



TREATREC (ITN-EID) TACKLING FUTURE WASTEWATER CHALLENGES



This project is funded by
the European Union

<http://treatrec.eu/>

The key to training professionals for future success

A powerful and innovative method of training research professionals for a bright and successful future in wastewater management is being delivered by the pan-European TreatRec project

Looking into the future there will be additional high pressure demands facing wastewater management in Europe. In order to combat these challenges it is important a new generation of highly skilled researchers have the ability to face these issues. Part of this will be the capacity to develop new technologies which can be integrated to fit into current systems to address future problems.

TreatRec is a European Industrial Doctorate (EID) project funded by Marie Skłodowska-Curie Actions (MSCA) programme of Horizon 2020. The project focuses on developing interdisciplinary concepts for municipal wastewater treatment and resource recovery. It kicked off in January 2015, runs for a period of four years and is designed to change the typical approach on PhD training by partnering industry and academia. The purpose is to provide scientific co-operation between the two sectors, which allows for early stage researchers to become competent and efficient scientists with transferable skills in practice.

Dr Mira Petrovic, who is an ICREA Research Professor based at the Catalan Institute for Water Research, is the TreatRec Project Coordinator. She explains:

'TreatRec offers a new and powerful vision of how PhD training in wastewater treatment technologies can be conducted by introducing a strong component of interdisciplinarity into the program, in addition to exposing the trainees to a broad spectrum of research issues and environments (industry, university, research institute).' She further outlines that the TreatRec research programme is structured in a way that results in unequalled industrial influence on training needs and adds that the application of new technologies could 'help meet the ever increasing regulatory demands that are being placed on water agencies around the world and ultimately secure a healthier environment for humans'.

COMING TOGETHER

The core idea of the TreatRec project is the collaboration between industry (ATKINS and AQUAFIN) and academia (Catalan Institute for Water Research and University of Girona) where the two sectors work together to identify research questions. With multisectorial insight TreatRec fellows will be able to readily access information and competence and conduct enhanced progress in meaningful research. Through this communication the project has identified five main technological and knowledge gaps around which the research programme has been built. These

are: improving efficiency of wastewater treatment regarding micropollutant removal; improving understanding of transformation processes affecting emerging microcontaminants; improving the effectiveness of the systems; recovery of energy and recovery of nutrients from wastewater; global change and resilience of wastewater treatment in stress conditions; and improving and facilitating decision support tools for decision makers.

As a response to these needs TreatRec contributes to fill in the gaps and improve understanding of wastewater treatment processes and ability to solve potential future challenges. They will do this by studying state of the art technologies for wastewater treatment upgrade for successful removal of emerging microcontaminants, and making clear pathways and identifying main transformation processes from a number of relevant unstudied emerging microcontaminants. 'In addition, we are identifying the best combination of anaerobic ammonium oxidation plus struvite precipitation to increase the phosphate recovery and to minimise ammonium recycles to the water line, providing a means to risk assess urban wastewater treatments response to current and future stressors in combination, and offering a great opportunity for decision support system development within the wastewater treatment field by involving from the very beginning industrial partners which will define the requirements of such systems and which will provide experimental examples for validation,' notes Petrovic.

LIFE OF A FELLOW

Each of the five TreatRec fellows undergo extensive training and they are all enrolled in the Doctoral Programme in Water Science and Technology at the University of Girona, Spain. The Doctoral Program in Science and Technology of Water is an official doctoral programme that provides



students with advanced training in research techniques and includes the presentation and defence of a doctoral thesis, consisting of original research work. This approach to training is unique in the way industry is included throughout the process, each of the TreatRec fellows will have a supervisor from non-academic institutions. For two of the Early Stage Researchers (ESR) the main supervisor is from industry partners AQUAFIN and ATKINS, while other three ESRs will be co-supervised by researchers from non-academic institutions assuring

among a variety of other ways the public and scientists can view the progress and results of the project. Making the knowledge gathered on this project accessible and available to the scientific community and the public is a really important component of the team's work. 'The research results will be disseminated to a professional scientific audience through publications in high profile international journals, lectures and posters at international meetings and conferences and popular scientific media,' Petrovic says.

findings to the business and policy sectors. 'From a research perspective our efforts will provide recommendations and guidance for decision makers on upgrading wastewater treatment plants for future challenges, such as microcontaminant removal and nutrient recovery from a sustainable perspective.' The overall outcome of the project will lead to a sustainable future in wastewater management with leading technologies that will safe guard future generation's water quality and water availability.

TreatRec offers a new and powerful vision of how PhD training in wastewater treatment technologies can be conducted

therefore full and equal distribution of supervision responsibilities among academic and non-academic partners.

One of the ways that the public can learn about what it is like to be a TreatRec fellow is through reading the blog on the TreatRec website, this is an interesting and engaging understanding of a fellow's personal journey. The blog highlights the passage of individual growth and study experience through their insight, opinions and thoughts. TreatRec fellows share about travel, culture and life in a new country, plus knowledge, opinions and causes of wastewater issues, this easy to read forum also includes research progress and tips and tricks for others who are studying or writing.

SUSTAINABLE AND ACCESSIBLE

Improving dissemination and making results accessible and available to the scientific community and the public is an important focus of the project, all published articles will be open access and can be found at the TreatRec webpage,

Outreach activities of scientific results are based on several activities. These include the TreatRec webpage which is hosted by ICRA, as well as Fellows blog released via the TreatRec web site for the attention of the public at large. Non-scientific publications in paper form or electronically and blogs (one example is <http://www.iagua.es/blogs/LEQUIA>) are also important to share the knowledge. 'Strong involvement in the education of students in water science, environmental science, technology, ecotoxicology, environmental and analytical chemistry (Undergraduate, Master and Doctoral programme at University of Girona); and active participation in the activities aimed to popularise science.' These include Science Week, Researchers' night, open day, presentations at schools and demonstrations.

TreatRec will produce a new generation of professionals with the skills to design and apply efficient technologies for wastewater treatment, but also able to transfer research

Project Insights

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BENEFICIARY PARTNERS

ATKINS (UK) • Aquafin (Belgium) • Catalan Institute for Water Research (Spain) • University of Girona (Spain)

PARTNER ORGANISATIONS

Bavarian Research Alliance (Germany) • Severn Trent Water (UK) • University of Bath (UK) • Waterschap De Dommel (The Netherlands)

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PROJECT COORDINATOR BIO

Dr Mira Petrovic has been an ICREA Research Professor since December 2005. She has a PhD in Chemistry (1995) from the Faculty of Chemical Engineering and Technology, University of Zagreb, Croatia. Currently she is a senior researcher at the Catalan Institute for Water Research (ICRA), Girona, Spain. Petrovic is responsible for the research line involving pollutants in wastewater. She has participated in 16 EU projects since 1999, published 180 papers in SCI journals (Hirsch Index 57), edited seven books and published 34 book chapters.



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Impact Objectives

- Identify technological gaps and knowledge needs in wastewater treatment and management, and build a research programme based on these
- Create a group of young researchers capable of conducting high quality research to address industrial and societal needs and implement wastewater-related directives in practice

Tackling future wastewater challenges

TreatRec (European Industrial Doctorate) aims to educate and train professionals able to transfer research findings to business and policy sectors and influence institutional, regional and national technological developments in the field of wastewater treatment. Project Coordinator Dr Mira Petrovic discusses the training programme and sharing the knowledge gathered



What are some of the current issues surrounding wastewater management?

Climate change and the resulting unpredictability of precipitation patterns and temporal or permanent water scarcity may become strong additional drivers of water reuse within European legislation currently being developed. Following the accepted philosophy of the circular economy an improved recovery of other resources in wastewater, such as nutrients or energy is also of high relevance. Following these arguments, it is apparent that more and more internal recycling loops will become implemented increasing the connectivity of different compartments of the water cycle. Within this system of connected flows, water will also be an important transport medium for contamination, including industrial and human consumption chemicals.

Can you explain how the European Industrial Doctorate (EID) project TreatRec (Interdisciplinary concepts for municipal wastewater treatment and resource recovery) aims to resolve future wastewater issues?

As a general goal, academic and non-academic partners of TreatRec, including wastewater treatment plant operators, engineers responsible for the design and a water authority which has experience in water policy implementation, will generate a set of recommendations to provide guidance for decision-makers on

upgrading wastewater treatment plants. This is to address future challenges such as microcontaminants removal and nutrient recovery from a sustainable perspective.

In what ways does the combination of academic and non-academic partners enhance the needs of the project?

TreatRec involves two academic partners (Catalan Institute for Water Research and University of Girona) and two non-academic partners (ATKINS and AQUAFIN). Typically the industrial sector identifies a research question that they want resolved and let a contract to the academic partner to do the work. Here, the TreatRec research programme is structured as a collaboration between the academic partners and industrial partners resulting in unequalled industrial influence on (and relevance of) the training needs. The research questions have been identified in dialogue between the academic and the non-academic researchers creating a new basis for scientific collaboration between the two sectors.

Can you share some of the main achievements to date?

An extensive training program through advanced training courses, technical workshops and individual research projects has been implemented to provide competences in cutting-edge technologies for wastewater treatment and resource recovery, aimed to improve and maximise efficiency of treatment configurations needed for the successful implementation of European directives. TreatRec fellows

have received extensive training in several areas. These include state-of-the-art technologies and tools for wastewater treatment and resource recovery from wastewater; socio-economic issues, policy drivers and regulations related with the management of urban wastewaters; inter-sectoral issues (industry engagement, networking and client development); and complementary skills (such as project management, communication in science and communication to the stakeholders).

How does the TreatRec training programme encourage originality and innovation?

A particularly novel feature of TreatRec is its strategy to tackle the research objectives using the dual perspectives of industry and academia, with additional input from associate partners to make sure that not only high quality research is achieved but also high impact of the research by proper dissemination of the results to the whole of society. The research programme identifies basic skills that researchers must have at the end of the training to be able to continue with their career development (either in academia or in industry) with success. By exposing trainees to the innovations and novelty described above, they will naturally develop independent and critical thinking which seeks for originality and innovation. Further originality in the approach lies in the way researchers are trained to consider the industrial needs and the relevance of policy in shaping the technology under their development and the ways in which the outputs of their work can influence policy reform.