



safe
CREW

Climate-resilient management for safe water supply systems

Final report

Deliverable D5.4, WP5



**Funded by
the European Union**



Report “Climate-resilient management for safe water supply systems”

Deliverable D5.4, WP5

Project Number	101081980
Project Title	Climate-resilient management for safe disinfected and non-disinfected water supply systems
Project Acronym	SafeCREW
Project Duration	1 November 2022 – 30 April 2026
Call identifier	HORIZON-CL6-2022-ZEROPOLLUTION-01
Due date of Deliverable	Month 42, 30.04.2026
Final version date	Month 42, 29.04.2026
Dissemination Level	PU (Public)
Deliverable No.	D5.4
Work Package	WP5
Task	T5.6
Lead Beneficiary	Tutech Innovation GmbH (TUTECH)
Contributing Beneficiaries	DVGW-TUHH, all partners
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This project has received funding from the European Union’s Horizon Europe research and innovation programme under grant agreement No 101081980.

History of Versions		
Version	Publication Date	Change
0.1	30 March 2026	Input by all partners delivered
0.1	9 April 2026	Preparation of report for review and first draft for internal quality check and review by M. Remmert-Rieper
0.1	14 April 2026	Internal quality check and review delivered by M. Ernst
0.2	21 April 2026	Consolidated D5.4; 1st version sent to the coordinator by WP Lead M. Remmert-Rieper
0.3	24 April 2026	Final review by Anissa Grieb
1	29 April 2026	Submitted to commission

Part. No.	Participant organisation name	Short name
1 (Coordinator)	German Association for Gas and Water, local research branch at Hamburg University of Technology	DVGW-TUHH
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3	Berlin Centre of Competence for Water	KWB
4	BioDetection Systems B.V.	BDS
5	Centre Tecnològic de Catalunya (EURECAT)	EUT
6	German Environment Agency	UBA
7	Helmholtz-Centre for Environmental Research	UFZ
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12	The National University of Water and Environmental Engineering	NUWEE



Abstract

This public report “Climate-resilient management for safe water supply systems” gives a brief overview about the key outcomes of the SafeCREW project and provides guidance towards the deeper insights in more detailed publications, reports and resources.

SafeCREW was funded by Horizon Europe to contribute to the safe production and distribution of drinking water in the context of climate change. Between November 2022 and April 2026 twelve research institutes and industry partners across Europe collaborated to develop innovative tools and strategies that address emerging water quality challenges. This report presents a comprehensive overview of the key results and insights gained throughout the project, demonstrating SafeCREW’s contribution to strengthening the resilience and preparedness of the EU water sector.

The main objectives of SafeCREW ranged from the development of monitoring tools and innovative drinking water treatment processes via strategies for safe drinking water distribution to integrated risk assessment frameworks to guide future interventions that sustain safe drinking water supply in the face of climate change. The innovations were tested and applied in four cases studies in Germany, Italy, Spain and Ukraine following the drinking water supply system (DWSS) from the raw water source via the drinking water treatment plant (DWTP) and the drinking water distribution network (DWDN) to the consumers.

The key achievements at the end of the project are briefly presented followed by the transfer of the solutions to the utilities via the application examples in the case studies. The uptake and implementation of solutions in case study #3 (Tarragona, Spain) illustrates the impact of SafeCREW particularly well.

A brief overview about SafeCREW’s engagement to promote climate resilient management for safe water supply systems is given which leads to the compilation of repositories and resources in the annexes. Resources include publications, reports, analytical protocols, guidelines, webinars, the MOOC, and the two videos introducing SafeCREW to the public.



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Abbreviations

AC	Activated carbon
AI	Artificial intelligence
ANN	Artificial neural network
AOP	Advanced oxidation process
CALUX	Chemical-Activated Luciferase gene eXpression
CAT	Consorti d'Aigües de Tarragona (Tarragona Water Consortium)
CEWM	Centre of Excellence for Water Management
ClO ₂	Chlorine dioxide
CNS	Cellulose nanosponge
CS#1, CS#2, CS#3, CS#4	Case study (#1 – northern Germany, #2 – Milan, Italy, #3 – Tarragona, Spain, #4 – Western Ukraine)
DBP	Disinfection by-products
DVGW	German Technical and Scientific Association for Gas and Water
DVGW-TUHH	DVGW Research Centre at Hamburg University of Technology
DW	Drinking water
DWD	Drinking Water Directive
DWDN	Drinking water distribution network
DWSS	Drinking water supply systems
DWTP	Drinking water treatment plant
EBM	Effect-based method
EBT	Effect-based trigger values
EC	European Commission
EU	European Union
FCM	Flow cytometry
FT-ICR-MS	Fourier transform-ion cyclotron resonance mass spectrometry
GAC	Granular activated carbon
GC	Gas chromatography
HAA	Haloacetic acid
HAN	Haloacetic nitrile
HRMS	High resolution mass spectrometry
KWB	Kompetenzzentrum Wasser Berlin
LC to FT-ICR-MS	Liquid chromatography to Fourier transform-ion cyclotron resonance mass spectrometry
LC-OCD/-UVD/-OND	Liquid chromatography (size exclusion)-organic carbon detection / UV detection and organic nitrogen detection
MAR	Managed aquifer recharge
ML	Machine learning
MM	Metropolitana Milanese Spa
MOOC	Massive open online course
MSS	Multisensor Systems Ltd.
NAM	Non-animal methods
NaOCl	Sodium hypochlorite
NOM	Natural organic matter
NUWEE	National University of Water and Environmental Engineering
PARAFAC	PARAllel FACTor analysis
PFAS	Per- and polyfluoroalkyl substances
POLIMI	Politecnico di Milano



This project has received funding from the European Union’s Horizon Europe research and innovation programme under grant agreement No 101081980.

QCRA	Quantitative chemical risk assessment
QMRA	Quantitative microbial risk assessment
R&D	Research and development
RBF	Riverbank filtration
SFC	Supercritical fluid chromatography
SO	Specific objective
THM	Trihalomethane
TOC	Total organic carbon
TUTECH	Tutech Innovation GmbH
UBA	Umweltbundesamt (German Environment Agency)
UFZ	Umweltforschungszentrum Leipzig (Helmholtz Centre for Environmental Research)
UV	Ultraviolet
WP	Work package
ZP4W	ZeroPollution4Water Cluster



1. Introduction

The SafeCREW project, funded by Horizon Europe, is dedicated to enhancing the safety and reliability of drinking water production and distribution in the context of climate change. Between November 2022 and April 2026 twelve research institutes and industry partners across Europe collaborated to develop innovative tools and strategies that address emerging water quality challenges. This report presents a comprehensive overview of the key results and insights gained throughout the project, demonstrating SafeCREW’s contribution to strengthening the resilience and preparedness of the EU water sector.

SafeCREW focused on securing the reliable operation of disinfected and non-disinfected drinking water supply systems (DWSS) which will face challenges like increasing water temperature and higher levels of natural organic matter due to climate change. SafeCREW aimed at answering related questions ranging from the microbial stability of non-disinfected drinking water to possible adaptations to disinfection procedures. Advancing the knowledge about disinfection by-products, their formation and removal also was an objective.

Four specific objectives (SO) guided the SafeCREW approach:

- SO#1: Promote the use of a combined set of sampling and monitoring tools for a comprehensive water quality characterisation;
- SO#2: Support the implementation of novel drinking water treatment solutions to actively respond to identified threats;
- SO#3. Support the management of the drinking water distribution networks to avoid water quality deterioration up to final consumers; and
- SO#4. Transfer the solutions, tools and knowledge to end-users to boost their preparedness.

Case study sites in Germany, Italy, Spain and Ukraine served to test and apply the developed solutions, following the three main parts of DWSS, the raw water source, the drinking water treatment plant (DWTP) and the drinking water distribution network (DWDN) which delivers water to the consumers. These case study sites are characterised by different conditions and challenges:

- Case study #1 in northern Germany (Berlin and Hamburg) focused on improved monitoring and microbial risk assessment of natural recharged groundwater sources to ensure the safety of currently non-disinfected drinking water.
- Case study #2 in Milan, Italy, addressed the interaction of relining materials with disinfectants and the optimisation of disinfection parameters supported by soft sensors.
- Case study #3 in Tarragona, Spain, is characterised by the highest climate change impact due to river water as source water with high temperatures and a 400 km distribution network and aimed at the development and implementation of holistic management approaches.
- Case study #4 in western Ukraine aimed at applying modern methods to monitor, model and manage the drinking water quality, including transfer and implementation of water safety plans and EU regulation.

The following chapter 2 presents the key solutions and achievements of SafeCREW. Chapter 3 illustrates their application at case study #3 (Tarragona, Spain) while chapter 4 summarises the dissemination activities to promote climate-resilient drinking water management. The annex guides towards the repositories for publications, materials, webinars and the MOOC (massive open online course).



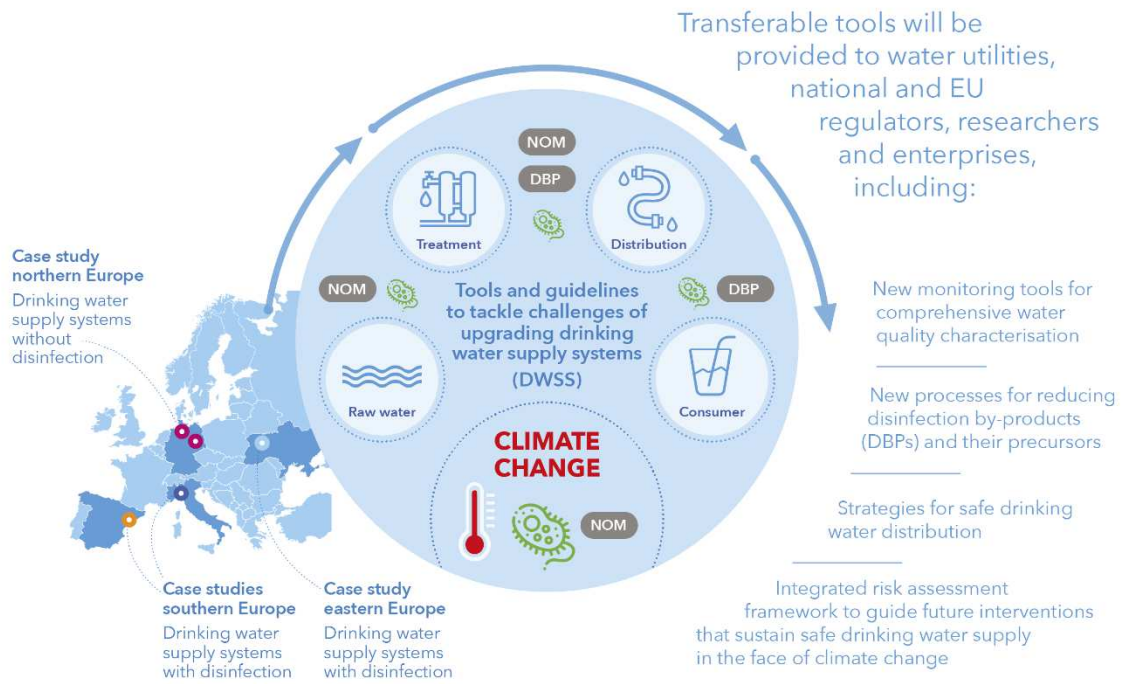


Figure 1: Graphical abstract of SafeCREW (Copyright Tutech Innovation GmbH)

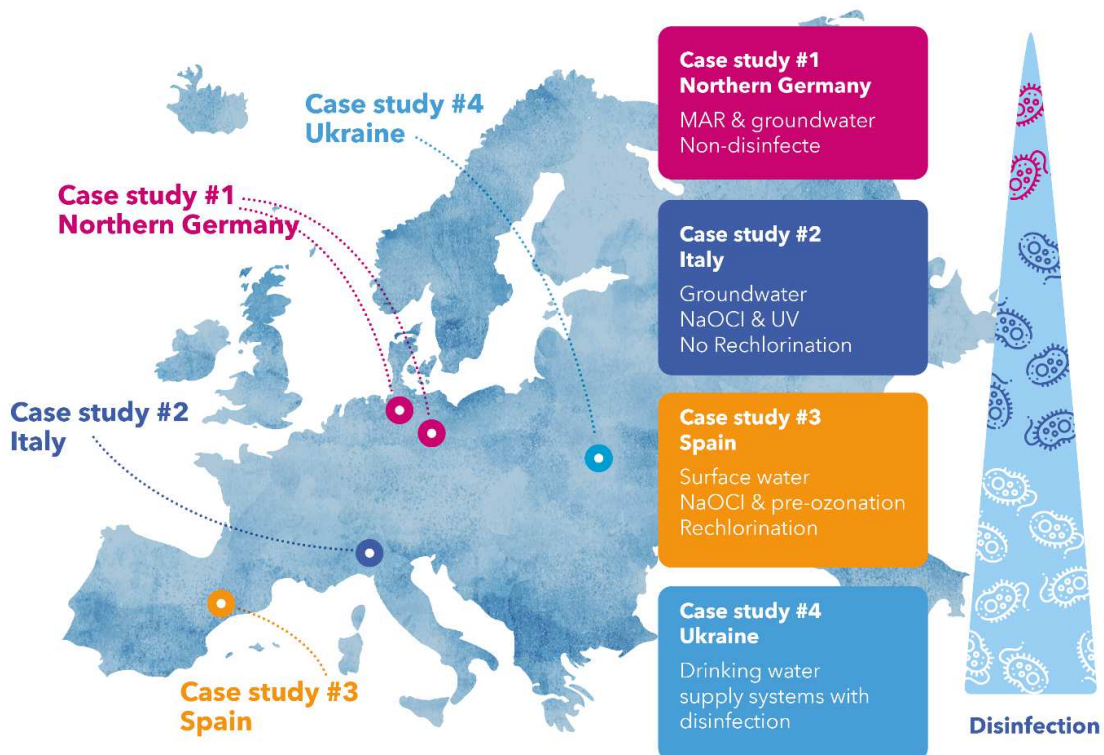


Figure 2: Illustration of SafeCREW’s case study sites (Copyright Tutech Innovation GmbH)



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2. Key achievements of SafeCREW

Following the four specific objectives, SafeCREW developed a set of new monitoring tools for comprehensive water quality characterisation and new processes for reducing disinfection by-products (DBPs) in drinking waters. These tools and methods were integrated into strategies for safe drinking water distribution to avoid water quality deterioration up to the final consumer and an integrated risk assessment framework to guide future interventions that sustain safe drinking water supply in the face of climate change.

2.1 New monitoring tools for comprehensive water quality characterisation

SafeCREW developed a combined set of complementary and flexible tools that will overcome still existing hurdles in chemical, toxicological and microbiological characterisation of water. These comprise tools to improve natural organic matter (NOM) characterisation models, detect previously unknown polar DBPs, differentiate the four main trihalomethanes (THMs) by online-monitoring technique, assess toxicity in complex water mixtures by rapid biotests and effectively monitor microbial loads continuously.

2.1.1 Combined fluorescence spectroscopy (with PARAFAC) and LC-OCD/-UVD/-OND and FT-ICR-MS for improved NOM characterisation models

Characterising the complex, heterogeneous natural organic matter (NOM) in drinking water is challenging. SafeCREW combined UV absorbance, fluorescence spectroscopy, LC-OCD, and LC-FT-ICR-MS, demonstrating that these complementary techniques enable systematic assessment of NOM composition and reactivity. They can link specific NOM characteristics to the potential formation of regulated and emerging DBPs. This supports water utilities in optimising treatment for NOM removal and DBP control, and aids researchers in identifying DBP precursors and formation mechanisms. Results are described in the SafeCREW Analytical Protocol #2, the Deliverable D1.2 and Nihemaiti, M. et al., 2026.

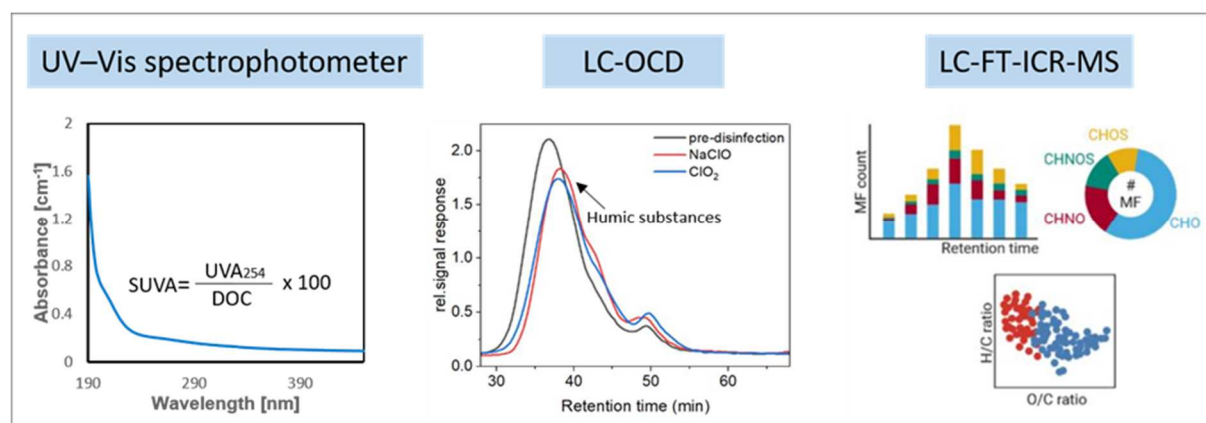


Figure 3: Overview of analytical methods described in deliverable D1.2 for characterising natural organic matter (Copyright UFZ)



2.1.2 Improved detection of polar DBPs by using Supercritical Fluid Chromatography (SFC) coupled to High Resolution Mass Spectrometry (HRMS)

DBP formation is usually analysed using gas chromatography and reversed phase liquid chromatography coupled to mass spectrometry, overlooking very polar DBPs and thus a significant portion of total DBPs. SafeCREW developed a new method using supercritical fluid chromatography coupled with high-resolution mass spectrometry to identify sulfonated DBPs, providing water utilities and policymakers with improved tools to enhance monitoring, treatment processes, and regulatory guidelines. Results are described in the SafeCREW Analytical Protocol #1, Deliverable D1.1, and Nihemaiti, M. et al., 2026.

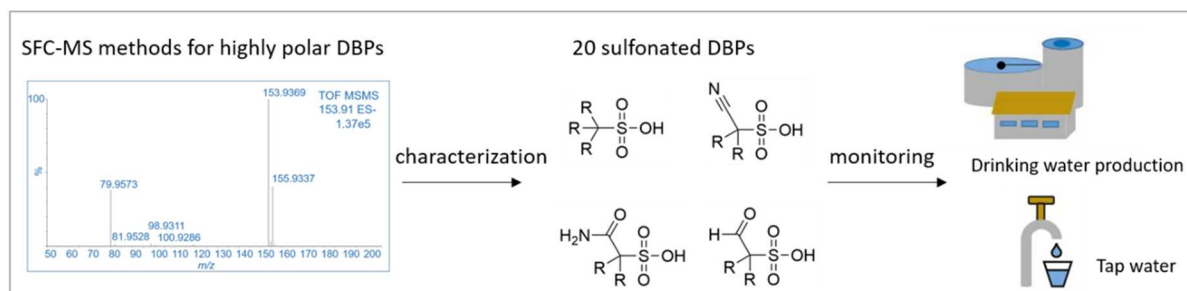


Figure 4: Schematic illustration showing an example mass spectrum and representative structures of sulfonated disinfection by-products detected in the finished water and tap water (Copyright UFZ)

2.1.3 Affordable and reagent-free THM sensor for online monitoring of the four main THMs



Figure 5: Multisensor Systems' new online THM analyser including measurement unit (Copyright Multisensor Systems)

At project start, existing methods for detecting THMs were time-consuming, costly, and unable to differentiate in THMs in an online sensor-based approach. SafeCREW developed an electronic nose system that uses sensor arrays and artificial neural networks (ANNs) to rapidly detect and differentiate the four main THMs in drinking water, without GC-methods and a view of offering water utilities a more efficient, cost-effective tool to monitor THM variations and improve water safety. The instrument is in the latter stages of development, and market launch is currently planned for 2027 (Ostuni, G., 2026).



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2.1.4 Integration of CALUX bioassays as early warning system for toxicity in complex water mixtures

Knowledge on the toxicity of DBPs especially in complex mixtures is still limited. SafeCREW accomplished *in vitro* toxicity testing for known and unknown DBPs in source and drinking water via high-throughput, non-animal bioassays, enabling water utilities to monitor potential harmful effects, support risk-based treatment interventions, and provide regulators and policymakers with data to update legislation/technical rules for safer, toxic-free drinking water. Results are described in SafeCREW Analytical Protocol #3, Deliverables D1.3, D2.5 and D4.3 and Behnisch, P. et al. (2025).

2.1.5 Passive sampler for effective microbial monitoring for early warning

Current microbial monitoring relies on grab sampling and detects contamination only at advanced stages. SafeCREW developed a proof-of-concept passive sampler method capable of measuring time-averaged pathogen concentrations, accounting for water temperature, materials, and microbial strains. Targeting drinking water systems, where relevant microbial concentrations are typically low, it enables the development of early-warning systems. Results are presented in Deliverable D1.4.

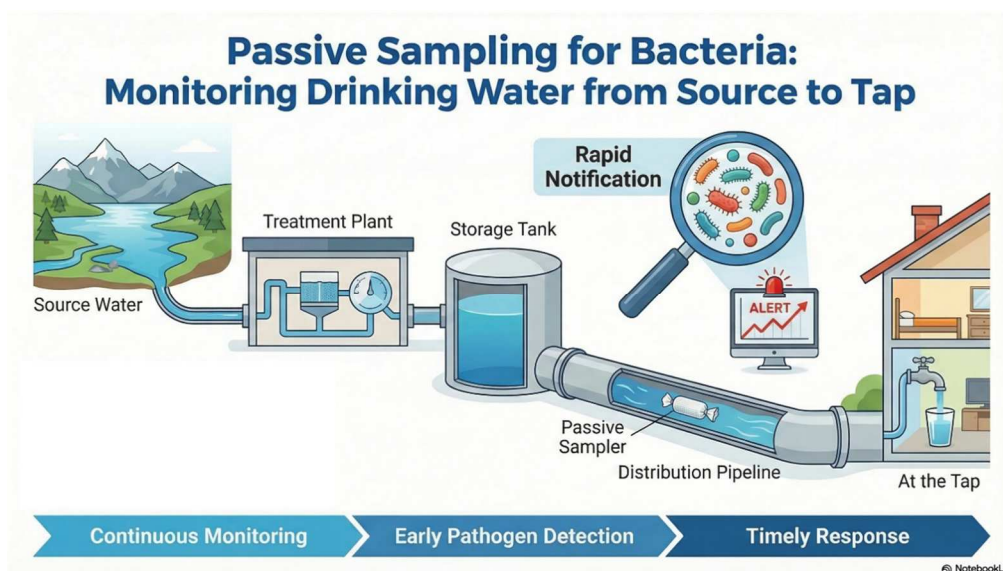


Figure 6: Infographic illustrating the principles of passive samplers (Copyright POLIMI)

2.1.6 Microbial log-removal estimation in low concentration systems for application in managed aquifer recharge wells (MAR)

Detecting pathogens in groundwater is challenging due to their low concentrations and the need for large sample volumes for reliable Quantitative Microbial Risk Assessment (QMRA). SafeCREW implemented ultrafiltration modules to concentrate microorganisms from large volumes, improving pathogen detection accuracy and providing water utilities and policymakers with more reliable data to enhance monitoring programs and risk management for safer drinking water. Results are described in Deliverable D2.1.



2.2 New processes for reducing disinfection by-products

Five novel treatment processes to actively respond to identified threats were developed to upgrade drinking water treatment processes according to a multi-barrier approach for non-disinfected and for disinfected drinking water supply systems. These treatment processes address enhanced NOM removal targeting especially those with a high DBP formation potential. They comprise novel adsorber membranes with reagent-free electrochemical regeneration, optimised advanced oxidation processes, conventional and innovative materials and processes for improved adsorption of DBPs and DBP precursors and improved automatic control for NOM removal in coagulation-flocculation systems.

2.2.1 Adsorptive membranes to selectively remove NOM and reduce DBP formation coupled with a sustainable electrochemical regeneration method

Conventional ion-exchange materials for removing NOM require chemical regeneration or disposal after use, limiting sustainability. SafeCREW developed an NOM adsorber membrane process with reagent-free electrochemical regeneration using extremely low electrical current to restore adsorption capacity. The new process has considerable potential for upscaling to provide water utilities with a sustainable, low-waste solution for NOM removal that reduces chemical use and operational costs. It can be integrated into existing treatment systems. Results are described in Deliverable D2.2, Wullenweber, J. et al. (2024) and Wullenweber, J. et al. (2026).

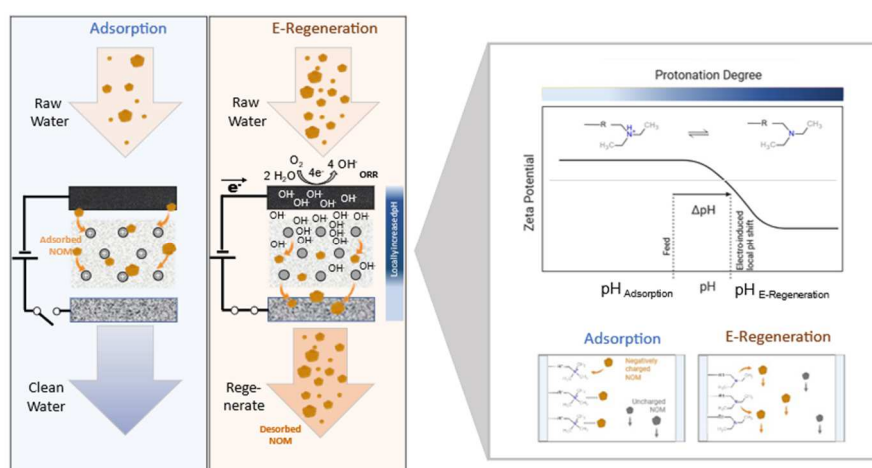


Figure 7: Schematic illustration showing the electrochemical regeneration of the adsorptive membrane (Copyright DVGW-TUHH)

2.2.2 Optimised Advanced Oxidation Process (AOP) techniques targeting DBP precursors

Existing advanced oxidation processes (AOPs) typically operate non-selectively towards water constituents, transforming present NOM fractions without specifically targeting those that predominantly generate DBPs. Within the SafeCREW project, an enhanced oxidation approach was developed, focusing on DBP-specific precursors. This method was tested using real drinking water from case study #3 (Tarragona, Spain). When combined with a post-adsorption step, the process effectively reduces the key precursor fractions responsible for DBP formation. This novel approach can be implemented by water utilities to improve water quality management, particularly in systems where NOM composition exhibits high variability. Results are described in Deliverable D.2.4.



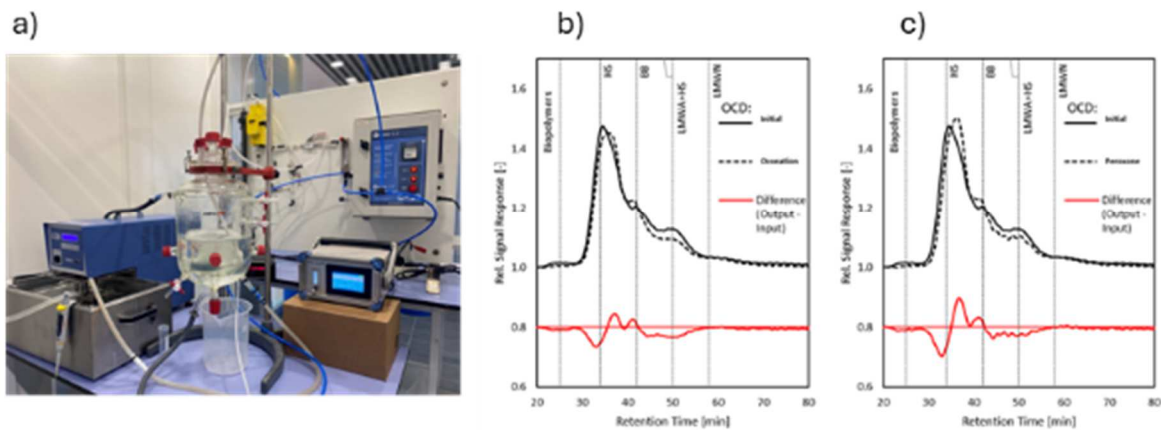


Figure 8: (a) Experimental system for AOPs (b) LC-OCD profiles for conventional ozonation of NOM and (c) LC-OCD profiles for peroxone process (Copyright EUT)

2.2.3 Conventional and innovative adsorbents for the removal of DBPs and their precursors

Activated carbon removes NOM and reduces DBPs but is less effective for polar organic compounds. SafeCREW developed two complementary solutions: guidelines for optimized carbon selection and process design for the treatment of the drinking water sourced from groundwater, and tailored cellulose-based nanosponges for NOM removal. These guidelines support water utilities in achieving sustainable, cost-efficient treatment while ensuring safe drinking water under climate change pressures. Results are described in Guideline #1 and Deliverable D2.3.

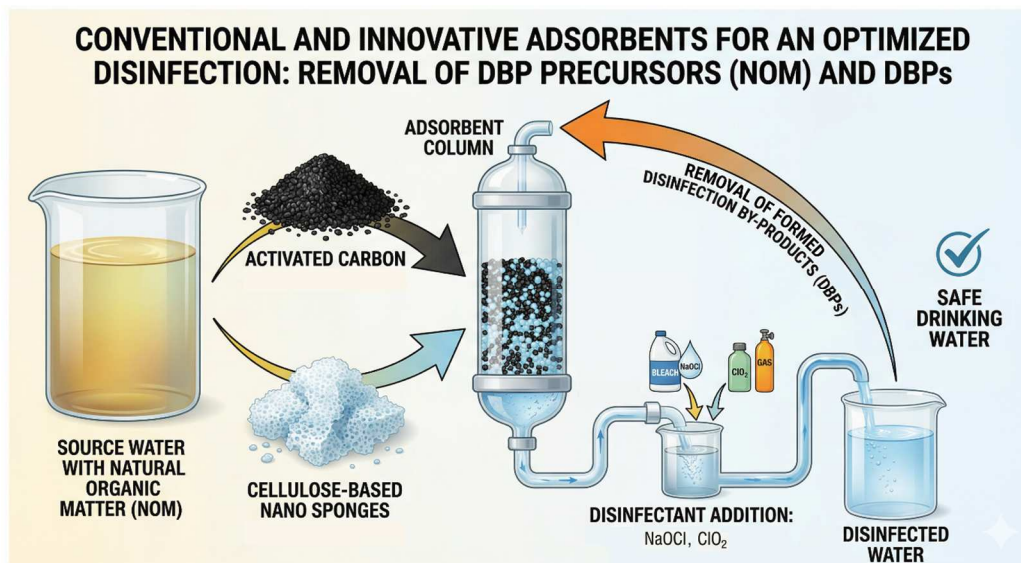


Figure 9: Conventional and innovative adsorbents for an optimized disinfection (Copyright POLIMI)

2.2.4 Improved NOM adsorption to activated carbon (AC) by combining with pre-chlorination

Current activated carbon (AC) selection and operational protocols often overlook seasonal variations in NOM, reducing the effectiveness of AC in removing organic matter and DBP precursors. Within the SafeCREW project, an innovative protocol was validated using both synthetic and real water matrices from case study #3 (Tarragona, Spain). The approach combines pre-chlorination followed by AC adsorption, enhancing the adsorption of DBP precursors and ultimately reducing DBP formation during post-chlorination. This protocol offers high potential for broad implementation, particularly in both new and existing drinking water treatment plants aiming to reduce DBP formation with minimal



modifications to existing infrastructure and operational practices. Results are described in SafeCREW Guideline #1.

2.2.5 Automatic control for NOM removal in flocculation systems

Coagulation-flocculation control currently relies on discrete setpoints based on water turbidity and lab tests. SafeCREW developed improved automatic control for targeted NOM removal in coagulation-flocculation systems. NOM removal models were developed and implemented in Tarragona’s drinking water treatment (case study 3) with successful initial tests. Figure 10 show the monitoring of operational changes using in-line sensors. Three different operational scenarios were tested by modifying flocculant and ozone dosages, resulting in improved process efficiency, as predicted by the developed models. Further upgrades for independent coagulation and flocculation dosage and online monitoring are planned. The replication by water utilities is high as they will benefit from better control of their treatment processes.

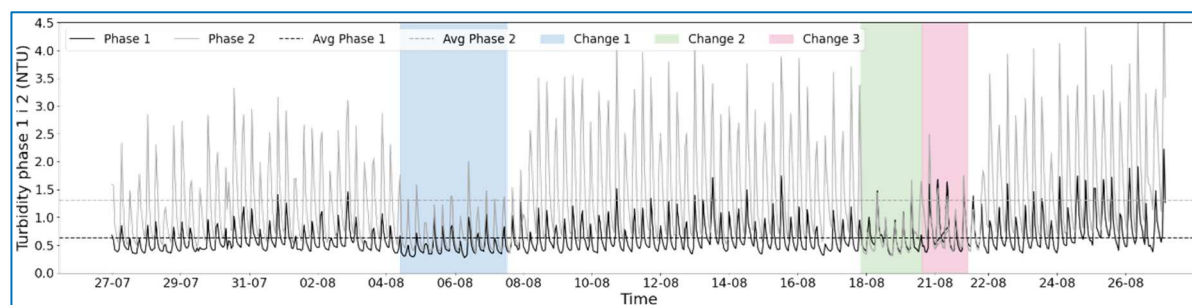


Figure 10. Continuous monitoring using turbidity and multiparameter sensors of the effluent water quality at the outlet of the sedimentation stage. Three operational configurations are shown using a color code: blue (Phase 1: $O_3 = 0.8$ ppm, flocculant = 1.1 ppm; Phase 2: $O_3 = 0.8$ ppm, flocculant = 1.5 ppm), green (Phase 1: $O_3 = 0.8$ ppm, flocculant = 1.1 ppm; Phase 2: $O_3 = 2$ ppm, flocculant = 2 ppm), and pink (Phase 1: $O_3 = 0.5$ ppm, flocculant = 1.1 ppm; Phase 2: $O_3 = 0.5$ ppm, flocculant = 2 ppm). (Copyright CAT)

2.3 Strategies for safe drinking water distribution to avoid water quality deterioration up to final consumers

SafeCREW developed tools to overcome the multiple challenges around proper handling of DWDN and investigated links between quality of distributed drinking water and boundary conditions. These tools comprise soft sensors for DBP monitoring, DBP prediction models in drinking water distribution networks and a test protocol to understand the interaction between disinfectants and materials in contact with water.

2.3.1 Soft sensors for DBP monitoring in drinking water

Conventional sensors measure surrogate parameters, while direct DBP monitoring remains costly and infrequent. Leveraging advances in machine learning (ML), SafeCREW developed data-driven models that function as virtual sensors (soft sensors), providing real-time estimates of key water quality parameters. These tools improve anomaly detection, optimise disinfection dosage, and support risk-based management, enabling cost-efficient delivery of safe drinking water. Results are described in Guideline #2 and Deliverable D4.2.



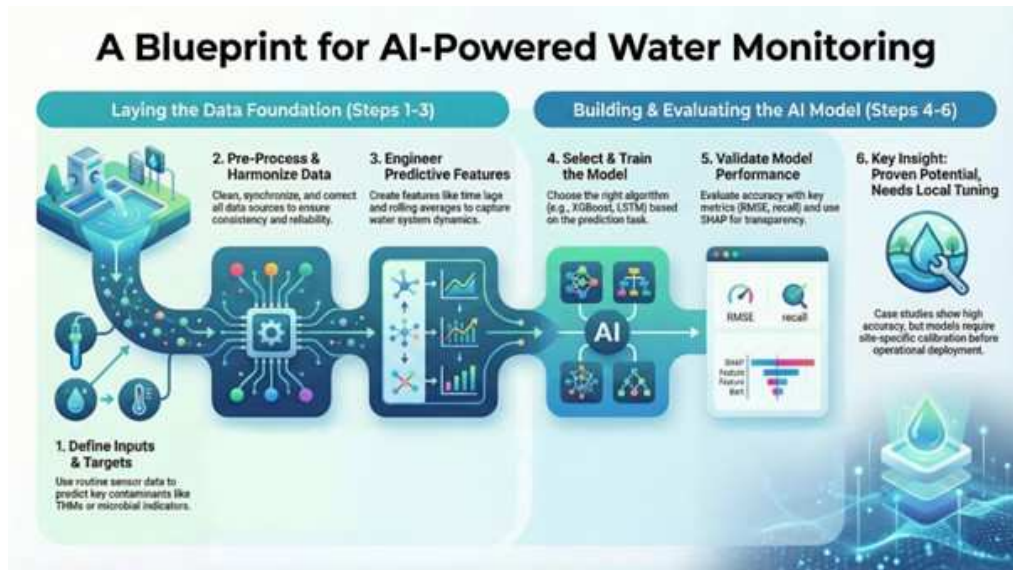


Figure 11: Soft sensors for DBP monitoring in drinking water – a blueprint for AI-powered water monitoring (Copyright POLIMI)

2.3.2 DBP prediction models in DWDN for case study #3 in Tarragona, Spain (surface water)

Predicting the formation of harmful disinfection by-products in distribution networks disinfected with sodium hypochlorite is challenging. Within SafeCREW, advanced mathematical models and modelling strategies were developed, integrating reaction kinetics with on-line monitoring data including hydraulic and water quality parameters. These tools enable accurate prediction of both individual and total trihalomethanes, haloacetic acids, haloacetonitriles and chlorate. Developed models are described in Deliverable D3.2.

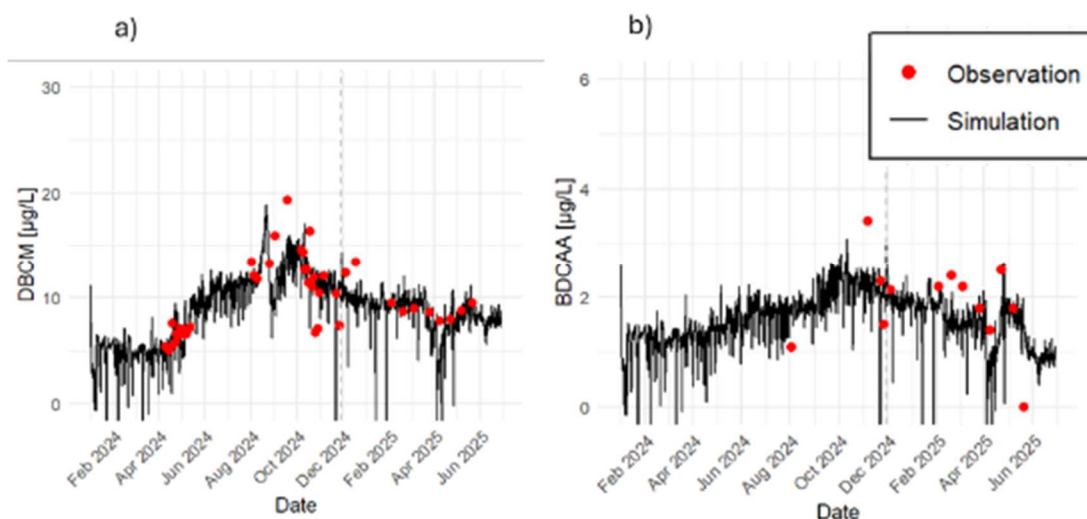


Figure 12: Modelling results for one specific site in case study #3 for (a) dibromochlormethane (THM) and (b) bromodichloroacetic acid (HAA). Data before dashed lines was used for calibration and data after dashed line was used for validation (Copyright EUT)



2.3.3 Optimal set-points for chlorination boosters in the network based on DBP modelling

Set-points for chlorination boosters in distribution networks are currently determined based on operator judgement to achieve target chlorine residuals. Within SafeCREW, a DBP prediction model was developed and applied to optimise free chlorine set-points at booster stations. The resulting modelling framework enables improved control of both chlorine residuals and DBP formation. Moreover, the developed models can be readily transferred to other case studies with minimal adaptation. Detailed results are presented in Deliverable D3.2.

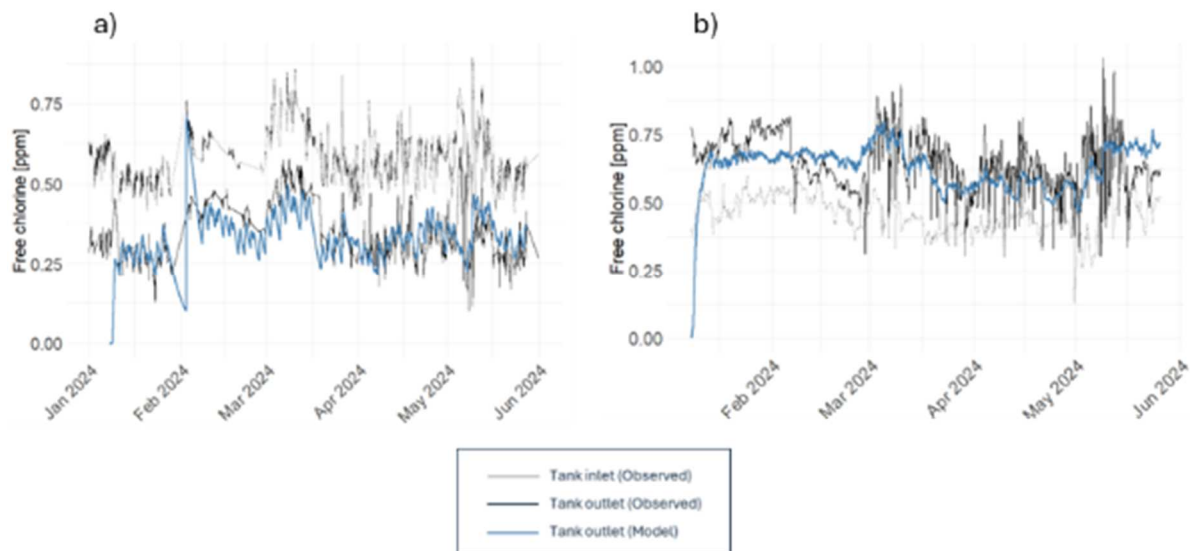


Figure 13: Simulated chlorine concentration in a storage tank (a) and a chlorine booster station (b) compared with sensor data. Models are used for chlorine predictions and optimal set-point definition (Copyright EUT)

2.3.4 Validated testing protocol for reactions between disinfectants and materials

Climate change is expected to increase the need for disinfection in drinking water systems, while interactions between disinfectants and infrastructure materials remain insufficiently understood. In SafeCREW, a worst-case approach, in which materials were ground into a powder, was developed to quantify chlorine consumption, organic carbon release, and DBP formation from common drinking water materials. The results, described in SafeCREW Analytical Protocol #4, Deliverable D1.5 and Langenbach, D. et al. (2026), support material selection, risk assessment, and regulatory development for drinking water utilities.



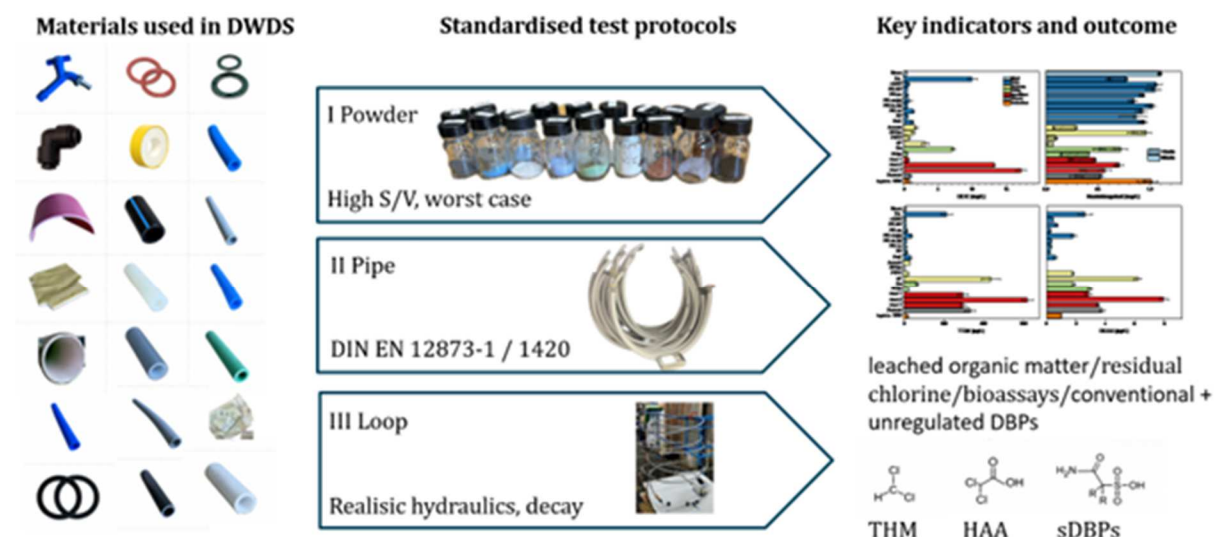


Figure 14: Schematic illustration showing the protocols for testing materials in contact with disinfected drinking water; Powder – Pipe – Loop (Copyright UBA)

2.4 Integrated risk assessment framework to guide future interventions that sustain safe drinking water supply in the face of climate change

A range of supporting tools, risk assessment framework, guidelines and policy briefs have been developed based on the novel analytical methods, the treatment technologies and the model developments for drinking water supply systems. These guide future interventions in drinking water supply systems in the face of climate change. They comprise climate change scenarios relevant for DBPs, a guideline for monitoring water quality and the management of DBPs in drinking water distribution networks and an integrated risk assessment framework to support decision making in drinking water supply systems by balancing microbial and chemical risks.

2.4.1 A set of climate change scenarios and future projections of parameters relevant for DBPs

The impact of climate change on freshwater availability and characteristics on drinking water supply systems which may result in the need to adapt infrastructures is still understudied. SafeCREW developed a set of scenarios and models of parameters relevant for DBPs based on regional historical data, literature review and climate change projections. An estimation of the water quality variation at different horizons was made for a relevant compound to consider on disinfected drinking water supply system like organic matter. Results are described in Deliverable D4.1.

2.4.2 DWDN management based on quantitative chemical risk assessment QCRA and DBP prediction models

Based on the DBP prediction models in DWDN, chemical risk management is built on the predicted concentrations of DBPs in the network and the assessment of their risk for human health. This innovation consists of visualising the network not only in terms of DBPs concentration but also in terms of human health risk to increase the information of the utility personnel to take decisions on the network and water treatment plant operation. This resulted in a **water management tool for the minimisation of disinfection by-products** that was developed and launched online ([SafeCREWApp](#)). Results are described in Deliverable D3.3 and Guideline #4.



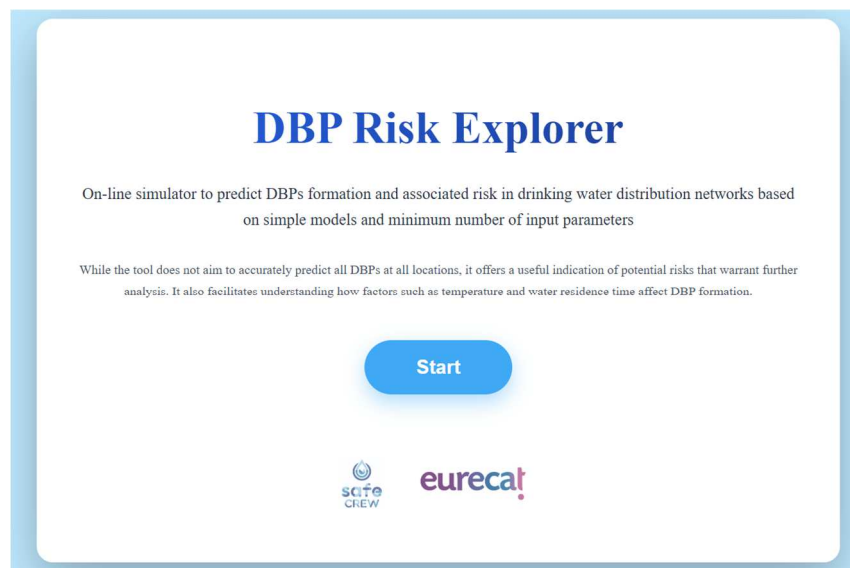


Figure 15: <https://dbpriskexplorer.eurecatprojects.com/> – a DWDN management tool based on chemical risk assessment QCRA and DBP prediction models. (Copyright EUT)

2.4.3 Integrated risk assessment framework for microbial and chemical safety in drinking water

Conventional approaches to risk assessment typically address microbial and chemical risks separately and poorly integrate effect-based monitoring, limiting public health protection. SafeCREW developed a flexible, scalable framework combining these aspects. It supports decision-making in the management of drinking water supply systems by optimizing current practices and strengthening preparedness for climate-driven challenges. Results are described in Deliverable D4.3.



Figure 16: Infographic illustrating the integrated risk assessment framework for microbial, and chemical safety in drinking water (Copyright POLIMI)



This project has received funding from the European Union’s Horizon Europe research and innovation programme under grant agreement No 101081980.

2.5 Transfer of solutions to utilities - application in SafeCREW case studies

Optimisation of disinfection in the drinking water distribution network of case study #2 (Milan, Italy) has been facilitated by the validation of the online microbial monitoring tools and the soft sensor in the case study. Case study #4 in western Ukraine applied the knowledge gained from the other three case studies to develop water safety plans (WSP) and adopt soft sensor technology. In addition, a Centre of Excellence for Water Management (CEWM) has been conceptualised to modernise applied water research and development in western Ukraine.

2.5.1 Optimisation of disinfection in the network (case study #2)

Early in the project, a key difficulty was balancing effective disinfection with microbiological stability, without resorting to excessive chlorination in water. To tackle this, SafeCREW designed a set of integrated online microbial monitoring tools combined with soft sensor modelling, enabling continuous, real-time adjustment of disinfectant dosage and contact time. The approach was validated through testing in case study #2 (Milan, Italy), ultimately offering water utilities with reliable solutions to improve water quality management, lower chemical usage, and align with evolving regulations on materials and emerging contaminants.

2.5.2 Integrated monitoring and water safety plans for western Ukraine (case study #4)

Water quality monitoring and water supply safety in Ukraine requires improvement and alignment with European Union standards. SafeCREW facilitated knowledge transfer through continuous partner exchange and international visits, enabling the development of Water Safety Plans (WSP) and the adoption of technology (e. g. soft sensors, Flow Cytometry, etc.) to enhance water safety and introduce EU water working schemes and standards as a blueprint for future Ukrainian regulations. Results are described in deliverable D7.2 and Martynov et al. 2026.

2.5.3 Conceptualisation of a Centre of Excellence for Water Management (CEWM) for western Ukraine (case study #4)

In Ukraine, water supply companies use outdated technologies and equipment, which does not comply with high risk mitigation standards for providing safe drinking water. Addressing gaps in applied water research and development (R&D) can be achieved through the establishment of the Centre of Excellence for Water Management (CEWM) at NUWEE, which will deepen cooperation between EU and Ukrainian research and educational institutions, and water utilities. The CEWM will promote the dissemination of best water management practices, support the implementation of the EU Water Policy, and help attract additional funding. Results are described in deliverable D7.3.

3. Uptake of SafeCREW solutions by water utilities – case study #3

Tarragona, Spain

Case study #3 illustrates the outcomes and the impact of SafeCREW well (Figure 17). The full-scale drinking water treatment plant (DWTP) with a 400 km distribution network of Consorci d'Aigües Tarragona (CAT) serves 800,000 inhabitants in winter and 1.5 million in summer. Source water from the Ebro River currently undergoes a complex treatment train consisting of pre-ozonation, flocculation, sand filtration, main-stage ozonation, activated carbon filtration, ultraviolet disinfection, and final disinfection with sodium hypochlorite with several chlorination boosters along the network to keep the required level of residual free chlorine.



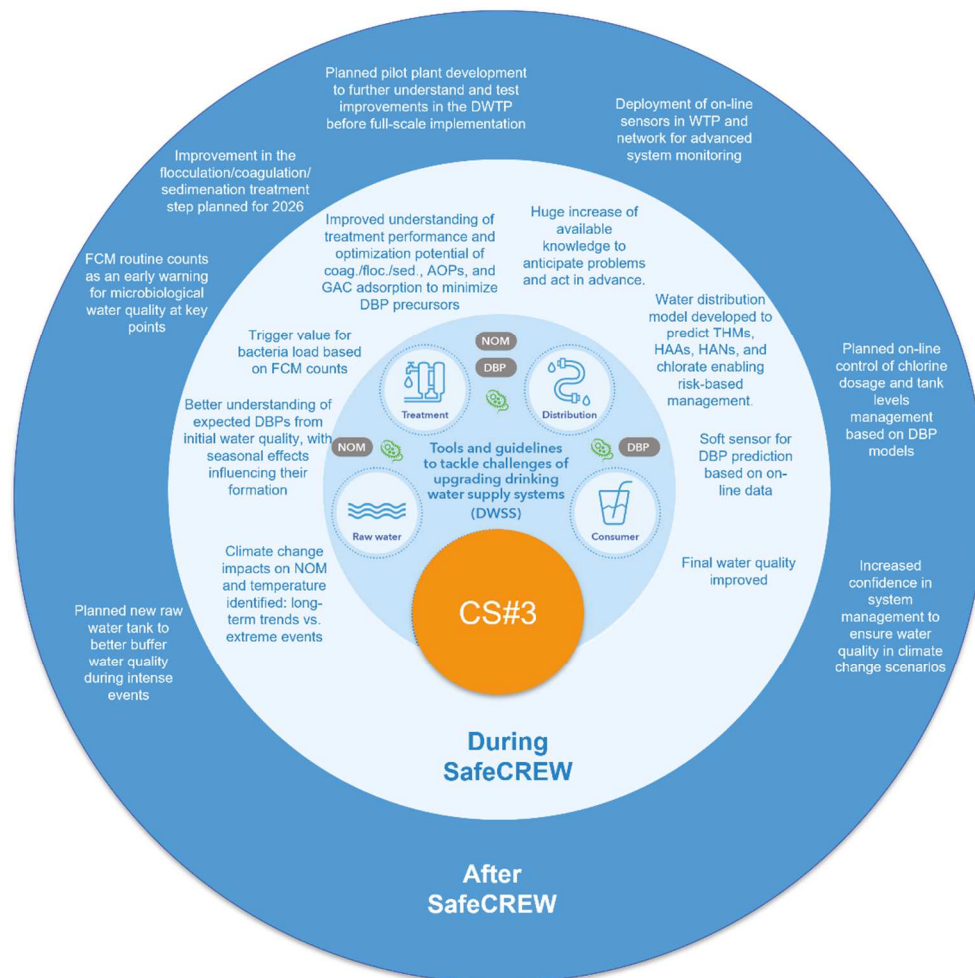


Figure 17: Development, testing and implementation of SafeCREW solutions in Case Study #3 – Tarragona, Spain. Inner light blue circles: outcomes during the project. Outer dark blue circle: CAT's implementation plans beyond the project. (Copyright EUT)

The SafeCREW consortium developed and tested many of its innovations in this case study, starting from analysing climate change impacts, monitoring DBP formation with the new monitoring tools from chapter 2.1 and exploring new treatment solutions coagulation-flocculation, AOPs and GAC adsorption (chapter 2.2). The development of models and soft sensors to predict DBPs enable risk-based management, anticipating problems and acting in advance. This results in the immediate improvement of water quality at the consumers.

Preparations for implementation and further development beyond SafeCREW have already started, e.g. the implementation of flow cytometry (FCM) routine counts, the renewal of the flocculation-coagulation-sedimentation step or the planned online control of chlorine dosage and tank levels management based on the DBP models (dark blue circle in figure 18).



4. Promoting climate-resilient management for safe water supply systems



Figure 19: Impressions from dissemination activities – ZP4W Cluster events October 2023 and December 2025, Panel discussion and policy briefs at the SafeCREW Final Conference in March 2026 (from upper left to bottom right). (Copyright Water Europe, Tutech Innovation GmbH)

To promote the climate-resilient management of safe water supply systems and the uptake of solutions, tools and knowledge by water utilities, technology providers and policy makers, SafeCREW engaged actively in the internal and external activities and events of the [ZeroPollution4Water Cluster](#) (ZP4W). This included the preparation of the Case Study Inventory (European Commission (2025)), the Market Analysis Recommendations (Ostuni (2026)) and the participation in three ZP4W events attached to events organised by Water Europe (e.g. Water Knowledge Europe Winter Edition 2025, see deliverables D5.6, D5.7 and D5.9 for details). A series of webinars was conducted in cooperation with the ZP4W Cluster and Hamburg Wasser to train water professionals and stimulate uptake. Five webinars have been recorded and are available on [Zenodo](#) (see Annex 5 webinars), another four webinars (in Ukrainian language, not recorded) aimed explicitly at training Ukrainian water utilities. Analytical protocols and guidelines (see Annex 6) provided brief summaries that guide towards the detailed guidance provided in publications and deliverables (References and Annex 7). The [Horizon Results Platform](#) has been used for SafeCREW key results to invite further development in future collaboration projects (Annex 7). Networking events with German, Italian, Spanish, Ukrainian and European authorities, utilities, and their associations were conducted for mutual exchange about challenges and solutions in drinking water supply systems. Three joint policy briefs with the ZP4W Cluster and three SafeCREW policy briefs were published (Annex 6) to provide scientific evidence for policymaking. Two short videos informed the interested public about the case studies and the key solutions (Annex 3).



This project has received funding from the European Union’s Horizon Europe research and innovation programme under grant agreement No 101081980.

5. Conclusions and outlook

SafeCREW aimed to ensure that drinking water continues to meet high-quality standards for all EU consumers in the face of the effects of climate change by supporting water utilities in climate-resilient management procedures. This report presents the key outcomes of the project. SafeCREW increased the EU scientific and technological knowledge base with a combined set of novel analytical methods to monitor water quality comprehensively, with a special focus on NOM as DBP precursors, bacteria concentration as well as regulated and emerging, still unregulated DBPs. This allowed the identification of correlations between NOM as precursor compounds and DBP formation and contributed to the robust knowledge of the occurrence, persistence and degradability of DBPs. The analytical methods proved their applicability during the monitoring campaigns in the SafeCREW case studies. SafeCREW also developed innovative drinking water treatment processes to remove NOM and thus reduce DBP formation. Virtual sensors, modelling and validation of interaction between disinfectants and materials in contact with water allow better DBP prediction and improved strategies for safe drinking water distribution. Finally, this resulted in tools, an integrated risk assessment framework and guidelines for future interventions that sustain safe drinking water supply in the face of climate change. The SafeCREW utilities as case study operators are directly improving their processes by the implementation of novel treatment and management practices in their drinking water supply systems, thus acting as frontrunners for advanced and cost-effective drinking water treatment and disinfection processes. The availability of solutions on the Horizon Results Platform will stimulate collaborative further development of the monitoring tools, DBP reduction processes, risk assessment frameworks. Finally, the engagement of the ZeroPollution4Water Cluster for zero pollution of the water sector will be continued by a cohort of new projects. However, further research as well as financing will be needed to address the challenges of e.g. currently unregulated sulfonated DBPs found in SafeCREW.



References

Behnisch, P., Besselink, H., Wullenweber, J., Cantoni, B., Antonelli, M., Ernst, M., Grieb, A. and Magna, M., **EU Safe Crew project for evaluating organohalogens (e.g. PFAS, DBPs) in drinking water in Milano (Italy) by using a panel of effect-based bioassays**, Toxicology Letters, Volume 411, Supplement, **2025**; P. S455

<https://doi.org/10.1016/j.toxlet.2025.07.1048>

European Commission: European Research Executive Agency, Remmert-Rieper, M., Meilmann, D., Martins, R., Charpentier, L. et al., **ZeroPollution4Water Cluster – The overview and the inventory of 32 case studies in drinking and groundwater**, Publications Office of the European Union, **2025**,

<https://data.europa.eu/doi/10.2848/3536872>

David Langenbach, D., Kalweit, C., Kaczmarek, D. and Ruhl, A.S. (2026). **Evaluating DBP Formation in Chlorinated Drinking Water: Effects of Contact with System Materials**, ACS ES&T Water, February 26, 2026, <https://pubs.acs.org/doi/10.1021/acsestwater.5c0135>.

Martynov, S., Klimov, S., & Kucherova, A. **Hazard identification and assessment in water supply systems**, Problems of Water Supply, Wastewater Disposal, and Hydraulics. Scientific-Technical Bulletin. 2025. Kyiv, Ukraine: Kyiv National University of Construction and Architecture, Issue 52, pp. 74–80. <https://zenodo.org/records/19563397>

Nihemaiti, M., Wullenweber, J., Stefanoni, M., Kahle, L., Lechtenfeld, O.J., Cantoni, B., Antonelli, M., Ernst, M., Reemtsma, T., **Formation of regulated and novel disinfection by-products during chlorine and chlorine dioxide disinfection of surface water and groundwater**, Water Research, Volume 290, **2026**, <https://doi.org/10.1016/j.watres.2025.124996>.

Ostuni, G. (2025). ZeroPollution4Water Cluster Case Study: Key steps for market uptake of the THM Analyser, Meilman, D. (ed.). https://zeropollution4water.eu/wp-content/uploads/2025/11/Case-study_final.pdf, accessed 10 February 2026.

Ranjbar, E., Kaczmarek, D., Khorasani and H., Ruhl, A. S., **Investigating chlorine consumption through semi-mechanistic modeling and its implications for trihalomethane formation: A comparison of diverse drinking water**, Water Research, Volume 288, Part A, **2026**, <https://doi.org/10.1016/j.watres.2025.124673>.

Wullenweber, J., Bennert, J., Mantel, T. and Ernst, M. 2024. **Characterizing Macroporous Ion Exchange Membrane Adsorbers for Natural Organic Matter (NOM) Removal—Adsorption and Regeneration Behavior**, *Membranes* **2024**, 14(6), 124; <https://doi.org/10.3390/membranes14060124>

Wullenweber, J., Vahedi, Sh., Bennert, J. and Ernst, M. (2026). **Electrochemical regeneration of macroporous anion exchange membrane Adsorbers for the removal of natural organic matter (NOM)**, Journal of Water Process Engineering, Volume 85, **2026**, 109770, ISSN 2214-7144, <https://doi.org/10.1016/j.jwpe.2026.109770>.



Annex – Collection of resources

The following annexes comprise a compilation of publicly available materials and resources. It starts with a list of repositories, followed by links to the DBP Risk Explore and the videos. A compilation of the MOOC modules, the recorded webinars, the analytical protocols, guidelines, policy briefs and public deliverables complete the collection of resources.

Annex 1 – SafeCREW repositories

- SafeCREW community on Zenodo: <https://zenodo.org/communities/safecrew>
- SafeCREW on CORDIS: <https://cordis.europa.eu/project/id/101081980>
- SafeCREW results on CORDIS: <https://cordis.europa.eu/project/id/101081980/results>
- SafeCREW on Horizon results Platform: <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform/search?keywords=SafeCREW>
- SafeCREW website: <https://safecrew.org>

Annex 2 – DBP Risk Explorer (DWDN management tool)

- DBP risk explorer (DWDN management tool) based on chemical risk assessment QCRA and DBP prediction model; see chapter 2.4.2, deliverable D3.3): <https://dbpriskexplorer.eurecatprojects.com>

Annex 3 – SafeCREW videos

Two videos present the work and results of the SafeCREW project carried out by twelve partners across Europe. They are available on YouTube with subtitles in several languages and provide insights into the project’s outcomes.

- Video 1:
Securing future proof drinking water supply – (13 minutes, https://youtu.be/QZ8n_EjUHBg)
- Video 2:
Part II - Advancing climate resilient drinking water management – (27 minutes; <https://youtu.be/9QHNmmlss98>)



Annex 4 - Summary and compilation of training modules – the MOOC

The SafeCREW MOOC aims to provide a comprehensive and practice-oriented overview of how climate change is impacting drinking water systems and how these challenges were addressed in the SafeCREW project through innovative monitoring, treatment, modelling, and risk management approaches. The course is designed for water professionals, early-career researchers, students, and stakeholders involved in drinking water safety and management, as well as anyone interested in climate-resilient water systems. The MOOC is structured into four main modules, covering climate change impacts on water quality, drinking water treatment, monitoring tools, and distribution system management. It consists of short video lessons and is available in English with English and Ukrainian subtitles to ensure broad accessibility across Europe. The course is accessible through the POLIMI platform at the following master link: <https://www.pok.polimi.it>.

- **Module 1: Drinking water quality and climate change**
 - 1.1.1 Introduction to the MOOC: goals, tools, expected outcomes and knowledge advances (DVGW-TUHH)
 - 1.1.2 Water quality in climate change scenario: how it is changing (POLIMI):
<https://youtu.be/D-LVbEuNlwl>
- **Module 2: Key process issues in controlling drinking water quality**
 - 2.1.1 Riverbank filtration in Europe: The subsurface as a hygienic barrier (KWB)
 - 2.1.2 Conventional processes for organic matter removal (EUT)
 - 2.1.3 Chemical and physical disinfectants (CAT)
- **Module 3: Tools for water quality monitoring**
 - 3.1.1 Sampling and monitoring: different approaches for an effective water quality evaluation (MSS)
 - 3.1.2 Advanced analytical techniques for NOM, conventional and polar DBPs detection (UBA)
- **Module 4: Tools for process control and distribution network management**
 - 4.1.1 Water and pipe’ materials interactions (UFZ)
 - 4.1.2 Mechanistic modelling of the distribution network (EUT)
 - 4.1.3 Machine learning and Multi-Armed Bandit (MAB) framework (POLIMI)
 - 4.1.4 Risk assessment and EBT approaches for consumers’ protection (POLIMI)



Annex 5 - Summary and compilation of webinars

In cooperation with the ZeroPollution4Water Cluster and H2OforAll, SafeCREW organised and recorded a series of five webinars to train water professionals on disinfection by-products. The webinars covered an introduction into DBP, their monitoring and treatment, removal of DBP precursors, water system modelling and digitalisation, and preparing drinking water supply systems for climate change, with the final session highlighting case study results from three projects. The titles of the webinars are listed below, and the recordings are available on Zenodo:

- 1st ZeroPollution Webinar ‘All about disinfection by-products (DBP)’ (30 November 2023) – <https://zenodo.org/records/15396882>
- 2nd Webinar DBPs – Monitoring, Treatment, and Regulation (25 March 2024) - <https://zenodo.org/records/15397202>
- 3rd Webinar – Precursors of disinfection by-products (4 June 2024) - <https://zenodo.org/records/15397253>
- 4th Webinar – Drinking Water Systems Modelling and Digitalization (3 December 2024) [Agenda](#), [presentations](#), [shownotes](#) & [recording](#) - <https://zenodo.org/records/15397311>
- 5th Webinar – Preparing drinking water supply systems for climate change – case study insights (3 April 2025) - <https://zenodo.org/records/15397427>

Annex 6 - List of analytical protocols, guidance documents and policy briefs

- SafeCREW Analytical Protocol #1 – Advanced analytical procedures for the characterization of sulfonated disinfection by-products in drinking water: <https://doi.org/10.5281/zenodo.18852969>
- SafeCREW Analytical Protocol #2 – Robust analytical methods to comprehensively characterise natural organic matter and related disinfection by-products formation potential: <https://doi.org/10.5281/zenodo.18853650>
- SafeCREW Analytical Protocol #3 – Test protocol for effect-based in-vitro toxicity assessment of disinfection by-products: <https://doi.org/10.5281/zenodo.18853699>
- SafeCREW Analytical Protocol #4 – Protocol for testing materials in contact with disinfected water, integrating batch- and continuous-flow conditions: <https://doi.org/10.5281/zenodo.18864855>
- SafeCREW Guideline #1 – Application guideline about disinfection by-product precursor removal by different materials: <https://doi.org/10.5281/zenodo.18864995>
- SafeCREW Guideline #2 - Guidelines to develop and validate soft sensors for target contaminants, as backbone of an early-warning system: <https://doi.org/10.5281/zenodo.18965943>
- SafeCREW Guideline #3 - Integrated risk management by a combination of QMRA, QCRA and EBT for optimal management of DWSS with minimal risks for consumers; under preparation
- SafeCREW Guideline #4 - Guideline for monitoring water quality and management of DBPs in DWDNs: <https://doi.org/10.5281/zenodo.19576957>
- ZeroPollution4Water Joint Policy Brief #1 (31 March 2024): “[Preventing groundwater contamination and securing drinking water](#)”



This joint policy brief introduces the ZeroPollution4Water Cluster, with a focus on zero pollution for groundwater and drinking water.

- ZeroPollution4Water Cluster Joint Policy Brief #2 (29 August 2025): “[Responding to the Challenges of Disinfection by-products to Help Ensure Trust in Tap Water](#)”
This joint policy brief focuses on drinking water. It addresses approaches to reduce DBPs and promotes trust in tap water.
- SafeCREW Policy Brief #1 (1 December 2025): “Advancing NAM/EBM for the Assessment of Disinfection By-Products and Complex Chemical Mixtures in Drinking Water”. <https://doi.org/10.5281/zenodo.18847520>
The first SafeCREW policy brief addresses the toxicity assessment of mixtures of DBPs and other pollutants in drinking water, with a focus on non-animal, effect-based methods.
- SafeCREW Policy Brief #2 (1 February 2026): “Major Outcomes on Disinfection and Disinfection By-Products and Solutions”. <https://doi.org/10.5281/zenodo.18852423>
This policy brief summarizes SafeCREW outcomes on disinfection and disinfection by-products, recommending precautionary attention on emerging DBPs and new treatment and risk assessment approaches to guide drinking water management amid climate change.
- SafeCREW Policy Brief #3 (28 February 2026): “Managing the transition from non-disinfected to disinfected drinking water supply systems”. <https://doi.org/10.5281/zenodo.18852788>
Based on SafeCREW’s main findings, this policy brief provides evidence-based guidance for transitioning to disinfected drinking water networks, supporting decision makers and utilities in managing DBPs in water treatment and distribution systems.
- ZeroPollution4Water Cluster Joint Policy Brief #3 (27 March 2026): “[Reinforcing EU groundwater policy for emerging risks](#)”
This policy brief recommends strengthening groundwater protection and reinforcing the Ground Water Directive (GWD) implementation. Key recommendations comprise e.g. nature-based solutions (NbS) and improved monitoring of emerging pollutants. SafeCREW contributed.



Annex 7 - List of entries on the Horizon Results Platform

The following SafeCREW key results were published on the [Horizon Results Platform](#) to invite further development in future collaboration projects (accessible via search words “ID: 101081980” or “SafeCREW”).

- Improved detection of polar disinfection by-products by using supercritical fluid chromatography-mass spectrometry (ID: 93153 - Last published on Feb 26, 2026): <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform/93153>
- Integration of CALUX bioassays as early warning system for toxicity in complex water mixtures (ID: 83590): <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform/83590>
- Adsorptive membrane process to selectively remove NOM coupled with a sustainable electrochemical regeneration method (ID: 93597 - Last published on Mar 12, 2026): <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform/93597>
- Cellulose-based nanosponges to adsorb DBP precursors - a sustainable alternative to active carbon (ID: 94699 - Last published on Mar 25, 2026): <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform/94699>
- Design of soft sensors for target contaminants, as the backbone of an early-warning system (ID: 93715 – under preparation)
- Disinfection-by-products prediction models (ID: 83792 – under preparation)

Annex 8 - List of public deliverables

Repositories for all public deliverables after approval:

<https://cordis.europa.eu/project/id/101081980/results> and <https://safecrew.org/resources/#Publicdeliverables>

- [D1.1 Advanced analytical procedures for the characterisation of disinfection by-products and methodology for remote sensing of natural organic matter](#) (2024). Authored by Nihemaiti, M., Jou, S., del Val, L., Lange, D. and Ribalta, M.
- [D1.2 Robust analytical methods to comprehensively characterise natural organic matter and related disinfection by-products formation potential](#) (2024). Authored by Nihemaiti, M., Jou, S., del Val, L., Lange, D. and Ribalta, M.
- [D1.3 Test protocol for effect-based in-vitro toxicity assessment of disinfection by products](#) (2023). Authored by Behnisch, P.
- D1.4 A proof-of-concept of a passive sampler for microorganism sampling, with potential for patenting the developed methodology (2024). Authored by Matracchi, M., Punta, C., Riva, L., Wullenweber, J., Ernst, M. and Carraro, M. Confidential.
- D1.5 Protocols for testing materials in contact with disinfected water, integrating batch- and continuous-flow conditions (2024). Submitted October 2024.
- [D2.1 Report on seasonal bacteria fluctuation in raw water of non-disinfected case study sites in Northern Germany](#) (2024). Authored by Sprenger, Ch. and Wullenweber, J.
- [D2.2 Report on material properties of conductive membrane for optimal disinfection by-product precursor removal](#) (2024). Authored by Wullenweber, J.



This project has received funding from the European Union’s Horizon Europe research and innovation programme under grant agreement No 101081980.

- [D2.3 Application guideline about disinfection-by-product precursor removal by different materials](#) (2024). Authored by Stefanoni, M., Riva, L., Punta, C., Fargas Marques, A., Fabregas Serra, J., Martorell, A., Jubany Güell, I., Pérez Estrada, L., Vinardell Magre, L., Ruhl, A.S. and Ranjbar, E.
- D2.4 Report on natural organic matter transformation via ozone oxidation and advanced oxidation processes (2025). Submitted October 2025.
- D3.2 Disinfection-by-product prediction models (2026). Submitted April 2026.
- D3.3 Guideline for monitoring water quality and management of disinfection by-products in drinking water distribution networks (2026) Submitted April 2026.
- D4.1 A set of climate change scenarios and related impacts summarised through infographics, and guidelines for tipping point identification (2024). Submitted June 2024.
- D4.2 Guidelines to develop and validate soft sensors for target contaminants, as backbone of an early-warning system (2025). Submitted October 2025.
- D4.3 An integrated modelling framework for risk management optimization, combining Effect-Based-Trigger, Quantitative Microbial Risk Assessment and Quantitative Chemical Risk Assessment (2026). Submitted February 2026.
- D4.4 Policy brief to support unavoidable transition from non-disinfected to disinfected drinking water supply systems (2026). Submitted February 2026.
- [D5.2 Project website and flyer release](#) (2023). Authored by Remmert-Rieper, M.
- D5.4 Report “Climate-resilient management for safe water supply systems” (2026). Submitted April 2026.
- D5.5 Policy brief regarding disinfection and disinfection-by-products (2026). Submitted January 2026.
- [D5.6 Summary of communication and clustering activities in year 1](#) (2023). Authored by Remmert-Rieper, M.
- [D5.7 Midterm review of communication and dissemination activities and plans](#) (2025). Authored by Remmert-Rieper, M.
- D5.9 Final summary of clustering, dissemination and communication activities and plans beyond project (2026). Submitted April 2026.
- [D6.2 Data Management Plan – Initial](#) (2023). Authored by Grieb, A.
- D6.3 Public summary of midterm achievements ([excerpt](#)) (2024). Authored by Remmert-Rieper, M.
- D6.4 Data Management Plan – midterm (2025). Submitted April 2025.
- D6.5 Data Management Plan – final (2026). Submitted April 2026.
- D7.1 State of DW production in western Ukraine & future outlook (2025). Submitted April 2025.
- D7.2 Water Safety Plans for small DWSS: public summary (2025). Submitted October 2025.
- D7.3 CEWM roadmap: public summary (2026). Submitted April 2026.



Annex 9 – Contact to the coordinator

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Funded by
the European Union