



EiCLaR

NEWSLETTER

AUTUMN 2024

Enhanced and Innovative *In Situ* Biotechnologies
for Contaminated Land Remediation

Dissemination and outreach is the focus for the EiCLaR team

Final EiCLaR Project Meeting

The final EiCLaR project meeting was held in Rotterdam, Netherlands from 1-2 October 2024, kindly hosted by DSBP*. The meeting was attended by Chinese and European project partners and Pierre Matz (Solvay) and Ye Yuan (Center International Group Company) from the Stakeholder's Board, as well as other valuable colleagues from China. In a break from tradition and to enhance both general and work package-specific discussions, the format of the meeting was organized around posters, rather than formal presentations. This led to greater interaction and a more dynamic atmosphere. There was even time for a game about environmental stakeholders!



Project team in Rotterdam.

EiCLaR Public Symposium

The positivity surrounding the first two days was extended to a day of science and technology outreach at the EiCLaR public symposium, held on 3 October at the Institute for Housing and Urban Development Studies (IHS), Erasmus University Rotterdam. The morning session showcased cutting-edge research in environmental sustainability, with presentations from researchers exploring advanced topics like bioremediation and novel technological solutions. In the afternoon session partners, especially SMEs, showcased their flyers or posters related to the technologies or services they offer. The session highlighted innovative solutions developed through collaborative research (<https://eiclar.org/news-and-events/posters/>).

*Full names of project partners are given on page 5.

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RemTech Europe

The EiCLaR team had a strong presence at RemTech Europe between 16-20 September 2024. RemTech Europe is the International Conference and Exhibition on Land and Water Remediation Markets and Technologies and was held as a hybrid event - two days streamed only and three days allowing for both in-person (in Ferrara, Italy) and online participation.

EiCLaR project partners presented in the following sessions:

- Innovative PFAS soil remediation
- PFAS groundwater remediation
- Chlorinated solvents remediation
- CSIA and genetics in soil bioremediation
- Groundwater remediation



Zhengtao Li presenting at RemTech Europe.

The conference brought together experts, industry leaders, and technology providers, offering a platform for discussion and collaboration among stakeholders. RemTech Europe provides an annual overview of the European market and emerging trends in the field. However, one of its key objectives is to disseminate knowledge and technology globally, which is why participation is completely free.



www.EiCLaR.org



Update on EiCLaR Technologies

As the EiCLaR project nears its completion at the end of 2024, the majority of technology development and lab analysis work is drawing to a close. Some of the results are presented in the posters showcased on the Outreach Day in Rotterdam (see page 1). They can be accessed on the EiCLaR website (<https://eiclar.org/news-and-events/posters/>). In addition, there are still some ongoing experiments both in the lab and in the field and these are described further below.

USTUTT has reported on column experiments investigating electro-nanobioremediation (ENB).



Soil extraction from ENB boxes for column experiments.

Approximately 9 kg of soil was extracted from two different zones of the ENB box. The soil was then analyzed for iron species and filled into columns for the next part of the study. This will assess contaminant reduction by iron-reducing bacteria which have been stimulated with carbon-substrate injection.

After the summer, SPAQUE, DVGW and Injectis worked together to implement the monitored bioaugmentation (MBR) technology at the Nouveaux Ateliers Mécaniques (NAM) site in Belgium. The suitability of the groundwater conditions of the site to sustain the MBR technology was established in previous lab studies at DVGW.

The pilot application began in the first half of September. The bioaugmentation using TCE/DCE degrading enrichment cultures is being supported by the injection of oxygen release compounds as the oxygen source. Results of regular sampling campaigns are awaited to see if the injections will lead to enhanced chloroethene degradation at the site.

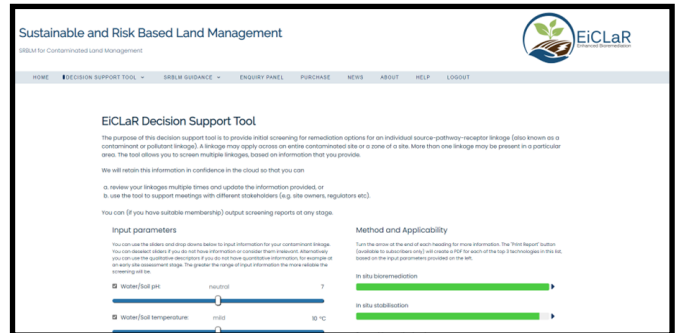


Injection equipment at the NAM site.

ISSAS has reported work on developing an in vivo assay for investigating co-metabolic defluorination of per- and poly-fluoroalkyl substances (PFAS), particularly polyfluoroalkyl substances, utilizing colorimetric fluoride detection. In addition, it has been investigating the interactions between microplastics and PFAS.

The decision support tool (DST) developed within the EiCLaR project has been sent widely for testing amongst stakeholders. The DST is designed to provide remediation option appraisal screening across 24 different remediation categories. While future developments may dive deeper within individual categories, the current focus is on covering a broad range of options.

The tool also features a report engine, which can generate annexes for option appraisal sections - such as those following a preliminary risk assessment report - helping to save consultancy time and provide neutral benchmarking. Additionally, the tool offers an enquiry panel service, as well as a free decision support service. Free access to general information and training will also be available. The DST is hosted on the website ContaminatedLand.info and is set to launch in 2025.



Screenshot of the DST.

For background on the ENB, BER, MBR and EPR technologies visit the EiCLaR website:

eiclar.org/technologies/enb

eiclar.org/technologies/ber

eiclar.org/technologies/mbr

eiclar.org/technologies/epr

Technical bulletins describing application of each of the four technologies and the DST will be available by the end of the project.



Interviews with Project Partners

Nicola Harries from CL:AIRE has been conducting a series of interviews with members of the EiCLaR team to find out a bit more about their backgrounds and how they got to where they are now.

All the interviews are now available to listen to on YouTube via the EiCLaR website (<https://eiclar.org/category/videos/>).

Nicola's next interview was with Kim Johansson, a PhD student working in the Waste Science and Technology Division of Geosciences and Environmental Engineering at LTU in Sweden. Kim is working on Work Package 3, which is all about enhanced phytoremediation.



Nicola from CL:AIRE interviewing Kim from LTU.

So let's find out about Kim:

I've been a PhD student at LTU for about 3 years now. I'm actually from Gothenburg in southwest Sweden, and that's also where I studied. I have two Bachelor of Science degrees, one in chemistry and one in environmental science. Then I did a Master's in ecotoxicology. All of this was undertaken in my hometown, at Gothenburg University.

In between the degrees I had a few years in industry to gain a different perspective. I worked at an environmental consultancy, an architectural firm with environmental issues and for the municipality at a waste company.

My PhD lasts for five years and within this time I am spending about 10-20% doing so-called institutional work. For example, I'm involved in the employment board here at the university, so it can be different tasks to teaching, and the other four years there is a mix of conducting research, writing, going to conferences, and also taking courses.

I am working on enhanced phytoremediation within the EiCLaR project. Phytoremediation is a remediation technology where we use vegetation to remediate soil and traditionally this was done by plant uptake of metals from the soil. So basically you're just using the normal mechanism in plants, which is to extract soil water with nutrients, but we use it to take up contaminants instead. But it can also mean, for example, stabilisation of contaminants by the root system or degradation of organic contaminants. Enhanced phytoremediation is really a combination of different remediation technologies – phytoremediation, bioremediation, electrokinetic remediation - and the optimization of them individually to create a greater remediation effect, a synergistic effect.

This work package is also moving from lab-scale proof of concept into real industrial scale implementations. This is something I think is very important and just one of the things that I like about the EiCLaR project, that it is a true collaboration between university and industry.

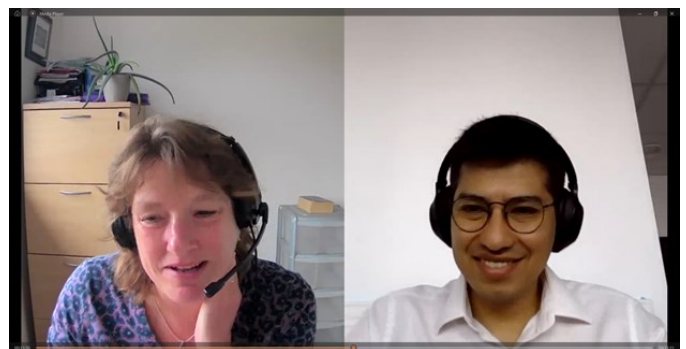
Nicola's final interview was with Azariel Ruiz-Valencia, a postdoctoral researcher at CNRS in Lyon, France.

So let's find out some more about Azariel:

I'm from Mexico and I studied as an engineer in the south of Mexico. Then I had the opportunity to come to France to do my PhD. I was able to do this through a programme run by an organisation called Campus France. It has an agreement with the Mexican government to provide some scholarships for people to come from Mexico to study in France. So this is what I did. I carried out my research in Montpellier in the south of France.

My PhD focused on a natural process to transform CO₂ into formic acid with the help of bacteria. This was very successful so we applied for a patent and I was very pleased to develop this process in the south of France. After the defence of my doctoral thesis in 2019 I stayed a further year, partly as a postdoc and partly as an engineer. So I am a very biological bioprocessing engineer. In fact, one of my motivations is to work with live microorganisms and to do something to improve the environment.

At the beginning of 2021 I was recruited into the EiCLaR project, specifically in Work Package 2 which is developing bioaugmentation and bioelectrochemical remediation technologies. The link between these two different technologies are the microorganisms. Understanding the microbial communities in order to see which ones are taking the lead in the biodegradation of the different pollutants is key to both technologies. In the case of bioelectrochemical remediation I am also developing the process to take it into a bigger scale, from lab scale to field scale. The bioelectrochemical technology is used to overcome some difficulties that natural attenuation is having. Note that this is not a new technology, but the application of this in polluted soils is very relevant.



Nicola from CL:AIRE interviewing Azariel from CNRS.



More project outputs to come

As the EiCLaR project nears the end the team is working hard to present the results in different ways to different audiences:

- Journal papers - most research projects produce journal papers for publication in peer-reviewed scientific journals; these outputs capture the most technical aspects of the research and are fundamental to demonstrate the quality of research being undertaken.
- Technical bulletins - a series of short, readily transferable bulletins to describe EiCLaR and its outputs to interested parties and signpost them to more detailed information. These bulletins will have a major role in facilitating exploitation by practitioner audiences.
- White papers - each “White paper” will provide a technical briefing for each of the EiCLaR technologies, targeted to different practitioner audiences: for site owners/ managers (including real estate developers), for regulators, for service providers and for environmental service procurement personnel.

- Animation and an education pack - aimed at the wider public to improve and promote the broad understanding of the technologies within the EiCLaR project.

Keeping informed post-project

The best place to keep informed about EiCLaR’s results is to visit our website at www.EiCLaR.org. Remember this is where you’ll find the posters and podcasts mentioned earlier.

Alternatively, you can get updates via [LinkedIn](https://www.linkedin.com/company/eiclara/) or WeChat (available in China) or by contacting Timothy M. Vogel at CNRS via email: vogel@univ-lyon1.fr

Project Partners

CNRS	French National Centre for Scientific Research, France
R3	r3 Environmental Technology Ltd, UK
DVGW	DVGW-Technologiezentrum Wasser, Germany
USTUTT	VEGAS: Research Facility for Subsurface Remediation, University of Stuttgart, Germany
PWT	Photon Water Technology s. r. o., Czech Republic
LTU	Luleå University of Technology, Sweden
TUL	Technical University of Liberec, Czech Republic
SPAQUE	SPAQUE, Belgium
CL:AIRE	CL:AIRE, UK
DSBP	Dutch Sino Business Promotions, The Netherlands
BOSS	BoSS Consult GmbH, Germany
SERPOL	SERPOL, France
EKO	EKOGRID Oy, Finland
ISSAS	Institute of Soil Science, Chinese Academy of Sciences, P. R. China
SJTU	Shanghai Jiao Tong University, P. R. China
ZJU	Zhejiang University, P. R. China
CUG	China University of Geosciences, P. R. China
GIG	Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, P. R. China

