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Y COMPETITIVIDAD

AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2013

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E INNOVACIÓN

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CIENTÍFICA Y TÉCNICA

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DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

Nombre: COROMINAS TABARES, LLUIS
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Título:

Integrated Management of Urban Water Systems and Sustainability Assessment

Resumen de la Memoria:

In 2000, Dr. Corominas obtained a FI scholarship from the Government of Catalonia to conduct his PhD thesis. Dr. Corominas defended his PhD in 2006 at the Laboratory of Chemical and Environmental Engineering from University of Girona (Spain) and afterwards was awarded a postdoctoral fellowship (Beatriu de Pinós, from the Government of Catalonia) to continue with his research activities at the Department of Civil Engineering of Université Laval (Québec, Canada) for 2 years and 7 months. There, he was embedded in an international context, being very active in the International Water Association and participating in a EU funded project. During his postdoctoral experience, he was entrusted with important research leadership tasks within the FP6 project NEPTUNE by his supervisors at that time Prof Peter Vanrolleghem and Dr. Leiv Rieger, outstanding researchers in water management. Afterwards he obtained a Juan de la Cierva scholarship from MICINN and joined ICRA in fall 2010, when he started an independent research career.

Currently, Dr. Corominas is leading the research line at ICRA on Integrated Management of Urban Water Systems and Sustainability Assessment. It involves the development of new monitoring tools, new models for water quality prediction (including nutrients, microcontaminants and greenhouse gases), new methodologies for incorporating sustainability in the decision making process (mainly Life Cycle Assessment), all embedded within the current policy context. Knowledge transfer is achieved through demonstration projects, training highly qualified personnel and dissemination of the results using scientific and media channels. His research group consists of 8 researchers and 1 technician. In his current position, he is responsible for the acquisition of research funding and projects, management and mentoring of students and technicians, financial resource planning and internal and external stakeholder relationship management.

He leads projects that involve fundamental and applied research, involving governmental agencies and industry. Dr. Corominas was granted the prestigious Marie-Curie Action Career Integration Grant by European Commission (FP7) with the project EcoMaWat (Ecosystem-based management of urban wastewater systems). He is the principal investigator for the ICRA contribution to the EU FP7 demonstration project R3-Water (Demonstration of innovative solutions for Reuse of water, Recovery of valuables and Resource efficiency in urban wastewater treatment), and leads the modeling part in the EU FP7 projects demEAUmed, GEISTAR (funded by MICINN) and WaterFATE (funded by MICINN).

Also, he is very active within the IWA (International Water Association) where he chairs the Working Group on Life Cycle Assessment of Water and Wastewater Treatment (LCA-Water WG). He is member of the IWA Task Group on Task Group on Benchmarking of Control Strategies for Wastewater Treatment Plants, and is member of the Environmental and economic Working Group within the COST Action Water_2020. He has been involved in the organization of 10 international conferences, is frequent reviewer for about 10 scientific journals in the area of water resources, and is editor of the Journal Water Practice & Technology (IWA Publishing).

Resumen del Currículum Vitae:

Dr. Corominas is an international recognized expert in monitoring, modeling and control of urban wastewater treatment infrastructures. He focused on modeling and control of biological reactors during the earliest stages of his career (until 2007), continued with benchmarking of wastewater treatment monitoring & control during his postdoctoral experience in Canada (2007-2010), and in the past years (from 2010 onwards) his research focuses on integrated management of urban water infrastructure. Sustainability assessment, in particular Life Cycle Analysis, is guiding his research line all along.

Dr. Corominas obtained scholarships for his pre-doctoral and postdoctoral research studies, the FI and the Beatriu de Pinós respectively, funded by the Catalan Government. In 2009, he obtained the Juan de la Cierva fellowship from the Spanish Ministry of Science and Innovation.

Dr. Corominas has participated in 15 R&D&I projects funded by competitive calls from public or private entities, 8 being at international level and 7 at national level. He has also participated in 3 non-competitive projects with 2 companies and 1 water agency. He is the principal investigator of two European projects which are currently running: a) the prestigious Marie-Curie Action Career Integration Grant with the project EcoMaWat (PCIG-09-GA-2011-293535), and b) the ICRA contribution on the EU FP7 demonstration project R3-Water (619093; FP7-ENV-2013-Water-Inno-Demo). Also, he is the principal investigator of the contracts with the Catalan Water Agency and Aigües de Girona, Salt i Sarrià de Ter.

His research activities have resulted in 29 publications. 25 of these publications are in ISI listed peer-reviewed journals, with an H-



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DE INVESTIGACIÓN
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CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
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index of 10 and receiving 257 citations. Additionally he has participated in the writing of 3 book chapters (2 on benchmarking of control strategies and 1 on Life Cycle Assessment) and is the main author of the deliverable 1.2 from the EU FP6 Neptune Project. He has disseminated the results of his research through the participation in 50 national and international conferences with 39 oral presentations and 11 posters. 5 of the oral presentations were realized after personal invitation.

Dr. Corominas is the main author of a patent which was submitted in 2012 (P4103/2012) on a new methodology for monitoring combined sewer overflows.

Dr. Corominas has officially supervised 1 PhD thesis (defended in 2012), 1 MSc and 4 BSc final projects.

Dr. Corominas has been involved in 6 research teams from the International Water Association: 1) Task Group on Benchmarking of Control Strategies for Wastewater Treatment Plants; 2) Task Group on the use of water quality and process models for minimizing wastewater utility greenhouse gas footprints; 3) Task Group on Design and Operations Uncertainty; 4) Task Group on Good Modelling Practice; 5) Working Group for Life Cycle Assessment of Water and Wastewater Treatment (LCA-Water WG); and 6) COST Action ES1202 within the working group 3 **◆Environmental and economic impact◆**. He is currently chairing the LCA-Water WG.

Dr. Corominas has been involved in the organization of 10 international conferences, is frequent reviewer for about 10 scientific journals in the area of water resources, and is editor of the Journal Water Practice & Technology (IWA Publishing).



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SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
PARA LA INVESTIGACIÓN

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Título:

Adaptation of Urban Water Infrastructure

Resumen de la Memoria:

In my research I investigate how to effectively characterise and manage uncertainty for the operation, design and planning of water infrastructure systems.

In my initial research I proposed methods to quantify uncertainty for design and performance assessment of water treatment systems. The studies focused on how to develop meaningful uncertainty estimates using applied statistics and mathematical models to obtain probabilistic predictions of disinfection and pollutant transformation. The work promoted the use of expert elicitation to obtain meaningful characterisation of parameter uncertainties as well as global sensitivity analysis to attribute model output uncertainty to parameters.

These approaches were further developed and expanded for risk-based design of wastewater treatment plants. Technology transfer and collaboration with practice allowed me to develop strong ties with engineering companies, utilities and water authorities. These interactions enabled me to reveal how benefits, costs, and risks are distributed among stakeholders depending on the contract delivery mechanisms in place. This work identified that the way how uncertainty is addressed in the initial planning stages has the highest impact on capital expenditure.

These findings lead to my current research which focuses on how to plan infrastructure systems under conditions of uncertainty. Identifying efficient and effective solutions is a pressing issue at the current time where required rehabilitation of rapidly deteriorating infrastructure and scarce public resources collide with fast socio-economic developments and climate change.

Taking the view of water infrastructure as a complex adaptive system a major current project of mine (adaptation in hindsight) identifies the relevant drivers, the timescales at which they act and interactions among them. Repeatedly, infrastructure conceived in a predict and provide mode, where historic trends are extrapolated, becomes inadequate very quickly. The long physical lifetimes stand in contrast to the rapid and interacting dynamic processes occurring in economic developments, load patterns, city growth or shrinkage, technological innovation or environmental requirements. Alternative strategies to the predict and provide mode of design aim at either increasing infrastructure flexibility in order to be able to adapt to changing conditions or they seek to increase robustness in order for systems to work satisfactorily under many possible futures instead of optimally for one expected future.

Resumen del Currículum Vitae:

I obtained an MSc in Rural Engineering in 1999 and a PhD in Environmental Engineering in 2007, both from ETH Zurich, Switzerland. From 2007 to 2008 I was Postdoctoral Researcher at Eawag, the Swiss Federal Institute of Aquatic Sciences and Technology. I was then a Postdoctoral Fellow with the Canada Research Chair on Water Quality Modelling from 2009 until 2012 at University Laval in Quebec City, Canada. In 2012 I was awarded an Ikerbasque Research Professorship from the Basque Science Foundation and currently conduct my research at the Basque Centre for Climate Change (BC3) in Bilbao, Spain.

A central topic of my research has been the use of rigorous uncertainty assessments for model-assisted design and performance assessment of water infrastructures. Case studies from urban drainage, drinking water supply and wastewater treatment have been used to demonstrate the value of explicitly accounting for and where possible quantifying sources of uncertainty and variability. I have promoted the use of global sensitivity analysis within environmental engineering, especially methods based on variance decomposition. A substantial part of my research was published in two of the highest ranked journals in environmental engineering and water resources: Environmental Science and Technology and Water Research.

At Université Laval I developed a new research line on risk-based design of wastewater treatment plants which was supported with a project grant from the Natural Sciences and Engineering Research Council of Canada (NSERC). I developed and coordinated the team for this line of research and collaborated extensively with water utilities, engineering consultants and software developers in North



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DE INVESTIGACIÓN
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL
DE RECURSOS HUMANOS
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America and Europe and. I coordinated the joint IWA (International Water Association) ♦ WEF (Water Environment Federation) Task Group on Design and Operations Uncertainty.

During this time at Université Laval I co-developed an auditing methodology for aqua-responsible cities. Within this project I also acted as an auditor for the pilot audit of Quebec City. This project has had a major impact on the city♦s current planning of infrastructure renewal and is currently being applied in other municipalities.

My current research projects focus on the development of long-term planning and design strategies for the development of water systems trying to explicitly account for rapid and dynamic changes in climate, society and environment.