewage system, requiring pH correction to comply with the legal parameters.

This project attempts to solve these problems by adjusting the water to a sufficient quality to be reused in the process. This prevents spillage and optimises water use in the construction process.



2.2.5. Technological development for self-sustainability of the urban cycle (SOSTAQUA)

<http://www.sostaqua.com/>

The ultimate goal of the project is to ensure that self-sustainability of the urban water cycle will be more likely the lower the requirement for natural resources (water and energy) and the lower the volume of waste generated.

The project plans to contribute to this objective through the exploitation of nonconventional water sources, the recovery of waste collected, minimising energy demand outside the cycle and assessing environmental health-risk behaviour.



2.3. Microcontaminants

2.3.1. Development of a continuous nitrate measuring probe in groundwater (NITROMED)

The main objective is to develop an industrial and commercial submersible probe for nitrate concentration measure in water.

The probe mechanism will enable remote and continuous measurement of nitrate in fresh-water, seawater and wastewater.



2.3.2. Nanoparticles and water quality (NANOQUAL)

The environmental and health risks of nanotechnology and nanomaterials are still not well known, and even less in water than in the air. The reason is the lack of data on the evaluation, behaviour and transformation of these materials. It is necessary, now that there is still time, to carry out extensive research work to determine the risks of nanomaterials and the use of nanotechnology. Knowledge of the environmental behaviour of these substances will allow ways to reduce these risks to be found.

The overall aim of this project is to gain knowledge, for materials representing different families, on their behaviour in water, mobility and final destination, as well as the appropriate techniques for their neutralisation and/or removal. Therefore, we will be able to tackle the problems that will be generated when, in a not too distant future, production and massive use of nanomaterials lead to concentrations of these products in water that could cause concern.



2.3.3. Emerging contaminants

The research activities consist of determining the occurrence, behaviour and evolution of emerging contaminants (pharmaceutical products, personal care products and nanomaterials) in surface and groundwater, and establishing relationships between land use and the appearance of emergent pollutants in groundwater.

2.3.4. A reference centre to manage information on Persistent Organic Pollutants (CNR-COPs)

<http://www.cnr-cop.es/>

COPs are chemicals that have certain toxic properties and, unlike other pollutants, are resistant to degradation, making them especially harmful to human health and environment. COPs bioaccumulate, are transported by air, water and migratory species and build



up in terrestrial and aquatic ecosystems. As this is a cross-border issue, it is therefore essential to take measures on an international level.

The actions of the National Implementation plan within this context focus on improving awareness, information and training of society in general and the sectors most directly involved.

2.4. Economic and Institutional Analysis

2.4.1. IWRM (Integrated Water Resource Management) – Economic and Legal Dimensions

- Modernisation of water management, regarding economic, legal and institutional aspects; specifically, use and water use rights markets, within a context of water economic scarcity and regulation of drinking water and sanitation services.
- Water conflict Management

2.4.2. Analysis of Economic Instruments for Water Management

Evaluation of effectiveness of economic instruments in integrated water policy (EPI-Water)

<http://www.feem-project.net/epiwater/index.html>

Economic policy instruments (EPI) have received widespread attention over the last three decades, and have increasingly been implemented to achieve environmental policy objectives. However, whereas EPI have been successfully applied in some policy domains (such as climate, energy and air quality), their application to tackle water management issues (drought/water scarcity, floods, water quality control) is beset by many practical difficulties.

Using a common multi-dimensional assessment framework, to compare the performance of single economic instruments with alternative policy instruments and baseline scenarios. In particular:

- Analysing the extent to which economic instruments contribute to achieving water policy goals (e.g. good ecological status of water bodies, flood protection, reducing risk and uncertainty in water availability), either directly (via changing use/consumption behaviour) or indirectly (via raising financial resources for implementing water policy protection measures);



- Analysing the efficiency implications of economic instruments, or to what extent they contribute to an optimum allocation and use of water resources (or goods and services provided by aquatic ecosystems), also in situations in which not all use- and non-use values are known or fully accounted for.
- Pinpointing the preconditions for economic instruments (or group of instruments) to be workable, effective and/or efficient in given socio-economic, hydrological, cultural and institutional conditions in Europe, whether in isolation or in combination with command and control mechanisms.
- Identifying remaining research and methodological issues that need to be addressed, in particular with regard to the further development and use of national accounting to support the design, implementation and evaluation of EPI in the field of water management.

2.4.3. Economic and Legal Analysis of drinking water and sanitation service regulation

- Analysis of international agreements on international trade and legal protection of foreign investment in water resources, rights and uses of local population and drinking water and sanitation supply.
- Analysis of factors driving the industrial structure of drinking water and sanitation (W&S) services.



2.5. Membrane Technology

The IMDEA Water membrane research group is working on the synthesis of thin film composite (TFC) membranes with sulphonated polymer, doped with nanoparticles and hybrid nanoparticles. Membranes are tested with reverse osmosis (RO) and forward osmosis (FO) processes to treat seawater. The group is also working on assessing fouling and the effectiveness of different cleaning treatments as well as surface modification of commercial membranes.

2.6. Geothermal

IMDEA Water collaborates in the Spanish Geothermal Technology Platform (GEOPLAT), participating actively in different working groups: shallow geothermal, deep geothermal, geothermal resources research, regulatory framework and training. IMDEA Water is also part of the AENOR working group, which is currently developing a regulation applicable in shallow geothermal energy. In addition, IMDEA Water is taking part in the Renewable Heating & Cooling European Technology Platform (RHC).

The Aim of IMDEA Water is to investigate geothermal energy from the point of view of water, because in all the different exploitation techniques for deep geothermal (flash plants, binary cycle plants, GS, etc.) and shallow geothermal (open loop, closed loop with heat exchanges etc.), water plays an essential role as vehicle for energy transport, with groundwater as the principal heat storage agent.

2.7. Water and Mining

2.7.1. Water and Mining Industry

Water resources are especially sensitive to mining activity, due to the intense environmental impact it causes, which in many cases includes generation of acid waters, pollution by heavy metals, modification of the hydrogeological conditions of auriferous, etc. These effects are compounded by the demand for water, especially in areas with scant resources, which often gives rise to competition with the demand from other productive sectors such as agriculture.

IMDEA Water has initiated two lines of work in the field of water and the mining industry: one in relation with the characterisation of the direct environmental impacts provoked by the mining industry, and another concerning water reuse and recycling for mining purposes.

2.7.2. Concentrate (Salt) management from inland desalination

IMDEA Water works to find solutions for the management of the concentrate obtained as a by-product in inland desalination and water treatment plants. It was observed that all usual processes for concentrate disposal (discharging on the surface, evaporation lagoons, and so on) lead to a loss of water and an extra economical burden, in addition to the negative aspects associated with each of them. This research line is therefore mainly focused on the only viable option to manage this kind of concentration nowadays, which is deep well injection, but only where the geology and hydrogeology of the area meets certain conditions to be able to carry out deep injection in isolated deposits. Similarly, IMDEA Water is examining different methods currently under research and development to achieve a sustainable and viable management of concentrate by-product from large interior desalination plants. All of these emerging methods tend to achieve virtually zero liquid discharge, which means a higher use of the water (as a resource) and, occasionally, the possibility to use the solid waste depending on its composition.



2.8. Biological Indicators

2.8.1. Biological indicators of water body quality: macroinvertebrates

The Index of Trophic Completeness (ITC) method of aquatic ecosystem health integrity estimation was developed in 1998 as a result of many years of joint research by the Russian Institute of Water Management and Protection (RosNII VH) and Dutch Institute RIZA. It is based on the ecosystem approach where pathways of energy and substances among biotic and abiotic components of ecosystem are of central importance. The Index of Trophic Completeness (ITC) is a new method for evaluating and monitoring the condition of aquatic ecosystems. The method focuses more on the study of functional connections (such as trophic links and nets) among organisms and their environment than on the species composition of communities, indicator species or species density. Results suggest that the new ITC method may be sensitive to a broad range of disturbances, such as agricultural activity, heavy metal and acid contamination, or river engineering.



2.9. Climate Change

2.9.1. Urban Hydraulic structures and climate change

This research line is focused on determining the possible changes in the design of hydraulic structures due to expected changes in precipitation extremes under a climate change perspective. A possible re-design should be considered either for new hydraulic schemes



or for existing structures under new conditions. The first step consists of analysing the long-term trends of precipitation and its fluctuations from weather stations with sufficient observed data (100 years or more). The second step will provide -based on medium and long-term timescales- the new design for hydraulic structures with the support of the changes anticipated by the IPCC.

2.9.2. Methodologies for calculating evapotranspiration: scintillometry and remote sensing

Dealing with water scarcity is nowadays one of the most important issues worldwide. In arid and semi-arid regions, irrigation water consumption becomes especially critical. Accurate estimates of crop evapotranspiration can help to regulate this water consumption.

We are currently carrying out an investigation on the estimation of evapotranspiration in the Henares river basin (Madrid-Spain). The aim is to develop a methodology for accurately estimating evapotranspiration through remote sensing, by relating satellite imagery with scintillometer ground measurements. Using a scintillometer we can gauge the sensible heat flow over a surface, from which it is possible, at the same time, to calculate the current evapotranspiration through a surface energy balance and the other components also measured (net radiation and soil heat flow).

2.10. Tool Development for Water Resource Management

There is a need to develop tools to support the management of water resources, through the correct assessment of the present state of the resource and its possible evolution in different scenarios.

IMDEA Water is working on the methodological development and application of different management support tools, including remote sensing, geodatabase construction and design, and geological and hydrological modelling. Remote sensing techniques enables the location and estimation with the required precision of some important terrain features such as crop evapotranspiration, land uses, vegetation index, etc. The geodatabase records and arranges all this information, giving as result a GIS able to analyse the topological and quantitative relations of different variables. The knowledge of those variables and their relations is materialised in the implementation of a Hydrological Information System. This will allow construction of the hydrological model and will be the basis for decision-making in managing the resources.

2.11. Hydraulic Heritage

Research into water heritage aims to resolve conflicts between the existence of heritage structures and the current social need for development and growth. To this end, four main lines of action have been created:

1. Inventory and valuation of heritage systems using new technology as an integrator of different sources of data and information processing.
2. Development of valuation and territorial management support structures as useful tools for decision making.
3. Analysis of socio-economic values of water cultural heritage systems, from a sustainable strategy of traditional systems that allow their survival and constitute forms of support for endogenous economic development.
4. Assessment of heritage and traditional landscape impacts (positive and/or negative) to be integrated in a holistic manner in complex landscape systems, in which water flows are common elements.

2.12. Water Footprint

Water footprint is an index to estimate the impact of human goods and service on water bodies, whether at local, regional, national or global level. These impacts are important not only at the point of production or consumption, but also in the international context. Estimating the virtual water flows associated with the exchange of goods and services could be a useful tool for river basin water management.

To determine the virtual water flows inside the country, the Spanish Environment Ministry has approved a planning statement (Order ARM/ 2656/2008) to include a periodical water footprint analysis in river basin water management.





3

human resources

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- 3.2. **Laboratory Technicians [36]**
- 3.3. **Management Area and Administration [36]**

research groups

water and chemistry



Dr. Eloy García Calvo

Director

Chair Professor at the Department of Analytical Chemistry and Chemical Engineering, University of Alcalá (Spain) since 1992. He graduated with a PhD in Industrial Chemistry from the Complutense University of Madrid in 1976 and has been engaged in research at the University of Alcalá since 1980.

Biochemical engineering focused on bioreactor design process development and wastewater treatment are currently his most notable research lines. He has guided and taken part in several research projects financed by European and Spanish public funds and also in cooperation with Spanish enterprises (R&D).

He is a peer-reviewer for several international journals and is also a member of international committees. He has wide experience in the management of R+D programmes, plans and actions, as well as his activities as manager of the Environmental R+D Programme (Spanish National R&D Plan) and coordinator of the Technologies for Environment Programme (Community of Madrid). He is currently the leader of the TRAGUA research group (wastewater treatment and reuse), a multidisciplinary project with more than 200 researchers.

Dr. Amadeo Rodríguez Fernández-Alba

Researcher

Head of the Department of Management and Regulation of Point and Diffuse Pollution of IMDEA Water. He obtained his PhD on Chemical Sciences from the University of Granada and is Chair Professor at the Chemical Department of the University of Almería (UAL).

His most outstanding research lines are currently the development and application of effective new analytical methodologies in determining emerging contaminants in water by advanced analytical techniques (GC-MS/MS, GCxGC-TOF-MS, LC-QTRAP-MS/MS, LC-QTOF-MS...), the development of analytical methods for pesticides in food, etc..

He has participated in more than 36 research projects funded by both public and private entities and has negotiated more than 230 contracts and agreements for R&D. He has a large number of publications (182) and scientific-technical documents to his name.

He has been lecturing and participating in PhD courses at the University for 28 years. He has also been directed or assisted on summer courses and masters organised by the University of Almería, the Complutense University of Madrid and the University of Alcalá. He has guided 10 PhD theses and holds three patents.

He also has proven experience in organising scientific-technological conferences and seminars as well as in R&D management.





Dr. Pedro Letón García

Associated Researcher

Graduated in Chemistry in 1985 from University of Alcalá, with a Ph.D. in Chemistry from the Engineering Department of Alcalá University in 1992. Professor at the University of Alcalá, he is co-author of more than thirty papers in international peer-reviewed journals, and several technical reports for industry.

Nowadays he works on wastewater treatment focused on degradation of xenobiotic compounds by chemical (ozone) or biological (aerobic and anaerobic) processes. Xenobiotics of interest are pharmaceutical and personal care products detected in wastewater plant effluent which must be removed in order to reuse the water.

Toxicity aspects such as synergisms and antagonisms in mixtures between compounds and metabolites, as well as their evolution during treatment, are also of interest.

Dr. Roberto Rosal García

Associated Researcher

Master degrees with honours in Chemistry and in Business and a Ph.D. degree in Chemistry from the University of Oviedo with the distinguished dissertation Award. Professor of Chemical Engineering at the Department of Chemical and Environmental Engineering of the University of Oviedo from 1992 to 2003 and at the Department of Analytical Chemistry and Chemical Engineering of the University of Alcalá since 2003.

His scientific interests centre on chemical kinetics and catalytic processes with emphasis on the development of catalysts and the design and modelling of advanced oxidation processes.

He is also involved in the development of methods for assessing the ecotoxicology of emerging pollutants. He has participated in more than thirty financed research projects and R&D contracts and published over fifty scientific articles and book chapters.



Dr. Antonio Rodríguez Fernández-Alba

Associated Researcher

Graduate in Chemistry (1974) and Pharmacy (1989) from the Complutense University and Ph.D. in Chemistry (1998) from Alcalá University, he was assistant professor (2003) at the Chemical Engineering Department and Consultant (2006) for the Fine Chemistry Pilot Plant of Alcalá University (Alcalá de Henares-Spain).

His research is focused on the development of Biotechnological yeast-based processes for the manufacture of recombinant protein with therapeutic actions and AOP-based technologies to reclaim wastewater. He has participated in more than 40 research projects sponsored by the Spanish government and private enterprises.

He is co-author of 40 scientific papers as well as co-registrar of three patents for wastewater treatment processes.



Dr. Shivanand Teli

Researcher

Graduated with B.Sc in Chemistry (2001) and M.Sc in Polymer Chemistry (2003) from Shivaji University, Kolhapur (MH), INDIA. He joined as Doctorate Student in Jan 2004 in same department and university and received his doctorate degree in September 2007.

During his Ph.D, he was awarded departmental research scholarships (DRFs). Upon completion of his doctorate degree, he worked as a Research Associate (RA) in Chemical Engineering Department, Indian Institute of Technology (IIT), Kanpur INDIA. While working in IIT, he received a post-doctorate offer from Research Institute for Agriculture and Life Science, Seoul National University, South Korea in 2008. After completion of his one-year tenure, he was awarded a Brain Korea Fellowship sponsored by the South Korean government and joined the Department of Energy Engineering Science at Hanyang University Seoul, South Korea (2009). He currently works as a Marie Curie Research Fellow at IMDEA Water, University of Alcalá de Henares (Madrid), Spain.

His primary research was into sulphonated polymer synthesis for water desalination and for separation of liquid-liquid mixtures. He has worked on reverse osmosis (RO), UF, MF, PV and ED etc. and has published several articles in scientific journals, as well as conference proceedings covering some 15 sources.

Dr. N. Sridhara Chary

Researcher

Masters degree in Environmental Science and Technology with distinction in the year 2000 from Jawaharlal Nehru Technological University (JNTU), India. He pursued his doctoral studies on the fate, mobility, risk assessment, human exposure studies and remedial methods of heavy metal pollutants in industrially contaminated sites. His doctoral research was carried out at the Indian Institute of Chemical Technology (IICT) and he received his PhD in 2005 from JNTU, India. Soon after this, he was selected for the Research Associate position of CSIR and pursued the same at IICT. During this period he was offered a postdoctoral position by the French National Institute of Agricultural research (INRA), France. Later, he worked as postdoctoral associate at the National Taiwan University, Taiwan.

His general research interest lies in the area of Environmental monitoring and risk assessment studies with respect to anthropogenic pollution of both inorganic and organic pollutants, with emphasis on the determination of emerging contaminants in the environmental matrix. His research currently focuses on volatile organics in the environmental matrix with particular interest on development of new methods using advance mass spectrometry techniques.

He has 22 research papers 2 review articles in peer reviewed journals and a text book chapter to his credit, in addition to many conference contributions. He has also written popular science articles for the science and technology sections of leading newspapers.





Dr. María José Gómez Ramos
Researcher

Obtained her PhD on Chemistry from the University of Almería in 2008. Her research is mainly focused on the determination of organic pollutants in environmental water and wastewater by advanced analytical techniques (GC-MS/MS, GCxGC-TOF-MS, LC-QTRAP-MS/MS, LC-QTOF-MS, etc.), the evaluation of the removal efficiencies of these contaminants after applying advanced wastewater treatment technologies and the environmental impact assessment of wastewater effluents containing organic pollutants.

She has participated in 17 research projects. She has published more than 25 papers in international journals and participated in numerous national and international workshops.

She has made research stays at the Institute of Chemical and Environmental Research (National Research Council-CSIC) in Barcelona (Spain) and in the Laboratoire Environnement et Chimie Analytique at the École Supérieure de Physique et de Chimie Industrielles de la Ville de Paris (ESPCI), Paris (France). She has collaborated in the organisation of two scientific meeting.



Julio José Lado Garrido
Predoctoral Researcher

Degree in Chemistry from Alcalá University. Spain.

MSc in Hydrology and Water Resources at Alcalá University and Rey Juan Carlos University, Madrid. Spain.

Research: Asymmetric Capacitive Deionisation for water treatment applications.



Carla Adriana Arregoitia Sarabia
Predoctoral Researcher

Degree in Science in Chemical and Biochemical Engineering. University of Western Ontario. Canada.

MSc in Spatial management from International Space University. ISU, France.

Research: Desalination by Forward Osmosis.

Sonia Herrera López
Predoctoral Researcher

Degree in chemistry from University of Almería. Spain.

Research: Emerging pollutants.

Raquel García Pacheco
Predoctoral Researcher

Degree in Chemical Engineering from Rey Juan Carlos University. Madrid. Spain.

Research: Membrane Technology.



water reuse



**Dr. Irene de Bustamante
Gutiérrez**

Deputy Director

Professor in External Geodynamics at the Department of Geology, University of Alcalá (Spain) since 1990. She was awarded her PhD in Geological Sciences from the Complutense University of Madrid. Dr. de Bustamante's research is mainly focused on water quality and pollution, wastewater reuse and environmental cartography. She has directed and participated in several research projects financed by public funds and has also carried out various R&D contracts with companies and public services.

With numerous scientific-technical documents and papers published, she is co-inventor of two patents and one software application, as well as the director of PhD and Degree theses. She has wide experience of participation in courses and masters related with water resources management.

She has taken part in several committees and international representations, and collaborated in the organisation of diverse R&D activities and events. She also has broad experience in the management of R&D programmes, plans and actions, particularly the coordination of five IV PRICIT programmes (Scientific Research and Technological Innovation Regional Plan of the Community of Madrid). She is currently a member of the Editorial Board of the Elsevier Journal of Cultural Heritage.

**Dr. Francisco Javier
Lillo Ramos**

Associated Researcher

He graduated in Geology in 1985 from the University Complutense of Madrid and received the Diploma in Geological Engineering from the same University in 1985. He obtained a Ph.D in Earth Sciences from the University of Leeds (Britain).

He subsequently spent ten years working in the industry, mainly as field geologist for exploration and nuclear waste repository projects and for the Geological Map of Spain. In 1999, he joined the academic staff of the Rey Juan Carlos University, where he lectures in Geology and Hydrology and has been Head of the Geology Group since then. He was granted academic tenure in 2003. Dr. Lillo is the co-director of the Master of Hydrology and Water Resources Management (University of Alcalá-URJC) since 2005.

He has published 32 papers in peer-reviewed international journals and has taken part in 13 research projects funded by public grants. Dr. Lillo has also collaborated in several projects with industry. His research is currently focused on environmental geochemistry, soil contamination by heavy metals, hydrochemistry and water quality, and reuse of treated waste waters in aquifer recharge.



Dr. Irene Ortiz

Associated Researcher

Graduated in Sciences (Geology) in 1996 from the University of Granada, Spain. She received her European Ph.D. degree in Geological Sciences in 2002 from the University of Granada, Spain, obtaining the Outstanding Doctorate Award in Geological Sciences. During her PhD, Dr. Ortiz-Bernad spent several months in Dr. Sposito's Environmental Geochemistry Group, at the University of Berkeley (USA), and in Dr. Stoops's lab at the Department of Geology and Soil Science of the University of Gent (Netherlands). In 2002, she joined Dr. Derek Lovley's lab as a Post-doctoral Research Associate in the University of Massachusetts (USA). Since the end of 2005, Dr. Ortiz-Bernad has worked as a Researcher with the Ramón y Cajal National Science Program at the Department of Geology of the University of Alcalá, Madrid. In addition, she is the Secretary General of the Spanish Society of Soil Science. Her current research activities are focused on bioremediation of soils contaminated by metals, the application of biological reduction for the removal of sulphate from wastewaters, and the study of sedimentary microbial fuel cells to harvest electricity from the biodegradation of organic pollutants in contaminated soils.





Dr. Ana Berreteaga Escudero
Associated Researcher

Graduated in Geological Sciences at the University of the Basque Country and received her PhD in 2008 at the same University, specialising in issues related with vertebrate paleontology, phosphate geochemistry and especially stratigraphy, geological mapping and basin analysis.

In 2009 she joined the hydrogeology research team from the University of Alcalá de Henares under the guidance of Dr. Irene de Bustamante, studying desalination processes and management of the rejections resulting from different water purification processes (desalination, reuse, etc.). She also participates actively in research into Geothermal Energy at IMDEA Water.

Her current research focuses on variations in thermal conductivities of subsoil, depending on the lithology and the amount of water, with the ultimate aim of achieving greater development of geothermal energy. On the issue of managing rejections from various water purification techniques, her research focuses on studying the possibility of deep underground injection of the same.



Dr. Francisco Carreño Conde
Associated Researcher

Graduated in Geological Sciences from the Complutense University of Madrid and obtained a Ph.D. for the Rey Juan Carlos University. He worked for four years in a private sector environmental company and three years on a research grant in remote sensing (Complutense University of Madrid).

He has been Professor of Biology and Geology Department at Rey Juan Carlos University since 2002. He is a co-author of six papers in international peer-reviewed journals, one scientific book and four chapters of scientific books, and more than 40 marine geology and geomorphology maps. His research is currently focused on remote sensing and GIS techniques applied to prospecting, management and conservation of water, geology, detection of submarine groundwater discharges. He has also experience in 3D geological surfaces for groundwater modelling.



Ángel de Miguel García
Predoctoral Researcher

Degree in Environmental Sciences from Alcalá University. Madrid. Spain.
MSc in Hydrology and Water Resources at Alcalá University and Rey Juan Carlos University. Madrid. Spain.
Research: Water Footprint and water resource stress.

María Leal Meca
Predoctoral Researcher

Degree in Environmental Sciences from Alcalá University. Madrid. Spain.
MSc in Hydrology and Water Resources at Alcalá University and Rey Juan Carlos University. Madrid. Spain.
Research: Horizontal Permeable Reactive Barriers for groundwater recharge with treated wastewater.



María de las Virtudes Martínez Hernández
Predoctoral Researcher

Degree in Environmental Sciences from Alcalá University. Madrid. Spain.
MSc in Hydrology and Water Resources at Alcalá University and Rey Juan Carlos University. Madrid. Spain.
Research: Emerging contaminants and groundwater.

Víctor González Naranjo
Predoctoral Researcher

Degree in Chemical Engineering from University of Las Palmas de Gran Canarias, Canary Island. Spain.
MSc in Hydrology and Water Resources at Alcalá University and Rey Juan Carlos University. Madrid. Spain.
Research: Analysis of priority and emerging pollutants in soil samples and their impact on groundwater.



water biology and bioelectrogenesis



Dr. Abraham Esteve Núñez

Associated Researcher

Graduated in Biochemistry in 1995 from the University of Murcia, Spain. He carried out his doctoral research on biodegradation of explosives in the El Zaidin Experimental Station (CSIC) and received his Ph.D. degree in Biochemistry in 2000 from the University of Granada, Spain, obtaining the Outstanding Doctorate Award. He spent his first Postdoctoral period (4 years) in the Environmental Biotechnology Centre (Massachusetts, US) investigating different aspects of microbial iron reduction. Then, he joined the Astrobiology Centre (CSIC-INTA) in Madrid (3 years) to provide insights into the exocellular electron transfer in electricity-producing bacteria.

As of 2009 he is a Researcher with the Ramón y Cajal National Science Programme at the Department of Analytical Chemistry and Chemical Engineering of the University of Alcalá, Madrid.

He is currently leading a research group into the microbial production of electricity, a novel process that merges biotechnology with renewable energies, with applications in the field of wastewater treatment, in situ bioremediation and nanobiotechnology. He is also a member of the consortium responsible for the BACWIRE project (7FP) dedicated to improving the bacteria-electrode interaction by nanotechnology tools in order to make the waste-into-bioelectricity process a feasible application. At IMDEA Water, he is leading the research focused on the molecular and bioelectrochemical aspects of microbial fuel cell technology in wastewater treatment.

Dr. Timur E. Pavluk

Researcher

PhD in Aquatic Ecology since 1998. He has been leading the research team in Hydrobiological issues, as a member of the Department for River and Reservoir Rehabilitation at the Russian Research Institute for Integrated Water Management and Protection (RosNIIIVH, Yekaterinburg). Highlighted topics of his research include: microinvertebrates in applied research, biological monitoring of waters, forecast of the water quality in reservoirs, assessment of the ecological condition of different water bodies, early warning systems application and development.

For years he has been involved in ongoing International activity with NEPTUNE Network Educational Organisation as a Project Leader on the Russian side. Since the end of 2009 he is also a Board Member of the European Centre for River Restoration (ECRR), representing Russia's interests in the Organisation.

In addition to his scientific and public management work, he has been supervising students at Ural State University during their annual research projects and final year work (Diploma).

Numerous publications in scientific journals, books, newspapers and conference proceedings covering around 90 sources.





Dr. Karina Boltes Espínola

Associated Researcher

Chemical Engineering. PhD in Chemistry from the University of Alcala in 2000. Assistant Professor in Chemical Engineering Department. Her research is focused on optimisation of biological processes for degradation of xenobiotics using reactors of different configurations. Toxicological evaluation of mixed pollutants in wastewater and biostimulation of microorganisms for in-situ biodegradation are other research areas. She has participated in 20 research projects sponsored by the Spanish government and private enterprises. She has also been the director of a PhD thesis, and many post-graduate research projects in the Master on Hydrology and Water Management from the University of Alcala.



Sara Tejedor Sanz

Predoctoral Researcher

Degree in Chemical Engineering from University Complutense of Madrid, Spain.

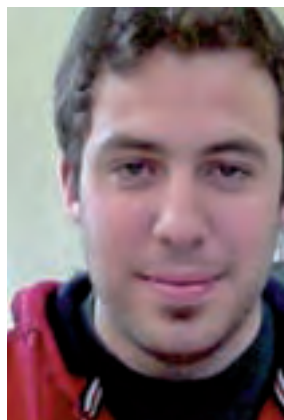
Research: Wastewater Treatment by microbial electrogenesis process.

Alejandro Reija Maqueda

Predoctoral Researcher

Degree in Biotechnology from Francisco de Vitoria University, Madrid, Spain.

Research: Wastewater treatment using natural purification systems (NPS): bioelectrogenic wetlands.



water and climate change



Dr. Pedro Berliner

Researcher

Professor at the Blaustein Institute for Desert Research, Ben Gurion University of the Negev in Israel, teaching courses related to agrometeorology and the use of marginal waters as part of the Hydrology and Dryland Agriculture graduate student programmes. He spent his sabbatical year at IMDEA from April 2009 to March 2010 and is currently Adjunct Senior Scientist at IMDEA, collaborating in developing and heading the "Sustainable Management of Water Bodies" Department in which the efficient use of recycled sewage water in agriculture, is being addressed. He has published more than fifty articles in international peer reviewed journals and ten chapters in books on topics related to the efficient use of water in agriculture, and supervised more than thirty M.Sc. and Ph. D. Students. He was a visiting Professor at CIDESON, Mexico (1994-95) and at the Desert Research Institute, Univ. of Tottori, Japan (2001-02). He is a member of the Israeli delegation to the UNCCD (Convention for Combating Desertification), Israel's Ministry of Science representative to the ESF COST programme (domain: forests, products and services), and was one of the leading scientists that took part in a Middle East multilateral watershed and water resource management project, administered by the World Bank and various other international forums. He has led competitively funded research projects in Southern Africa, Kenya, Uzbekistan, Kazakhstan, Turkmenistan, India and Argentina. These projects were funded by the US AID, BMBF (Germany), 6PM EU and Argentina's CONICET among others.

His research areas are the mass and energy balances in the biogeosphere interface, and their dependence on the movement of water in the soil-plant-atmosphere continuum. One of the topics of special interest is the role played by the direct evaporation of water from the soil surface, in the presence or absence of plants, on the dissipation of solar energy. The use of remote sensing tools to assess the spatial distribution of these phenomena, their modelling and the expected effect of climate change on them are also among his research topics. Over the last twenty years he has paid special attention to the generation and efficient use of rainfall generated runoff for the irrigation of crops and forest, and developed the runoff agroforestry systems concept, which is particularly well adapted to arid land regions in the developing world.

Dr. Juan Antonio Pascual Aguilar

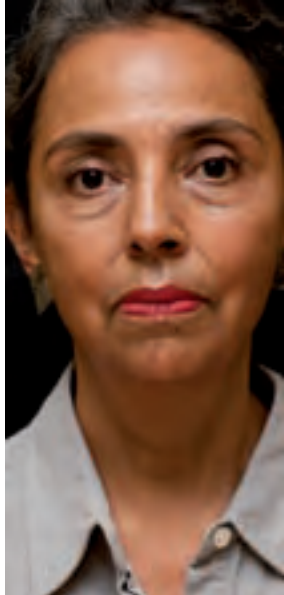
Associated Researcher

Graduated in Geography in 1991 from the University of Valencia where he later obtained his PhD in Geography. He has taken part in 9 Spanish and European competitive projects and more than 30 non competitive projects through academic and private contracts.

He has published 39 papers between book chapters and journals, apart from other literature presented at scientific meetings. He has participated as lecturer in 2 MSc programmes and given several guest talks at national and international meetings.

His research centres on the spatial analysis and temporal study of environmental land use and water processes using the application of models and Geographical Information Systems. He has also developed his expertise in landscape assessment, particularly on issues related with the preservation of traditional agricultural patterns and water use.





Dr. María Francisca Naranjo Pérez de León

Researcher

Ph.D. in Civil Engineering, Laval University, Québec (Canada). Post doctorate -Institute of Engineering UNAM Full Lecturer, Faculty of Sciences, Adjunct and Full Lecturer, Engineering Faculty, UNAM. Head of multidisciplinary group for integrated problems and solutions in urban centres at the Water Research Centre (CIA), based in Mexico City.

Several publications in international and national journals on different topics related to statistical and probabilistic models in hydrology and water resources management in river basins and urban centres. Historical water resources planning and management.



Alberto de Tomás Calero

Predoctoral Researcher

Degree in Environmental Sciences from Alcalá University. Madrid. Spain.

MSc in Geographical Information Technologies from Alcalá University. Madrid. Spain.

Research: Estimating evapotranspiration through scintillometry and remote sensing.



Reynaldo Payano Almanzar

Predoctoral Researcher

Degree in Civil Engineering from University Católica Tecnológica de Cibao. Dominican Republic.

MSc in Hydrology and Water Resources at Alcalá University and Rey Juan Carlos University. Madrid. Spain.

Research: Hydraulic Heritage.

Ojilve Ramón Medrano Pérez

Predoctoral Researcher

Degree in Civil Engineering from the Autonomous University of Santo Domingo. Santo Domingo. Dominican Republic.

MSc in Hydrology and Water Resources at Alcalá University and Rey Juan Carlos University. Madrid. Spain.

Research: Water and Energy Synergy. Distribution networks as savings instrument.



economic and institutional analysis



Miguel Solanes

Researcher

Head of the Department of Economic and Institutional Analysis of IMDEA Water. He has been a water and legal advisor for the United Nations since 1984. Based in New York until 1994 before being seconded to ECLAC (Economic Commission for Latin America and the Caribbean) in Santiago, Chile. He has a rich experience in water law, privatisation and regulation of water-related utilities, international and interstate (federal countries) water law and public utilities and the international agreements for protection of foreign investment. As part of his research at the UN, Miguel (M.A. in Water Resource Management at Colorado State University and Research Scholar at the Kennedy School of Government) has promoted the need for stable and secure water rights as an incentive to private investment and water markets as efficiency devices and re-allocation tools in scarcity conditions or climate change scenarios. At the same time, he has provided evidence on the risk that non-conditioned water rights may encourage monopolisation. Miguel has provided legal advice for public policy design in Guatemala, Ecuador, Paraguay, Argentina, Peru, Syria, Jordan, Trinidad and Tobago, Turks and Caicos, Bahamas, St. Vincent and the Grenadines, Gambia, Tanzania, India, China, Sudan, Turkey, Brazil, Venezuela, Yemen, Ethiopia, Mozambique, Ghana, Oman, Solomon Islands, Papua New Guinea, Tuvalu, Kiribati, Bulgaria, Costa Rica, Chile, El Salvador, Colombia, Honduras, Nicaragua, Vietnam, Thailand, Dominican

Republic, South Africa and Morocco. In 2006 he was a member of the High Level Panel of Experts advising the UNDP on his Human Development Report on water and human development. In addition, he is currently a member of the Academic Panel of GTZ Global Water Dialogues and was co-ordinator of the South American Technical Advisory Committee (SAMTAC) of the Global Water Partnership (GWP) from 2001 to 2006 and member of the Technical Committee of that institution, from 1996 to 2006.



Dr. Carlos Mario Gómez Gómez

Associated Researcher

Carlos Mario Gómez is Professor of Economics at the University of Alcalá since 1996. Graduated in Political Science (in Colombia) and Economics (in Spain), Master's in Agricultural Economics and Development at the University of London in 1992. He received his Ph.D. degree in Economics at the University of Alcalá (Madrid). He was appointed as a Research Associate at the Institute of Business and Economic Research of the University of California Berkeley in 1994, and as a Visiting Scholar for a sabbatical leave in 2000.

He has done extensive research on environmental economics with emphasis on water economics which was published in different peer reviewed national and international journals. Since 2000 he has led a sequence of competitive national projects and has been involved in the national and European economic analysis groups formed to support the implementation of the Water Framework Directive.

At IMDEA he is currently leading the research team of the EPI Water project approved in 2010 under the Seventh Framework Program of the European Union.



Gonzalo Delacámara Andrés
Junior Researcher

Lecturer on Economic Analysis at the UAH (1997-2008). Researcher of the Department of Economic and Institutional Analysis of the IMDEA Water Foundation. He has been the Coordinator of the research group on Environmental Economics at the Department of Economic Analysis of the UAH since 2001. International consultant for the Economic Commission for Latin America and the Caribbean (ECLAC) of the United Nations, the World Bank, and the Inter-American Development Bank (IADB), on water and energy economics. Gonzalo has coordinated a number of research projects over the last few years: the economic valuation of ecosystem services in Spain (Ministry of the Environment, 2005-2009), with emphasis on the valuation of water ecosystem services; the economic analysis of environmental external (marginal) costs of electricity generation (IDAE, 2004-2005) or the economic valuation of water resources (GWP and the UN, 2001-2003), with case-studies on the rivers Mendoza (Argentina), Maule (Chile), Paraíba do Sul (Brazil), Catamayo Chira (Peru) and Quindío (Colombia). Gonzalo was also a Research Manager for ECOTEC Research & Consulting (1999-2001),

and developed a number of projects for the European Commission (economic analysis of environmental taxes and charges, water pricing, spatial development, etc.). In Latin America, he carried out the economic analysis of public policies for the promotion of liquid biofuels for transport (UN, 2006-2007). As a researcher of IMDEA Water, he is currently working on the analysis of economic and institutional impacts of climate change on water resources and their end-uses and the economic assessment of social benefits derived from water quality improvement plans.



Marta Rodríguez Gómez
Predoctoral Researcher

Degree in Environmental Sciences from Autonomous University of Madrid. Spain.

Research: Drivers affecting the industrial structure of water and sanitation services.

Estefanía Ibáñez Moreno
Predoctoral Researcher

Degree in Environmental Sciences from Alcalá University. Madrid. Spain.

MSc in Contemporary Latin America and relations with the European Union: a strategic cooperation from the University of Alcalá. Madrid. Spain.

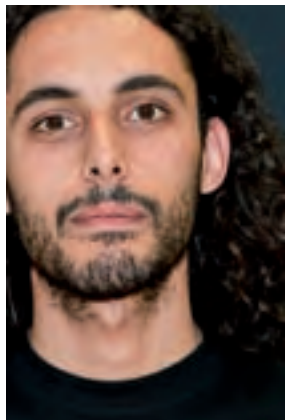
Research: Economic instruments for Water Management.



laboratory technicians

Francisco Martínez Serrano
Laboratory Technician

FPII: Environmental Chemistry.



Carolina Guillén Fuentes
Laboratory Technician

FPII: Control and Analysis.
FPII: Environmental Chemistry.



David Solé Fernández
Senior Laboratory Technician

Licenciado in Chemistry from Alcalá University. Madrid.



management area and administration

Rafael Irastorza Vaca
Manager

Degree in Economic Sciences.



Juana Sanz García
R&D Management Coordinator

Degree and MSc in Environmental Sciences.



María Luz Barquilla Crespo
Accountant Technician

Degree in Economic Sciences.



Josefa Simón Recio
Secretary





4 infrastructure and scientific equipment

- 4.1. Water Analysis Lab [38]
- 4.2. Water Biology Lab [39]
- 4.3. Geomatics Lab [39]
- 4.4. Soil Lab [40]

4.1. Water Analysis Lab

The water analysis lab has up-to-date analytical equipment to enable detection of organic micropollutants. Moreover, it is fitted with all the basic scientific equipment needed to carry out research into contaminant detection and monitoring of pollution processes necessary to work on different types of water (consumption, waste, surface, etc.) in an integrated manner.

Microcontaminants

The main equipment is for chromatography, both gas and liquid, coupled with mass spectrometry:

- Bidimensional gas chromatography coupled with a mass spectrometer with flight time detector (GCxGC-TOF-MS) with an automatic multi-injection system.
- Gas chromatography coupled with a simple quadrupole mass spectrometer (GC-QqQ-MS/MS).
- Liquid chromatography coupled with mass spectrometer (LC-Q-TOF-MS/MS) for determining mass errors of less than 3 ppm.
- Necessary equipment for the extraction of samples using SPE, LLE, PLE

Basic Analysis

- ICP-Mass
- Ion chromatography computer for analysis of anions and cations
- HPLC-UV
- Total Organic Carbon analyser
- Thermoreactor and photometer for determining COD
- Respirometric Oxitop method for determining BOD
- Analyzer for trace and organic compounds by polarography
- Automatic titrator for alkalinity
- Volumetric sensor for measuring particles in water
- Bloc digest and auto-titration Kjeldahl distiller
- Spectrophotometers
- Multimeter (measuring pH, conductivity, and potential Redox)
- Turbidity meter and colorimeter





4.2. Water Biology Lab

The laboratory is divided in three areas: Molecular Microbiology, Microbial Bioelectrochemistry and Hydrobiology.

In addition to all basic equipment necessary to perform the research tasks, the lab is equipped with:

- Binoculars with transparent and reflected light sources, Olympus SZ51
- Microscope, Olympus CX41
- Counting nematode eggs camera
- Gel Documentation System, Alphamager
- Real Time PCR machine, AB7300
- Nano-photometer, Epoch

4.3. Geomatics Lab

The Geomatics Unit is a resource that provides an infrastructure dedicated to solutions based on new technologies. The Lab has a complete framework consisting of a set of hardware, software, and databases:

- Twelve terminals under a central server.
- Peripherals of different sizes, including printers, plotters and a medium format scanner.
- Support materials which aid data collection and its inclusion in drive systems (laptops, pagers, GPS and SLR cameras).
- ARCGIS
- GIS IDRISI
- GIS ILWIS
- GIS GVSIG
- ERDAS IMAGINE
- Geostatistics SURFER
- Spatial Metric Analysis -FRAGSTAT
- Estimation of Soil Parameters, Hydrologic Modelling - HEC and SWMM family
- Water Erosion Models – WEAP



4.4. Soil Lab

IMDEA Water is provided with a soil laboratory primed and ready to process and analyse soil samples. Physical, physico-chemical, and chemical soil properties are determined for the complete analysis of the soils, with special attention to processes related with soil contamination and remediation. It is equipped to carry out soil determinations such as particle size distribution, organic carbon content, water content, soil colour, pH, electrical conductivity, total calcium carbonate, cation exchange capacity, exchangeable bases and total metal contents, among others. For all analyses, the laboratory is fitted with the following equipment:

- COY Type C Vinyl Anaerobic Chamber
- Centrifuge (EPPENDORF 5810R)
- Overhead Shaker (HEIDOLPH Reax 20)
- Mixer Mill (RETSCH MM400)
- Electromagnetic Sieve Shaker (CISA RP20)
- Vibratory Micro-Mill (FRITSCH Pulverisette 0)
- Orbital Mixer and Shaker with heating platform (SELECTA)
- Drying and Sterilising Natural Convection Oven with Temperature and Time Regulation and Digital Reading (SELECTA)
- Electronic Autoclave for Sterilisation (SELECTA)
- UV-Spectrophotometer (SHIMADZU UV-1800)
- Hotplate (SELECTA) • Electronic Balance (GIBERTINI)
- Electronic Analytical and Precision Balance (SARTORIUS)
- Microprocessor Conductivity Meter (EC/TDS/NaCl/°C) (Hanna Instruments HI 2300)
- pH-Meter (CRISON GLP 21+)
- Sand Bath (SELECTA Combiplac-Sand)
- Magnetic Stirrer (NAHITA)
- Agate Mortar
- Calcimeter
- Surface Layer Scintillometer for measuring sensible heat and momentum fluxes
- Bowen Ratio Psychrometers





research results and knowledge dissemination

- 5.1. Scientific Papers [42]
- 5.2. Conferences [46]
- 5.3. Invited Seminars and Lectures [50]
- 5.4. Fellowships [51]
- 5.5. PhD Thesis [51]
- 5.6. Internships [52]
- 5.7. Mobility [52]
- 5.8. RTD activities organization [53]

5.1. Scientific Papers

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1. Astibia, H., Bardet, N., Pereda-Suberbiola, X., Payros, A., De Buffrénil, V., Elorza, J., Tosquella, J., Berreteaga, A. & Badiola, A. (2010). New fossils of Sirenia from the Middle Eocene of Navarre (Western Pyrenees): the oldest West European sea cow record. *Geological Magazine*. 147: 665-673.
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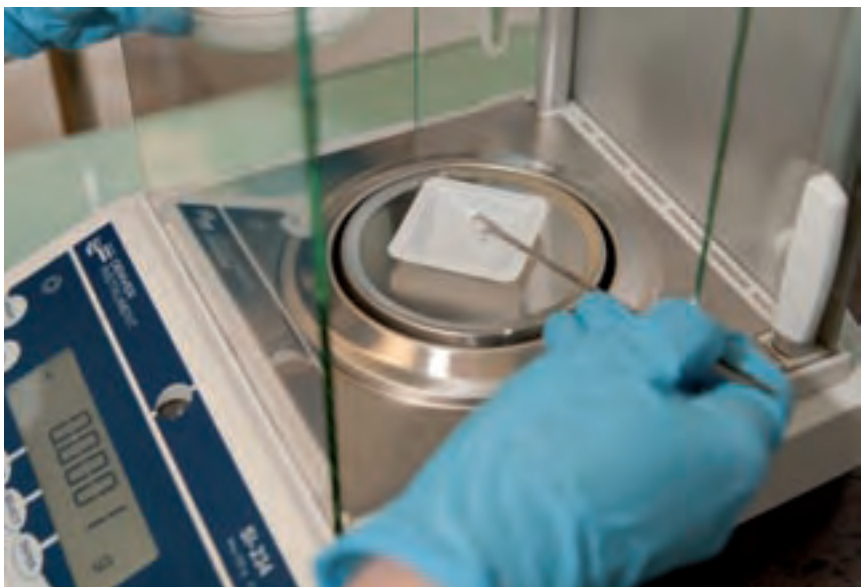
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31. Pascual, J.A., Andreu, V., Vazquez, P. Picó, Y. (2010). Presence of illicit drugs in surface waters of protected natural wetlands, connected to traditional irrigation systems and urban areas. I simposio sobre gestión del agua en espacios protegidos. Viñales, Cuba. Eds.: IMDEA Agua. CD abstract. ISBN: 978-84-693-6884-8.
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34. Reija, A., Esteve-Núñez, A., Ortiz-Bernad, I. (2010). Microcosmos electrogénicos: un nuevo método para monitorizar y estimular la biodegradación de contaminantes orgánicos en suelos contaminados. IV Congreso Ibérico de la Ciencia del suelo (CICS2010). Granada, Spain. 21- 24 September. CD Abstracts. ISBN 978-84-15026-39-6
35. Rodríguez, A., Rosal, R., Letón, P., Pérez, J.A., Petre A., Boltes, K., García-Calvo, E. (2010). Uso del ozono en la regeneración de aguas residuales. Reunión de la Mesa Española de Tratamiento de Aguas: Tecnología del Agua y Sostenibilidad, Bilbao. Spain. 9-11 December.
36. Rodríguez, A., Rosal, R., Perdigón-Melón, J.A., Petre, A., Santiago, J., Gómez, M.J., Letón, P., García-Calvo, E., Fernández-Alba, A.R. (2010). Reclamation of an STP effluent by ozone/hydrogen peroxide system. 7th ANQUE International Congress. Oviedo. Spain. 13-16 June.
37. Rosal, R., Boltes, K., García-Calvo, E. (2010). Evaluation of the toxicological interaction of mixtures of xenobiotics with perfluorooctane sulfonate (PFOS) on *Pseudokirchneriella subcapitata*. IWA World Water Congress and Exhibition. Montréal. Canada. 19-24 September.
38. Rosal, R., Rodea-Palomares, I., Boltes, K., García-Calvo, E., Fernández-Piñas, F., Leganés, F., Petre, A. (2010). Ecotoxicology of cerium dioxide nanoparticles. 20th SETAC Europe Annual Meeting. Sevilla. Spain. 23-27 May.
39. Rosal, R., Rodríguez, A., Perdigón-Melón, J.A., Petre, A., Carbajo, J., Gomez, M.J., Letón, P., García-Calvo, E., Fernández-Alba, A.R. (2010). Removal of emerging pollutants in urban wastewater through biological treatment followed by Ozonation. 7th ANQUE International Congress. Oviedo. Spain. 13-16 June. CD Abstracts. ISBN 978-84-693-2258-1
40. Santiago, J., Rosal, R., Perdigón-Melón, J.A., García-Calvo, E. (2010). Oxidation of fenofibric acid by UV/H₂O₂ and heterogeneous photocatalysis on mesoporous titanium dioxide. 19th International Congress of Chemical and Process Engineering CHISA - 7th European Congress of Chemical Engineering ECCE-7. Praga (Rep. Checa) 28 August – 1 September.
41. Sanz, J.M., De Miguel, A., De Bustamante, I., De Tomás, A., Goy, J.L. (2010). Depuración y reutilización de aguas para la mejora socioambiental de poblaciones aledañas a espacios protegidos. I simposio sobre gestión del agua en espacios protegidos. Viñales, Cuba. Eds.: IMDEA Agua. CD abstract. ISBN: 978-84-693-6884-8.

42. Solanes, M. (2010). Aspectos críticos de la regulación del sector de agua potable y saneamiento en América Latina. Seminario Internacional: sostenibilidad, eficiencia y equidad en la provisión de servicios de agua potable y saneamiento básico en Iberoamérica. Madrid. Spain. April.

43. Solanes, M. (2010). Mercados de aguas: experiencias y estructuras. 7º Congreso Internacional de la ANQUE "ciclo integral de agua: presente y futuro". Oviedo. Spain. 13-16 June.

44. Wouters, J., Tejedor, M., Lado, J., Anderson, M. (2010). Electrodes in a Capacitive Deionization System. 217th Electrochemical Society Meeting, Vancouver. 25-30 April.

5.3. Invited Seminars and Lectures

1. "Diálogo de expertos sobre Vida y... Agua". Conferencias «Vida y... Agua». Fundación Félix Rodríguez de la Fuente y La Casa Encendida. 3 de febrero. Madrid. Spain.

2. Water Policy Workshops. Durham University. 22 March. Durham-UK.

3. «Acuerdos de inversión y regulación de aguas y servicios públicos». II Taller Internacional sobre Sinergias Ambientales entre las Aguas Continentales y las Marinas. Agencia Nacional de Promoción Científica y Tecnológica de Argentina, y Universidad de Buenos Aires. 29-31 March. Buenos Aires, Argentina.

4. «Relación entre capitalización de economías de escala y el logro de los objetivos ambientales». Taller Conversatorio: «Retos al Futuro del Sector de Agua Potable y Saneamiento Básico». Superintendencia de Servicios Públicos Domiciliarios (República de Colombia); Comisión Económica para América Latina y El Caribe (CEPAL). 8-9 June. Bogotá, Colombia.

5. "Hidrología, Hidrogeología y Vulnerabilidad de Acuíferos en los Espacios Naturales Protegidos". Jornadas sobre Geomorfología y Geología Ambiental Aplicada a la Gestión de Espacios Naturales Protegidos del Suroeste de Castilla y León y Norte de Extremadura. Universidad de Salamanca. 12 July. Salamanca. Spain.

6. "Ordenación de espacios protegidos: Paisaje Protegido de El Rebollar". Jornadas sobre Geomorfología y Geología Ambiental Aplicada a la Gestión de Espacios Naturales Protegidos del Suroeste de Castilla y León y Norte de Extremadura. Universidad de Salamanca. 13 de julio. Salamanca.

7. "Internacionalización de la I+D". I+D en las universidades. OCU, Red de rectores latinoamericanos. July. Colombia.



8. Round Table: «Why I am a scientist» (Researchers' night). IMDEA and mi+d. 24 September. Madrid.

9. "Experiences and challenges encountered by group members in implementing the HR Strategy". Institutional Human Resources Strategy Group. 3rd Working Meeting. University of Maribor. 29 September. Maribor, Slovenia.

10. "R+D management in IMDEA Water". Visit from Austral University of Chile. CIEMAT. 19 October. Madrid

11. "Importance of R+D and water technologies". I IBEROAQUA encounter on water management innovation in Iberoamerica. IBEROAQUA. 22-25 November. Lima, Perú.

12. "Investigation and reuse of waters supplied in small communities". Collaboration framework with UNESCO Chair in Scientific education for Latin America and the Caribbean. UNESCO Chair in Scientific education for Latin America and the Caribbean and Universidad Ricardo Palma University (Peru). 3-8 December. Lima, Peru.

5.4. Fellowships

María de las Virtudes Martínez Hernández

Research: Emerging contaminants and groundwater

Category: Support Research Fellowship

Fund: Scientific and Technological Research Regional Plan



David Solé Fernández

Category: Senior laboratory technician

Fund: Spanish Ministry of Science and Technology Affairs (MICINN)



5.5. PhD Thesis

Symmetric Capacitive Deionisation for water treatment applications

Julio José Lado Garrido

Desalination by Forward Osmosis

Carla Adriana Arregoitia Sarabia

Membrane Technology

Raquel García Pacheco

Water Footprint and Water Resource Stress

Ángel de Miguel García

Emerging contaminants and groundwater

María de las Virtudes Martínez Hernández

Horizontal Permeable Reactive Barriers for groundwater recharge with treated wastewater

María Leal Meca

fellowships
PhD
thesis

Analysis of priority and emerging pollutants in soil samples and their impacts on groundwater

Victor González Naranjo

Wastewater Treatment by microbial electrogenesis

Sara Tejedor Sanz

Wastewater Treatment using Natural Purification Systems (NPS) bioelectrogenic wetlands

Alejandro Reija Maqueda

Estimating evapotranspiration through scintillometry and remote sensing

Alberto de Tomás Calero

Water and Energy Synergy. Distribution Networks as savings instrument

Ojilve Ramón Medrano Pérez

Hydraulic Heritage

Reynaldo Payano Almanzar

Drivers affecting the industrial structure of water and sanitation services

Marta Rodríguez Gómez.

Economic instruments for Water Management

Estefanía Ibáñez Moreno

Quanawat in Alcalá de Henares

Enrique Fernández Tapias

5.6. Internships

Student: Rebecca Leigh Mitchell

Program: Gateway to Madrid

Fund: Congressional Hispanic Leadership Institute and PROMOMADRID

Date: June – July 2010

5.7. Mobility

Predocctoral Researcher: Julio José Lado Garrido

Centre: University of Wisconsin, Madison. USA

Date: September – December 2010

Predocctoral Researcher: María de las Virtudes Martínez Hernández

Centre: Colorado School of Mines. USA

Date: July 2010 – February 2011

internships

mobility



RTD activities organization



5.8. RTD activities organization

- Participation in the development and instruction of the “Master in Hydrology and Water Resources Management” organised by the University of Alcalá and Rey Juan Carlos University in Madrid. Spain.
- Participation in Doctorate course in “Hydrology and Water Resources Management”. University of Alcalá.
- Organization of International Seminar «Sustainability, efficiency and fairness in provision of potable water and basic cleaning services in Ibero-America». In collaboration with the Iberoamerican General Secretariat (SEGIB) and the Raúl Prebisch Chair (IELAT). 22-23 April. Madrid. Spain.
- Co-organization of I Symposium on water management in protected areas. In collaboration with Ecovida (Environmental Research and Services Centre); SNAP (National System of Protected Areas). 2-6 November. Viñales (Cuba).
- Members of the scientific committee and executive secretariat at the I Symposium on water management in protected spaces. 2-6 November. Viñales (Cuba).
- Vice-chair of the Executive Committee and Chair of the Committee and scientific committee member at the 7th International ANQUE Congress on “Integral water cycle: present and future”. 13-16 July. Oviedo. Spain.

institutional activities

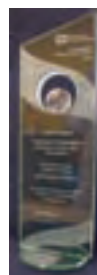
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- 6.1. Awards and Merits [55]
- 6.2. Collaboration [55]
- 6.3. Other Activities [57]



6.1. Awards and Merits

- IWA 1st prize: “IWA prize for innovation in the practical realisation of sustainable urban water management” (in the frame of the “2010 Prizes for Excellence in Sustainable Urban Water Management”) awarded to the CONSOLIDER TRAGUA project. September, 22nd 2010. Montreal, Canada.
- Acknowledgement in Human Resources Excellence Research, given by European Commission.
- Nomination of IMDEA Water for the “ENDESA 2010 Awards for most sustainable real estate promotion.”



HR EXCELLENCE IN RESEARCH

6.2. Collaboration

With Research Organizations



With Companies

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6.3. Other Activities

- Member of Human Resources Strategy Group (European Commission). Euraxess Rights



- Incorporation in the Community of Madrid Research Laboratories Network (REDLAB)
- Participation in 10th Science Week. Madrid. Spain. 2010.
- Activities organisation during World Water Day, 22nd March 2010.
- Member of Euraxess Service Network. Local Contact Point



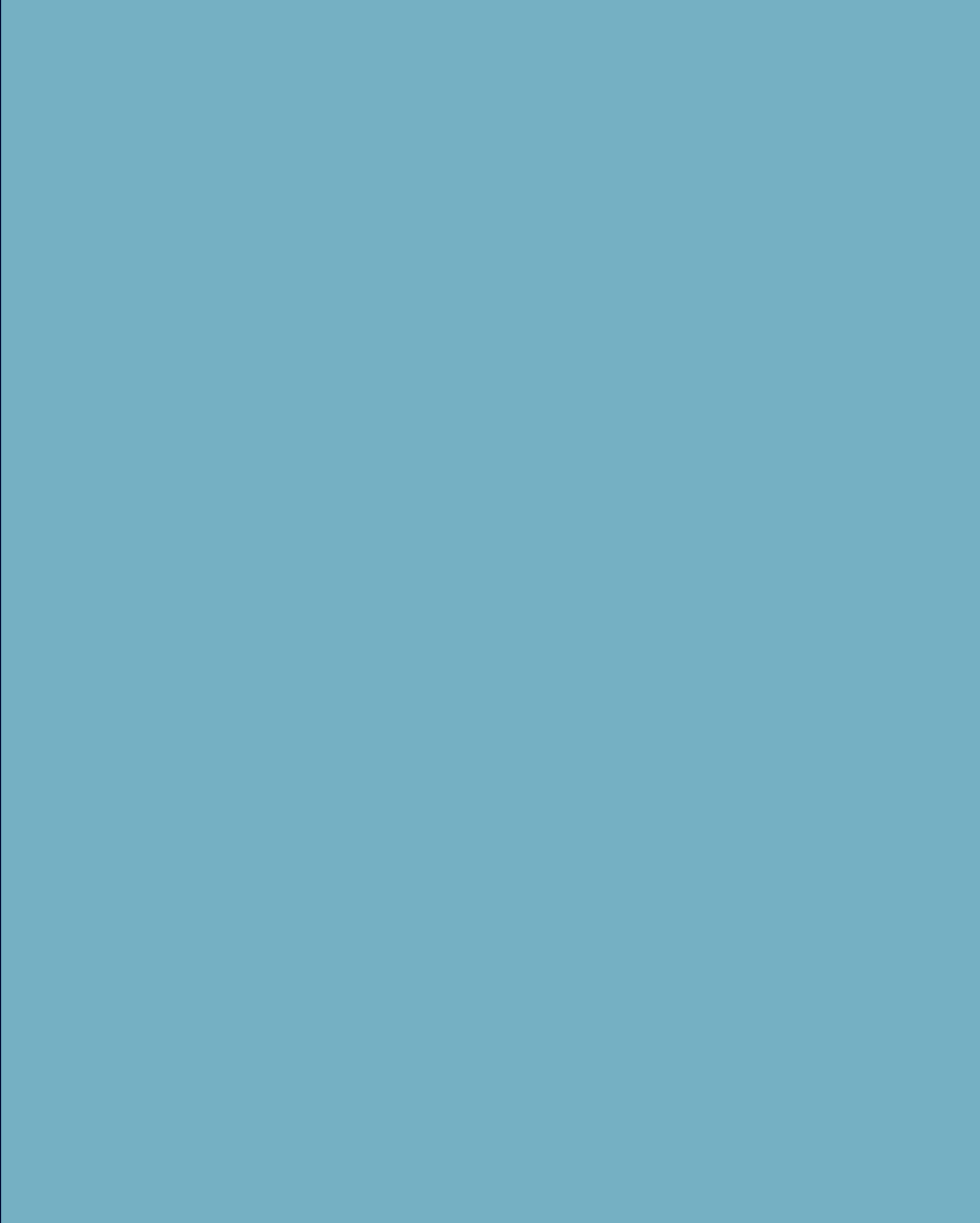
- Member of working group 3 "Setting standards for shallow geothermal energy" of AENOR.
- Participation in blog "El Agua". Madri+d.



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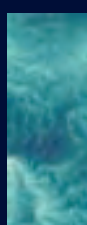
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