



# Deliverable 11.9

Final conference

**Date:** 31 December 2024



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## Disclaimer

The information included herein is legal and true to the best possible knowledge of the authors, as it is the product of the utilization and synthesis of the referenced sources, for which the authors cannot be held accountable.

## Keywords

▪ Circular water economy ▪ Resource recovery ▪ Sustainable water management ▪ Circular business models ▪ Advanced policy formulation



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## Deliverable information

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<b>1</b>	31-12-2024	Final Conference	Patricia Osseweijer (TUDELFT)

<sup>1</sup> **R**=Document, report; **DEM**=Demonstrator, pilot, prototype; **DEC**=website, patent fillings, videos, etc.; **OTHER**=other; **ETHICS**=Ethics requirement, **ORDP**=Open Research Data Pilot

<sup>2</sup> **PU**=Public; **CO**=Confidential, only for members of the consortium (including the Commission Services); **EU-RES** Classified Information: RESTREINT UE (Commission Decision 2005/444/EC); **EU-CON** Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC); **EU-SEC** Classified Information: SECRET UE (Commission Decision 2005/444/EC)

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## Executive Summary

The Final Conference of WATER-MINING was held 29-30 September 2024 at the Green Village, Delft University of Technology, The Netherlands and was attended by over 70 people from over 12 countries.

The outcome of the Sea, Urban and Industrial Mining Case Studies were presented and discussed with multidisciplinary panels where also sustainability impacts; policy measures; and business models were discussed. The meeting agreed the preparing of a White Paper to highlight key results and future research agenda's for a diverse audience, which will be presented in 2025.

In summary, all Case Studies showed improved foot print impacts with the Case Studies on Sea Mining as most economically advantageous. Interlinking with renewable energy systems is crucial (for desalination) and Industrial water management requires first sustainable resources. Public private partnerships may help build trust and implement circularity. Re-use of wastewater and its components is shown to have the potential of being a real gamechanger and with wastewater treatment earning incomes, more people can access clean water. It is important that regulation treat wastewater as *pre-drinking* water. Indeed, solving urgent local needs can help conflict resolution. In all cases it is crucial is to include Stakeholder engagement early on in the design phase. For the future R&D Agenda it was concluded that marine science needs to adopt a more holistic approach to support sustainable innovation with impact analysis integrating circularity and social impacts in the methodology. We also need new designs of circular economically viable Business Models, based on defined and jointly agreed local problem definitions. Novel approaches on decision making and weighing criteria may help to develop small scale technology solutions for access for all and that is adaptive to changing situations. Complexity requires (public private) collaboration and a system approach with a focus on product marketing – transfer from public to business.

The White Paper will be developed in 2025 and presented the First Congress on Water Smart Economy & Society, planned from 25-28 Mat 2025 in Rotterdam <https://wses2025.dryfta.com/>.

A Press Release of the Final WATER-MINING conference was presented here: [https://watermining.eu/wp-content/uploads/2024/10/WM\\_PR\\_Conference\\_24-1.pdf](https://watermining.eu/wp-content/uploads/2024/10/WM_PR_Conference_24-1.pdf)

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## Acronyms

<b>CAPEX</b>	Capital expenditure
<b>CE</b>	Circular Economy
<b>CWE</b>	Circular Water Economy
<b>EU</b>	European Union
<b>EFC</b>	Eutectic Freeze Crystallization
<b>EPS</b>	Extracellular Polymeric Substances
<b>FR</b>	Flame Retardant
<b>HPO</b>	High-Pressure Oxidation
<b>LOIs</b>	Letters of Intent
<b>NPV</b>	Net Present Value
<b>OPEX</b>	Operating Expense
<b>PMs</b>	Policy Measures
<b>R&amp;D</b>	Research & Development
<b>TRL</b>	Technology Readiness Level
<b>UWWT</b>	Urban Waste Water Treatment



# 1. Overview of the project

WATER-MINING is a project funded by the European Commission (Horizon 2020 – Grant Agreement No 869474) with a total duration of 48 months (Start date: 01/09/2020 – 31/08/2024) and a total budget of approx € 19 million (EU Contribution: € 16,876,959.59). The project is entitled “Next generation water-smart management systems: large scale demonstrations for a circular economy and society” and it is a project granted under the call topic “[CE-SC5-04-2019](#): Building a water-smart economy and society”. Further information about all the sister projects funded under this topic can be found at the CORDIS website [here](#). The WATER-MINING consortium comprises 38 (+1 added) partners from 12 countries, led by the Delft University of Technology (TU Delft). More information about the project can be found at the project website (<https://watermining.eu>) as well as the dedicated website at CORDIS database (<https://cordis.europa.eu/project/id/869474>), while an overview is provided below.

The WATER-MINING project aims to provide for real-world implementations of Water Framework Directive (and other water related legislation), as well as the Circular Economy and EU Green Deal packages by showcasing and validating innovative next generation water resource solutions at pre-commercial demonstration scale. These solutions combine WATER management services with the recovery of value-added renewable resources extracted/MINED from alternative water resources ("WATER-MINING").

The project integrates selected innovative technologies that have reached proof of concept levels under previous EU projects. The value-added end-products (water, platform chemicals, energy, nutrients, minerals) are expected to provide regional resource supplies to fuel economic developments within a growing demand for resource security. Different layouts for urban wastewater treatment and seawater desalination are proposed, to demonstrate the wider practical potential to replicate the philosophy of approach in widening circles of water and resource management schemes. Innovative service-based business models (such as chemical leasing) are being introduced to stimulate progressive forms of collaboration between public and private actors and access to private investments, as well as policy measures to make the proposed water solutions relevant and accessible for rolling out commercial projects in the future. The goal is to enable costs for the recovery of the resources to become distributed across the whole value chain in a fair way, promoting business incentives for investments from both suppliers and end-users along the value chain. The demonstration case studies are first implemented in five EU countries (NL, ES, CY, PT, IT) where prior successful technical and social steps have already been accomplished. The broader project consortium representation will be an enabler to transferring trans-disciplinary project know-how to the partner countries while motivating and inspiring relevant innovations throughout Europe.

## 2. Scope of the deliverable

Within WATER-MINING project, Work Package 11 (WP11) is focusing on the “Dissemination and communication activities”. WP11 is structured on the following four (4) Tasks:

- **Task 11.1:** Strategic Communication Plan;
- **Task 11.2:** Visual identity, Online Presence & Communication Materials;
- **Task 11.3:** Communication, networking, and information exchange;
- **Task 11.4:** Dissemination for exploitation and commercialisation support of WATER-MINING results.

The results from the implementation of this work package are presented through nine (9) deliverables:

- **Deliverable 11.1:** Strategic communication plan;
- **Deliverable 11.2:** Website;
- **Deliverable 11.3:** Newsletters;
- **Deliverable 11.4:** Modular mobile exhibition;
- **Deliverable 11.5:** Videos;
- **Deliverable 11.6:** Capacity building & citizen engagement;
- **Deliverable 11.7:** WATER-MINING Layman’s Report;
- **Deliverable 11.8:** Three sector specific role out events; and
- **Deliverable 11.9:** Final conference.

The current deliverable comprises the ninth deliverable of WP11. The work was led by TU Delft within Task 11.4, under Subtask 11.4.4.

This deliverable is also a “Public” deliverable, thus not containing any confidential information.

### 3. Introduction

This deliverable documents the key outcomes and recommendations of the Water Mining conference, ‘Water Mining: Lessons Learned in creating value for Society’. The conference was held on September 30, 2024, at the Green Village, Delft University of Technology in Delft, the Netherlands. The conference brought together European policymakers, academics, industry and wastewater treatment institutions, and shared solutions for Industrial, Sea, and Urban mining in circular sustainable (waste)water management enabling resource, nutrient, and water recovery and presented amongst others the six successful European case studies (Lampedusa, Almeria, Faro, Larnaca, La Llagosta and Rotterdam). The approach included integrated impact assessment and stakeholder engagement and co-creation as well as co-development of market models and policy advice.

The objective of the specific deliverable is to report the main outcomes of the conference and to highlight the main topics discussed, insights, and key takeaways from the presentations and panel discussions.

## 4. Agenda of the conference

# WATER-MINING CONFERENCE

## 29 September – 30 September 2024

Venue:

Green Village Delft, Van den Broekweg 4, 2628 CR Delft &

Delft University of Technology, Faculty of Applied Sciences, van der Maasweg 9,  
2629 HZ Delft

### Sunday 29 September

16.00 – 19.00 Registration

17.00 – 18.00 Welcome and Stand up podium

18.00 – 19.00 Reception

### Monday 30 September

**“Water Mining: lessons learned in creating value for society”**

**Venue: Green Village Delft**

9:00 – 9:10 Welcome and introduction  
*Patricia Osseweijer and Mark van Loosdrecht, Delft University of Technology*

9:10 – 9:20 Key learnings and challenges of Water Mining  
*Dimitris Xevgenos, executive project manager, Delft University of Technology*

9:20 – 9:45 **Key note: Resource Recovery for smart water management**  
*Mark van Loosdrecht, Delft University of Technology*

9:45 – 10:15 *Coffee Break*

## WATER-MINING Success Stories – 5 minute Pitch

10:15 – 10:20 WATER-MINING solutions for less developed regions (UN collaboration)  
*Mar Palmeros, Delft University of Technology*

## SEA-MINING

10:25 – 10:40 Desalination and recovery: clean and feasible  
*Dimitris Xevgenos, Delft University of Technology*

10:40 – 10:55 Industry perspectives on implementing sea mining practices in Lampedusa and Almeria, Spain  
*Kalliroi Panteleaki, Sealeau*

10:55 – 11:25 Panel discussion  
Panel members: Frithjof Kuepper, University of Aberdeen; Berta Roset, University Autònoma de Barcelona; Guillermo Zaragoza, Ciemat; Diego Acevedo, University of Aruba; Kalliroi Panteleaki, Sealeau  
*Moderator: Dimitris Xevgenos, Delft University of Technology*

## INDUSTRIAL-MINING

11:25 – 11:40 Technological advancement in brine purification with HPO  
*Michael Christopharo, KVT Technology*

11:40 – 11:55 Industrial-Mining in Rotterdam port industrial area  
*Michiel de Beer, Nobian and Ellen Tuinman, Westlake Epoxy*

11:55 – 12:25 Panel discussion  
Panel members: George Tsalidis, Imperial College; Michiel de Beer, Nobian; Ellen Tuinman, Westlake; Alberto Turnes, University of Santiago de Compostela; Michael Christopharo, KVT  
*Moderator: Patricia Osseweijer, Delft University of Technology*

12:25 – 13:25 **LUNCH BREAK**

## URBAN-MINING

13:25 – 13:40 Water, resource, nutrient and energy recovery: what are the winning concepts?  
*Mark van Loosdrecht, Delft University of Technology*

13:40 – 13:55 Recovering beyond expectation for social benefits  
*Rene Noppeney, RoyalHaskoningDHV, The Netherlands*

13:55 – 14:25 Panel discussion  
Panel members: Maria Ferreira, KWR; George Tsalidis, Imperial College; Angelos Hadjicharalambous, President of the District Local Government Organization of Larnaca; Rene Noppeney, Royal HaskoningDHV; Jordi Llimós, Eurecat; Teresa de la Torre, Sorigue  
*Moderator: Mark van Loosdrecht*

## WATER-MINING Success Stories – 5 minute Pitches

14:25 – 14:40 Innovation management for Market exploitation  
*Dimitris Xevgenos*  
Spin-off business development by young Water Mining researchers  
*Ali Elahinik*  
Patents in urban mining

*Nouran Bahgat*

- 14:40 – 15:00 **Key note: Best practices in Stakeholder Engagement**  
**Gonzalo Gamboa, Universitat Autònoma de Barcelona**
- 15:00 – 15:20 Panel discussion on best practices and new insights on integration  
 Panel members: Stefania Muneretto, KWR; Koen Vervoort, ENOLL; Lotte Asveld,  
 Delft University of Technology; Carlos Picon, JIN  
*Moderator: Gonzalo Gamboa*
- 15:20 – 16:00 Break & visit to the Green Village**  
**Walk to Building 58 for parallel session I**

## Policy implications

### (parallel session I, Building Applied Sciences, Kronig zaal)

- 16:00 – 16:15 Policy packages: changes for better implementation!  
*Ehud Segal and Jeff Dodick, JIIS (video)*
- 16:15 – 16:30 Addressing policy actions in Cirseau  
*Dimitris Xevgenos, Delft University of Technology*
- 16:30 – 16:45 White paper on integrating social sciences with technology innovation for Water  
 Smart Economy & Society  
*Patricia Osseweijer, Delft University of Technology*
- 16:45 – 17:30 Panel introductions; discussion and conclusions  
*Louis Lemkow, University Autònoma de Barcelona*  
*Loic Charpentier, Water Europe*  
*Leon Korving, Wetsus*  
*Moderator: Patricia Osseweijer, Delft University of Technology*

## WATER-MINING: Industrial Mining best practices for scaling up, Roll-out event by ENOLL

### (parallel session II, Green Village Delft, main hall)

- 16:00 – 17:30 Key insights from the WATER-MINING project's goals, achievements, and results  
 best practices and solutions in industrial water mining by Living Labs: Floating Farms,  
 Plataforma Solar de Almería LL, and TU Delft
- Discussions with companies and other key stakeholders & thought-provoking invitation to consider practical application of the different solutions of WATER-MINING and their potential to enhance companies' efficiency in water management

## CLOSING Reception Open Conference Day at Green Village Delft

## 5. Key takeaways from the conference presentations

### 5.1. Welcome and introduction

Presenter: Patricia Osseweijer and Mark van Loosdrecht, Delft University of Technology

### 5.2. Key learnings and challenges of Water Mining

Presenter: Dimitris Xevgenos, Delft University of Technology

The presentation highlighted the key learnings and challenges in building a water-smart economy and society. The uptake of innovative circular water solutions is hindered by a lack of a common understanding of the benefits of the systemic solutions and a lack of a systematic analysis of the various technological, regulatory, and social barriers. Systemic innovation is critical for a transition to a circular water economy and should be supported by trans-disciplinary research, and by understanding the stakeholders' objectives in the transition to circular water solutions, mapping the problems at a system level, and designing appropriate governance and policy interventions.

### 5.3. Key note: Resource Recovery for smart water management

Presenter: Mark van Loosdrecht, Delft University of Technology

In this presentation, practical measures to minimize resource usage and output of greenhouse gasses in wastewater treatment were presented. By utilising aerobic granular sludge (Nereda©) and applying new system configurations to batch operations, around 30% less energy is needed. Greenhouse gas emissions of nitrogen gas can be minimised by means of denitrification. A brief history of wastewater treatment was presented to contextualise the current practices of resource recovery, which was followed by a focus on recovery of phosphate (struvite and vivimag), cellulose and bioplastics. The presentation continued to show new resources such as EPS (Extracellular polymeric substances) and the use of Kaumera to produce new materials, which will contribute to the integration of wastewater treatment into the circular economy.

### 5.4. Water – Mining solutions for less developed regions (UN collaboration)

Presenter: Mar Palmeros Parada, Delft University of Technology

The presentation was aimed at discussing the potential of resource recovery in addressing global sanitation challenges, in low- and middle-income countries. Limited infrastructure, financial, and operational barriers are crucial aspects to be considered in ensuring safely managed sanitation in less developed regions. The production of resources from wastewater generates additional revenue streams and thereby could contribute to paying part or all operation costs, while also decreasing environmental impacts, contributing to increasing water systems' sustainability. To understand the

potential adoption and impacts of resource recovery technologies, it is essential to take into consideration local conditions, regulations, and social and economic factors.

## 5.5. Sea Mining: Desalination and recovery: clean and feasible

Presenter: Dimitris Xevgenos, Delft University of Technology

The presentation focused on introducing the two Sea Mining Case Studies of the Water Mining project, presenting the potential of resource recovery from seawater brines and decarbonizing the desalination systems by utilizing waste heat and renewable energy sources. The main achievements of the Case Studies were highlighted, which include recovery of high-quality water, and high purity magnesium hydroxide, and valuable chemicals as well as successful demonstration of integrating waste heat and renewable energy sources in different pilots. This was illustrated including its documentation in published papers, and presentations in workshops, as well as a patent approval for EFC technology, and acquisition of LOIs, and agreements within market exploitation activities.

## 5.6. Sea Mining: Industry perspectives on implementing sea mining practices in Lampedusa, Italy and Almeria, Spain

Presenter: Kallirroï Panteleaki-Tourkodimitri, SEALEAU

The presentation focused on explaining the economic feasibility of the Sea Mining case studies, based on the techno-economic analysis results, analyzing the CAPEX, OPEX, revenues from the water, and resources being recovered, as well as NPV and payback period calculations. In addition, the presentation also covered the business model, outlining the agreements between various stakeholders. A potential replication of Case Study 1, taking place in Chios island is currently being assessed, identifying together with local stakeholders the chemicals demand, and tailoring the treatment chain accordingly for the production of the desired chemicals through brine treatment.

## 5.7. Industrial Mining: Technological advancement in brine purification with HPO

Presenter: Michael Christopharo, KVT Technology

The presentation focused on technological advancements in brine purification, particularly with KVT's SEABRINE™ and HPO demo technologies. KVT's waste brine treatment technology, used in various industries, employs high pressure and temperature oxidation to treat brine with high salt and organic content. A key part of the presentation details the HPO demo plant, highlighting its success in optimizing brine purification and reducing operational costs through catalyst recovery innovations. Furthermore, brine recycling for Chlor-Alkali electrolysis was tested, showing feasibility but requiring continuous brine quality monitoring. The results indicate significant potential for industrial application and future optimization.

## 5.8. Industrial Mining: Circular brine in Rotterdam Port industrial area

Presenter: Michiel de Beer, Nobian and Ellen Tuinman, Westlake Epoxy

The epoxy resins industry in the Netherlands has Hexion plants, which are located within the chlorine cluster in the Rotterdam harbor area. Hexion plants are receiving sodium hydroxide and chlorine from Nouryon. A big portion of sodium chloride ends up in salts contained in wastewater, and the



wastewater stream is disposed to surface water, after treatment. The sodium chloride contained in wastewater is the exact sodium chloride used by Nouryon to produce the caustic and the chlorine through the electrolysis process. Thus, the objective of Work Package 6 was to demonstrate a recycling of purified brine to Chlor-Alkali membrane electrolysis, so that the recovered sodium chloride can be provided to Nouryon. The application test results indicate that brine recycling is technically feasible but that continuous brine quality monitoring is critical.

## **5.9. Urban Mining: Water, resource, nutrient and energy recovery: what are the winning concepts?**

Presenter: Mark van Loosdrecht, Delft University of Technology

In this presentation, the functioning of the Kaumera production and prototype was highlighted. The bottlenecks in logistics and market supply were also described, with a market analysis of the potential of the recovered products in waste water treatment. Trade-offs need to be considered for the resource recovery, including the balance between extracellular polymers, electricity and heat consumed and anaerobic digestion. Finally, key bottlenecks in the value chain and economic resource recovery were presented, such as the lack of good value chain models and systems analysis, as well as subsidy dependency and lack of interaction between all necessary stakeholders.

## **5.10. Urban Mining: Recovering beyond expectation for social benefits**

Presenter: Rene Noppeney, Royal Haskoning DHV, the Netherlands

This presentation showcased the Kaumera Extraction Installation (KEI) prototype in Faro/Olhao WWTP, introducing additionally a cellulose recovery project based in the UK. The KEI installation highlights the importance of Kaumera's contribution to changing the mindset from resource consumption and waste production to resource recovery, highlighting the potential of increasing the circular economy in WWTPs. Moreover, he argued that co-creation through social engagement is critical to ensure societal embedding and take into account stakeholders' opinions. A start-up "Kaumera B.V." has been established, aiming to provide a platform for buyers and accelerate sales of Kaumera. For distributors/clients, it is critical to ensure validation and a CE marking for Kaumera as a biostimulant. A CE marking, certifying Kaumera as anorganic soil improver is expected to be obtained in October 2024, and then Kaumera can be traded in the whole EU.

## **5.11. Innovation management for market exploitation**

Presenter: Dimitris Xevgenos, Delft University of Technology

The presentation highlighted the key exploitable results generated as outputs during the project, which can be used to create impact, either by the project partners or by other stakeholders. The project results can be reusable and exploitable as such, or be further used as elements that have the potential to contribute to further work on research or innovation. The presentation incorporated a Hype Cycle diagram, to illustrate the progression of various circular water management and resource recovery projects, while also introducing the new project named "CIRSEAU", which consists of five sister projects granted under the same Call as WATER-MINING, which aims to combine lessons learned and demonstrating the feasibility of a water-smart economy and society.

## 5.12. Spin-off business development by young Water Mining researchers

Presenter: Ali Elahinik, Delft University of Technology

The presentation demonstrated an innovative technology that addresses two goals of the circular economy: waste reduction and decoupling of economic activities from resource consumption. This is achieved through the production of a flame retardant (FR) from sewage sludge biopolymers. Wastewater treatment plants (WWTPs) generate significant amounts of sludge, containing valuable organic biopolymers. This sludge is currently treated as waste, resulting in high disposal costs and environmental footprint. Many current FRs contain halogenated chemicals that persist in the environment and pose health risks, while green, cost-effective alternatives are limited. Biofire Polymer is created as a result from WATER-MINING research, to repurpose sludge biopolymers, and to produce a green, carbon-neutral, and scalable solution for fire retardancy while meanwhile advancing a circular economy.

## 5.13. Patents within Urban Water Mining

Presenter: Nouran Bahgat, Delft University of Technology

The presentation showcased two patents developed within the PhD project on “Integrated phosphorus and EPS recovery from Aerobic Granular Sludge”. The first patent refers to phosphorus recovery from acidic streams as strengite, while the second patent is titled “EPS Engineering via P chemistry”, focusing on increasing the P esters content in EPS. Both contribute to the further economic uptake of circular solutions.

## 5.14. Key note: Best practices in Stakeholder Engagement

Presenter: Gonzalo Gamboa, Universitat Autònoma de Barcelona

The process of engaging stakeholders is generally confirmed as important and should ideally start in the project writing step, in order to ensure that societal needs and concerns can be included in the project proposal. Participatory research processes may take the form of Communities of Practice, Living lab, and Competency groups, among others. Different levels of TRL require different types of stakeholder engagement. In addition, market and policy analysis requires the implementation of innovative participatory methods to incorporate unexpected scenarios of technology implementation. There is a need to create (jointly overlooked) spaces to implement emerging technologies at a small scale, to explore unexpected implications of implementation and deployment of new technologies, and to identify and create adequate norms and institutions. These spaces may take the form of living labs or projects implementing innovative and best practice solutions (e.g. Life EU program).

## 5.15. Policy packages: changes for better implementation!

Presenters: Ehud Segal and Jeff Dodick, JIIS

Promoting the dissemination of innovative WATER-MINING technologies is a complex, multidimensional challenge requiring a synergetic policy package. A tailor-fit policy package was designed for each of the WATER-MINING subsectors, with 18 Sea-Mining policy measures (PMs), 17 Urban-Mining PMs, and 14 Industrial-Mining PMs. The PMs were grouped according to their respective roles: devising strategies, setting standards, leveling the playing field, promoting inter-governmental

collaboration, promoting conservation & efficiency efforts, addressing public perceptions, promoting R&D, and promoting alternative/renewable energy.

These sub-sector packages were compiled with the efforts of a diverse team of WATER-MINING consortium members from the fields of social science, economics, policy, and engineering, as well as with stakeholders. The packages were also designed to overcome implementation barriers identified in each of the case studies.

## 5.16. Addressing policy actions in CIRSEAU

Presenter: Dimitris Xevgenos, Delft University of Technology

The presentation introduced the new project named “CIRSEAU”, and focused on a working group established to address policy & long-term impact. The CIRSEAU project consists of five sister projects and aims to demonstrate the feasibility of a water-smart economy and society. In addition, the presentation featured the results of a workshop that took place in June 2024, titled “Building water-smart economy: how circular economy solutions contribute to ensuring water resilience and security?”, highlighting some key important learnings, among others the need to connect water resilience with other sectors, the need for adoption of CE solutions by utilities, the importance and benefits of the implementation of the UWWT directive by utilities, challenges related to the micropollutants removal, the potential increase of tariffs and the significance of establishing a link between water resilience and water security within the green and digital transition policy/work. Within the tasks of the CIRSEAU project, an acceleration program for circular water start-ups will be established, along with an MSc course and a bi-annual scientific conference on CWE.

## 5.17. WATER-MINING: Industrial Mining best practices for scaling up, Roll-out event by ENOLL

Organizer: Koen Vervoort, ENOLL

Presenting the best practices from the two WATER-MINING living labs : the Desalination living lab, and Floating Farm, it became clear that many possibilities for upscaling developed solutions exist and industrial parties certainly are interested in implementing certain solutions. The living labs provide space for experimentation and data assembly. However, for interested parties to know which have most potential, more in-depth information needs to be provided by the living labs, including financial aspects of the best practices since companies cannot decide without knowing the risks and opportunities. Logically, not all best practices fit all interested parties, and therefore bilateral business trajectories will need to be kicked off by the living labs to upscale their solutions with individual interested parties.

## 6. Concluding remarks

The Final Conference day was visited by over 70 people from more than 12 different countries. Prof. Patricia Osseweijer presented a summary of conclusions. During the panel discussion it was concluded that for both Sea; Industrial and Urban Water-Mining:

- 1) Water scarcity is driver
- 2) Local issues, needs and opinions/values are important
- 3) Complexity requires (public private) collaboration and systemic approaches
- 4) Focus is needed on product marketing – transfer from public to business: can a broker be a solution?
- 5) Viability of the business plan is crucial as nobody pays for environment

In the policy session we discussed and highlighted that there is a public mix up between visions and regulation and that Europe is the best place for implementing policy and regulation, but that these policy measures take time to develop and are maintained for 20 years, so they cannot be too detailed. We also concluded that stakeholder engagement remains key for implementation.

The panel sessions on Sea, Industrial and Urban Mining also concluded that:

- ❖ Using an appropriate heat storage, high recovery desalination can be operated fully by solar energy
- ❖ Open innovation is key to progress
- ❖ Resource recovery is not always perceived as beneficial, it depends on local needs and opportunities
- ❖ Rebound effects due to increased water availability are seen as serious threats
- ❖ Tensions between land use, energy consumption, brine generation and GHG emissions make decisions difficult
- ❖ Prior to industrial symbiosis, industrial parks should focus primarily on provision of sustainable consumables when environmental sustainability is the objective
- ❖ Even when closed loops may be achieved: Economy overrules environmental gain: Getting an economically beneficial business case is key to creating a circular business model
- ❖ High operating costs, technical complexity and regulatory challenges are preventing the implementation of circular industrial solutions
- ❖ Sharing data and sensitive company information can be major obstacles in implementing circular collaboration
- ❖ Collaboration and transparency between stakeholders and third parties on by-products is crucial to get good systemic analysis of environmental impacts
- ❖ General guidelines and long-term objectives in policies should serve as a guide to promote implementation of circular practices

- ❖ Involving multiple stakeholders along the supply chain is key for achieving new models. Technology providers, users, and end customers are needed.
- ❖ With wastewater treatment installations as a fee earner, developing nations can afford much improved wastewater treatment.
- ❖ The future of wastewater treatment lies in decentralization and localized solutions

In the discussion on the new research agenda the following research themes were suggested:

- ❖ How to make business models financially viable and how to improve and develop new economic frameworks that help to make this possible
- ❖ Develop incentives for the chemical industry to better collaborate to face the huge sustainability challenges which require changes along the entire value chain
- ❖ Design of incentives to support establishing public private partnerships
- ❖ How to realize the full potential of re-use of wastewater and its components to realise a real gamechanger
- ❖ Circular water, materials and energy systems require trust, collaboration, and open mindedness. Are we, as society and individuals, prepared and willing to share these values?

Together we decided to develop a White Paper for a multitude of audiences, with a goal to present the key outcomes of Water Mining and sister projects (Cirseau) and present consequential action points for improved water systems. To enable this we will together with Cirseau partners define the key outcomes and barriers for socially adaptive, economically sound and sustainable desalination and wastewater treatment systems and define action points for policy reform; R&D agenda's; business development and models; and stakeholder engagement. The Paper will also present an action plan for communication.

In summary, all case studies showed improved foot print impacts with the Case Studies on Sea Mining as most economically advantageous. Interlinking with renewable energy systems is crucial (for desalination) and Industrial water management requires first sustainable resources. Public private partnerships may help build trust and implement circularity. Re-use of wastewater and its components is shown to have the potential of being a real gamechanger and with wastewater treatment earning incomes, more people can access clean water. It is important that regulation treat wastewater as *pre-drinking* water. Indeed, solving urgent local needs can help conflict resolution. In all cases it is crucial is to include Stakeholder engagement early on in the design phase. For the future R&D Agenda it was concluded that marine science needs to adopt a more holistic approach to support sustainable innovation with impact analysis integrating circularity and social impacts in the methodology. We also need new designs of circular economically viable business models, based on defined and jointly agreed local problem definitions. Novel approaches on decision making and weighing criteria may help to develop small scale technology solutions for access for all and that is adaptive to changing situations. Complexity requires (public private) collaboration and a system approach with a focus on product marketing – transfer from public to business.

The White Paper will be developed in 2025 and presented the First Congress on Water Smart Economy & Society, planned from 25-28 Mat 2025 in Rotterdam <https://wses2025.dryfta.com/>.

A Press Release of the Final WATER-MINING conference was presented here: [https://watermining.eu/wp-content/uploads/2024/10/WM\\_PR\\_Conference\\_24-1.pdf](https://watermining.eu/wp-content/uploads/2024/10/WM_PR_Conference_24-1.pdf)



## 7. Conference Photos



Prof. Patricia Osseweijer in presenting the WATER-MINING project in the introduction sessions.



Prof. Mark van Loosdrecht giving the key-note on Resource Recovery State-of-Art.



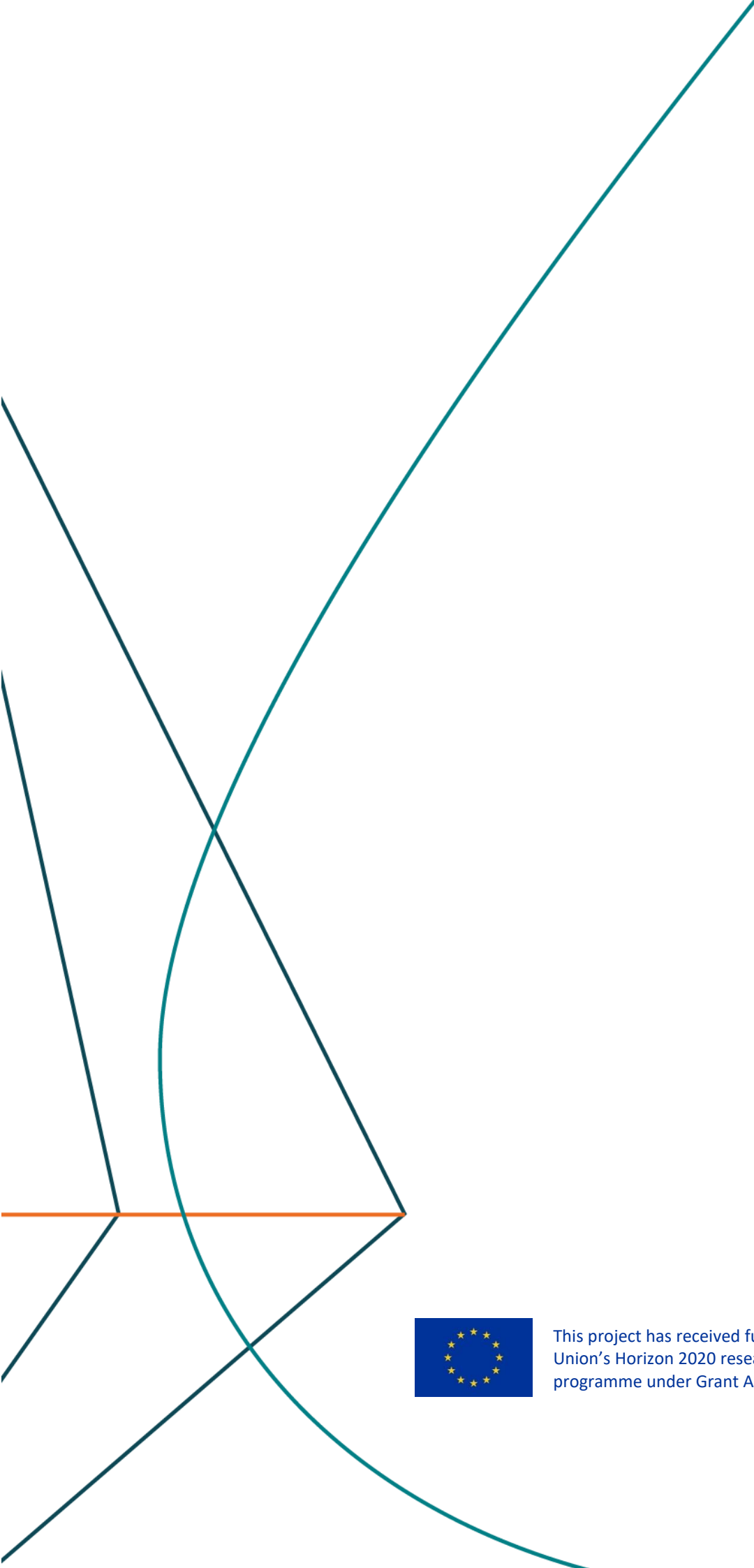
Left : Dr. Dimitris Xevgenos presenting Sea-Mining results.



Above: Dr. George Tsalidis in the panel discussion on Industrial-Mining.



Group photo  
Final  
Conference  
WATER-MINING  
30-9-2024



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