

The cluster RedCoPollutants has achieved the general goal of broadening and transferring knowledge on the characterization and CEC transformation, physical, chemical or biological, and on the methodologies and strategies to monitor, remediate or reduce these contaminants in aquatic ecosystems. Furthermore all the specific outputs and activities considered in the Implementation plan have been achieved and the indicators show that the achieved results go far beyond the initial aims according to the table 2 of the Implementation Plan.

It is shown that the added value of the TAP Cluster for researchers and funders has been already achieved and the transfer of knowledge to policy-makers and stakeholders will continue during 2024.

Table 2.- RedCoPollutants, specific outputs, activities and indicators.

LEVERAGE NETWORK				
GOALS	SPECIFIC GOALS	Planned outputs		Achievements
CEC Expert Cluster	Critical mass	Extending the TAP - 8 initial projects + 4 projects - 4 countries+ 1 country (Sweden) + 4 other countries (Denmark, Vietnam, Bangladesh, South Africa)	May 22	+50% new projects  +125% new countries
		>20 involved researchers	July 22	>120 *6 involved researchers
	Involvement of young researchers	>4 young researchers/PhD students	July 22	34 *5 involved young researchers 15 PhDs (5 direct TAP participants + 10 indirectly involved) 6 Master students directly involved 13 young researchers (2 direct TAP participants + 11 indirectly involved)
	Knowing each other	Who is Who brochure	July 22	Published with 3 updates
		Expertise inventory	Sep 22	Finalised with 2 updates
	Equality	Good gender balance	July 22	Excellent balance 47% Women/53% Men
	Inter/intradisciplinary network	>4 disciplines and 3 areas/topics	July 22	+150% disciplines: Analytical chemistry, microbiology, ecotoxicity, pharmaceutical, public health, medicine, environmental chemistry, biologist, bioinformatics, chemical engineering.  +66% areas: Environment, Engineering, Chemistry, Ecology, Health

An CEC Expert Cluster has been created with an inter and intradisciplinary critical mass and a high involvement of young researchers and seniors with an excellent gender balance. Knowing each other has been critical for a deep collaboration.

R+D COORDINATION					
Networking: Promoting transfer of knowledge, results, and data	Alignment meetings	4 meetings	July 22	100% achieved	
	Expertise core themes	Identification of common core themes	May 22	3 common core themes: Monitoring Mitigation Risks 100% achieved	
	Alignment of CEC language	Glossary	Nov 22 Oct 23	Finalised document with 2 updates	
	Discuss the best methodologies and protocols for CEC monitoring and mitigation.	3 protocols		Dec 23	10 protocols available +200%
		Cohesive protocol for cytostatics characterization in water samples		Jan-23 Sep 23	Finalised (UCM). It is been used within and outside the TAP
		Protocol for wastewater sampling		Nov 23	Finalised (UCM)
		Protocol for sampling, detection and quantification of ARGs in wastewater and sludge		May 23	Finalised (Jan Bartacek)
		Batch Adsorption Protocol for Removal of CEC		Sep 23	Finalised (UCM)
		Column Adsorption Protocol for Removal of CEC		Oct 23	Finalised (UCM)
		Practices for the removal of CEC		Dec 23	Finalised AOPs (UCM + Jan/Vojtech) Photocatalysis for greywater (Jan) Adsorption (UCM/Lada) Available in the presentations from Prague meeting
		Practices for the removal of AR genes		Dec 23	Finalised (Jan/Vojtech) Available in the presentations from Prague meeting
		Multidrug resistance detection protocol		Dec 23	Available under request (Hakan)
		PFAS detection protocol		Oct 23	Finalised (Lada)
	Effect based methods for assessment of ecotoxicity, genotoxicity, estro- and androgenity		Oct 23	Available under request (Premysl, Laetitia)	
	Exchange of knowledge on assessment of CEC risks	Common methodologies for CEC risk assessment (water/soil/ecosystems)		March 23	Report & scientific paper "Review of Risk Assessment as a Tool to Improve Water Resource Management" by Y Chernysh, L Stejskalová, P Soldán, FY Lai, UA Khan, C Stålsby, L Giambérini, L Minguez, MC Monte and A Blanco 100% achieved

	Align approaches of different projects maintaining its diversity and extending their limits: complementary R+D	Extend the knowledge on new contaminants beyond your studied compounds	Oct 23	Interaction of chemical compounds and ARB Common additional experimental studies planned for 2024
		Water and sludge management	Nov 23	CEC adsorb on sludge. Only thermal treatments remove them → research need (Jan)
		Water, sludge and soil management	Nov 23	Integral management is needed → Research gap
		Bibliometric analysis via VOSviewer on “emerging contaminants” and “antimicrobial resistant bacteria”	Dec 23	UCM: Conchi, Angeles, Yelizaveta, Laetitia Draft available
		Bibliometric analysis via VOSviewer on cytostatics	Dec 23	UCM 2nd draft available
		Discussion on environmental thresholds (EQS, PNEC) of micropollutants	Dec 23	Lada report & paper fingerprinting of EC: oct meeting Laetitia Cytostatics (Cris) dec 23
		Exchange of samples for specific contaminant analysis	Dec 23	5 water samples from Prague (inlet/effluent from EDAR and effluents from 2 hospitals) for cytostatic analysis at UCM Analysis after optimization of the protocol in february 24
		Integral chemical and toxicological approach. Exchange of samples	Oct 23	UCM ⇒ Water Research Institute (Guillermo) Samples and protocols are agreed. Final samples will be sent in feb 24
	Presentation of results of national projects to reduce the content of CECs	BAT for water treatments to remove CEC	Dec 22 Feb 23 June 23 Oct 23 Dec 23	All projects have presented the results 1 – 2 times on AOP+Adsorption (Guillermo) AOP (Vojtech), Ozone (UCM) Adsorption (UCM) Photocatalysis (Jan), PFAS removal (Lada), Cytostatic removal, etc
		BAT for sludge treatments to remove AMR genes	Feb 23 Oct 23	Sludge (Jan) Presented in Prague
Identification of failure research		June 23	<ul style="list-style-type: none"> <li>- O3 for EDAR 2 steps biological treat (UCM)</li> <li>- Role of activation on adsorption efficiencies of cytostatic (Silvia)</li> <li>- UV-H2O2 not always work (UCM)</li> <li>- UF effluent from WWTP with UV-H2O2 no removal (70 compounds)</li> </ul>	

				- Slow planning of lab research is needed (Lund-UCM)
	Scientific/technical meetings	2 Monitoring		More than 4 meetings
		2 Mitigation		More than 8 meetings
		2 Risks		More than 8 meetings
	Technical visits	2 visits	Jun 23 May 23 Oct 23 Oct 23	*2 = 4 visits: - C Corpa from UCM to LUND University - S le Floch to Lille University - A Blanco to T. G. Masaryk Water Research Institute - A Blanco to University of Chemistry and Technology
Discussions on research priorities	Meetings Workshop	List of RD priorities	Oct 23 Dec 23	Discussion on challenges in the 3 core groups during the meeting in Prague. Inputs for a new R+D common proposal
	Assessment of CEC quantification in different countries and regions. Reports may be focused on different chemicals, microplastics, pathogens, ARB and AMR ⇒ Assessment of research priorities on CEC	Report	Dec 23	Priorities have been reviewed and included in the new R+D proposal

Intensive networking has been carried out, promoting the alignment of individual projects towards a common goal, transferring knowledge between partners as well as carrying out common new activities beyond the national projects. Discussions have allowed us to obtain common and cohesive protocols, approaches and a wider view of different technologies, integrating water and sludge. Research priorities have been identified which are the base for future projects. Intensive collaboration between PhD students and young researchers has been carried out, strengthening the collaboration between different organisations.

#### INTERDISCIPLINARY AND TRANSDISCIPLINARY TRAINING

Training activities	Internal webinars	3 webinars		8 webinars +160% achieved
		Webinar on closure of water circuits in industry	Oct 23	UCM (paper industry)
		Webinar on quantification of cytostatics	Oct 23	Cristina
		Webinar on PFAS	Oct 23	Lada, Premysl
		AOPs and adsorption	Oct 23	Cris, Juan, Vojtech
		Fingerprinting	28 Nov 2023 1pm	Dr. Vít Kodes from the Czech Hydrometeorological Institute <a href="https://meet.google.com/kba-vjcp-jgk">https://meet.google.com/kba-vjcp-jgk</a>
		Point-of-use device for disinfection of antibiotic resistance bacteria in water for public health application, Assoc prof Suraj Tripathy	11 Dec 23	APRIAM project-Cecilia <a href="https://ki-se.zoom.us/j/64966012926">https://ki-se.zoom.us/j/64966012926</a> Meeting ID: 649 6601 2926

		Antibiotic residues and antibiotic resistance in water are a potential threat to human health, Dr Nada Hanna		
		Modelling and simulation of WWTP- WEST Hector Rey		UCM-Angeles on-line self service course
		Webinar on Aquatic Toxicology	2024	Premysl February 24 on-line
	External webinar	1 webinar		3 External webinars +200% achieved
		Removal of cytostatic pollutants from wastewaters	12 Oct 23	A Blanco at FSCN, Sweden <a href="https://miun-se.zoom.us/j/69553746750?pwd=Y2pyRXhUNUxwUHpBYjJadGNJNFVNdz09">https://miun-se.zoom.us/j/69553746750?pwd=Y2pyRXhUNUxwUHpBYjJadGNJNFVNdz09</a> Slices available
		Challenge and environmental water challenges based on closure water circuits in the paper sector	Oct 23	A Blanco at FSCN, Sweden <a href="https://miun-se.zoom.us/my/juhfis">https://miun-se.zoom.us/my/juhfis</a> Slices available
		Aquatic Pollution-Risk analysis	Dec 23	P Soldán at Czech Technical University in Prague, participants from USA, France, Kazakhstan, etc. Slices available
		1 External workshop	CEC session in the congress WCCE11-IICIBIQ 2023 in Argentina	June 23
	1 Virtual visits	Adsorption	Dec 23	Under request (UCM)
		Emerging contaminants detection Prague university	24 Nov 2023	<a href="https://meet.google.com/upf-ojff-tqh">https://meet.google.com/upf-ojff-tqh</a>

An active training program between partners have been created with a bottom up and a top down approach based on the expertise of the different experts. Fundamental and applied seminars have been organised as well as general and specific internal and external webinars.

#### FOSTERING MOBILITY

Technical and research visits	Short Term visits	1-3 visits		100% achieved
		Training missions to use new equipment	May-July 2023	C Corpa from UCM to Lund university 3 months
		Complementary experiments	2023	S le Floch from CEDRE to Lille University 1 week
		Specific training	18-21 Dec 23	J Bartáčková from VŠCHTPrague to UCM 1 week
		Potential collaborations	Oct 23	A Blanco from UCM to Water Research and to VŠCHTPrague 1 day

4 short term visits have been carried out with different goals. 1 has been 3 months and will allow the PhD student to obtain the international PhD. All visits have been of high interest for the transfer of knowledge and to start new collaborations.

### SHARING INFRASTRUCTURE

Collaboration between organisations	Inventory of relevant infrastructures	Report	Sep 22	Finalised
	Sharing infrastructures	5 sharing activities		UCM-LUND CEDRE-Lile University VŠCHTPrague-UCM UCM-Water Institute Prague UCM-Göteborg (planned in 2024)

The inventory allowed us to know better the expertise and equipment available at the different partners and the potential collaborations. Based on this information the technical short visits were organised.

### NEW HIGH ADDED VALUE KNOWLEDGE AND SCIENTIFIC SUPPORT

External knowledge transfer	EC protocols	IMDEA Agua	DEC-23 Jan 24	New activity Transfer of knowledge for I application of results by external partners
Promoting innovation	Best practices to reduce the risks of CEC	Contacts with water associations  Aguasresiduales.info	Dec 23	Transfer of knowledge to the international water networks.  Invitation to participate as member of the Advisory Committee of the International Aguas residuales network <a href="https://www.aguasresiduales.info/">https://www.aguasresiduales.info/</a>
		Aguasresiduales.info	2024	Seminar on microcontaminants 7th March 2024
Expertise support	Policy briefs	What is viable and reliable	2024	Under request
	Stakeholders briefs		2024	Under request planned though Aguasresiduales.info
Identifying knowledge gaps	Position paper on scientific and technological challenges and gaps	Inputs for Horizon Europe work programmes and Water4All Partnership.	2023	- Participation in Water4All meeting in Madrid - Support to Blue Deal document for the CONSULTATIVE COMMISSION ON INDUSTRIAL CHANGE CCMI/208 - Water-intensive industries and water-efficient technologies 10 May 2023 - Support to EU Core Group of the Community of Practice
Dissemination activities	Write 1-2 joint Scientific publications	Review on CEC removal technologies	Dec 23	Scientific presentation in WCCE11 in Buenos Aires. Abstract and presentations available.

		<b>Bibliometric review on CEC</b>	Dec 23	Draft available
		Enhancing Ecological Efficiency in Biological Wastewater Treatment: A Case Study on Quality Control Information System	Oct 23	Water. 2023; 15(21):3744. <a href="https://doi.org/10.3390/w15213744">https://doi.org/10.3390/w15213744</a>
		Effects and risks of CEC		Resources-2739713s, MDPI Under review
	Participation in Conferences	Environmental risk assessment: overview of approaches and trends for water resources management	Oct 23	The 5th International Scientific-Technical Conference Water Supply and Wastewater Disposal designing, construction, operation and monitoring October, 18-22, 2023, Lviv, Ukraine, Lviv Polytechnic National University
	Infographics for the Society	ARM	Nov 23	Available (Hakan)

New high added value knowledge has been achieved beyond the national project goals. Results are international and more robust. Harmonized protocols have been transferred to internal and external partners for their use, integration with other protocols and exploitation as water analysis services. Knowledge gaps have been identified as bases for future projects and collaborations. Dissemination activities have been carried out through publications. Dissemination will continue during 2024 in different national and international forums.

#### SUSTAINABILITY ACTIONS

Future R+D collaboration	New collaborative proposals	Water4all call-Theme 2	14 Nov	100% achieved Proposal under evaluation 1st phase
		Belmont forum" call for projects on the theme of "multi-risk" is due to come out shortly	??	
		Enhancing the European R&I system (HORIZON-WIDERA-2024-ERA-01) Coordination and support actions	6 Dec 23	12 March 2024
		Water4all-Theme 1	??	
	Win-win collaborations based on national funding projects	CEC analysis Target and non target	2024	UCM-LUND Analysis of cytostatics
		CEC and AMR interactions	2024	UCM-UG-ULund-Hakan
		Chemical stressors of AMB AOP stressors		UCM-U Lund large PhD collaboration
		Extending the limits of existing technologies	2024	UCM-Prague university Studies on improvement mass transport in biological treatments, ozonation, methanization

The sustainability of the TAP cluster could be maintained if the 1 common proposal under evaluation is approved. Anyhow other calls are also being considered. Bilateral collaborations will be maintained at least during 2024 between different partners.

