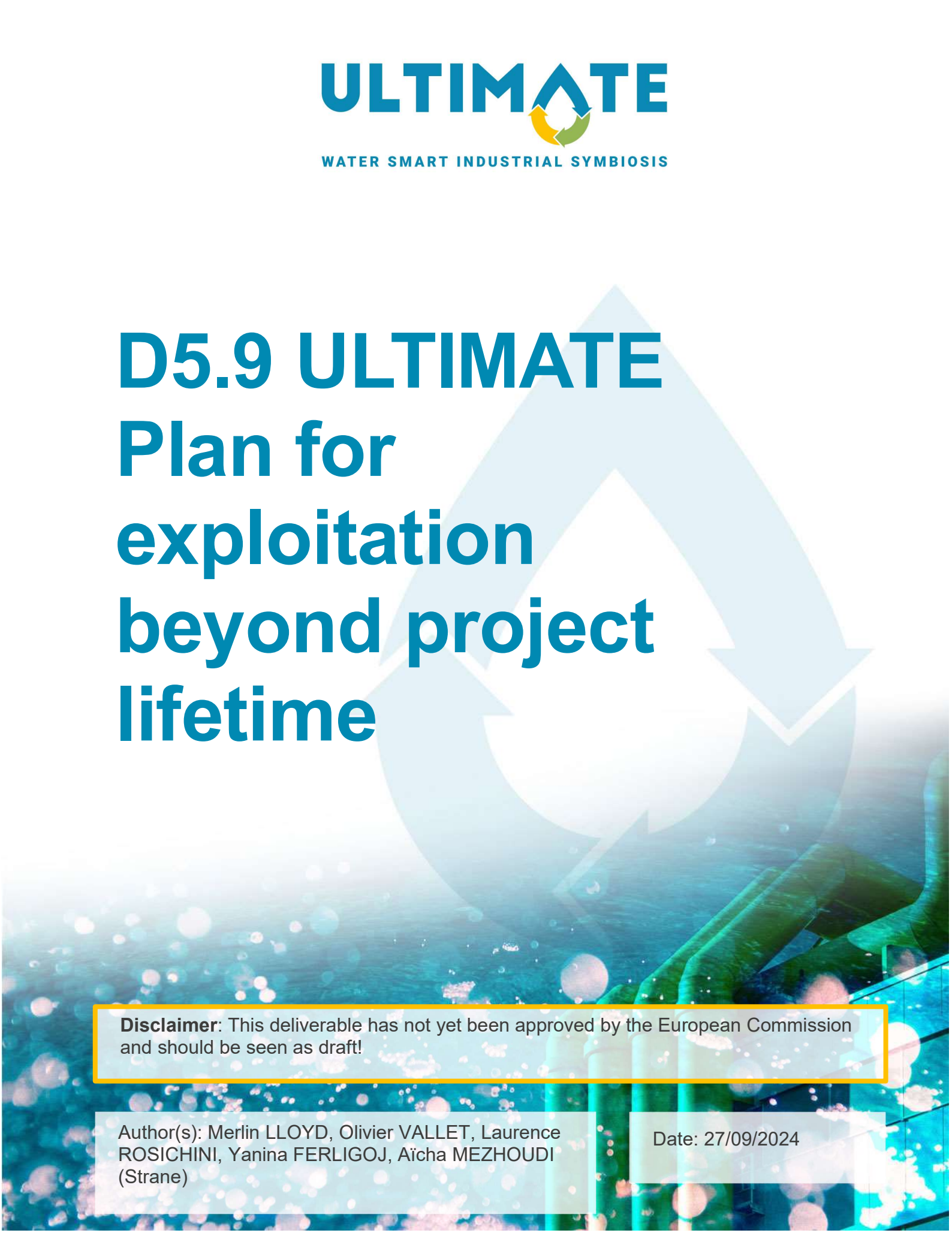
ULTIMATE

WATER SMART INDUSTRIAL SYMBIOSIS

D5.9 ULTIMATE Plan for exploitation beyond project lifetime



Disclaimer: This deliverable has not yet been approved by the European Commission and should be seen as draft!

Author(s): Merlin LLOYD, Olivier VALLET, Laurence ROSICHINI, Yanina FERLIGOJ, Aïcha MEZHOUDI (Strane)

Date: 27/09/2024

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318

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Authors: Merlin LLOYD, Olivier VALLET, Laurence ROSICHINI, Yanina FERLIGOJ, Aïcha MEZHOUDI (Strane)

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Technical References

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[1] PU = Public
PP = Restricted to other programme participants (including the Commission Services)
RE = Restricted to a group specified by the consortium (including the Commission Services)
CO = Confidential, only for members of the consortium (including the Commission Services)

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Document history

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Executive Summary

Summary of Deliverable

The ULTIMATE project, part of the Horizon 2020 European program, seeks to create economic value and enhance sustainability by reclaiming water, materials, and energy from wastewater treatment using a Circular Economy approach. This report summarizes the findings related to the exploitation of project results, focusing on the key innovations and the general approaches taken by project partners to bring these innovations to market.

During the project, **26** key innovations were developed, many of which focus on water, material, and energy recovery. These innovations represent a significant step forward in optimizing wastewater treatment processes and promoting sustainable practices across Europe.

The report also highlights the general market opportunities identified for these innovations, providing guidance on how they can contribute to the broader circular economy. Several partners are exploring diverse paths to commercialization, from integrating these innovations into existing operations to creating new business ventures.

A notable outcome of the project is the establishment of a platform to facilitate the commercialization of the project's results. This platform, along with the creation of new business ventures, is expected to drive economic growth and job creation across Europe.

The ULTIMATE project has made a significant impact on advancing circular economy practices, contributing to sustainability and resource efficiency at the European level.

Note: this report is the public version of a more detailed deliverable (D5.8), whose reading is limited to partners of the project and European Commission**.**

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Table of Contents

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318

Table of tables

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318

Table of Figures

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318

List of Acronyms

ABM	Agent-Based Models
ABS	Agent-Based Simulation
AGB	Agrobics
AI	Artificial Intelligence
AnMBR	Anaerobic Membrane Bioreactors
AOP	Advanced Oxidation Process
CAGR	Compound Annual Growth Rate
CAP	common agricultural policy
CAPEX	Capital expenditure
CE	Circular Economy
COD	Chemical Oxygen Demand
CPTM	Consorzio Polo Tecnologico Magona
CS	Case Study
CZ	Czech Republic
D	Deliverable
DES	Discrete-Event Simulation
DSS	Decision Support System
EPC	Engineering, Procurement and Construction
EU	European Union
EUT	Eurecat
GA	Grant Agreement
HEX	Heat Recovery
HMS	Hybrid Modelling and Simulation Approaches
HT-ATES	High-temperature Aquifer Thermal Energy Stores
ICT	Information and Communication Technology
IEX	Ion Exchange
IP	Intellectual Property
IPR	Intellectual Property Rights
IS	Industrial symbiosis
IWW	Industrial wastewater
K	Potassium
KER	Key Exploitable Result
KWB	KOMPENTENTZZENTRUM WASSER BERLIN
LCA	Life Cycle Assessment
LCC	Life Cycle Cost
LE	Low Energy
LRD	Legal Readiness Level
M	Month
MBR	Membrane Bioreactors
MCDA	Multiple Criteria Decision Analysis
MD	Membrane Distillation
N	Nitrogen
N/A	Does not apply
NF	Nano Filtration

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318

NTUA	National Technical University of Athens
NuReSys	Nutrients Recovery Systems
nZLD	Near Zero Liquid Discharge
OP	Key Outputs
OPEX	Operating expenses
ORL	Organizational Readiness Level
P	Phosphorus
PEDR	Plan for Exploitation and Dissemination of Project Results
PID	Proportional Integral Derivative Controller
PLC	Programmable Logic Controller
QMRA	Quantitative microbiological risk assessment
QMRA	Quantitative Microbiological Risk Assessment
R&D	Research in Development
RO	Reverse Osmosis
ROI	Return on investment
SBP	Small Bioreactor Platform
SD	System Dynamics
SME	Small Medium Enterprises
SRL	Societal Readiness Level
T	Task
TBD	To be defined
TOTEX	Total expenditure
TRL	Technology Readiness Level
UCRA	Cranfield University
UF	Ultra-Filtration
UNEXE	University of Exeter
UNIVPM	Università Politecnica delle Marche
UV	Ultraviolet
UWW	Urban wastewater
VAC	Value-added Compounds
WE	Water Europe
WP	Work Package
WRP	Wastewater Recovery Plant
WSIS	Water Smart Industrial Symbiosis
WW	wastewater
WWRP	Wastewater Recovery Plant
WWTP	Wastewater Treatment Plant
YoY	Year-over-Year

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1 Introduction

1.1. Context

ULTIMATE is a 4-year Horizon2020 project under the EU Water in the scope of the Circular Economy (CE) program. The objective of this project is to apply circular economy models within the water cycle, specially to the urban and industrial wastewater.

Industrial Symbiosis (IS) is the main concept being applied in the ULTIMATE project. IS a form of CE applied within industrial contexts that develops symbiotic relationships between industrial partners by systematically reusing waste resources. By being applied to the water cycle, IS limits the negative impact of current water extraction, use and treatment. ULTIMATE aims to implement "Water Smart Industrial Symbiosis" (WSIS) which involve water efficient systems, recovery and reuse technologies, and practices with a smart and digital management of resources. Water and wastewater (WW) play a key role in WSIS both as a reusable resource but also as a vector for energy and materials to be extracted, treated, stored, and reused. ULTIMATE focuses on three main areas:

1. **Reuse water:** Recover, refine & reuse wastewater from industries & municipalities.
2. **Exploit energy:** Extract & exploit energy, combined water-energy management, water-enabled heat transfer, storage & recovery.
3. **Recover materials:** Nutrient mining & reuse, extraction & reuse of high-added value exploitable compounds.

The project also integrates digital technologies to better manage the resources and symbiosis.

The project aims to assess and demonstrate the performance and the technical feasibility of innovative technologies and symbiosis strategies at large scale. ULTIMATE demonstration activities are built around 9 Water-Smart Industrial Symbiosis Case Studies (CS). CS are located in 7 countries as indicated in **Erreur ! Source du renvoi introuvable.**:**Erreur ! Source du renvoi introuvable.** Spain, The Netherlands, Italy, Israel, United Kingdom, France and Denmark.

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Figure 1: Map of ULTIMATE Case Studies location and Partners

ULTIMATE is represented by a strong partnership of industrial clusters**,** leading water companies and water service providers, specialist SMEs, research institutes and water-industry networks. Some of the partners of the project can be located in **Erreur ! Source du renvoi introuvable.**.

ULTIMATE' s WP5 aims to maximise the project impact by setting-up customised business models and an impactful exploitation strategy during and after the project lifetime. WP5 explores, developed, and demonstrated innovative arrangements and business models, and other exploitation mechanisms. Activities for WP5 started on M1 and have beencarried out until the end of the project on M48.

This deliverable corresponds to Task 5.3 performed by Strane Innovation. The main objectives of this tasks are:

- Develop a high-impact exploitation strategy, during and after the project, that allows to widely commercialise project technologies.
- Identify most promising technologies for exploitation and the development of spinoffs and start-ups.
- Characterise ULTIMATE technologies, market factors and market opportunities.
- Thoroughly assess all opportunities found with alongside technology owners and ULTIMATE partners to develop exploitation plans and strategies.

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1.2. Objective and Scope of the Deliverable

The deliverable focuses on developing an exploitation plan tailored for each partner involved in the ULTIMATE project. This strategic document is designed to outline the methods for maximizing the impact and value of the project's outcomes. By serving as a roadmap, it guides the transformation of research findings, innovations, and project results—financed by the European Commission—into tangible benefits for both the partners and society. A key aspect of this plan is the identification and development of Key Environmental Results (KERs), each of which aims to make a significant environmental impact.
The target audience is the European Commission, project partners, public authorities, industrial organisations, and policy maker.

This deliverable aims to:

- Present an exploitation strategy for the project and provide a holistic overview of the exploitation landscape surrounding it;
- Detail the actors, markets and sectors that are relevant in the context of exploitation;
- Highlight the exploitation possibilities for each partner and technology of the project
- Ensure that exploitable entities will be utilised in an optimal way and that the desired impact is achieved;
- Make a focus on market ready technologies in order to ensure that their potential is maximized
- Highlight the value of the ULTIMATE project to the public and how it supports innovation

This was achieved by working closely with each partner to tailor strategies that align with their specific needs and goals.

The present document is based on data available during its writing. Exploitation strategies are also expected to evolve depending on evolutions of markets.

Three scopes have been analysed and summarised in this document, as presented in Figure 2: :

- **Key Exploitable Results (KER)** developed during the project, which have to be exploited by each partner after the end of the project. Exploitation of KERs are strongly linked to their technological maturity (measured thanks to TRL) and potential marjets. This scope is analysed in section 2 and 3.
- **Exploitation strategy of each partner of the project:** indeed exploitation of KERs is strongly linked to the strategy of the partner who developed the KER. It depends on company’s strategy, available human and financial resources, and long-term objectives. This scope is analysed in section 4.
- **Spinoff and particular exploitation routes are highlighted in Section 5**

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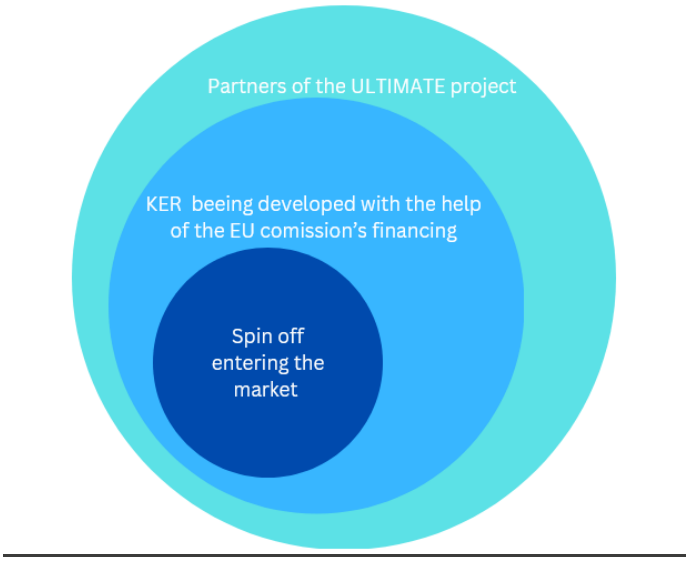

Figure 2: Different scopes of the ULTIMATE Project

1.3. Methodology

To efficiently organize and analyse the Key Exploitable Results (KERs) for Deliverable 5.8 (and then D5.9), a comprehensive table was created to gather all relevant data. This table served as a centralized resource, allowing for easy access and comparison of information across the project. The first step involved deciding which specific data points were necessary for the deliverable, ensuring that all critical aspects of each KER were captured. Once the data requirements were defined, the table was populated with existing information that had already been provided by project partners in previous deliverables. This pre-filled table was then uploaded on the project's Sharepoint and shared with the partners, allowing them to review, update, or refine their entries as needed. This collaborative approach ensured that the data was accurate, up-to-date, and reflective of the current status of each KER, facilitating a more effective exploitation strategy.

In cases where further clarification or detailed input was required, meetings were scheduled with specific partners. These meetings provided an opportunity to discuss the data in greater depth and ask more precise questions about the KERs being developed.

After that, each Key Exploitable Result (KER) was classified according to the specific market sector it targets, ensuring a clear alignment between the technologies and their intended applications. Additionally, market size estimations were conducted to gauge the potential impact of these technologies, along with identifying geographical zones with a high density of potential users.

The exploitation plan for each partner was drafted using the data entered in the KER table, complemented by the additional questions posed during meetings and the insights gained from the market analysis. These plans outlined clear pathways for maximizing the impact and value of the project outcomes, focusing on commercialization, dissemination, and sustainable application of the technologies within relevant market sectors.

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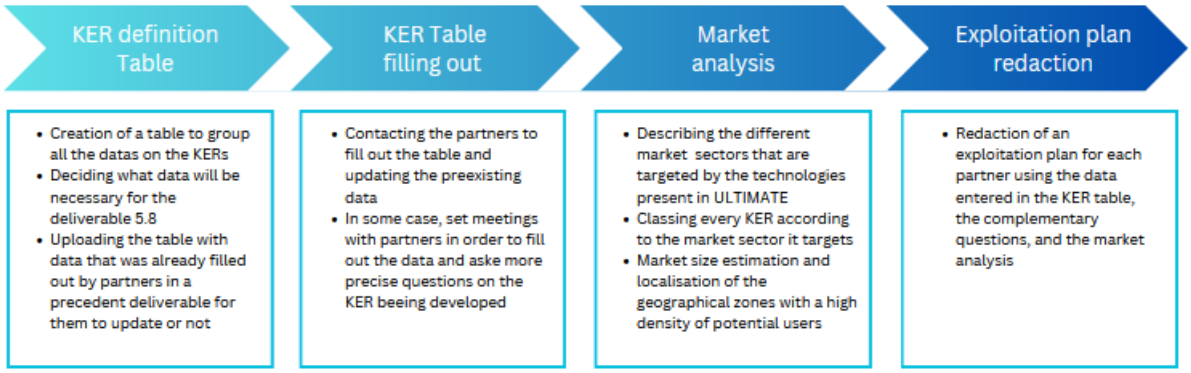

Figure 3 : Schematic representation of Strane ' s approach to T5.3's activities for D5.8 and D5.9

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2. Key Exploitable Results

2.1. Overview

Erreur ! Source du renvoi introuvable. shows the ULTIMATE Key Exploitable Results (KER), as listed with the help of the partners. This list has been updated since the publication of D5.3 (which presented KER and their exploitation during the project) to include new KER developed in the second part of the project.

This table summarises all KER, with the name(s) of involved partners, the case study where it has been tested, and its initial and final Technology Readiness Level (TRL). 26 Key Exploitable Results are listed below.

The following of this report analyses their market and their exploitation routes envisaged by each partner.

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318

Table 1 : Key Exploitable Results of ULTIMATE project

KER	Key result	Partner involved	CS/WP	Initial TRL	Final TRL
1	**Technology Evidence Base**	NTUA, Water Europe, KWB, EUT, UNIVPM	All CS	7	9
2	**Demonstration of the nZLD (Reverse Osmosis + Membrane Distillation)**	AITASA, EURECAT, VEOLIA	**CS1**	**5**	**7**
3	**Ammonia removal via zeolite adsorption**	AITASA, EURECAT	**CS1**	**5**	**6**
4	**Closed loop greenhouses with water and nutrient recycling**	KWR	**CS2**	**4**	**6**
5	**Real-time data driven monitoring and process control for salinity management**	ARETUSA, UNIVPM, WEST systems, CPTM	**CS3**	**2**	**8**
6	**Data-driven matchmaking platform for water reuse**	ARETUSA, UNIVPM, WEST systems, CPTM	**CS3**	**1**	**8**
7	**Mobile WWTP for use in fruit processing**	Greener than Green Technologies	**CS4**	**4**	**7**
8	**AnMBR (with post-treatment) for beverage WW treatment and reuse**	Aquabio	**CS5, CS7**	**7**	**9**
9	**Treatment of biotech WW based on novel membranes in combination with pre-treatment**	Pentar X-FLOW	**CS9**	**5**	**8**
10a	**High-Temperature ATES methods**	KWR	**CS2**	**5**	**7**
10b	**Drilling method for screening of aquifers**	KWR	**CS2**	**9**	**9**
11	**Biogas production in anaerobic bioreactors**	Aqualia	**CS5**	**5**	**8**
12	**Heat recovery from AnMBR effluent**	Aquabio Cranfield University	**CS7**	**6**	**7**
13	**Data driven cable-based control system for WWTP operation**	KCR, NZ, KWB (involved)	**CS9**	**5**	**8**
14	**Extraction process for value added compounds in olive mill wastewater**	Greener than Green Technologies	**CS6**	**4**	**7**
15	**Ammonia recovery methods**	Aquabio, Cranfield University	**CS7**	**5**	**7**
16	**Method for recovery of sulphur from flue gas**	Suez-RR-IWS-Chemicals DEEP	**CS8**	**4**	**6**
17	**Recovery of metals from the flue gas cleaning water**	Suez-RR-IWS-Chemicals	**CS8**	**2**	**4**
X1	**By-products used as coagulant/floculant at full scale**	ARETUSA, UNIVPM	**CS3**	**4**	**7**
X2	**Reuse Aluminium sludge**	UNIVPM	**CS3**		
19	**HMS Simulation & Stress-Testing**	UNEXE KWR	**All CS**	**4**	**6**
20	**Interactive Gamified Visualisation Tool**	UNEXE	**All CS**		
21	**Immersive Media Experience**	NTNU	**CS2, CS3, CS9**	**7**	**7**
22	**Biogas production in anaerobic bioreactors**	Agrobics	**CS6**	**5**	**8**
23	**Methodology to accompany industrial sites and municipalities to set up REUSE projects**	STRANE INNOVATION	**All CS**	**0**	**9**
24	**Tool to identify geolocalised synergies**	STRANE INNOVATION and its subsidiary SEITISS	**All CS**	**9**	**9**

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318

Description of technical innovation corresponding to these KER

To ensure a better understanding of these KER, descriptions of their innovative aspects are summarised in the following table. This table was presented in D5.3 and has been updated since then.

Table 2 Technical innovation of ULTIMATE KERs

KER 02	Advanced Reverse Osmosis, with an innovative operation mode. Membrane distillation for brine concentration in order to increase water recovery.
KER 03	This technology allows to: - Increase water yield in current WRP - Low costs in comparison with current RO - Lower energy consumption in comparison with current RO
KER 04	The technical innovation is the selective separation of the sodium from the wastewater while retaining the nutrients. The solution applied uses membrane filtration, with at its core electrodialysis membrane filtration. To make the water suitable for re-use, the innovative solution will be combined with established treatment technologies in horticulture (carbon filtration, UV disinfection).
KER 05	The ICT tool will integrate real-time flow data from the two WWTPs and the upstream sewer system as well as online conductivity data at the WWTP outlets and at strategic points of the sewer systems. This monitoring system will give us the ability to manage the flow splitting and equalization in ARETUSA WWRP through an automation package. An Early Warning System for the intrusion of seawater and salinity management will be developed, using a model-based approach with hydrometeorological forecasts, hydrogeological data to predict intrusions.
KER 06	Innovativeness to introduce compared to the current existing service, we would like to reuse as much water as possible aiming at reducing groundwater withdrawal. So, this matchmaking platform will facilitate this kind of symbiosis process managing the distribution of ARETUSA reclaimed water to Solvay and other potential reuse, depending on the quality parameter achieved. Nowadays is not present something similar: when the water doesnt comply with the contractual values it is not withdrawn by Solvay. There is not another option to reuse.
KER 07	This plant is containerised and mobile, it can be removed in the different sectors of the factory according to the fruits and vegetables seasonality, this will avoid stopping and restart the biological treatment according to the seasonality of the fruits and vegetable, and avoid the constraints associated with this issue as the operating constrain. This technology allows the valorisation of high value-added compound unlike the conventional process which consist of treating them by the biological treatment. The high added-value compounds will be extracted from the selective resin by means of subcritical water extraction, the choice of water due to its lack of toxicity compared to organic solvents used in other process.
KER 08	Previous technology: traditional technology of activated sludge which results in the removal of soluble and suspended organic matter from wastewater. The AnMBR technology allows the reuse of wastewater in the industry own process, generates biogas to feed the thermal needs of the water treatment and will reduce the quantity of sludge produced about 4 or 5 times, compared to the current treatment

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318

KER 09	WWTP effluents can contain a high share of non-degradable carbon, especially from biotech industries, which leads to high fouling of RO membranes. The novel ultrafiltration pre-treatment (ultra-tight UF) will remove more organic substances without the need of coagulant dosing. This will result in the following advantages: - Less fouling of the RO-unit and the possibility of operation at a higher capacity (higher flux and recovery) - longer lifetime of the RO-membranes - no chemical waste because of coagulant dosing.
KER 10	Natural gas fuel is replaced by alternative heat sources (e.g., geothermal heat) to feed the greenhouse. Due to the offset of heat production and use, the technology developed is focused on high-temperature aquifer thermal energy storage system (HT-ATES) system. Heat will be produced by a source during the summer and exceeds the demand. Therefore, it will be stored in a local aquifer during the summer, and autumn until the temperature decreases. It will be then recovered and used to feed the greenhouses.
KER 11	Biogas is a mixture of methane and carbon dioxide. Quality is usually similar compared to other anaerobic treatments, independently of the type of wastewater. However, because ELSAR® is an anaerobic reactor coupled with an electro-chemically assisted process, a significant production of hydrogen is expected. Therefore, a higher calorific value is expected on the biogas coming from ELSAR®. To the authors' knowledge, ELSAR® in Case Study nr 5 will be the biggest electro-chemically based solution for wastewater treatment, or the first conceived as full-scale.
KER 12	Heat exchangers are commonly used in a range of industries, but it will be evaluated in this project as part of the overall integration of the different systems. Understanding the energy balance of the advanced integrated treatment train proposed and identifying the optimum use of heat available will lead to a reduction of energy requirement in the wastewater treatment and water reuse process solutions.
KER 14	See KER 07
KER 15	Identification of the most appropriate technology for ammonia recovery from AnMBR effluent with high concentrations of ammonia in terms of operational costs, performance and quality of products generated and its integration as part of a complex multi-stage process treatment.
KER 16	Flue gas scrubbing & dust removal for sulphur recovery as sodium bisulphite Pilot-scale sulphur recovery. Industrial pilot including condensation, dust cleaning and scrubbing will be operated. Sulphur recovery from flue gas will broaden the chemical spectrum of liquid waste treated on-site, while respecting locally defined standards for sulphur released into the Rhône. The implementation of ULTIMATE results will decrease the environmental footprint of Suez-RR-IWS-Chemicals both by decreasing the amount of sulphate discharged and by producing marketable products which will replace primary raw materials. Furthermore, the implemented sulphur recovery will enhance the portfolio of the company moving from waste removal towards waste recovery. This new offer creates a business opportunity both for high-sulphur waste (>40-50% of sulphur) and customers looking for waste recovery and not just disposal, following a CE approach.
KER 19	HMS will integrate and leverage the scenario exploration power of computer models developed using various methodologies. For example, Agent-Based Models (ABM) model the emergence and evolution of a system by simulating interaction among different agents' categories; Discrete-Event Simulation (DES) allows exploration of operational/process-flow scenarios by modelling an existing or a proposed system using queues, servers, and constraints (queuing theory); a System Dynamics (SD) model implements stock and flow models to provide a holistic representation of the wider system. As these models developed using ABM, DES and SD operate on different resolutions. HMS technology enables to identify: a) Existing deviations between local and global optimizations, with small deviations suggesting high symbiotic performance potential, opening the way for the creation of the right balance between an industry and their context

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	b) Possible optimal interventions on behalf of the participant industries with the target of maximizing overall value-added that will be redistributed between the industries and examine their performance under different socio-economic, regulatory, and political futures.
KER 20	Accessible online serious games that run a modular System Dynamic Model in the backend, that allows adaptation to different case studies from a generic template.
KER 21	Immersive Media Experience enables a large audience to better understand water reuse projects, thanks to innovative digital solutions. IMX has been installed on 3 case studies to communicate about them
KER 23	This methodology enables NEWASYS consultants to analyse all wastewater sources (quantity, quality, seasonality…) and identify all relevant uses in a 3km radius. The methodology enables to analyse all technical, economic, regulatory, organisational and environmental aspects to have all data to make a decision of setting up a REUSE project.
KER 24	This innovative solution, developed by Strane and Seitiss (its subsidiary) enables to identify all potential synergies between 2 given industrial sites.

As presented in the previous table, ULTIMATE delivers technological innovation both in terms of hardware (i.e., novel treatment processes, thermal storage installations, purification and reuse technologies, high-added-value compounds recovery technologies) and software (i.e., novel models, tools, online knowledge co-development infrastructure, ontology based IS matchmaking and online performance assessment tools powered by FIWARE). ULTIMATE technologies drastically improve the SOA (Service-Oriented Architectures) of wastewater treatment reclaiming high-price value added compounds and water for industrial reuse or safe disposal. Hybrid technologies ensure compatibility and efficiency, in plug-and-play, factory-optimised units (incl. cases with mobile units (e.g., Case 4) enabling business models suitable for highly distributed industries – such as fruit and olive oil processing).

The project directly contributed to the mid-term actions proposed in the "Digital Single Market for Water Services Action Plan" promoting cross-domain decision making for a European water-smart society while fostering new data-driven business models through custom services for water utilities and symbiotic industrial sectors.

Moreover, business innovations were also encouraged: even though at technical level, industrial ecology has made significant progress to industrial symbiotic clusters[1], a significant gap in the development of industrial ecosystems -and generally CE markets- is observed at financial level. The project developed KPIs to encode the performance of industrial ecosystems into a set of targeted indicators on which financial contracts can be built. New business models and new governance schemes based on fair distribution of value among stakeholders over CE value chains have been generated. New ideas (such as chemical leasing) are explored and existing marketplaces around CE are strengthened to support WSIS. The need for new WSIS solutions has been assessed, when appropriate, to prepare attractive financing schemes for investors, capturing value beyond normal revenue streams, especially by internalising externalities.

Novel viable business models based on value streams catalysed by the project's innovations created a new potential for IS and boosted the uptake of the CE paradigm in the European industries.

[1] Grant Agreement

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2.2. Categories of KER

A few analyses can be done on the KER table. The following table outlines the allocation of Key Environmental Results (KERs) across various areas of resource recovery and digital management. It categorizes KERs into five distinct sectors, including material recovery, energy recovery, water treatment and reuse, digital management and optimization, and knowledge. Each sector is represented by a specific number of KERs, which is also expressed as a percentage of the total. This distribution reflects the relative importance and focus given to different aspects of sustainability and environmental management within the ULTIMATE project.

Table 3: Resource recovery distribution in ULTIMATE technologies

Resource recovery & Digital Management	Number of KER's are associated with	Percentage of KER's
Material Recovery	9	32%
Energy Recovery	4	14%
Reuse of the Water (Water treatment and Recovery of treated)	7	25%
Digital Management and optimization	6	22%
Knowledge	2	7%

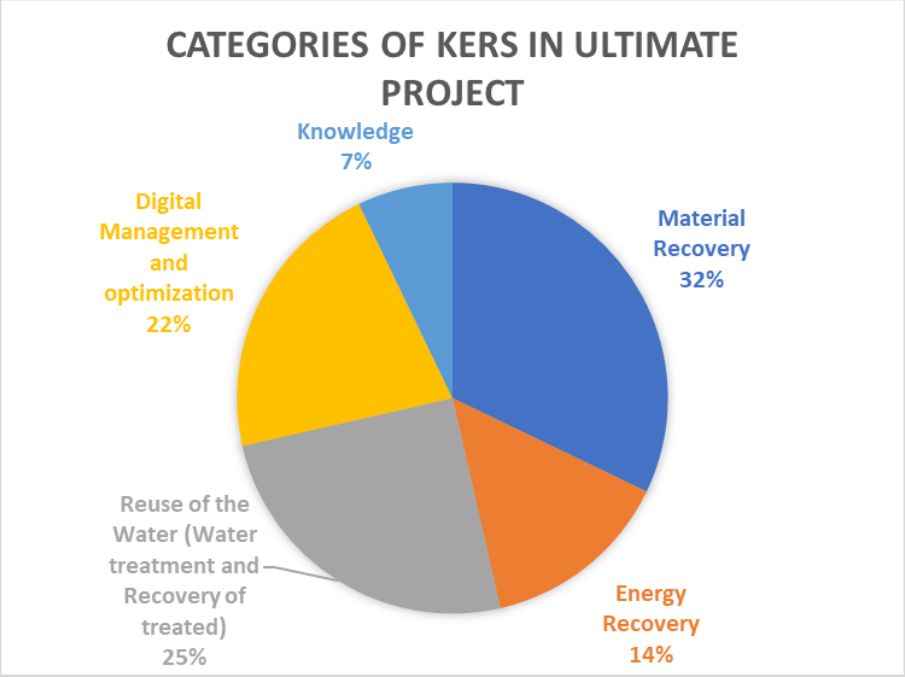

Figure 4 : Categorization of the KER ' s by resource recovery

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The data shows that Material Recovery is the most significant area, comprising 32% KERs. Water treatment and recovery of treated water follows with 25%, and Digital Management and optimization accounts for 22%, highlighting the critical roles these areas play in resource efficiency. Energy recovery is responsible for 14% of KERs, while Knowledge contributes 7%, indicating a smaller yet important focus on expertise in environmental sustainability.

Another analysis can be done on Technology Readiness Level (TRL). The following table shows the final TRL, reached at the end of the project, and compares it with the expected final TRL (as defined at the beginning of the project).

Table 4 : Comparison between real and expected final TRL

KER	Key result	Partner involved	Final TRL	Expected TRL
1	**Technology Evidence Base**	NTUA, Water Europe, KWB, EUT, UNIVPM	9	9
2	**Demonstration of the nZLD (Reverse Osmosis + Membrane Distillation)**	AITASA, EURECAT, VEOLIA	**7**	**7**
3	**Ammonia removal via zeolite adsorption**	AITASA, EURECAT	**6**	**6**
4	**Closed loop greenhouses with water and nutrient recycling**	KWR	**6**	**7**
5	**Real-time data driven monitoring and process control for salinity management**	ARETUSA, UNIVPM, WEST systems, CPTM	**8**	**8**
6	**Data-driven matchmaking platform for water reuse**	ARETUSA, UNIVPM, WEST systems, CPTM	**8**	**8**
7	**Mobile WWTP for use in fruit processing**	Greener Than Green Technologies	**7**	**7**
8	**AnMBR (with post-treatment) for beverage WW treatment and reuse**	Aquabio	**9**	**9**
9	**Treatment of biotech WW based on novel membranes in combination with pre-treatment**	Pentar X-FLOW	**8**	**7**
10a	**High-Temperature ATES methods**	KWR	**7**	**7**
10b	**Drilling method for screening of aquifers**	KWR	**9**	**9**
11	**Biogas production in anaerobic bioreactors**	Aqualia	**8**	**8**
12	**Heat recovery from AnMBR effluent**	Aquabio Cranfield University	**7**	**8**
13	**Data driven cable-based control system for WWTP operation**	KCR, NZ,	**8**	**8**

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		KWB (involved)		
14	**Extraction process for value added compounds in olive mill wastewater**	Greener Than Green Technologies	**7**	**7**
15	**Ammonia recovery methods**	Aquabio, Cranfield University	**7**	**7**
16	**Method for recovery of sulphur from flue gas**	Suez-RR-IWS-Chemicals DEEP	**6**	**6**
17	**Recovery of metals from the flue gas cleaning water**	Suez-RR-IWS-Chemicals	**4**	**6**
X1	**By-products used as coagulant/floculant at full scale**	ARETUSA	**7**	**7**
		UNIVPM		
X2	**Reuse Aluminium sludge**	UNIVPM		
19	**HMS Simulation & Stress-Testing**	UNEXE KWR	**6**	**6**
20	**Interactive Gamified Visualisation Tool**	UNEXE		
21	**Immersive Media Experience**	NTNU	**7**	**7**
22	**Biogas production in anaerobic bioreactors**	Agrobics	**8**	**8**
23	**Methodology to accompany industrial sites and municipalities to set up REUSE projects**	STRANE INNOVATION	**9**	**9**
24	**Tool to identify geolocalised synergies**	STRANE INNOVATION and its subsidy SEITISS	**9**	**9**

The Key Exploitable Results (KERs) developed during the ULTIMATE project can be categorized into four groups based on their Technology Readiness Level (TRL):

- KERs that exceeded TRL expectations by the end of the project.
- KERs that met TRL expectations by the end of the project.
- KERs that did not meet TRL expectations by the end of the project.
- KERs that either did not have TRL expectations or did not have updated TRLs.

Table 5: comparison between expected final TRL and real final TRL of the ULTIMATE project

TRL that met objectives	TRL that exceeded objectives	TRL that did not meet objectives	N/A
17	2	3	4

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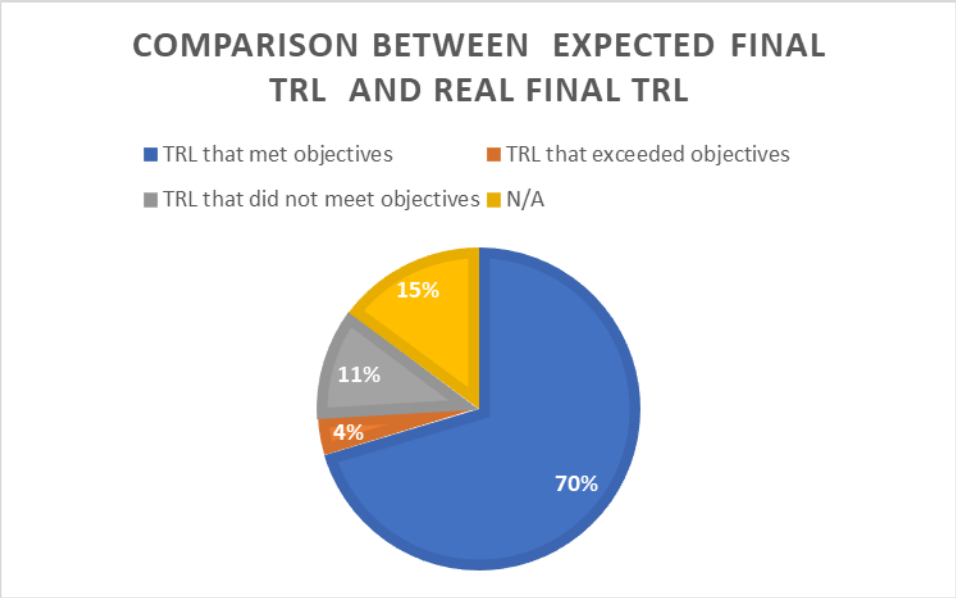

Figure 5 : Graph comparing expected final TRL and real final TRL of the ULTIMATE project

As presented above, 74% of the KERs have met or overachieved the expected TRL by the end of the ULTIMATE project. Only 11% of the KERs did not fully meet expectations. This shortfall may be attributed to factors such as abandonment due to non-functioning technology or delays caused by unforeseen events.

2.3. Exploitation Pathways of KERs

The main objective of ULTIMATE Exploitation WP5 is to implement and execute an exploitation strategy to ease the successful exploitation and adoption of results and benefits within industrial services, research communities and policy advisers. Exploitation activities in the ULTIMATE project seek to ensure the permanence and stability of the project' s results through either policy uptake, further research, or commercial applications.

Task 5.3 aims to explore the potential expansion of the project results and to plan the following exploitation process. According to the Grant Agreement, exploitation is in fact a compulsory activity, as each beneficiary must —up to four years after the period set out in end of the project —take measures aiming to ensure exploitation of its results (either directly or indirectly, through transfer or licensing, or Spin-off).

There have been multiple routes identified at initial stage of project development from the partners, which are listed below:

- **Follow-up research**
- **Feasibility/Design studies**
- **Policy change/Standards/Guidelines**
- **New Spinoff/Start-up/Joint Venture**
- **Consulting Service**
- **Product Sale**
- **Patent Licensing/Transfer agreement**
- **Equipment Sale**

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The above-mentioned routes are initially identified by the KER’ s technical characterisation table filled by the partners. These pathways depend on the technological advancement and associated cost. Exploitation routes chosen by each partner are explained and analysed in Section 4.

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3. Market analysis

Alongside analysing Key Exploitable Results (KER), a focus has been done on markets targeted by each KER. The Business exploitability of KER is indeed a critical aspect to ensure a large replication of innovations developed and tested during ULTIMATE project. The following section sumps up markets sizes and geographical distribution of sites where ULTIMATE solutions can be installed, and then market sizes and geographical distribution of final clients (using materials recovered thanks to ULTIMATE solutions).

3.1. Market overview

3.1.1. Characteristics of Wastewater in General

Wastewater can be divided into 2 categories, as described below:

- Industrial wastewater
- Municipal wastewater

3.1.1.1. Industrial wastewater

Industrial wastewater is a liquid discharge produced by activities related to the processing, manufacturing, and handling of raw materials. This wastewater is generated across all scales of industries and arises from various processes such as cooling, heating, production, extraction, and washing of by-products.

Industrial wastewater can significantly differ from domestic wastewater, with its characteristics varying widely between industries. Key types of industrial wastewater include:

- **Process water:** The pollutants and load of this water vary according to each industrial process.
- **Cooling water:** Typically less polluted, as it is used in heat exchangers and air cooling towers for gaseous effluents and does not come into direct contact with products.
- **Wash water from floors and machines:** This water contains various substances such as detergents, raw materials, and cleaning products.

Depending on their industrial origin, industrial wastewaters may contain:

- **Fats** (e.g., from the food industry and rendering),
- **Hydrocarbons** (e.g., from refineries),
- **Acids, bases, and various chemicals** (e.g., from chemical industries and tanneries),
- **Metals** (e.g., from surface treatment and metallurgy),
- **Radioactive materials** (e.g., from nuclear power plants and the treatment of radioactive waste).

The characteristics of industrial wastewater typically fall into several categories:

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- **Organic Load:** Industrial wastewater often contains organic compounds from manufacturing processes, chemicals, or raw materials, contributing to biochemical oxygen demand (BOD) and chemical oxygen demand (COD) levels.
- **Nutrients:** May contain nitrogen and phosphorus from organic matter, cleaning agents, or chemical additives. Excessive nutrient discharge can lead to eutrophication and ecological imbalances.
- **Suspended Solids:** Includes particulate matter, sediments, or solid waste from manufacturing operations, which can affect water quality and require appropriate treatment for removal.
- **pH Imbalance:** Wastewater may have pH levels that deviate from neutral, depending on the industrial processes involved. Acidic or alkaline wastewater can be corrosive, harmful to aquatic life, and impact treatment efficiency.
- **Temperature:** Elevated temperatures in wastewater from cooling processes or certain industries can affect aquatic ecosystems, alter oxygen levels, and potentially harm aquatic organisms.
- **Contaminants:** Specific industries introduce particular contaminants based on their processes, raw materials, and chemicals used. These contaminants can include heavy metals, oils, grease, toxic substances, and trace pollutants requiring proper treatment to meet regulatory standards.

3.1.1.2. Municipal wastewater

Municipal wastewater, also known as domestic or sewage wastewater, primarily originates from households, commercial buildings, and institutions. It typically contains organic matter, pathogens, nutrients, and human waste, and is often treated using standardized processes. In contrast, industrial wastewater, with its unique contaminants, often requires specialized treatment methods. Despite these differences, both the Municipal Water Market and Industrial Water Market often rely on the same water sources in many regions, which can lead to potential conflicts, especially during periods of water scarcity.

3.1.2. Water treatment processes and technologies

3.1.2.1. Introduction to the technologies of the ULTIMATE project

Technologies and practices must be selected and designed according to the wastewater to be treated and the quality of treated water to be obtained at the end of the treatment train. Thus, you may find some or all the technologies presented here, in line or not, at one or several stages in the water treatment, according to the treatment train design. The same technologies may be applied either to the inlet to get an improved water quality "compliant with the process", or to the outlet, as wastewater treatment, to comply with regulation or other constrains (for instance, to be allowed to send it to a "centralized" wastewater plant).

Reverse Osmosis (RO) Systems (KER 2) effectively remove dissolved salts and ions from water streams with high salinity, producing purified water for reuse in industrial processes.

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RO can be combined with other pre-treatment processes such as filtration, sedimentation, and chemical dosing for optimal performance.
Global reverse osmosis (RO) system market size was USD 7,925.7 million in 2022 and its market is projected to touch USD 10,830 million by 2028 at CAGR 5.3% during the forecast period (BUSINESS RESEARCH INSIGHTS 2024).

Biological Treatment processes (KER 9), such as activated sludge systems and biological filters, degrade organic pollutants in wastewater streams.
These systems utilize microbial activity to break down organic compounds into simpler, less harmful substances, reducing the organic load of the water.

Membrane Bioreactors (KER 2, 7, 14), combine the biological treatment process with membrane filtration, providing enhanced removal of organic matter, suspended solids, and pathogens. MBRs offer a compact and efficient solution for treating wastewater with high organic loads, producing high-quality effluent suitable for reuse.

Anaerobic Bioreactor (KER 8, 11, 12) is a system designed for the treatment of organic waste through anaerobic digestion, a process that occurs in the absence of oxygen. In this environment, microorganisms break down biodegradable material, producing biogas, primarily composed of methane (CH_4) and carbon dioxide (CO_2), and digestate, a nutrient-rich substance that can be used as fertilizer.

Zero Liquid Discharge (ZLD) Systems (KER 2) aim to recover and reuse all water from industrial processes, leaving zero liquid waste. By combining various treatment technologies like evaporation, crystallization, and membrane processes, ZLD systems can effectively manage streams with high salinity or pollution, enabling maximum water recovery.

3.2. KER Categories for market research

To enhance efficiency, KERs are first grouped by type of the industry where the technology will be applied. Subsequently, all KERs focused on material or energy recovery are classified based on the type of material recovered. This classification enables us to conduct a unified market study for a larger number of KERs and allows for comparison between the industrial sectors where the technology will be implemented and those that may benefit from the recovered materials.

This approach also provides an overview of the various industrial sectors addressed by the ULTIMATE project and illustrates the potential impact of the project on European industry.

3.2.1. Industrial sector aimed by each KER

The following table analysis in details industrial sectors where ULTIMATE solutions can be used. The number before the name of the industrial sector refers to the NACE code, the statistical classification code of the industrial sector. This code is commonly used to identify and categorize businesses and facilities within this specific sector.

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Table 6 Industrial sector of application for each KER

#KER	KER	CS Involved	Industrial Sector of Application
2	nZLD system for industrial water reuse	CS1	**37.00** Urban Wastewater Treatment Plants 36.00 Water collection, treatment, and supply
3	Zeolite adsorption for ammonia removal	CS1	
5	Real-time data driven monitoring and process control for salinity management	CS3	
6	Data-driven matchmaking platform for water reuse	CS3	
9	Treatment of biotech WW based on novel membranes in combination with pre-treatment	CS9	
8	AnMBR (with posttreatment) for beverage WW treatment	CS5, CS7	**10.0** Manufacture of food products **10.2** Processing and preserving of fish, crustaceans, and mollusks **10.3** Processing and preserving of fruit and vegetables **11.0** Manufacture of beverages **11.05** Manufacture of malt liquors, such as beer, ale, porter and stout **10.51** Dairy **11.02** Manufacture of wine from grape **11.05** Manufacture of beer
11	**Biogas production in anaerobic bioreactors**	CS5	
12	**Heat recovery from AnMBR effluent**	CS7	
15	**Ammonia recovery methods**	CS7	
4	Closed loop greenhouses with water and nutrient recycling	CS2	Farms owners Greenhouses Geothermal operators
10	High-Temperature ATES methods (Long term storage of residual heat)	CS2	
7	**Mobile WWTP for use in fruit processing**	CS4	**10.3** Processing and preserving of fruit and vegetables **11.0** Manufacture of beverages **10.4** Manufacture of vegetable and animal oils and fats (more precisely Olive Oil Manufacture) **11.02** Manufacture of wine from grape
14	**Extraction process for value added compounds in olive mill wastewater**	CS6	

Fruit and vegetable processing falls under Agrifood, but since KERs 7 and 14, both developed by Greener Than Green Technologies, specifically target this sector, it is more beneficial to conduct a market study focused exclusively on these industries.

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A sum-up of the previous table allows to categorize each KER by the industrial sector where it can be used. This sum up is then used for analysing markets.

Table 7 : Listing Ker per general industry sector

Industries targeted by the technology	KER targeting this market
Beverage and fruit processing	KER 7, 8, 11, 12, 14, 15
Farms, Greenhouses	KER 4, 10
Agrifood	KER 8, 11, 12, 15
Urban Waste Water Treatment Plant	KER 2, 3, 5, 6, 9

In summary, most of technologies developed during the project are focused on the reutilization of wastewater, targeting key industries to promote sustainability and resource efficiency. For the beverage and fruit processing sector, KER 7, 8, 11, 12, 14 and 15 offer innovative solutions that enable the effective reuse of wastewater, reducing water consumption and minimizing waste. In the agricultural domain, KER 4 and 10 provide cutting-edge technologies for farms and greenhouses, facilitating the recycling of water and enhancing irrigation practices. The agrifood industry benefits from KER 8, 11, 12, and 15, which introduce advanced methods for treating and reusing wastewater, ensuring a more sustainable food production process. Additionally, urban wastewater treatment plants can utilize KER 2, 3, 5, 6, and 9 to improve wastewater management and reclamation, contributing to urban water sustainability. These targeted technologies ensure each sector can maximize the reutilization of wastewater, promoting environmental conservation and operational efficiency.

3.2.2. Markets of recovered materials for each KER

After analysing industrial sectors where ULTIMATE solutions can be used, a market analysis can also be done to analyse industrial sectors of final users.

Several materials are recovered by technologies developed in the ULTIMATE project:

- **Nutrients**
- **Sulphur**
- **Polyphenols**
- **Heat**
- **Biogas**

Each of these recovered materials has distinct industrial applications that must be identified to assess the potential of each KER effectively. For instance, on CS7, sulphur is recovered from the agrifood industry and can then be used by agricultural sector. The following table lists final users' industrial sectors.

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Table 8: industrial sectors of final users

#KER	KER	CS Involved	Material recovered	Industries interested by recovered material
4	Closed loop greenhouses with water and nutrient recycling	CS5, CS7	Nutrients	**20.15** Manufacture of fertilizers and nitrogen compounds **19.20** Manufacture of refined petroleum products **20.13** Manufacture of other inorganic basic chemicals **20.14** Manufacture of other organic basic chemicals **20.15** Manufacture of fertilisers and nitrogen compounds **20.16** Manufacture of plastics in primary forms **21.10** Manufacture of basic pharmaceutical products
15	Ammonia recovery methods	CS5		
3	Zeolite adsorption for ammonia removal	CS1		
7	Mobile WWTP for use in fruit processing	CS4	**Polyphenols**	**20.42** Manufacture of perfumes and toilet preparations **21.20** Manufacture of pharmaceutical preparations **21.10** Manufacture of basic pharmaceutical products
14	Extraction process for value added compounds in olive mill wastewater	CS6		
16	Method for recovery of sulphur from flue gas	CS7	**Sulphur**	**20.15** Manufacture of fertilisers and nitrogen compounds
10	High-Temperature ATES methods (Long term storage of residual heat)	CS2	**Residual heat storage**	**Power plant**
11	Biogas production in anaerobic bioreactors	CS5, CS6	**Biogas**	**10.51** Operation of dairies and cheese making. **11.05** Manufacture of beer.
12	Heat recovery from AnMBR effluent	CS7	**Heat recovery**	

A sum up of the previous table enables to categorize KER into 4 industrial sectors using recovered materials, as described in the following table.

Table 9: synthesis of industrial sectors using recovered materials

Industries aimed by the technology	KER aiming this market
Nutrients and Ammonia Fertilizers and other chemical manufacture industries	KER 3, 4, 15, 16
Polyphenols Cosmetic and pharmaceutic industries	KER 7, 14
Powerplants	KER 10, 12
Biogas recovery Dairy production and breweries	KER 11

Four industrial sectors have been identified for the use of recovered materials. The next step is to analyze the distribution of these industrial plants across Europe and compare the

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distribution of potential buyers of recovered materials to the distribution of potential users of each technology that would recover the materials initially.

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3.3. Study of the different markets targeted by ULTIMATE solutions

This market study aims to analyse the application of Key Exploitable Results (KERs) across various industries, identifying the potential for innovation and growth within each sector. Our focus spans several critical markets, including chemical and petrochemical, beverage and fruit processing, greenhouses, farms, agrifood, and wastewater treatment plants (WWTPs). By studying the geographical disposition of the different industries aimed by the KERs, an exploitation strategy can be made for each partner especially on where to develop their technologies and on what scale.

3.3.1. Urban Wastewater Treatment Market

3.3.1.1. Market size

In Europe, on average, 76% of wastewater are treated. Germany, Luxembourg, the Netherlands or Austria are even at 100% of treated wastewater (European Environment Agency 2024).

For this market estimation, a sample of the WWTP with a capacity of over 80,000 people was identified. The distribution of these plants is shown in **Erreur ! Source du renvoi introuvable.**. Furthermore, there is an important demand for advanced technologies because of water scarcity and water stress in various geographical locations, driving a potential revenue growth of this segment.

The water reuse market is estimated of 16 billion in 2022 and is expected to reach over 28 billion in 2030. The practice of REUT is still very minor in some countries (less than 1% in France) but some countries actively develop it (14% in Spain, 8% in Italy and more than 90% in Israël) (Veolia 2024).

3.3.1.2. Geographical distribution in Europe

The distribution of WWTP in Europe shows a very important density of plants in the North of Germany, Belgium, as well as in Northern Italy and several regions in the UK.
Figure 6 below does not account for smaller WWTPs, which explains the apparent lack of facilities in certain regions. However, since larger sites have a greater environmental impact, it remains valuable to study the distribution of these facilities.

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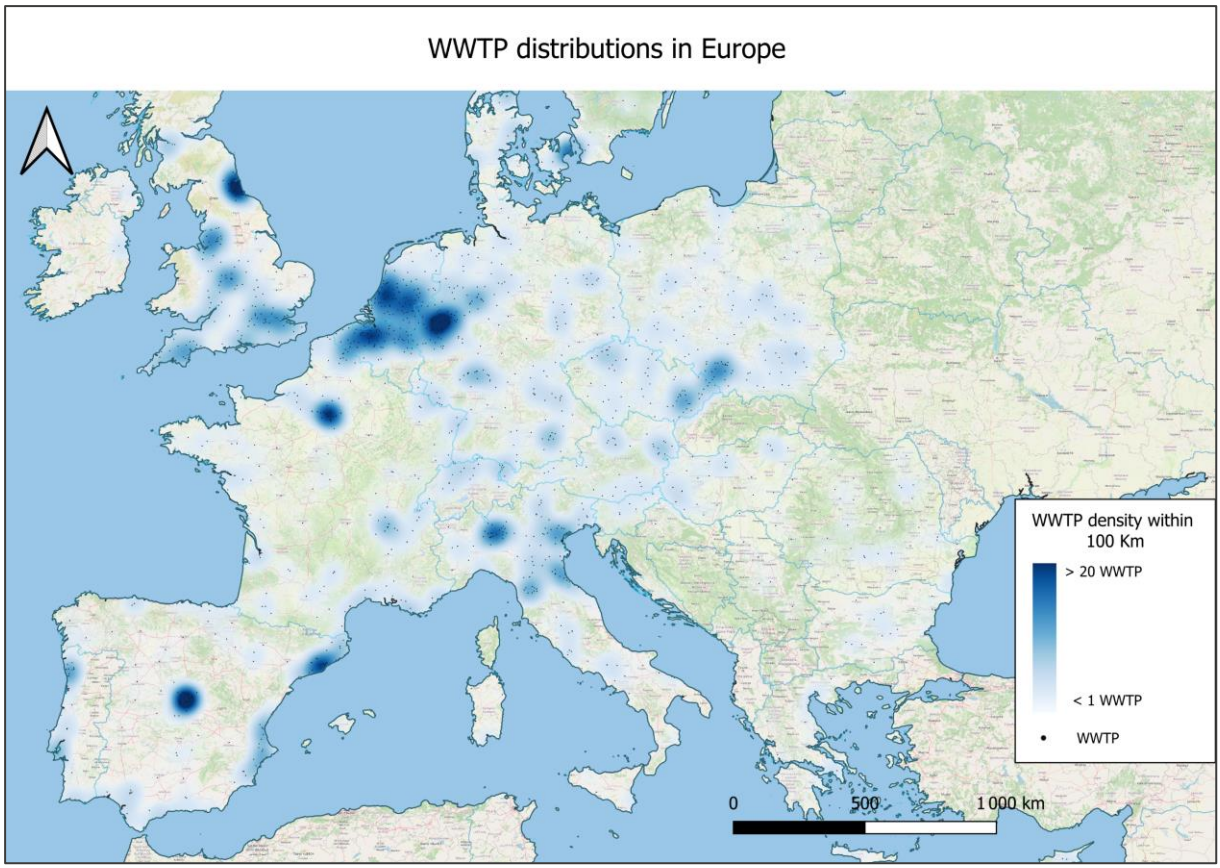

Figure 6 : WWTP distribution in Europe

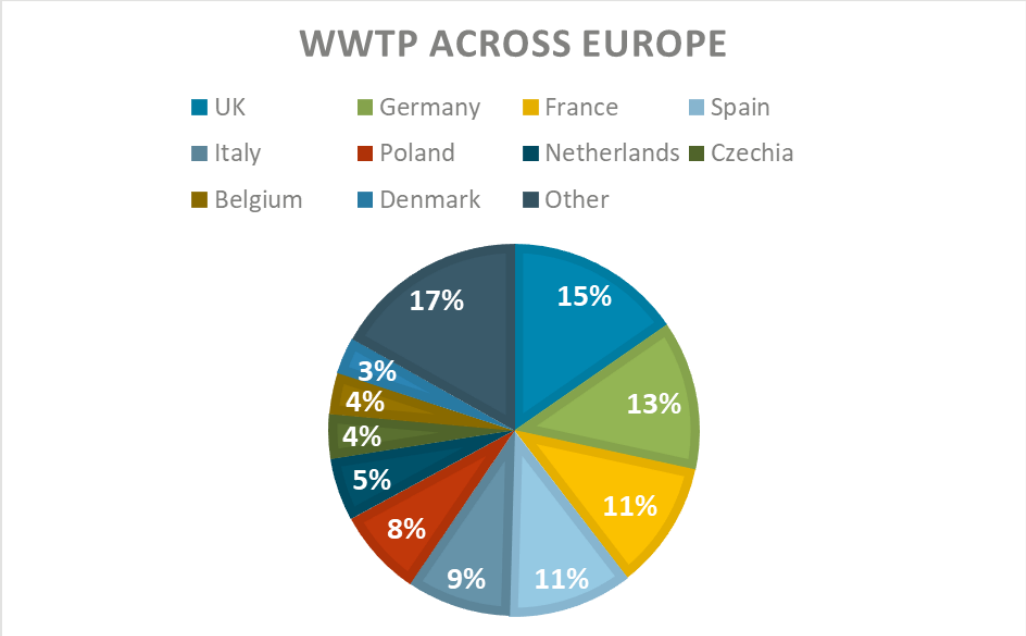

Figure 7 : Distribution of WWTP by country in Europe

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This graph supports what was described just above in the density map, a logical repartition of WWTP following the needs of each country in Western Europe, that said, Eastern countries seems to be falling behind regarding the treatment of wastewater. As said above, this study accounts only for large facilities (> 80,000 equivalent inhabitant) and by so, the writer cannot decrete that there isn’ t an important market of WWTP in certain countries.

Recommendations for partners targeting Urban Wastewater Treatment Plants

As described above, KER 2, 3, 5, 6, 9 can be used in this sector. Partners willing to replicate tests led during ULTIMATE project at a larger scale and to ensure a strong market traction, are strongly invited to focus their commercial efforts on the Benelux region, North of Germany, North of Italy and some selected areas in Spain and UK. Recruiting commercial staff speaking these languages can help to largely disseminate these innovations.

3.3.2. Agrifood industries in Europe

3.3.2.1. Market size

Irrigated agriculture remains the largest user of water globally, a trend encouraged by the fact that farmers in most countries do not pay for the full cost of the water they use. Agriculture irrigation accounts for 70% of water use worldwide and over 40% in many OECD countries (OECD 2024). Intensive groundwater pumping for irrigation depletes aquifers and can lead to negative environmental externalities, causing significant economic impact on the sector and beyond. In addition, agriculture remains a major source of water pollution; agricultural fertiliser run-off, pesticide use, and livestock effluents all contribute to the pollution of waterways and groundwater.

3.3.2.2. Geographical distribution in Europe

This market estimation is based on a sample of agrifood-related industries, ensuring a comprehensive approach that encompasses all industry sectors potentially interested in the technologies developed during the ULTIMATE project.

The industries taken into account for this market study can be categorized into :

- Crop Cultivation
- Animal Farming
- Food Processing and Preservation
- Beverage Manufacturing
- Dairy Production
- Sugar and Confectionery Manufacturing
- Tobacco Industry
- Manufacture of tobacco products
- Miscellaneous Food Manufacturing
- Wholesale of Food and Beverages

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- Agrifood Sector Support

Added up, the number of industries related to agrifood goes to 3450 plants, in a sector that looks to adapt and innovate, because of a very fierce global competition.

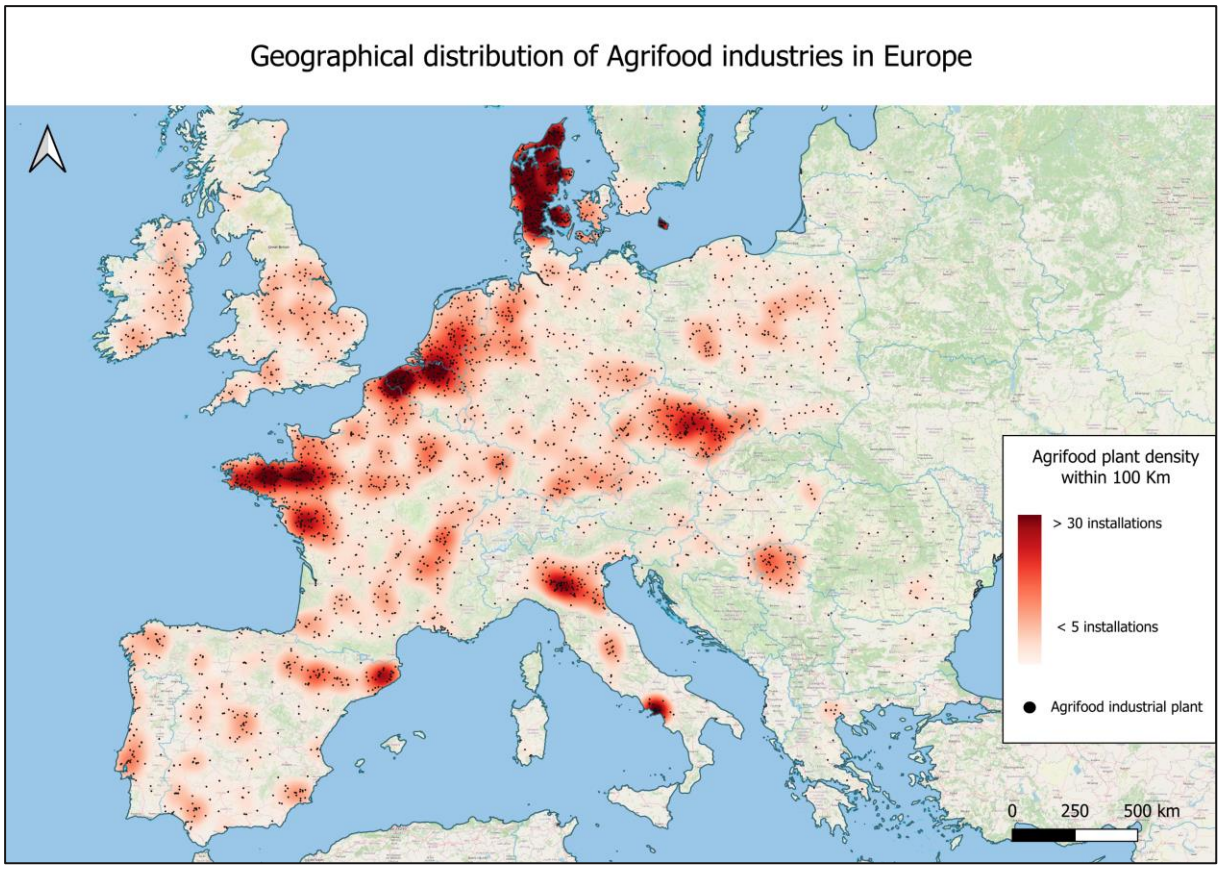

Figure 8 : Distribution of Agrifood industries in Europe

(Source: Strane Innovation)

The Figure 8 : Distribution of Agrifood industries in Europegives evidence of an important presence of potential customers across Europe. It also appears that a couple of regions with a very high density of Agrifood industries can be observed (Benelux, West of France, Danmark, Northern Italy, Napoli region and Czech Republic).

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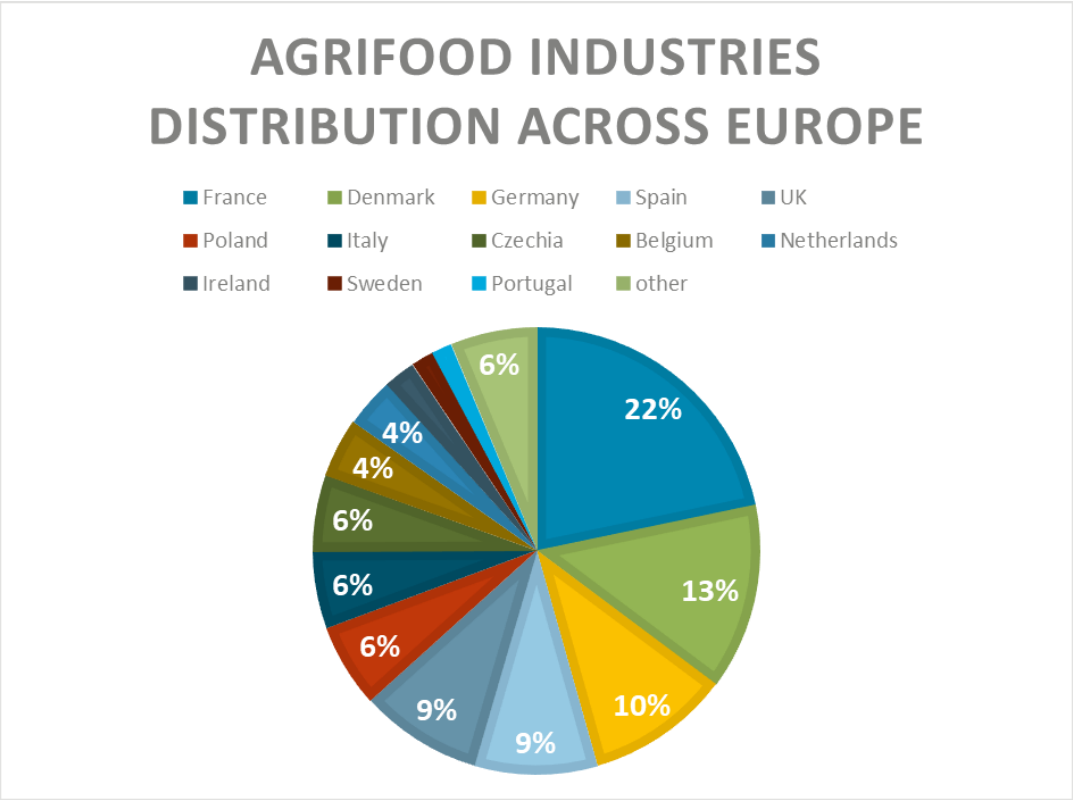

Figure 9 : Distribution of agrifood industries by country in Europe

Recommendations for partners targeting the Agrifood sector

As described above, KER 8, 11, 12 and 15 can be used in this sector. Partners willing to replicate tests led during ULTIMATE project at a larger scale and to ensure a strong market traction, are strongly invited to focus their commercial efforts on the Benelux, West of France, Denmark, Northern Italy, Napoli region and Czech Republic. Recruiting commercial staff speaking these languages can help to largely disseminate these innovations.

3.3.3. Installations dedicated to the processing, preserving or manufacture of fruit and vegetable sourced products

3.3.3.1. Market size

This market study will focus on the fruit and vegetables processing industries as well as the beverage manufacture, as it' s the main industries targeted by Greener than Green technologies, the owner of KER 7 and 14.

3.3.3.2. Geographical distribution in Europe

The categories taken into account for the market study of KER 7 and 14 are:

- Growing of citrus fruits
- Growing of grapes
- Growing of pome fruits and stone fruits

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- Growing of vegetables and melons roots and tubers
- Manufacture of fruit and vegetable juice
- Manufacture of wine from grape
- Other processing and preserving of fruit and vegetables
- Processing and preserving of potatoes
- Wholesale of beverages
- Wholesale of fruit and vegetables

In total, 333 large industrial plants are dedicated to the fruit and vegetables processing in Europe, as presented in the following figure. This list is not exhaustive (as it only focuses on large sites), and many more smaller plants exist in Europe. However, it gives a first idea of the largest sites in Europe.

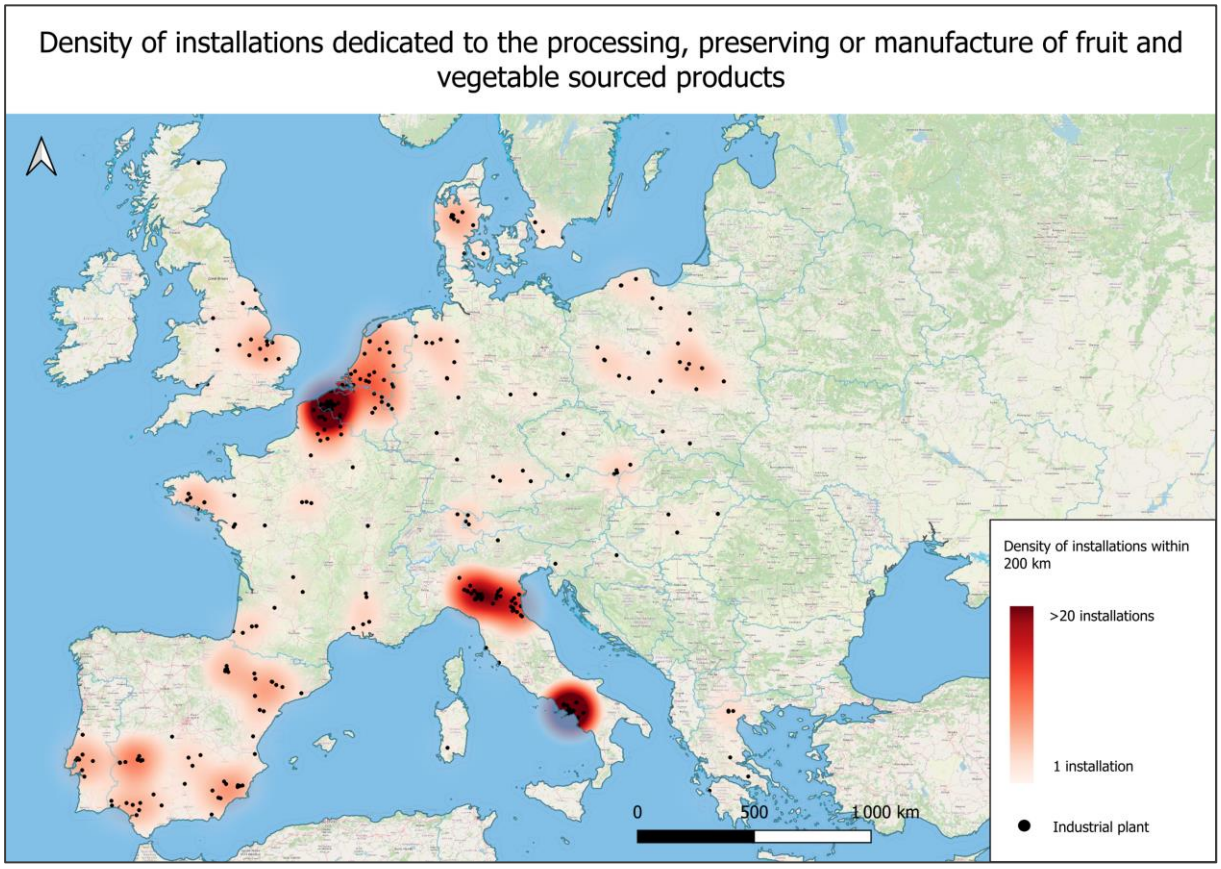

Figure 10 : Distribution of fruit and vegetable processing industries in Europe

(Source: Strane innovation)

This map gives a more precise idea of where to develop Greener Than Green technologies in Europe. The densest zones that can be identified are Northern Italy, the Napoli region and Benelux, also the south of Spain has several fruit processing industrial plants but on a larger surface.

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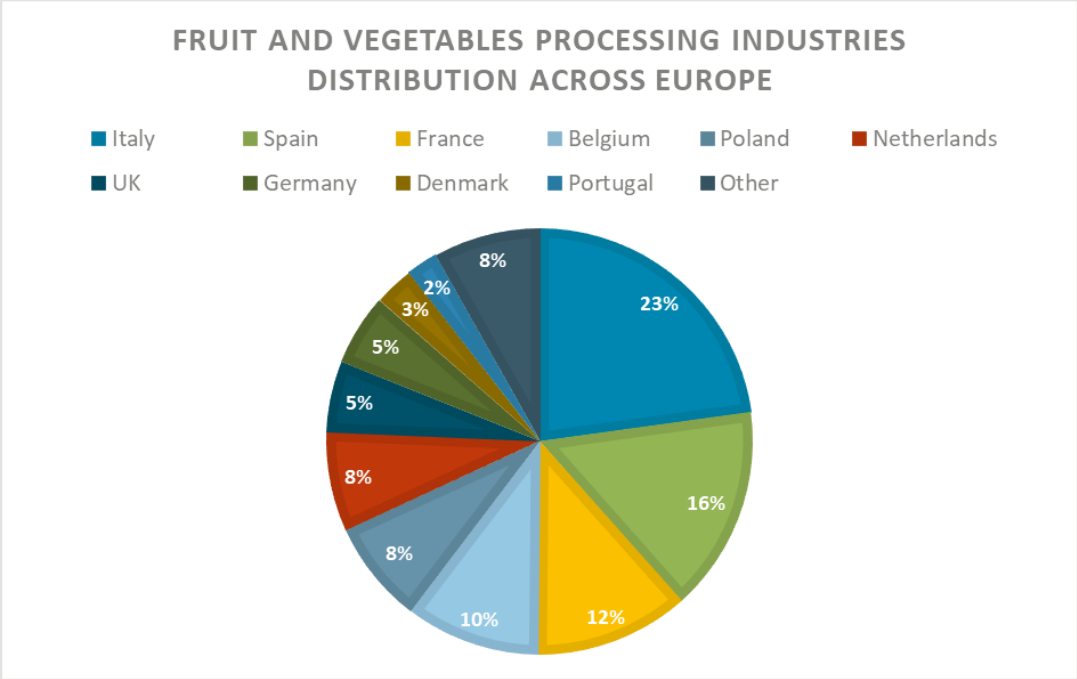

Figure 11 : Distribution of fruit and vegetable processing industries by country in Europe

(Source: Strane innovation)

The diagram in the previous figure Figure 11 : Distribution of fruit and vegetable processing industries by country in EuropeFigure 11 : Distribution of fruit and vegetable processing industries by country in Europebacks the assessment made above, no country is home for a majority of installations in this sector, even if Italy, Spain and the Benelux region concentrates an important share the sector.

3.3.3.3. Olive oil manufacture distribution

The subsector of olive oil manufacturing, part of the fruit and vegetables processing industries sector is analysed below, as it is a critical market for KER 7 and 14.

Europe’s olive oil market reached a value of USD 7.36 billion in 2023, securing its position as the largest globally, according to fortune business insights. This strong market presence is primarily driven by the extensive cultivation and production of olive trees in the region, with Spain and Italy leading as the top producers and suppliers of Olea europaea fruit oil. The growing demand for functional foods has further fueled the need for olive oil in Europe’s food manufacturing industry (FORTUNE BUSINESS INSIGHTS 2024).

Spain, responsible for half of the world’s olive oil production, is currently facing significant challenges due to adverse climatic conditions, leading to a decline in olive fruit harvests. This reduction in production is impacting global product availability. According to the U.S. Department of Agriculture, EU countries are experiencing a second consecutive decline in olive production for 2023-24. This decline is anticipated to result in a price increase and limited availability for domestic use, prompting governments to take initiatives to boost olive fruit production and address the supply-demand gap.

On average, 3 million tonnes of olive oil are produced globally each year, with approximately 2 million tonnes coming from the EU. The primary EU producers are Spain, accounting for

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66% of EU production, followed by Italy with 15%, Greece with 13%, and Portugal with 5% (EUROPEAN COMMISSION 2024).

3.3.3.4. Wine Manufacture in Europe

Another subsector can be studied more in details: the wine manufacturing. Wine manufacturing, similar to other fruit and vegetable processing industries, requires a significant volume of water and consequently, large facilities to treat wastewater. Given the extensive presence of the wine industry across Europe, this sector presents a significant opportunity for companies specializing in water treatment solutions.

By analyzing data from the International Organisation of Vine and Wine, the key countries dominating this market have been identified, highlighting the areas with the greatest demand for water treatment in the industry (THE INTERNATIONAL ORGANIZATION OF VINE AND WINE 2024).

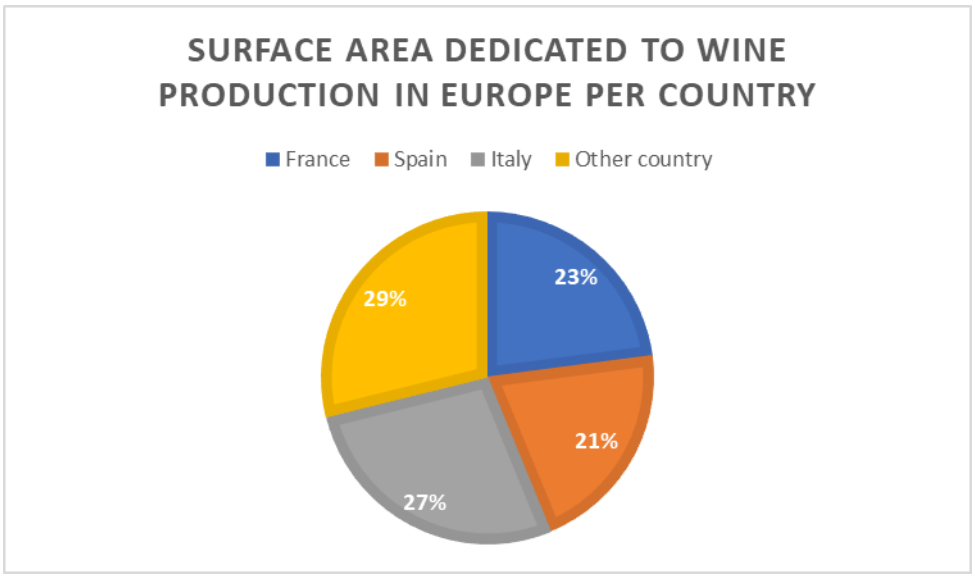

Figure 12 : Distribution of Surface dedicated to wine production across Europe

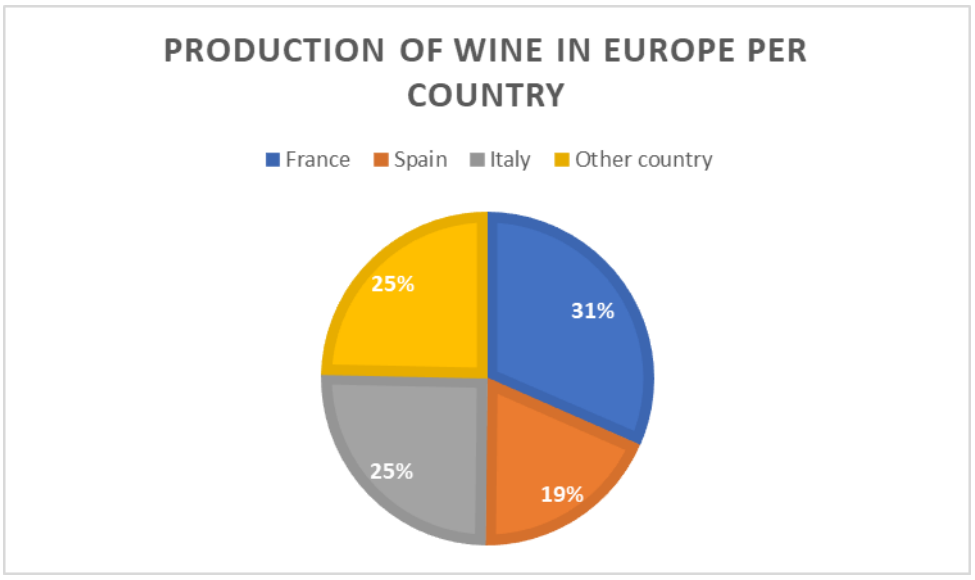

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Figure 13 : Distribution of Wine production across Europe

The total area dedicated to wine production across Europe amounts to 3,454 thousand hectares, with the majority of this land located in France, Spain, and Italy, as illustrated in the figure above. As expected, these countries with the largest areas dedicated to wine production also lead in output, although the correlation between surface area and production is not entirely direct. For example, despite having a smaller surface area than Italy, France produces more wine.

Recommendations for partners targeting beverage and fruit processing industry

As described above, KER 7, 8, 11, 12, 15 can be used in this sector. Partners willing to replicate tests led during ULTIMATE project at a larger scale and to ensure a strong market traction, are strongly invited to focus their commercial efforts on Northern Italy, the Napoli region and Benelux, also the south of Spain. Tests led in Greece and Israel are great POC, but the largest market stays outside these countries. Recruiting commercial staff speaking these languages can help to largely disseminate these innovations.

3.3.4. Farms geographical distribution in Europe

3.3.4.1. Geographical distribution

For this market study, a sample of industrial complex have been selected with the aim to determine their geographical distribution in order to find where the technology of KER 4 and 10 could find the most potential customer for the recovered nutrients.
For this study, the industrial sites sampled are the following:

- Raising of horses and other equines
- Raising of other animals
- Raising of other cattle and buffaloes
- Raising of sheep and goats
- Raising of swine/pigs

The result show that there are more than 10,000 installations of that type in Europe.

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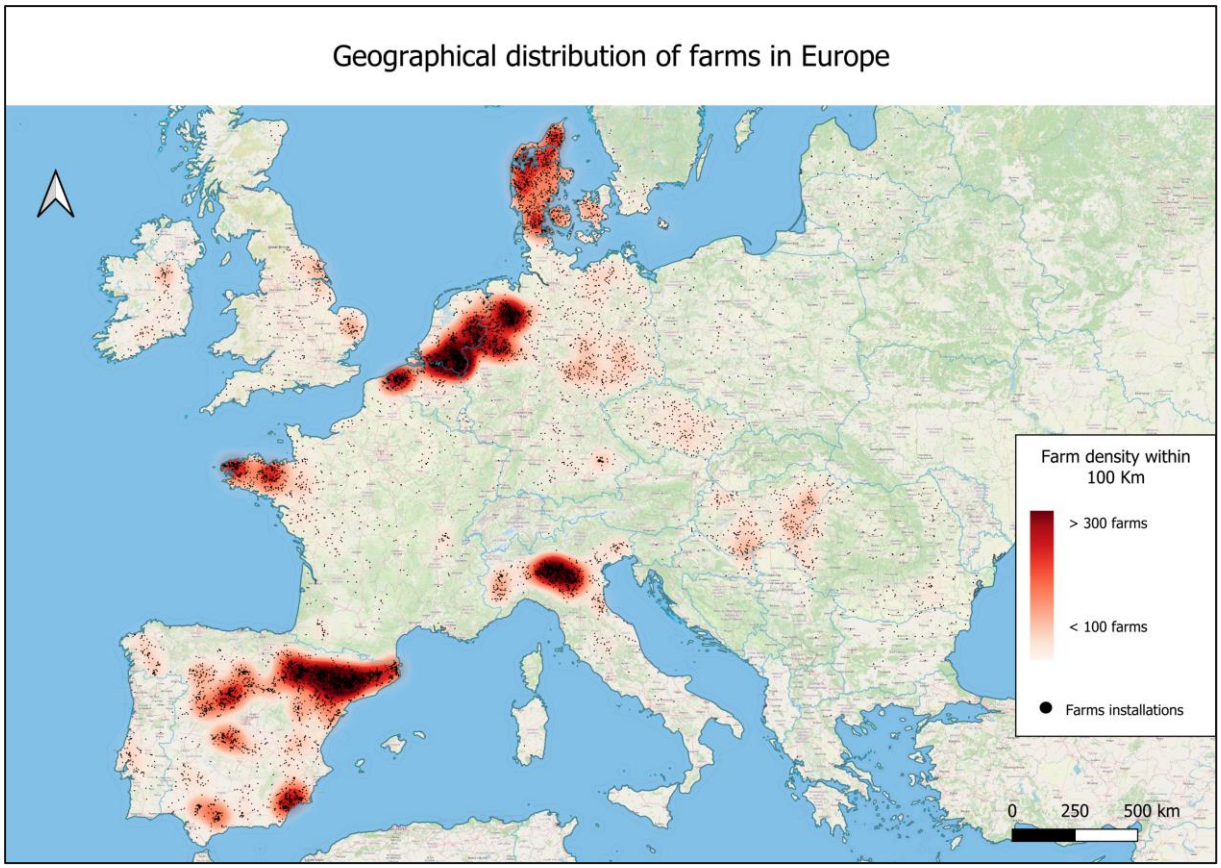

Figure 14 : Distribution of farms in Europe

The sectors are quite diverse, and the sites are spread throughout Europe. However, certain areas with particularly high concentrations can be identified: Northern Italy, Northern Spain and the Netherlands.

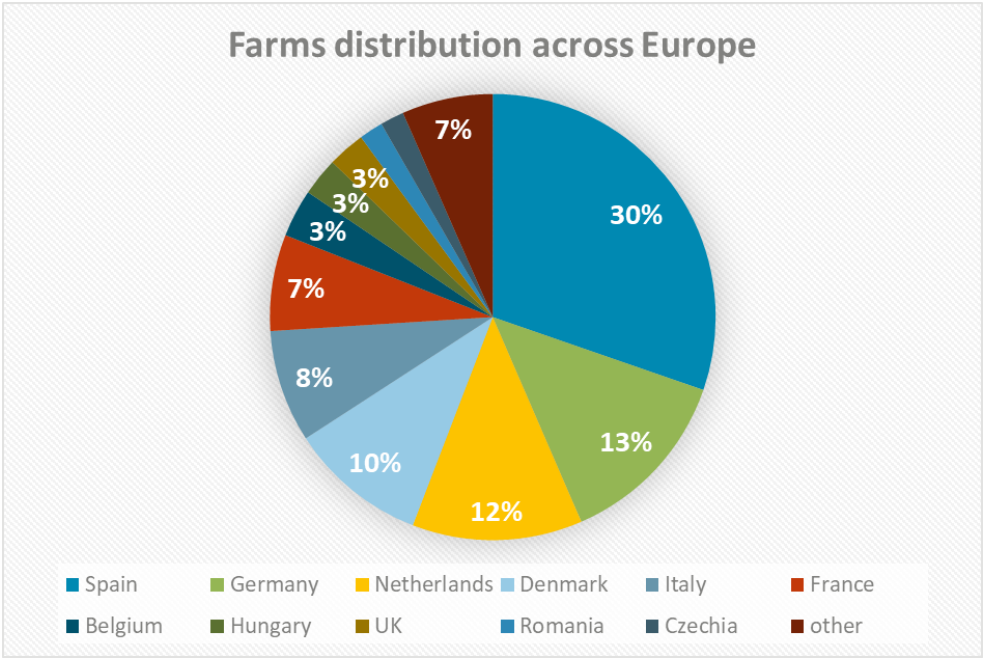

Figure 15 : Distribution of farms by country in Europe

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Recommendations for partners targeting farms and greenhouses

As described above, KER 4 and 10 can be used in this sector. Partners willing to replicate tests led during ULTIMATE project at a larger scale and to ensure a strong market traction, are strongly invited to focus their commercial efforts on Northern Italy, Northern Spain, the Netherlands. Recruiting commercial staff speaking these languages can help to largely disseminate these innovations.

3.3.5. Recovery of biogas from dairy production and breweries

According to the European Biogas Association, it is possible to recover around **14 Mtoe (142 TWh) of biogas** per year by valorising industrial wastewater from the spirits, biodiesel, pulp and paper, beer, vegetable oils, ethanol, meat, and cheese sectors. However, the large potential of biogas production from industrial wastewater is not yet considered in most studies evaluating the biogas production potential in Europe in 2050 between 87-114 Mtoe (1,008-1,326 TWh). Therefore, this potential can be higher than currently estimated.

The production of renewable gas from industrial wastewater can be economically attractive. According to EBA estimates, local jobs attributed to the anaerobic treatment of wastewater can grow from 1,000 direct jobs today towards 20,000 direct jobs spread among 85,000 SME's when untapping the full potential. The lifetime for wastewater treatment plants is typically 20-25 years, which means that until 2050 each wastewater treatment plant will be refurbished, rebuilt or replaced at least once. This creates opportunities for more sustainable choices in the coming years (THE EUROPEAN BIOGAS ASSOCIATION 2024)**.**

3.3.5.1. Geographical distribution

The following section of the market study is taken from deliverable D5.7, with some updates added.

The market size estimation involves KER 11 technology for biogas production. The sectors assessed are those of dairy production and breweries and they amount to **642 sites** in Europe. The dairy production market is significantly bigger than the beer production. There are 503 sites for the first and 139 for the later.

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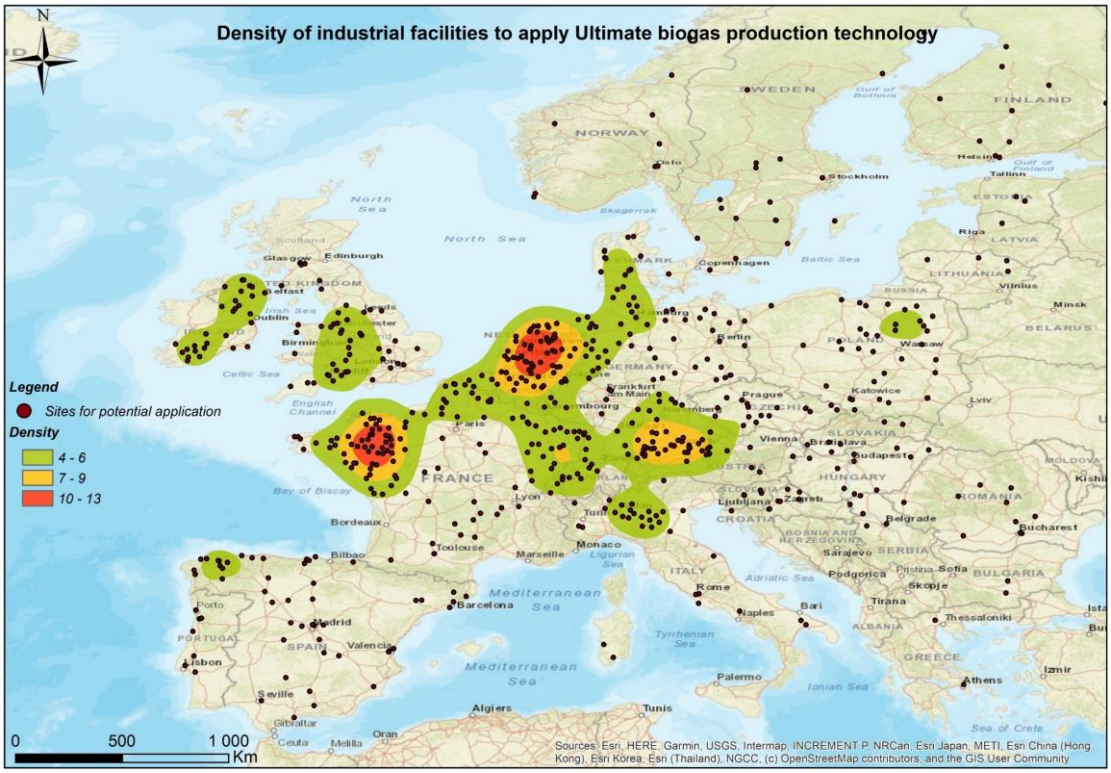

Figure 16 : Distribution of industrial sites using Biogas in Europe

Recommendations for partners recovering biogas from dairy production sites and breweries

As described above, KER 11 recovers biogas from dairy production sites and breweries. The geographical distribution of these industries highlights a strong interest for focusing commercial forces in the Benelux, West of France, and in some extend Germany, Denmark, UK and Czech Republic. Recruiting commercial staff speaking these languages can help to largely disseminate these innovations.

3.3.6. Intermediate conclusion

This section enabled to analyse market sizes and geographical distribution of industrial sectors where ULTIMATE solutions can be deployed. Results generated thanks to Strane's database of industrial sites drive strong recommendations in terms of commercial development for partners willing to disseminate and replicate their innovation.

3.4. Market study for the recovered materials

After analysing markets of industrial sites where ULTIMATE innovations can be deployed, a focus is now done on industrial sectors using products generated by ULTIMATE solutions (especially materials recovered thanks to these innovative technologies).

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3.4.1. Nutrient and Ammonia Market in Europe

3.4.1.1. Nutrient Market size

The three essential nutrients for agriculture are nitrogen (N), phosphorus (P), and potassium (K). These nutrients are commonly applied to the soil using synthetic fertilizers, which are a significant part of the industrial production sector. To enhance sustainability and land management, bio-based or organic fertilizers are increasingly being used as replacements for synthetic ones.
On an average base on the last three growing season, fertilizers containing an average of 9.3 million tons of nitrogen, 2.3 million tons of phosphate, and 2.5 million tons of potash were applied to 123.8 million hectares of farmland (FERTILIZERS EUROPE 2024).

In 2022, consumption of mineral fertilizers in EU-27 suffered from the worst drop since 2009, due to the energy crisis that followed the Russian invasion of Ukraine and severely affected the European industry. Consumption decreased by 11% for nitrogen, 16% for phosphate and 15% for potash fertilizer. However, in the long term, some normalization is forecasted (FERTILIZERS EUROPE 2024).

3.4.1.2. Ammonia Market size

The European green ammonia market was 48.46 tons in 2022 and is projected to grow to 3,660.8 tons by 2030, with a compound annual growth rate (CAGR) of 71.7% from 2023 to 2030. This significant growth is driven by Europe's strong commitment to reducing emissions and meeting climate goals, as evidenced by initiatives like the European Green Deal. Green ammonia, produced using renewable energy and emitting no carbon dioxide when burned, aligns with Europe's ambitious plan to achieve climate neutrality by 2050 (MARKETSANDDATA 2024)

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3.4.1.3. Geographical distribution in Europe

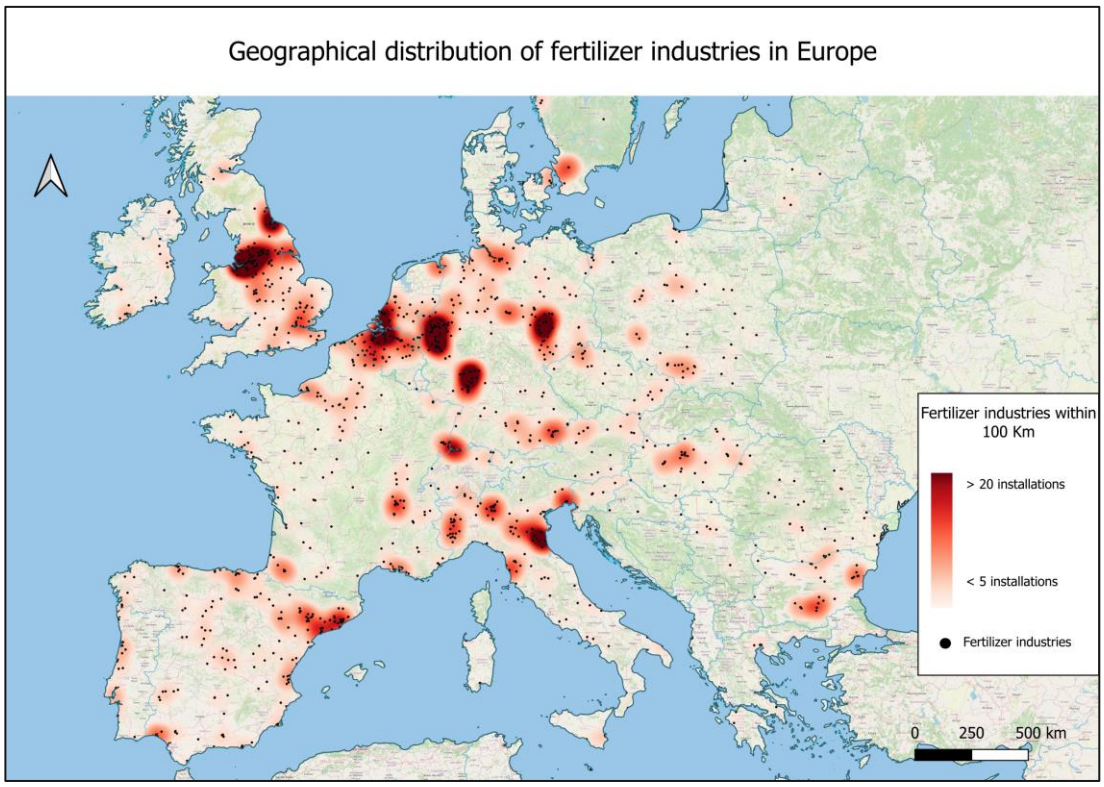

Figure 17 : Distribution of fertilizer industries in Europe

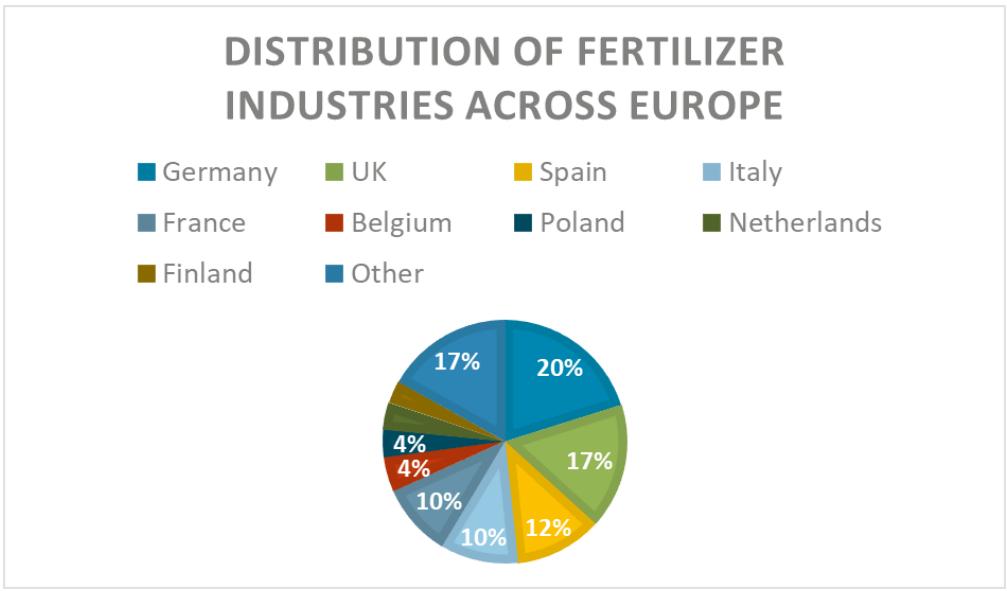

Figure 18 : Distribution of fertilizer industries by country in Europe

Fertilizer industries of very scattered across Europe/ However regions like the Benelux or the UK, have a high density of industries producing fertilizers.

On the other hand, final users of these products are farmers and greenhouses owners, with a geographical distribution already presented above (see section 3.3.4)

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The high added value of these materials makes them economically viable for transportation over medium and large distances. As a result, geographical proximity between producer and consumer is not essential, allowing for greater flexibility in market reach and distribution. This ability to transport materials efficiently across various regions expands potential markets and enables producers to connect with consumers globally, regardless of location.

Recommendations for partners recovering nutrients

As described above, KER 3, 4 15 and 16 enable to recover nutrients, which can then be used as fertilizers. Partners willing to sell these materials at a larger scale and to ensure a strong market traction, are strongly invited to focus their commercial efforts on Northern Italy, Northern Spain, the Netherlands, where many farms and greenhouses are settled.

3.4.2. Polyphenols Market in Europe

3.4.2.1. Geographical distribution in Europe

The geographical distribution of industries using polyphenols in Europe has been analysed thanks to Strane and Seitiss' database. The result is given below.

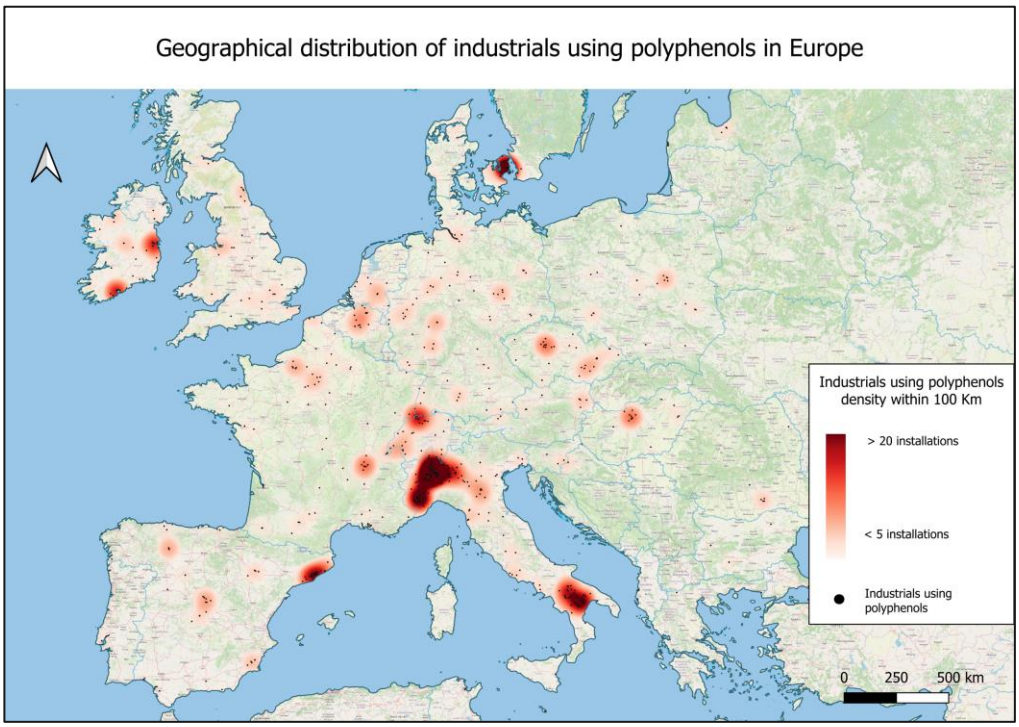

Figure 19 : Distribution of industrial sites using polyphenols in Europe

This figure shows a high density of polyphenols user in Northern Italy, which has also a high density of fruit and vegetables processing factories. This region seems very promising for the development of technologies such as the ones developed by Greener than Green Technologies.

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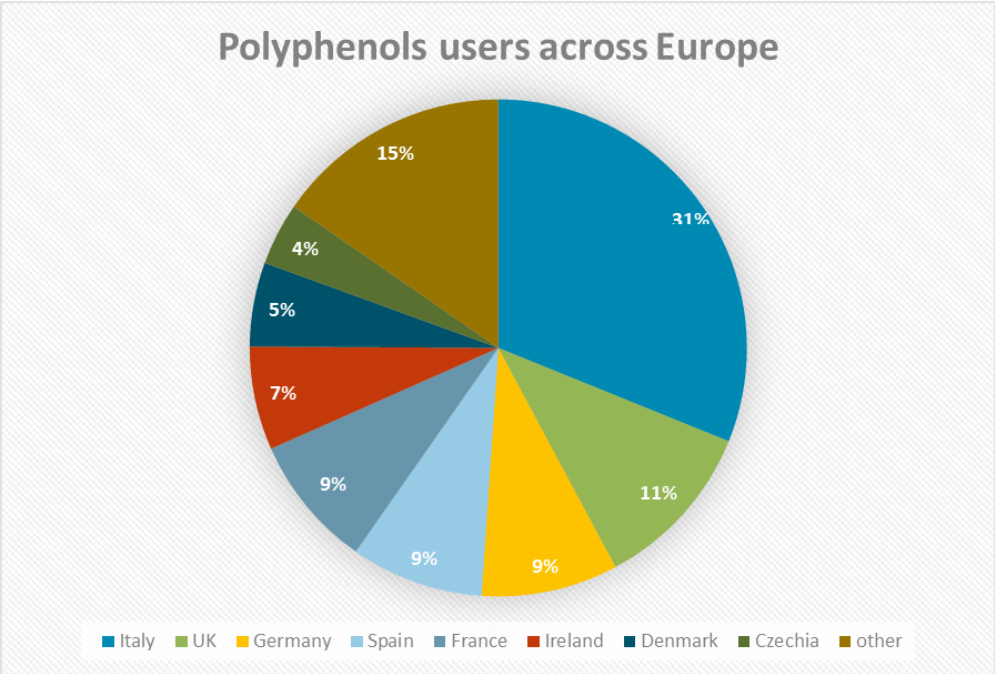

Figure 20 : Distribution of industrial sites using polyphenols by country in Europe

This graph reinforces what the density map already indicated: Italy presents a very promising market for the polyphenols recovered by Greener Than Green Technologies. Even more interestingly, the two regions in Italy with a significant concentration of potential customers for the recovered polyphenols also have a high density of fruit processing industries.

Recommendations for partners selling polyphenols

As described above, KER 7 and 14 enable to recover polyphenols. These high added value components are mostly used in Italy, and in some extend in Spain, Ireland and Denmark. Partners willing to replicate tests led during ULTIMATE project at a larger scale and to ensure a strong market traction, are strongly invited to focus their commercial efforts on these regions. Recruiting commercial staff speaking these languages can help to largely disseminate these innovations.

3.4.3. Heat storage in Europe

This section is taken from what has been previously presented in deliverable D5.7. It focuses on long term residual heat storage (corresponding specifically at KER 10).

The size of the market was estimated through the European powerplants, which provide energy and heat. The total number of sites is **871** distributed as shown in the following figure. The market that seems the bigger one is Germany, followed by United Kingdom, Italy, and Spain.

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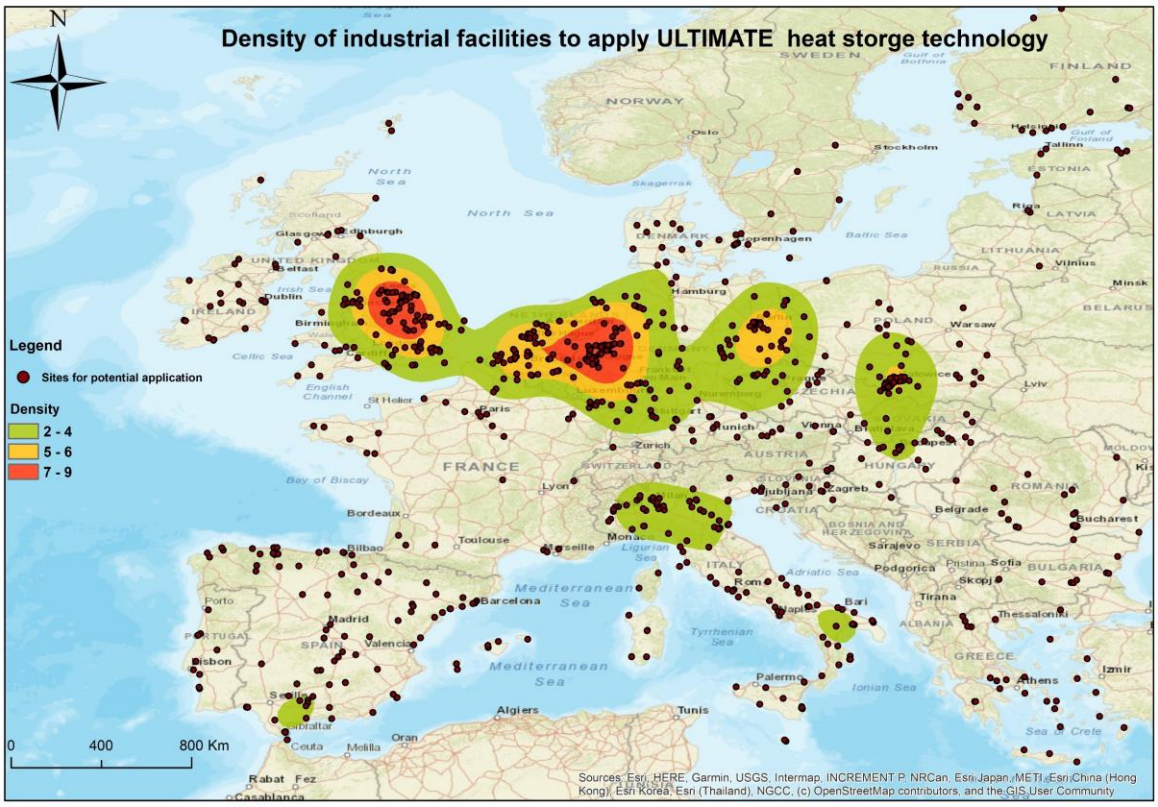

Figure 21 : Distribution of industrial facilities to apply Ultimate heat storage in Europe

This map highlights key "concentration areas" for power generation plants where residual heat in summer could be stored in suitable aquifers. Notably, there is an interesting region extending from eastern Germany (covering a significant portion of the country) to Belgium, Luxembourg, and the Netherlands. Additional concentration areas are located in northern Italy and southwestern Spain. Another significant region is found in central England.

Recommendations for partners storing heat

As described above, KER 10 recovers and stores heat as a medium to long term. This technology can complete and/or replace heat produced by powerplants and distributed to households. Partners willing to replicate tests led during ULTIMATE project at a larger scale and to ensure a strong market traction, are strongly invited to focus their commercial efforts on the Benelux region and UK. Northern Italy, and Poland can also be interesting markets in some extend. Recruiting commercial staff speaking these languages can help to largely disseminate these innovations.

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4. Individual strategies for exploitation

This section deals with strategies decided by each partner to exploit its Key Exploitable Results. Strane Innovation sent a questionnaire to each partner to gather information about their strategy. In some cases, Strane also used data from previous deliverables (D5.3 and D5.7). Results are presented in this section.

4.1. KWR

Table 10 : Exploitation strategy of KWR (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: KWR KWR Water Research Institute generates knowledge to enable the water sector to operate water-wisely in an urbanised society. KWR's scientific findings and the resulting practical innovations contribute, worldwide, to a sustainable water provision in the urban water cycle. 'Bridging science to practice' is KWR's motto. Their researchers work at the interface of science, business, and society. Their strength lies in their translation of scientific knowledge into applicable, practical solutions for end-users in the Dutch and international water sector. They have built a solid reputation as top-level innovation accelerators and international network builders, and increasingly play a coordinating role in national and international collaborations.	
Key Exploitable Results	• **Ker 4** (CS2): Closed loop greenhouses with water and nutrient recycling (Final TRL: 6) • **Ker 10a** (CS2): High-Temperature ATES methods (Final TRL: 7) • **Ker 10b** (CS2) : Drilling method for screening of aquifers Final TRL 9)
Owner/Co-owners	Owner of both KER
Final users	Ker 4 aims the following sectors: • **Farmer cooperatives / Collectives** • **Municipalities** • **Greenhouse owners** Ker 10a and 10b aims the following sectors: • **HVC and other energy supply companies** • **Geothermal operators**

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Benefits/competitive advantages	• **Ker 4:** The selected treatment method used to produce irrigation water from wastewater (electrodialysis) requires less energy input (electricity) per m3 produced than the industry standard (RO). • **Ker 10b:** This KER significantly reduces costs of aquifer screening for HT-ATES as drilling is combined with geothermal well drilling.
Environmental impact	These technologies are looking to make the sector more efficient in terms of water, nutrients and thermal energy used per kg of produce and by so reduce the sector’ s impact on the environment. Furthermore, these technologies allow to recover these materials using less energy input and so reducing again the impact of the sector on the environment
Exploitation Strategy	KWR plans to exploit these KER by **adding these expertise to their consulting services offer.** They also foresee **leveraging public-private partnerships** to further optimize the performance of closed-loop greenhouses, particularly in terms of selectivity. KWR plans to combine multiple treatment steps and utilize more selective membranes that are not yet available on the market. This approach aims to enhance the system's efficiency and effectiveness. These collaborations will be instrumental in advancing the technology, providing the necessary funding, and facilitating the development of more selective membranes and efficient treatment processes. Public-private partnerships will also support large-scale demonstrations, helping to establish credibility and accelerate the market adoption of closed-loop greenhouses with water and nutrient recycling. Their strategy includes a full-scale demonstration to build trust among end-users, particularly farmers, regarding the product's performance and ease of use. Demonstrating the system in a real-world setting will provide valuable insights and encourage adoption by showcasing its practical benefits. Additionally, they will focus on improving the energy efficiency of the closed-loop system. By making energy consumption more efficient, they aim to reduce the cost of water produced, making it competitive with current alternative sources such as drinking water. Theses expertise can also be sold through the partnership with NEWASYS (partnership in discussion, see dedicated section).

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4.2. EURECAT

Table 11 Exploitation strategy of EURECAT (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: EUT EURECAT is a non-profit private technological center whose aim is to efficiently contribute to improve the competitiveness and the technological and sustainable development of companies by providing specialized services and carrying out R&D and innovation projects. EURECAT has participated in numerous projects and individual contracts aimed at innovation, development, testing and optimization of water treatment and reuse technologies, in urban, agriculture, industrial and environmental sectors. Among its expertise fields, EURECAT has large experience and knowledge of the mechanisms involved in separation technologies and biological treatments for water and wastewater treatment. Furthermore, EURECAT has large experience in Life Cycle Assessment (LCA) and Life-cycle Cost (LCC) studies.	
Key Exploitable Results	• **Ker 1 (all CS):** WaterEurope Marketplace (Final TRL: 9) • **Ker 2 (CS1):** Demonstration of the nZLD (Reverse Osmosis + Membrane Distillation) (Final TRL: 7) • **Ker 3 (CS1):** Ammonia removal via zeolite adsorption (Final TRL: 6)
Owner/Co-owners	Involved in all KER (not owner)
Final users	For Ker 2 & 3, the sector expected to use these technologies: - **Industries that could implement the technology:** - Industrial Complex that needs to close their water cycle - Wastewater treatment plants **- Industries that could buy the recovered materials:** - Chemical industries
Benefits/competitive advantages	• **KER 2:** The technology developed is a commercial solution already implemented at industrial scale with high water recovery. It reduces costs of water recovery. • **KER 3:** The reverse osmosis is a well-known system. Results generated during the project enables to reduce costs of such technologies to easily implement it on industrial sites using reverse osmosis
Environmental impact	These technologies are looking to recover wastewater and the nutrients present in them, thus reducing the use for extraction of new resources. By reducing the costs of such recovery systems, it supports its large dissemination.
Exploitation Strategy	Technologies and expertise developed in ULTIMATE through CS1 will be added to EURECAT's portfolio of consulting services offer. These

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	technologies, which explore the potential to reclaim water from industrial effluent for reuse as cooling water, are valuable for EURECAT. The next step would be to assess in more detail the use of Ultrafiltration (UF) and Reverse Osmosis (RO) processes to obtain reclaimed water. These expertises strengthen EURECAT's image of innovative technological center, able to offer dedicated solutions to their final clients. Theses expertise can also be sold through the partnership with NEWASYS (partnership in discussion, see dedicated section).

4.3. AITASA

Table 12 : Exploitation strategy of AITASA (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: AITASA Aguas Industriales de Tarragona Sociedad Anónima (AITASA) is a company founded in 1965 to supply water to industries, mainly chemicals that were then beginning to be established in the Tarragona industrial estates. AITASA has an infrastructure that has become strategic to support the Public Administrations of the territory in times of crisis (the salinization of the decade of the 1970-80s, or the drought of 2007-08)	
Key Exploitable Results	• **KER 2 (CS1):** Demonstration of the nZLD (Reverse Osmosis + Membrane Distillation) (Final TRL: 7) • KER 3 (CS1): **Ammonia removal via zeolite adsorption (Final TRL: 6)**
Owner/Co-owners	Owner of Ker 2 and 3
Final users	For Ker 2 & 3, the sector expected to use these technologies: - **Industries that could implement the technology:** - Industrial Complex that needs to close their water cycle - Wastewater treatment plants **- Industries that could buy the recovered materials:** - Chemical industries
Benefits/competitive advantages	• **Ker 2:** The technology developed is a Commercial solution already implemented at industrial scale with high water recovery. It aims to reduce costs of water recovery. The demonstration of a nZLD scheme for industrial reclamation will allow EURECAT to gain knowledge on the application of technologies for brine minimization in water treatment (mainly the combination of RO and Membrane distillation). The knowledge will be useful for future projects and for providing

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	consultancy services to other industries regarding brine management strategies. • **Ker 3:** The reverse osmosis is a well-known system and reducing costs of such technologies will be easily implemented by industrial already using reverse osmosis. The use of zeolites for the removal of ammonia in reclaimed water will mainly provide knowledge to the Eurecat's unit on the application of this technology for water treatment at low inlet ammonia levels
Environmental impact	These technologies are looking to recover wastewater and the nutrients present in them, thus reducing the use for extraction of new resources. By reducing the costs of such recovery systems,
Exploitation Strategy	KER 2 and 3 will be exploited by AITASA during their **daily operations.** Indeed, AITASA aims to build a tertiary treatment for the new industrial WWTP of the petrochemical complex with the new ULTIMATE scheme.

4.4. AQUABIO

Table 13 : Exploitation strategy of AQUABIO (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: AQUABIO Aquabio is a pioneering company born with a passion for innovation combined with a strong ethos for environmental sustainability. We provide some of the world's most advanced systems for the treatment and reuse of industrial wastewater at our customer facilities. We deliver solutions from concept development through to complete installation and operation.	
Key Exploitable Results	• **KER 8 (CS 7):** AnMBR (with post-treatment) for beverage WW treatment and reuse (Final TRL: 9) • **KER 12 (CS7):** Heat recovery from AnMBR effluent (Final TRL: 7) • **KER 15 (CS 7):** Ammonia recovery methods (Final TRL: 7)
Owner/Co-owners	• Owner of Ker 8 and 15 • Co-owner of KER12 with Cranfield University
Final users	1. Water utilities 2. Food and Beverage 3. Brewery 4. Distillery 5. Dairy industry

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	6. Chemical processing 7. Manufacturing 8. Biotech 9. Malting industry 10. Meat & Poultry processing
Environmental impact	These technologies are looking to recover wastewater and the nutrients present in them, thus reducing the use for extraction of new resources.
Exploitation Strategy	KER developed by AQUABIO through ULTIMATE will be integrated into their commercial portfolio and sold to final clients. This additional expertise helps AQUABIO to address additional needs of their clients, to recover nutrients and heat on their installations. The next step is developing the technologies by multiplying the implementations, funding this expansion by clients. AQUABIO also plans to do follow-up research, especially from the UK Research and Innovation (UKRI).

4.5. AQUALIA

Table 14 : Exploitation strategy of AQUALIA (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: AQUALIA Aqualia is the fourth-largest private water company in Europe in terms of population served and is among the top ten in the world. Aqualia meets the needs of all parties, both private and public, at all stages of the water cycle, providing water for human, industrial, and agricultural use. Aqualia focuses on each stage of the complete water cycle, optimizing resources to ensure sustainable development. It is a preferred partner for some of the world's most significant and complex water management projects and is also synonymous with innovation, with its 31 innovative projects in areas such as biofuels, smart metering, and data analysis.	
Key Exploitable Results	• **KER 8 (CS5):** AnMBR (with post-treatment) for beverage WW treatment and reuse (Final TRL: 9) • KER 11 (CS5): **Biogas production in anaerobic bioreactors (Final TRL: 8)**
Owner/Co-owners	• **Owner of Ker 8** • **Co-owner of Ker 11** with University of Alcalá (not part of ULTIMATE project)
Final User	Industries that could implement the technology: - Agrifood industries

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Environmental impact	These technologies are looking to treat waste water with high-strength biodegradables, by reducing the costs of such recovery systems, there are more affordable for users and will be more likely to be used.
Exploitation Strategy	KER developed during ULTIMATE project will enable AQUALIA to add new products and new expertise added to their commercial portfolio. Indeed, Aqualia is currently developing two Ker both on CS5 and both technologies are reaching a sufficient TRL to enter the market. Moreover, Aqualia, through the company SMVAK, that it owns up to 98.7%, aims to enhance the replication potential of ULTIMATE solutions in the Czech industrial sector. The focus is on identifying and implementing new water and energy recovery systems, developing innovative business models, and engaging stakeholders through optimized ICT tools. SMVAK will conduct market research to identify potential sites and industries for ULTIMATE solutions. This includes analyzing the current state of water and energy systems, identifying key sectors, and assessing the competitive landscape. Efforts will be made to promote ULTIMATE solutions through communication materials, presentations at industry events, and digital platforms. The goal is to raise awareness and highlight the benefits of these solutions. SMVAK will organize meetings with public and private stakeholders to foster partnerships. This includes engaging with policymakers, industry leaders, and other relevant entities to support the adoption of water and energy recovery systems. A strategic road map will be developed to guide the implementation of ULTIMATE solutions. This includes outlining technical requirements, identifying funding sources, and defining the steps for project deployment. The plan aims to identify potential sites, engage stakeholders, and promote ULTIMATE solutions. Expected outcomes include increased awareness, successful partnerships, a detailed implementation road map, and improved stakeholder interaction. The next expected steps are the financing through private and public investment.

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4.6. ARETUSA

Table 15 : Exploitation strategy of ARETUSA (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: ARETUSA ARETUSA Consortium is a non-profit consortium consisting of: ASA Azienda Servizi Ambientali Spa, which is the company for Environmental Services of Livorno, water utility; Solvay Chimica Italia spa, the local industrial site; and TME Termomeccanica Ecologia Spa, which is the technology provider, the one who designed the ARETUSA Water Reclamation Plant.	
Key Exploitable Results	• **KER 5 (CS3):** Real-time data driven monitoring and process control for salinity management (Final TRL 8) • **KER 6 (CS3):** Data-driven matchmaking platform for water reuse (Final TRL: 8) • KER X1 (CS3): **By-products used as coagulant/floculant at full scale (final TRL: 7)**
Owner/Co-owners	• Co-owner of Ker 2 and 3 with UNIVPM, West system and CPTM • Co-owner of KER X1 with UNIVPM
Final User	Public wastewater treatment companies, Industries and other sectors that need to close their water cycle and reuse it.
Environmental impact	These technologies contribute to reducing water consumption for industrial sites, and then have more water available for local communities.
Exploitation Strategy	ARETUSA will use KER 5, 6 and X1 in its daily operations. These KER will improve efficiency of the water treatment and make more water available to SOLVAY. ARETUSA also plans to make these KER available to Water Utilities to enable them to have better quality water coming out of their wastewater treatment plants, water that can be reused for many purposes.

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4.7. UNIVPM

Table 16 : Exploitation strategy of UNIVPM (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: UNIVPM UNIVPM is a Polytechnic University located in the Mediterranean area. At UNIVPM water science and engineering is addressed from sustainability, circularity and resilience of urban water services and infrastructure to surface and groundwater and to the coastal and seawater sustainable management and environmental protection.	
Key Exploitable Results	• **KER 1 (all CS) :** Water Europe marketplace (Final TRL: 9) • **KER 5 (CS3):** Real-time data driven monitoring and process control for salinity management (Final TRL: 8) • KER 6 (CS3): **Data-driven matchmaking platform for water reuse (Final TRL: 8)**
Owner/Co-owners	Involved in all Ker
Final User	Ker 1 : The marketplace targets the water industry at every level : • **technology providers** • **researchers** • **water business providers** • **Public sectors** There are technologies present in 13 different countries that are listed on the marketplace Ker 5&6 : Public wastewater treatment companies, Industries and other sectors that need to close their water cycle and reuse it.
Environmental impact	These technologies are looking to recover waste water and the nutrients present in them, thus reducing the use for extraction of new resources. By reducing the costs of such recovery systems,
Exploitation Strategy	UNIVPM plans to exploit expertise developed through KER 5 and 6 in other research projects. UNIVPM is now able to interlink industrial needs with the management of urban water infrastructure. As a follow-up, they can design a superstructure capable of optimizing urban water cycle services (e.g., wastewater treatment and collection), while also considering the interface with local industry and agriculture. KER 1 is commonly exploited through the WaterEurope Marketplace, in which UNIVPM is involved. It serves as a key platform for sharing technologies with potential customers and investors. Developing and promoting the marketplace will be highly beneficial for UNIVPM, as it expands its influence in the wastewater sector.

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4.8. AGROBICS

Table 17 : Exploitation strategy of AGROBICS (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: AGROBICS Agrobics Ltd. is a start-up that develops a technology for treating wastewater containing high organic loads. Agrobics' technology is based on a unique, patented process for preparing "pre-treated" biomass, immobilized in a polymeric matrix that has high handling capability and fast acclimatization to wastewater streams containing high organic loads. These are treated mainly by an anaerobic, biological treatment that produces biogas.	
Key Exploitable Results	• **KER 22 (CS6):** Biogas production in anaerobic bioreactors (Final TRL: 8)
Owner/Co-owners	Owner of KER 22
Final User	Industries • Water utilities; • Consultancies Industry (agro-food, chemical, manufacturing, biotech); • Industrial park operators; • Energy utilities;
Benefits/competitive advantages	This technology offers a short RPI and a high saving potential of the operational costs.
Environmental impact	Lowering costs is a significant factor in encouraging industries to treat their wastewater. The recovery of biogas through this technology further reduces the need for natural gas extraction, minimizing its environmental impact.
Exploitation Strategy	**AGROBICS plans to exploit it KER by adding it to its commercial portfolio.** AGROBICS will sell its highly stable anaerobic treatment (either immobilized-based and/or combined with AnMBR) to improve the tolerance for agro-industrial effluent (mainly olive mill wastewater) in medium to large WWTP, with ROI of 2-4 years, 20-30% more biogas, less sludge production and energy consumption.

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4.9. STRANE INNOVATION

Table 18 : Exploitation strategy of STRANE (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: STRANE INNOVATION Strane Innovation (STR) is an SME start-up factory specialized in the sectors of sustainable development (energy, water, transport, environment, smart systems). STRANE creates independent startup companies based on technologies proven at lab or pilot scale, by assessing in detail the technologies and the market, developing a complete business concept, managing the legal creation and developing entirely the startup companies (staffing, business development, management of operations, investors' relations, company administration…).	
Key Exploitable Results	• **KER 23 (all CS):** Methodology to assess the potential and the feasibility of REUSE projects (Final TRL: 9) • **KER 24 (all CS):** Tool to identify geolocalised synergies (Final TRL: 9)
Owner/Co-owners	STRANE is owner of KER 23 STRANE (and its subsidy SEITISS) is owner of KER 24
Final User	• All industrial sites willing to reduce their water consumption/waste • All large municipalities
Benefits/competitive advantages	• **KER 23:** NEWASYS is independent from technology providers and relies on European Research & Innovation projects to identify innovative technologies. • **KER 24:** database is bigger than existing solutions, list of potential synergies is much more precise
Environmental impact	Through these solutions, Strane's KER contribute to reduce water consumption and industrial waste disposal
Exploitation Strategy	STRANE strongly exploits these KER: • SEITISS (Strane's subsidy) exploits the Synergy Builder on a daily basis for its operational activities (consulting services on circular economy). • STRANE has tested the potential of spinoff creation based on KER 23. NEWASYS, the consulting activity dedicated to water, accompanies industrial sites and municipalities to reduce their water consumption and reuse their wastewaters. More details about that exploitation are available in section 5.4.

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4.10. NTNU

Table 19 : Exploitation strategy of NTNU (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: NTNU NORGES TEKNISK-NATURVITENSKAPELIGE UNIVERSITET NTNU, the Norwegian University of Science and Technology (NTNU) is the largest university in Norway. NTNU is headquartered in Trondheim, with campuses in Gjøvik and Ålesund.	
Key Exploitable Results	• **KER 21 (CS2, 3, 9) :** Immersive media experiences (Final TRL: 8)
Owner/Co-owners	Co-owner of Ker 21
Final User	Industries and municipalities can use this KER to improve the stakeholder engagement on their projects. Following industrial sectors can be particularly interested: • Water utilities; • Consultancies; • Industry (agro-food, chemical, manufacturing, biotech); • Industrial park operators; Energy utilities;
	No IP protection is planned
Environmental impact	Better understanding of water resources stakes in general publics.
Exploitation Strategy	As university and research team, NTNU will exploit this KER and assessment of the impact of the KER on stakeholder engagement through scientific publications. A first publication has already been submitted, and specific results of the IMX will be published after the end of ULTIMATE project. NTNU will take part to follow-up research projects to further develop its Digital storytelling tools and Immersive media technology and enhance the capacities of the University’s Artificial Intelligence Lab and NTNU ARTEC (the Art and Technology task force) to provide services to the Industry and to enhance the curriculum of the Engineering and Media Schools with novel forms of science education

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4.11. NTUA

Table 20 : Exploitation strategy of NTUA (Source: Partners response)

1 SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: NTUA National Technical University of Athens is an academic partner and in Ultimate participates with the Laboratory of Hydrology and Water Resources Management. The expertise of the Laboratory focuses on water and wastewater engineering, urban water systems design, optimisation and performance assessment.	
Key Exploitable Results	KER 1 (all CS): Water Europe marketplace (Final TRL: 9)
Owner/Co-owners	Co-owner of Ker 1
Final User	The marketplace targets the water industry at every level : • **technology providers** • **researchers** • **water business providers** • **public sectors** There are technologies present in 13 different countries that are listed on the marketplace
Benefits/competitive advantages	Ker 1 : • Unique matchmaking platform with increasing amount of registered users (network effect) • Advanced back-end matchmaking algorithm function Endorsed by a Europe-wide renown water-authority (WaterEurope)
Environmental impact	Dissemination of technologies positive for water resources management.
Exploitation Strategy	The WaterEurope Marketplace, in which NTUA is involved, serves as a key platform for sharing technologies with potential customers and investors. Developing and promoting the marketplace will be highly beneficial for NTUA, as it expands its influence in the wastewater sector. Follow-up research, led by NTUA and its partners, will enable to enrich the WaterEurope Marketplace.

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4.12. KWB

Table 21 : Exploitation strategy of KWB (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: KWB The Berlin Centre of Competence for Water (Kompetenzzentrum Wasser Berlin gGmbH, KWB) is an international non-profit research center on urban water systems. The execution of R&D projects, and the dissemination of project results together with the organization of conventions and symposia. The KWB has a staff of 30 full-time persons, who are active in projects mainly related to water resource management and innovative water and wastewater treatment technologies.	
Key Exploitable Results	• **KER 1 (all CS):** Water Europe marketplace (Final TRL: 9) • **KER 13 (CS9):** Data driven cable-based control system for WWTP operation (Final TRL: 8)
Owner/Co-owners	Involved in Ker 1 and Ker 13 (not owner)
Final User	The marketplace targets the water industry at every level : • technology providers • researchers • water business providers • public sectors There are technologies present in 13 different countries that are listed on the marketplace
Benefits/competitive advantages	Ker 1 : • Unique matchmaking platform with increasing amount of registered users (network effect) • Advanced back-end matchmaking algorithm function Endorsed by a Europe-wide renown water-authority (WaterEurope)
Environmental impact	KER 13 contributes to reduce energy consumption of WWTP, and then reduce CO2 emissions
Exploitation Strategy	KWB will exploit expertise developed through ULTIMATE project in KER 1 and 13 in follow-up research projects and by adding this expertise to their consulting offer. KWB is now able to offer modelling services for WWTPs using the software SIMBA. The project enabled them to extend their knowledge and to generate new knowledge in terms of water, material and energy recovery, that will be used to develop new research projects. Through ULTIMATE project, KWB expanded its capacities in LCA and risk assessment from municipal water system to industry-water utility symbiosis, to be offered for other research projects and consulting services especially to Berlin Water Company. The activities in

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	Kalundborg also expanded the capacities of KWB on the strategic topics of WWTP modelling and water reuse. Theses expertise can also be sold through the partnership with NEWASYS (partnership in discussion, see dedicated section). The WaterEurope Marketplace, in which KWB is involved, serves as a key platform for sharing technologies with potential customers and investors. Developing and promoting the marketplace will be highly beneficial for KWB, as it expands its influence in the wastewater sector.

4.13. SUEZ RR

Table 22 : Exploitation strategy of SUEZ RR (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: SUEZ RR SUEZ is an industrial solutions and services group specialized in the reuse and safeguarding of resources, with extensive knowhow in water, water treatment, consulting, and the reuse and recycling of waste. For decades, the Group has been providing industrial customers and local authorities with the expertise and services of its remediation activity, specialized in the preservation of water resources and the reuse of contaminated sites. SUEZ's ROBIN plant produces local, green, sustainable and competitive energy from non-recyclable waste wood to supply the 15 sites on the Roussillon chemical platform and to support them in their energy transition. SUEZ RR IWS CHEMICALS operate incinerators for hazardous and non-hazardous liquid waste (aqueous and organic) coming both from co-located industries and elsewhere (via tanker trucks). Water used to wash flue gas resulting from incineration is sent to a WWTP on-site.	
Key Exploitable Results	• **Ker 16 (CS8):** Method for recovery of sulphur from flue gas (final TRL: 6) • **Ker 17 (CS8):** Recovery of metals from the flue gas cleaning water (final TRL: 4)
Owner/ Co-owners	Co-owner with DEEP laboratory (not part of ULTIMATE project)
Final User	Depending on the R&D process design structure within the industry the profiles that might get information from our results are: • Industry (agro-food, chemical, manufacturing, biotech); • Industrial Park operators; Energy utilities;
Benefits/competitive advantages	Decrease emissions and produce marketable products replacing primary raw materials
Environmental impact	Reducing pollution of air and water.
Exploitation Strategy	SUEZ-RR is still making tests to demonstrate feasibility of the process. It won't be finished at the end of the Ultimate project.

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	If results are positive, SUEZ-RR will exploit KER 16 and 17 on their **daily operations** to significantly improve sulphur recovery. An investment of of several million euros is expected for the equipment by 2026. The new unit should generate more than 1M€/y and lead to increased customer loyalty. Replication is foreseen to the 2 other incinerators managed by IWS in Europe and to new customers If results are not positive, additional follow-up research is expected to improve the technology and methodology.

4.14. 3S

Table 23 : Exploitation strategy of 3S (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: 3S Suez Smart Solutions (3S) places digital technologies at the core of its innovations to support all stakeholders involved in resource conservation, including local authorities, companies (industries, property managers), and users of water, water treatment, and waste processing services. This focus is the central business of 3S, a dedicated subsidiary that brings together 250 experts in fields such as environmental science, technical IT, and data sciences. They collect and process their own data, as well as that of their clients, to enhance expertise in the environmental field. This is accomplished by continuously investing in the development of internal skills in the following areas: - Data collection, processing, and validation - Mathematical algorithm development (for interpreting useful data for network and plant operators) - Digital modeling and simulation (to optimize operations on systems dedicated to drinking water and water treatment) - Operation of infrastructure on the cloud - Integration of open-source components	
Key Exploitable Results	None
Exploitation Strategy	3S, a subsidiary of SUEZ, will exploit expertise generated during the ULTIMATE project. They also plan to further develop the AQUADVANCED® software suite, which is currently focused on sewage, drinking water, and waste, to also cover industrial water. The new functionalities will include monitoring and performance requirements that can be replicated to address other industrial water issues. They will assess advanced data processing techniques on real-time WWTP monitoring, including automatic diagnosis, predictive analysis, and intelligent alarms.

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4.15. Water Europe

Table 24 : Exploitation strategy of WaterEurope (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: Water Europe Water Europe aims to make sure that everyone involved with water - from businesses to researchers, and governments join hands, in Europe and beyond to come up with better and locally adapted solutions for the water challenges. Investing in innovative solutions and circular practices puts Europe at the forefront of the water industry worldwide. This strategic focus not only promotes water security but also enhances Europe's competitive edge, ensuring its water-related sectors lead on a global scale.	
Key Exploitable Results	**KER 1 (all CS):** Water Europe marketplace (Final TRL: 9)
Owner/Co-owners	Owner of Ker 1
Final User	The marketplace targets the water industry at every level: • **technology providers** • **researchers** • **water business providers** • **public sectors** There are technologies present in 13 different countries that are listed on the marketplace
Exploitation Strategy	Water Europe centralized data from all the CS of the Ultimate Project and other technology water related in order to create a marketplace where partners can find innovative technologies and processes for their needs. Water Europe will exploit KER 1 as a key platform for sharing technologies with potential customers and investors. Developing and promoting the marketplace will be highly beneficial for Water Europe, as it expands its influence in the wastewater sector.

4.16. UNEXE

Table 25 : Exploitation strategy of UNEXE (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS
PARTNER: UNEXE The Centre for Water Systems-UNEXE (CWS) is internationally renowned for its research into water systems engineering. Supporting, developing and operationalising sustainable water management is a key challenge for the future that is strongly addressed by the Centre's activities. This includes research into water supply and distribution systems, waste water and urban drainage systems, flood risk management, and smart water systems.

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Key Exploitable Results	**KER 19: HMS Simulation & Stress-Testing** (Final TRL: 6) **KER 20: Interactive gamified visualisation tool**
Owner/Co-owners	• Involved in KER 19 • Owner of KER 20
Final User	Depending on the R&D process design structure within the industry the profiles that might get information from our results are: • follow-up research, • new spinoff/Start-up/Joint venture • consulting service • equipment sale
Benefits/competitive advantages	Assess symbiosis paths under different conditions to enhance transferability; improved collaborative decision-making.
Environmental impact	Recovery of heat and then reducing fossil fuel consumption for heating.
Exploitation Strategy	UNEXE will exploit its KER by adding expertise to their commercial portfolio. Indeed, UNEXE will leverage its Centre for Resilience in Environment, Water, and Wastes, developed in collaboration with South West Water utility, and seek opportunities to scale up ULTIMATE applications after the end of the project, through its ongoing business partnership facilitators, such as SETsquared and Impact Lab.

4.17. Greener than Green Technologies

Table 26 : Exploitation strategy of GreenerThanGreen (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS
PARTNER: GreenerThanGreen Greener than Green Technologies S.A. (Greener Than Green Technologies) is a clean tech start-up business that sprung out of university pioneered research on water treatment technologies and private funding. Its primary targets are the following: • To scale up and commercialize already developed laboratory-based techniques for water treatment as a standalone process or coupled to existing processes, • the identification, extraction, isolation and commercialization of value added/high interest compounds from organisms (e.g., plant, animal, microbial) or from industrial, agricultural or residential waste. Greener than Green Technologies SA (Greener Than Green Technologies) is active in R&D and marketing of disruptive water and wastewater remediation technologies and methodologies for the circular usage of water, providing tools and advice to industries and communities assisting the transition towards circular economy models.

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318

Key Exploitable Results	• **KER 7 (CS4):** Mobile WWTP for use in fruit processing (Final TRL 7) • **KER 14 (CS6) :** Extraction process for value added compounds in olive mill wastewater (Final TRL 7)
Owner/Co-owners	Owner of both KER
Final User	Industrial sectors targeted by this technologies: • Fruit and vegetables processing industries • Wine manufacturing • Olive Oil manufacturing
Benefits/competitive advantages	This technology offers a self-financing solution in the context of water remediation, recycling, and wastewater valorisation. The commercially available technologies are not shelf financed and, in most cases, there are no mobile complete solutions like this technology. The innovative business model allows for the food processing industry to adapt to today's environmental demand without the need for huge capital expenditure.
Environmental impact	These technologies provide improved wastewater treatment, enabling industries to recover valuable resources from the wastewater that can be reused or sold. This approach reduces the need for extracting new resources from the ground, thereby minimizing the environmental impact.
Exploitation Strategy	**Greener than Green technologies** will offer relevant industry applications, process optimization, and technical support, along with leasing mobile units for the isolation and purification of value-added compounds, depending on the seasonality of the raw material. Additionally, **Greener than Green technologies** may generate further revenue through the potential commercial exploitation of the extracted value-added compounds. For the detailed exploitation plan, see section 5.2

4.18. ALBERTA

Table 27 : Exploitation strategy of ALBERTA (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS
PARTNER: ALBERTA ALBERTA S.A., a Hellenic Fruit Processing Industry, specializes in the production of fruit juice concentrates, fruit purees, clarified juice concentrates, NFC juices, and tailor-made products and blends since 1981. The company produces juices not only from fruits but also from vegetables like carrots and red beets. Their main fruit juices come from citrus fruits (oranges, lemons, grapefruits, mandarins), pome fruits (apples, pears), stone fruits (peaches, apricots), pomegranates, aronia berries, grapes, carrots, and red beets. During the processing of any fruit or vegetable, a significant amount of wastewater and sewage sludge is generated, which ends

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up in the plant's sewage treatment system. These wastes are rich in physical substances that can be isolated and reused within the industry, and the processed water can be recycled.	
Key Exploitable Results	• **KER 7 (CS4):** Mobile WWTP for use in fruit processing (Final TRL 7)
Owner/Co-owners	Involved in KER 7
Exploitation Strategy	**Alberta** will use the KER in its daily operations. They will fully implement the technology to reduce freshwater demand (and hence the cost of production), and to reduce the cost related to the high BOD of the wastewater. The extraction of value-added compounds from the wastewater will allow development of additional value to products (functional foods) and new streams of revenue.

4.19. CRANFIELD UNIVERSITY

Table 28 : Exploitation strategy of Cranfield University (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: CRANFIELD UNIVERSITY Cranfield University (UCRAN) is an exclusively postgraduate, international center of excellence in research and teaching in strategic areas of science, technology, and management. The institution combines the academic rigor and long-term perspective of a university with the commercial and business focus of industry. It has a long and successful track record of delivering research rooted in the needs and operational realities of industrial sectors. The Cranfield Water Science Institute (CWSI) has over 40 years of experience in the water services sector and is recognized internationally for its work in the science, engineering, and management of water—for domestic consumption, agricultural needs, protecting and enhancing natural habitats, or manufacturing and industry. CWSI is also widely recognized for its work on the human dimensions of water management, including customer engagement, decision support, governance, and policy analysis. The institute hosts and coordinates Water Reuse Europe and has recently launched a new Centre for Doctoral Training in Water Infrastructure and Resilience (WIRe). Its research draws on a range of specialized laboratories as well as near-industrial scale pilot testing facilities. CWSI maintains close working relationships with the UK's water and wastewater service providers.	
Key Exploitable Results	• **KER 12 (CS7):** Heat recovery from AnMBR effluent (Final TRL: 7) • **KER 15 (CS7) :** Ammonia recovery methodsr (Final TRL: 7)
Owner/Co-owners	Involved in both KERs
Final User	1. Water utilities 2. Food and Beverage 3. Brewery 4. Distillery

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	5. Dairy industry 6. Chemical processing 7. Manufacturing 8. Biotech 9. Malting industry 10. Meat & Poultry processing
Benefits/competitive advantages	KER 12 and 15: Helps deliver an integrated system with heat and nutrients recovery at lower cost
Environmental impact	These technologies are looking to recover wastewater and the nutrients present in them, thus reducing the use for extraction of new resources.
Exploitation Strategy	**UNCRAN** will exploit these KER by submitting scientific publications. They will also leverage the validation of its research on integrated AnMBR, ion exchange/packed columns, and RO for energy and ammonia recovery and water reuse in the field. This will help to strengthen its collaboration with key industries, produce a variety of scientific outputs (such as scientific and trade articles), and initiate new research opportunities.

4.20. WEST

Table 29 : Exploitation strategy of WEST (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: WEST West Systems, founded in 1988, is a world leading company in the design and implementation environmental monitoring systems. The company provides qualified and highly specialized services, such as technical support and scientific consultancy, in the field of environmental engineering and environmental monitoring to private and public bodies. West Systems has accrued in-depth knowledge of water treatment services sector and its know-how and curriculum make it a leader in the engineering field, especially in the water services sector. West Systems has a large experience in Life projects and in several other National and International EU co-financed projects.	
Key Exploitable Results	• **KER 5 (CS3):** Real-time data driven monitoring and process control for salinity management (Final TRL: 8) • **KER 6 (CS3):** Data-driven matchmaking platform for water reuse (Final TRL: 8)
Owner/Co-owners	Involved in both KER
Final User	Ker 5&6 : Public wastewater treatment companies, Industries and other sectors that need to close their water cycle and reuse it.
Benefits/competitive advantages	KER 5 : There is no economic competitive advantage, but only an improvement in the public water service KER 6 : This technology offers Better quality of water leaving the systems

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318

Environmental impact	These technologies are looking to recover waste water and the nutrients present in them, thus reducing the use for extraction of new resources. By reducing the costs of such recovery systems,
Exploitation Strategy	**WEST** will exploit knowledge and expertise developed during the ULTIMATE project in adding it to their products and services offer. They especially enhanced their systems for smart monitoring and operation by incorporating insights gained from ULTIMATE and applying its innovative solutions.

4.21. KALUNDBORG

Table 30 : Exploitation strategy of KALUNDBORG (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: KALUNDBORG Kalundborg Utility is a company that handles both water supply & distribution (groundwater & surface water), wastewater treatment from municipality/industry and heat recovery to support district heating.	
Key Exploitable Results	• **KER 13 (CS9):** Data driven cable-based control system for WWTP operation (Final TRL: 8)
Owner/Co-owners	Owner
Final User	Public wastewater treatment companies
Benefits/competitive advantages	Lack of water resources is a hot issue both for our food, biotech, pharma industries, but also for the public which has a significant concern regarding those resources and the nature. Increasing WWTP energy efficiency in both Novozymes (NZ) and Kalundborg Utility (KCR) Increasing energy efficiency on heat pump at KCR as a conceptual study Physical trials, investigate potentials among stakeholders. Discover potentials in recovery of valuable nutrients, materials as a conceptual study
Environmental impact	Reduce energy consumption of WWTP.
Exploitation Strategy	**KALUND** will exploit this KER and knowledge gained during the ULTIMATE project in their daily operations. They aim to invest in water-reuse from wastewater directed at the specific needs for water quality, as the present freshwater production is not sustainable, wetland biotopes around Lake Tisso are at risk and further growth of the local industry as well.

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4.22. X-FLOW

Table 31 : Exploitation strategy of X-FLOW (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: X-FLOW X-Flow is a leading developer of membrane-based filtration technologies and a key player within Pentair's Filtration Solutions business. They produce and supply a diverse range of standardized membranes and modules for filtration and purification across various industries, including water, wastewater, and beverages. Renowned for their pioneering work in membrane technology, X-Flow supports equipment manufacturers and engineering contractors by delivering high-performance membranes that excel even under the most challenging conditions. With a strong focus on practical and economic advancements, they are committed to developing filtration technology that offers the lowest total cost of ownership while ensuring maximum efficiency.	
Key Exploitable Results	• **KER 9 (CS9):** Treatment of biotech WW based on novel membranes in combination with pre-treatment **(Final TRL: 8)**
Owner/Co-owners	Owner
Final User	Industries and other sectors that need to close their water cycle and need to treat wastewater
Benefits/competitive advantages	The new membrane will improve our product portfolio. This makes Pentair X-Flow more flexible in service to clients, which will strengthen the general expectations of clients when consulting Pentair
Environmental impact	The membrane developed doesn't use any coagulant thus lowering the environmental impact, because coagulants can harm the environment by contaminating water bodies, harming aquatic life, and introducing harmful chemicals or heavy metals if not properly managed.
Exploitation Strategy	**X-FLOW** will exploit this KER by adding it to their products and services offer. ULTIMATE enabled them to broaden the product portfolio for the market for tight ultrafiltration (or loose nanofiltration resp.) by developing and demonstrating a novel membrane type integrating water reuse and material recovery for different industry wastewater streams.

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4.23. CPTM

Table 32 : Exploitation strategy of CPTM (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: CPTM Consorzio Polo Tecnologico Magona (CPTM) (www.polomagona.it) was founded in 1997, creating a research centre of excellence in the ex-industrial Magona area in the city of Cecina (LI). CPTM represents a meeting point between companies searching for new solutions and the applied research, result of the synergetic competencies gained by universities, engineering consulting companies, and manufacturers. Applications include chemical and material engineering, environmental protection, industrial safety, energy industry, renewable energy and green chemistry.	
Key Exploitable Results	• **KER 5 (CS3):** Real-time data driven monitoring and process control for salinity management(TRL final : 8) • **KER 6 (CS3):** Data-driven matchmaking platform for water reuse (TRL final : 8)
Owner/Co-owners	Involved in both KER
Final User	**KER 5&6 :** Public wastewater treatment companies, Industries and other sectors that need to close their water cycle and reuse it.
Benefits/competitive advantages	KER 5 : There is no economic competitive advantage, but only an improvement in the public water service KER 6 : This technology offers Better quality of water leaving the systems
Environmental impact	These technologies are looking to recover waste water and the nutrients present in them, thus reducing the use for extraction of new resources. By reducing the costs of such recovery systems,
Exploitation Strategy	**CPTM** will exploit their KER and expertise in water-smart industrial symbiosis acquired thanks to ULTIMATE by publication of research and presentations at conferences.

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4.24. NOVOZYMES

Table 33 : Exploitation strategy of NOVOZYMES (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: NOVOZYMES Novozymes is a world leading biotech company that produces enzymes for several industries. Enzymes are used in agriculture to increase crop yields and reduce the use of chemicals and they are used in bread production to improve softness and freshness of bread.	
Key Exploitable Results	None
Environmental impact	By developing enzymes and microorganisms that replace traditional chemicals in industries like agriculture, food production, and bioenergy, the company reduces the need for harsh chemicals, lowers energy consumption, and decreases greenhouse gas emissions. Additionally, Novozymes promotes waste reduction and resource efficiency by enabling the production of biofuels and improving agricultural yields with fewer inputs, contributing to a more sustainable and environmentally friendly industrial landscape.
Exploitation Strategy	**NOVOZYMES** exploit results of ULTIMATE project in its daily operations, to improve its cost competitiveness and sustainability. The team in Kalundborg is part of the NOVO water management task force for production sites worldwide, thus ***ULTIMATE*** solutions will be considered in future water management decisions and may be replicated worlwide.

4.25. ESCI

Table 34 : Exploitation strategy of ESCI (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS
PARTNER: ESCI The European Science Communication Institute (ESCI) is a not-for-profit organisation that empowers scientists and engineers, helping them to communicate with a non-expert audience to bridge the gap between science, technology and society. ESCI supports national and international research initiatives in communicating effectively and leveraging their dissemination potential. In addition to providing up-to-date media training, ESCI has put together a compelling set of dissemination tools specifically with different stakeholders and target audiences in mind. ESCI leads WP6, which includes communication, connecting and dissemination activities.

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Key Exploitable Results	None
Exploitation Strategy	ESCI has gained greater visibility and secured new assignments or partnerships with ULTIMATE partners and other stakeholders. In collaboration with NTNU and NTUA, ESCI enhanced communication strategies through immersive storytelling. Additionally, the connection to the World Association of Newspapers via the Advisory Board is significant.

4.26. GSR

Table 35 : Exploitation strategy of GSR (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS	
PARTNER: GSR The Institute of Applied Research, the Galilee Society is the scientific-strategic project of the Galilee Society, was founded in 1995 with financial support of the Ministry of Science and Technology. Researchers at the Institute conduct basic and applied research on community-centered projects that address the environmental and health needs of the Arab population in Israel. Research, undertaken with local, regional and international research organizations and universities, has focused on issues related to health, water conservation, environmental biotechnology, applied biotechnology, agriculture, renewable energy, and medicinal herbs. Since its inception, the Institute has continued to maintain high levels of achievement and excellence, aiming to alleviate health and environmental hazards, enhance economic opportunities for the Arab community and provide additional scientific and educational tools for students	
Key Exploitable Results	None
Exploitation Strategy	**GSR** acquired specialized **knowledge** in water-smart industrial symbiosis, which will enhance its research activities. This expertise will result in publications, conference presentations, and increased visibility.

4.27. MEK

Table 36 : Exploitation strategy of MEK (Source: Partners response)

SUMMARY OF INDIVIDUAL EXPLOITATION PLANS
PARTNER: MEK Mekorot, Israel’s National Water Company is a public utility founded in 1937. Mekorot is one of the world’s most advanced water companies, a leader in water resources management, desalination, wastewater treatment and effluent reuse, rain enhancement, water quality, water security and engineering and planning of water projects. Mekorot was among the first in Europe and the Middle East to investigate and implement large-scale wastewater reuse systems like Soil Aquifer Treatment after conventional secondary treatment and is a leading reason for Israel’s record breaking reclamation rate to date (ca.

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85%). Mekorot supplies 80% of the water in Israel (about 1.5 billion m3 /year) to approximately 5,000 intermediary water providers including municipalities, regional associations, agricultural settlements, and industrial consumers. Mekorot also treats 40% of Israel’ s wastewater in eight water treatment plants and using its nine wastewater reclamation plants enables 60% of the reuse of treated effluents for agriculture purposes in Israel.	
Key Exploitable Results	• **KER 14 (CS6) :** Extraction process for value added compounds in olive mill wastewater (Final TRL 7)
Owner/Co-owners	Involved
Exploitation Strategy	MEK plans to exploit results of the ULTIMATE project in its daily operations to optimize its operations, leading to cost savings and the generation of new revenue streams.

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4.28. Analysis of individual exploitation strategies after the project

This section presents an analysis of the final exploitation strategy outlined by the ULTIMATE partners. An initial exploitation strategy was already proposed and submitted in the last exploitation plan deliverable D5.3 of the ULTIMATE Consortium. This version consists in an update with the final results of the project.

4.28.1. KER Exploitation

A first key exploitation route has been chosen by partners: the creation of a marketplace to gather all technologies and knowledge generated during the project. The WaterEurope marketplace (available online: https://mp.watereurope.eu/) is a key exploitation route as it quickly collects all results from the partners (9 main "products" referring to the 9 pilot sites, gathered in technology areas), facilitates a common communication strategy and simplifies the cost structure. More details about this innovative and specific exploitation route are given is section 5.1.

Moreover, an analysis can be done on other types of exploitation chosen by each partner. The following figure gives the overview of selected exploitation routes:

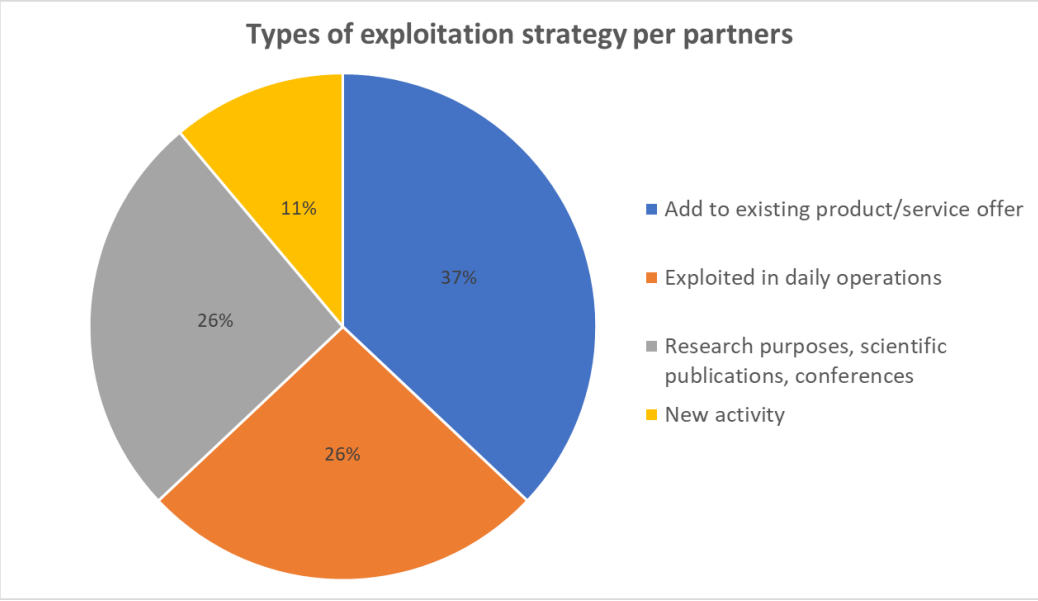

Figure 22 : types of exploitation strategy per partners

More than one third of partners have added expertise, knowledge and technologies developed during the ULTIMATE project to their portfolio of products and services. They will then use these KER to gain new contracts and continue to create value at European level.

One quarter of partners exploit their KER in their daily operations. Most of these partners are industrials (AITASA, ARETUSA, SUEZ RR, ALBERTA, KALUNDBORG, NOVO, MEK…). KER

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will then contribute to reduce their operation costs, improve their operations, reduce their environmental impact and reinforce their presence in Europe.

Another quarter of partners will exploit their KER for research purposes, make follow-up research projects, publish scientific publications and take part to conferences. They are mostly academic partners (UNIVPM, NTNU, NTUA, UNEXE, CRANFIELD, CPTM, GSR⋯). It will strongly contribute to creation of high-level scientific knowledge at European level.

31 **partners (representing 11% of the consortium) will create new activities thanks to ULTIMATE project. GreenerThanGreen, STRANE (through the creation of NEWASYS), and WaterEurope (with the help of all other partners through the Marketplace) will exploit their KER by the creation of new activities/spinoff, which will contribute to the creation of jobs and value at European level.**

4.28.2. Intellectual Property Strategy

Several partners are assessing the opportunity of patenting their results generated during the ULTIMATE project. An analysis in terms of number of partners is given below:

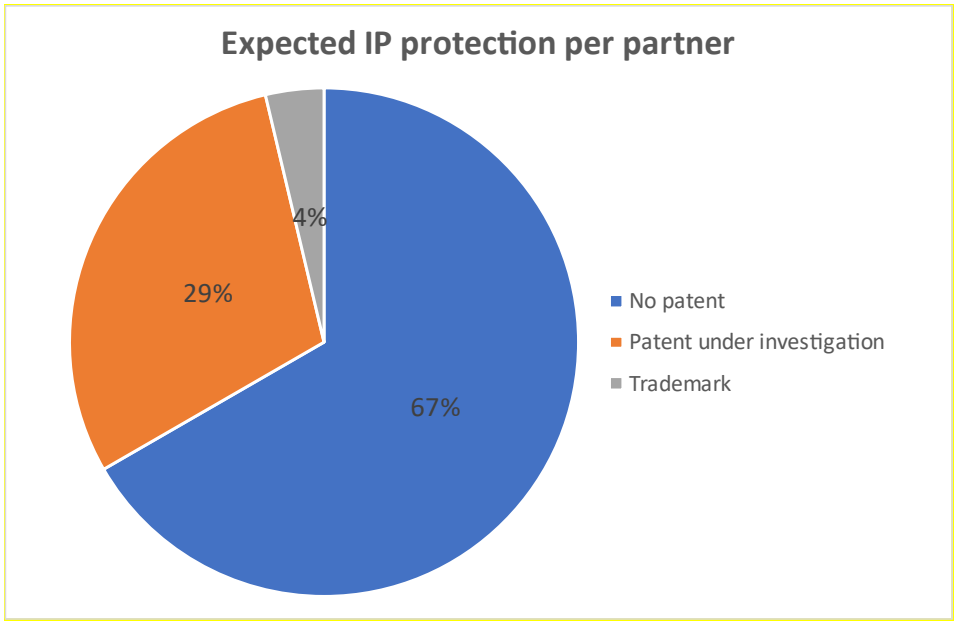

Figure 23 : Expected IP protection per partner

8 partners are investigating IP protection by patenting their results. KER 5 and 6 are especially subject to IP protection. These KER are co-owned by ARETUSA, UNIVPM, WEST Systems and CPTM. Further discussions between these partners are expected after the end of ULTIMATE project. GreenerThanGreen, AQUALIA, AQUABIO and SUEZ RR and also assessing the opportunity of patenting their KER.

31 partners have also submitted a trademark linked to ULTIMATE project: UNEXE and STRANE (which protected the trademark NEWASYS, see dedicated section 5.4).

Other partners don’t plan to patent their KER.

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5. Focus on specific exploitation plans

As ULTIMATE partners are strongly involved to create value and jobs at European level, while reducing environmental impacts of human activities, a focus is done here on some specific exploitation plans which particularly contribute to these objectives.

5.1. Water Europe Marketplace, a digital platform to support circular economy in Europe

5.1.1. Context

Water Europe focuses on bringing together businesses, researchers, and governments across Europe and beyond to develop better, locally adapted solutions for water challenges. By investing in innovative solutions and circular practices, Water Europe aims to position Europe as a global leader in the water industry. This strategic approach not only enhances water security but also boosts Europe’s competitive edge in water-related sectors. Through fresh ideas and research, Water Europe addresses critical issues like droughts, floods, pollution, and the impacts of climate change, promoting the smart management of water resources and the benefits of sustainable practices worldwide.

Water Europe aims to make sure that everyone involved with water – from businesses to researchers, and governments join hands, in Europe and beyond to come up with better and locally adapted solutions for the water challenges.

Investing in innovative solutions and circular practices puts Europe at the forefront of the water industry worldwide. This strategic focus not only promotes water security but also enhances Europe’s competitive edge, ensuring its water-related sectors lead on a global scale.

5.1.2. Concept

The Water Europe Marketplace is a versatile platform for networking, business development, discovering and sharing knowledge, and exhibiting achievement in the areas of Water, Energy, and Materials. Through this flexible platform, users may find and share information about innovative economy solutions and systems in the domains of Water, Energy and Materials that challenge established thinking and practices around resource use and reuse. It is also a place to get in contact with other stakeholders in the Circular Economy, share ideas, arrange meetings and join forces. The marketplace was originally created as part of the NextGen project and evolved through the B-WaterSmart and ULTIMATE projects into the Water Europe Marketplace, currently curated by Water Europe.

The platform 80acilitatees the meeting and matching of demand and supply by providing access to products and services, along with their characteristics, capabilities, and constraints. It creates a “digital” market where the three key players in the Circular Economy (CE) can interact: problem owners, who are searching for the best solutions; solution providers, who contribute technologies or products to the CE portfolio; and investors, who are looking for opportunities to maximize their investment returns.

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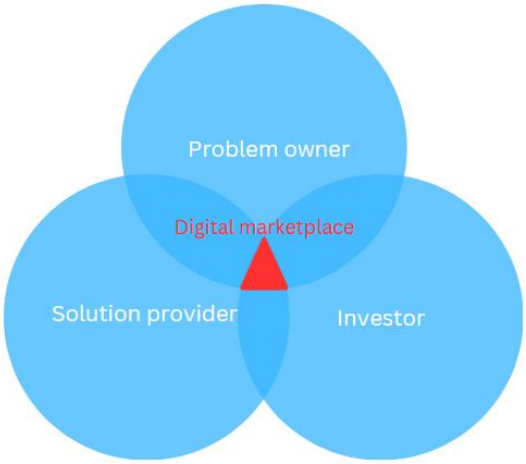

Figure 24 : The different actors of the Water Europe Marketplace

5.1.3. Users of the Water Europe Marketplace

The Water Europe Marketplace hosts a diverse array of organizations, with a presence from small and medium enterprises and research and technology organizations. Large enterprises also are represented. Governmental organizations and non-profit organizations add to the mix, highlighting the collaborative nature of the platform. Non-governmental organizations, intergovernmental organizations and publicly owned organizations are the least represented.

5.1.4. Content of the Water Europe Marketplace

The Water Europe Marketplace consists of different pages:

- **Products**
- **Technologies**
- **Call for solutions**
- **Networking**
- **Events**
- **EU Projects**

Each page is described in the following sub-sections.

5.1.4.1. Products

The product section of the Water Europe Marketplace showcases market-ready innovations. Users can browse solutions by type (e.g., software, hardware, service, process) and technology domain (e.g., water, energy, nutrients & materials, supportive technologies). Filters such as product owner, license type, and country are also available to refine the search.

The goal of the platform is to gather a wide variety of solutions, while ensuring that only validated products are featured. To maintain quality, a product approval process is in place.

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The process for publishing product factsheets on the Water Europe Marketplace involves several key steps for both users and administrators. Registered users submit product information through an online form, which is then checked to ensure all necessary fields are completed. During the approval process, users can edit their submissions as needed.

Once a product submission is made, the administrator reviews the factsheets and can approve, reject, or request changes. Approved factsheets are then published and become accessible to all platform users. Regular updates to product information help ensure the accuracy and relevance of the content.

Currently, 9 products are available on the platform, with more expected to be added in the coming months.

5.1.4.2. Technologies

Technologies, unlike products, are not described as market-ready due to their lower TRL, meaning they cannot yet be utilized by problem owners. Nonetheless, their presence on the marketplace offers several advantages:

- They showcase innovations that may attract investor interest.
- They provide problem owners with ideas of potential solutions that could become available to them in the future.
- They allow Water Europe to track the progress of these technologies, and when they reach market readiness, they can be moved to the product section.
- The technology section is really similar to the product section, but here user can identify all technologies from their field of application.

All the technologies that are available on the platform are classified in four main categories, as described below:

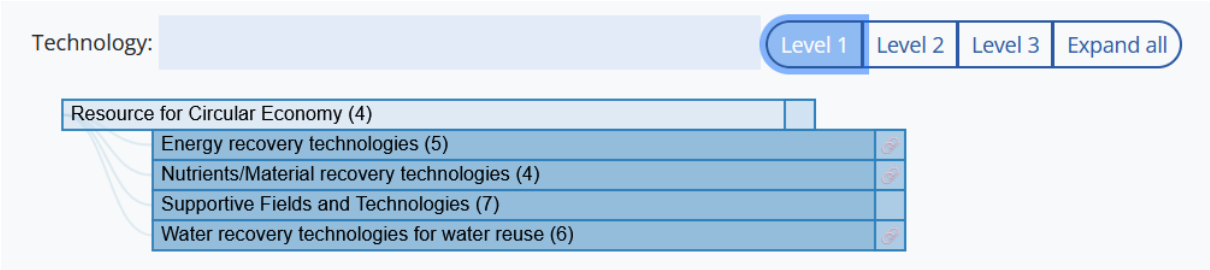

Figure 25 : General categories of Water Europe marketplace ' s technologies

That can also be subdivided in a total of 22 industrial sectors in which the technology applies.

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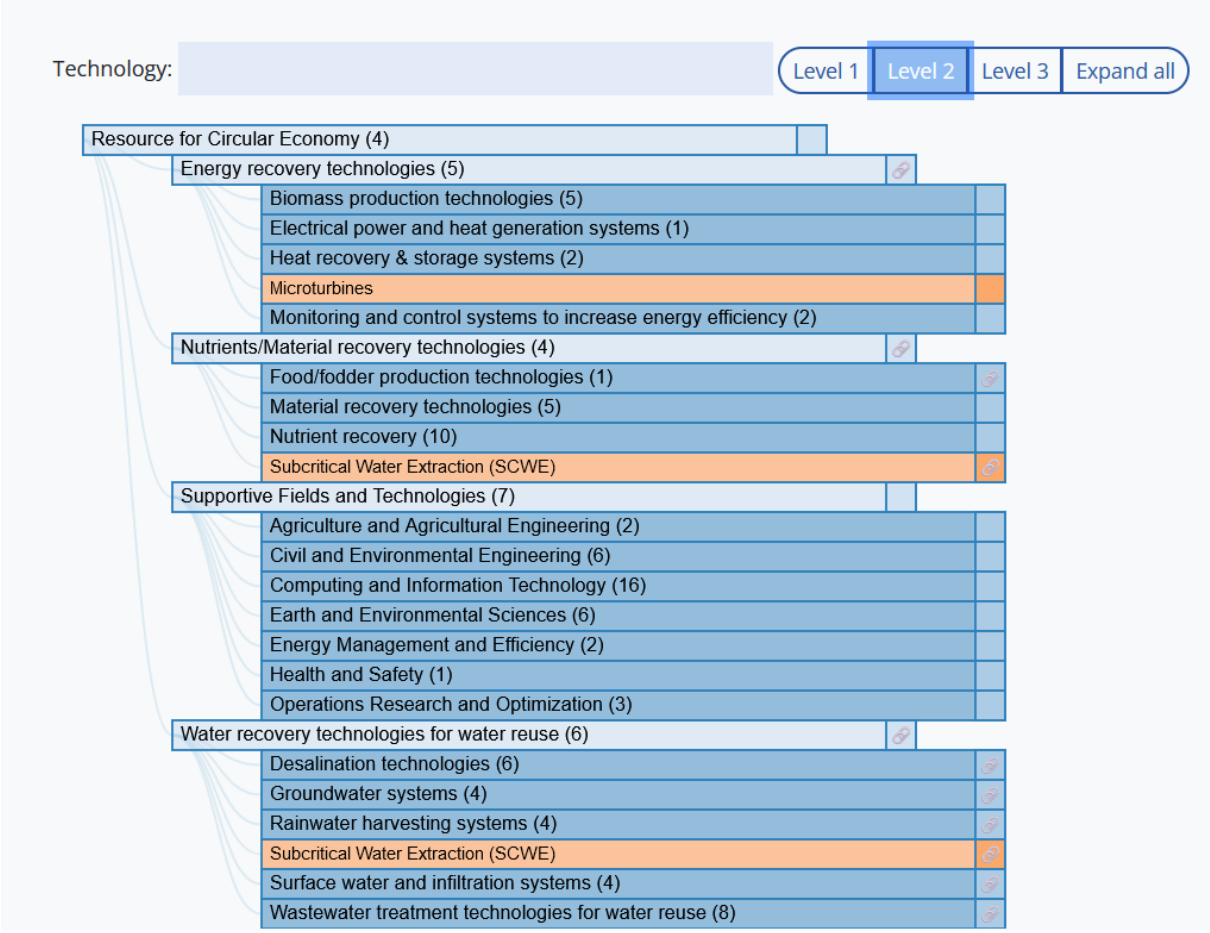

Figure 26 : Detailed Categories of Technologies on the WaterEurope Marketplace

88 technologies are currently available on the platform, which demonstrate how the Water Europe Marketplace hosts a diverse array of solutions for various wastewater issues. This plurality is a major key to the platform's attractiveness, offering comprehensive options for different challenges in wastewater management.

5.1.4.3. Call for solutions

This section enables users to highlight their challenges, detail their technology needs and encourage cooperation between actors. They can write a new call for solutions, all other users will see it and relevant answers can be provided.

5.1.4.4. Networking

This section enables users to connect to each other. A search can be done by name, types of interest, organizations, technologies, products, tags, and event participants.. The people They represent a large variety of profiles (researchers, large companies, SMEs⋯), located all around Europe.

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5.1.4.5. Events

This section highlights events around the Water Smart Society. People can identify future congress or conferences interesting for their work. Users have also the opportunity to add a new event to make it known by the community.

5.1.4.6. EU projects

As the platform comes from several European Research & Innovation projects, this section highlights European projects linked to circular economy. It presents major outcomes, case studies and best practices of each EU project.

5.1.4.7. Matchmaking module

The Water Europe Marketplace also integrates a matchmaking module on the user profile. It facilitates the exchange, reuse, and recycling of industrial by-products among industries.

The primary objective of this tool is to promote circular economy principles, reduce waste, and minimize the environmental impact of industrial processes. It focuses on industrial sectors where, according to the SCALER project, the potential for synergies is significantly maximized. Although still in development, the Water Europ Marketplace aims to achieve the following goals:

- Information Gathering: when industrial users register on the platform, they can provide detailed information about the waste materials they generate, including quantities, availability, location, and relevant properties.
- Classification: the platform uses information entered by the solution provider to classify each technology in order to help the customer find the solution that fits their needs.
- Matching: The Water Europe Marketplace utilizes algorithms to connect waste generators with potential users. The matchmaking process considers various criteria, such as material compatibility, distance between parties, and cost-effectiveness.

5.1.5. ULTIMATE as core part of the Water Europe Marketplace

The ULTIMATE project is a key factor in the growth of the Water Europe Marketplace, as it serves as the main source of revenue that supports the platforms daily operations. Additionally, the project has enabled WaterEurope to attract new solution providers to the Water Europe Marketplace. While some of the partners' technologies may not have been market-ready at the time, the project allowed these companies to showcase their market-ready products, which are now available for problem owners to utilize.

In the ULTIMATE project, specific technologies have been identified as particularly valuable for promoting industrial symbiosis. Additional domains and technologies have been documented, enhancing the Technology and Ecosystem Base (TEB, which is KER n° 1) with technologies relevant to the WSIS. Beyond technologies, a wide range of tools, products, and services utilizing Circular Economy (CE) technologies have been cataloged in the Water Europe Marketplace and linked to technologies specified in the TEB. This integration has enabled the creation of cross-links between related pages on the platform, personalized product recommendations based on users' preferences and interests, and facilitated the search for products within specific fields of interest.

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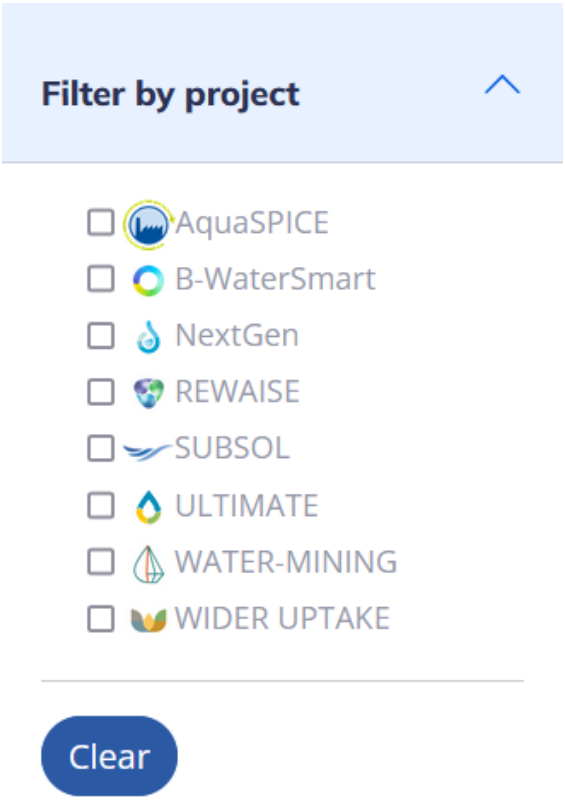

Figure 27 : Project filter for technologies on the Water Europe Marketplace

The solutions available on the platform can be filtered by project. Users can then see the impact of the ULTIMATE project by showcasing the technologies associated with it.

5.1.6. Business Model

The business model of the Water Europe Marketplace is quite simple, as presented in the following business model canvas.

WaterEurope strongly relies on several European projects to create and develop the marketplace. These successive fundings enable the technical development, alongside communication efforts to make the platform known. Another phase will begin in 2026, at the end of BOOST-IN project (grant n° 101135239). The platform will then adopt a freemium business model: subscriptions from users willing to get additional features.

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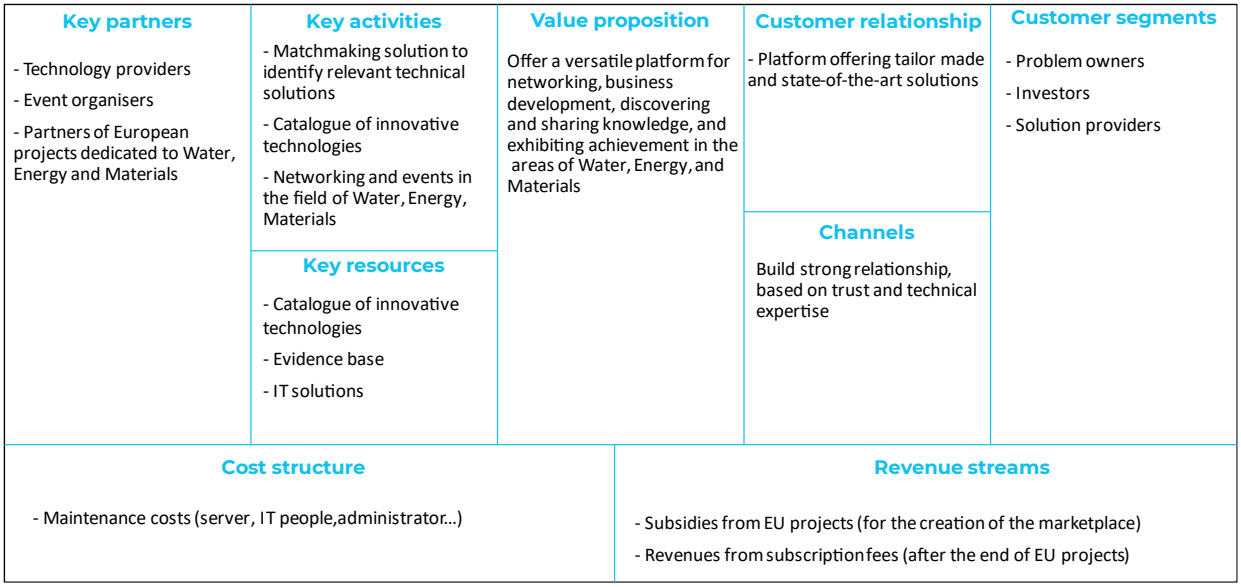

Figure 28 : Business model canvas of the Water Europe Marketplace

Revenue streams are essential to cover the maintenance costs of theWater Europe Marketplace. Although the approval/rejection process is not time-consuming, and Water Europe can handle it internally without additional financing, there are still significant expenses to consider. Servers require funding, an IT team is necessary to address technical issues, and an administrator is needed to validate new products and ensure the platform remains up to date. While these costs are not fully estimated at present, they will need to be thoroughly assessed as the marketplace expands.

Currently, the Water Europe Marketplace is supported financially by the European Commission, allowing the platform to expand and attract users. WaterEurope intends to keep the marketplace free for customers while offering optional paid services, such as feedback on technology listings. Additional revenue streams could include implementing subscription fees for solution providers or introducing an advertising system.

5.1.7. Business Plan

The Water Europe Marketplace operates with the support of European projects like ULTIMATE and others, including the BOOST-IN project, which began in January 2024 and is expected to be a significant factor in the marketplace’ s growth. An estimated 200 to 500 new technologies are anticipated to be added to the marketplace. In terms of users, the number of problem owners is expected to rise alongside the increase in solution providers, with an estimated addition of around 200 to 300 new problem owners. A dedicated action plan to reach these targets is planned in BOOST-IN project, funded by EC.

To attract new customers, Water Europe plans to leverage contacts from European projects like ULTIMATE and will also engage in conferences and other communication channels.

A strong growth of the traffic is then expected, with the objective to reach several hundreds of visitors per day/month/year. Revenues are then expected to grow accordingly and to cover all maintenance costs. Detailed business plan can be read in BOOST-IN project deliverables.

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5.1.8. Conclusion for the Water Europe marketplace

The Water Europe Marketplace has addressed the knowledge gap surrounding wastewater treatment technologies. By bringing together investors, problem owners, and solution providers, WE has established a platform that serves as a catalyst for the wastewater market.

The challenge lies in how the Water Europe Marketplace will sustain its growth in the future. Each customer, or problem owner, typically requires a unique solution and may not remain active on the Water Europe Marketplace once their wastewater treatment needs are met. The key lever for future development is finding a way to continuously attract new problem owners to the Water Europe Marketplace. This will ensure that solution providers have an ongoing incentive to stay engaged and continue promoting their offerings.

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5.2. Greener Than Green technologies, technology provider and operator for agrifood industry

Greener than Green Technologies was founded to transfer technologies from the lab bench into the real word, and address water and wastewater remediation problems with a modern approach and cutting-edge innovation. ULTIMATE project played a central role in the development of Greener Than Green technologies for the circular usage of water and wastewater, supporting the transition from linear to circular business models.

The ambition of Greener Than Green technologies is to extract value-added compounds from some industrial wastewater streams (food and processing industry and agro-industry). Technologies have been tested on two demo cases (case study 4 and case study 6) and enable the Greener Than Green Technologies startup to exploit its technology at a European level, out of Greener Than Green Technologies' s home country.

5.2.1. Background

The fruit and vegetable processing industry are inarguably a water demanding sector. Furthermore, to meet the effluent criteria as well as to reduce the cost of disposing wastewater to the municipal WWTP, all sizeable fruit processing plants have their own primary biological wastewater treatment unit. However, due to seasonality of this industry the biological treatment unit is stopped when not used and must be restarted when needed, driving the operational cost upwards and seasonality that most often coincides with the dry season puts a lot of strain on local freshwater resources, especially in southern European and Mediterranean countries.

Additionally, as part of the industrial processes, these processes are associated with use of water and produce wastewater that needs to be disposed of, in accordance with the local and international legislations. Given the high volumes and high concentration of pollutants, nutrients, etc. present in this wastewater the cost of the disposal of such water is continuously increasing. Fruit and vegetable industry wastewater are very rich in value-added compounds. Without theGreener Than Green technologies , they are usually sent to the sewage plant to be eliminated, which represents a big economic loss for the industry.

5.2.2. Wastewater treatment

The technology developed by Greener Than Green technologies and tested in two demo cases comprises three steps: Filtration, Adsorption/Extraction, and Advanced Oxidation Process (AOP), as described in Figure 29.

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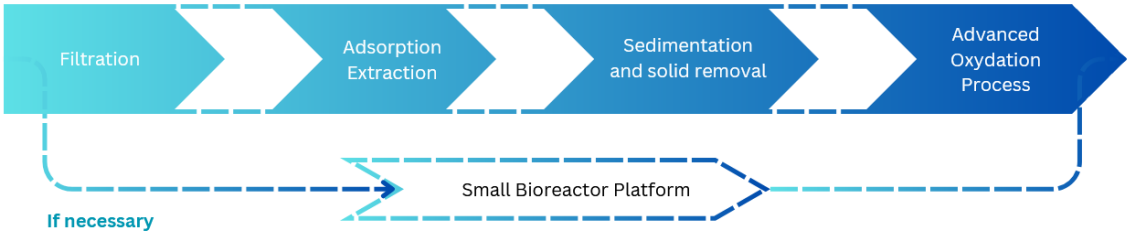

Figure 29: Wastewater treatment in Greener Than Green Technologies

More details can be given on each stage of the process:

- **Filtration:** In this stage, large organic particles, which are not suitable for biological treatment, are removed.
- **Adsorption/Extraction**: This stage utilizes technologies to selectively extract value-added compounds for further purification and isolation.
- **Advanced Oxidation Process (AOP):** The final stage employs AOP to significantly reduce the remaining organic load or convert non-biodegradable organic compounds into more biodegradable forms.

If necessary, a Small Bioreactor Platform (SBP) can be used concurrently, in parallel, or in series with the AOP step to further reduce the organic content.

This extraction process is interesting for industries because it allows them to valorise value-added compounds and decrease the cost of the wastewater treatment, this process uses subcritical water. Other extraction ways that can be found in literature are based on the use of organic solvents which are often toxic. Also, it can be coupled to existing wastewater treatment facilities or as a standalone unit, making it ideal for both large and as well as small (with no infrastructure).

5.2.3. Implementation of the technology: a non-disruptive process and an innovative business model

Undeniably, industrialized nations lead in innovation, frequently leveraging technology to address various problems. However, resistance to innovation often results in the slow adoption of new technologies by industries. High novelty proposals tend to receive lower evaluation scores due to several functional reasons: disruptive technologies often conflict with existing practices, workflows, or habits, and may incur additional costs and operational disruptions. Furthermore, an unclear value proposition or performance-to-price ratio may not provide sufficient incentives. Innovation also represents uncertainty and potential side effects that cannot be anticipated, with associated risks categorized into physical (e.g., environmental or health), functional (e.g., performance), and economic risks.

To enhance the adoption of the proposed technology and address these concerns, an innovative business model has been developed to make the value proposition clear and

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transparent. This model minimizes disruptions to existing workflows and reduces the need for additional complexity in operations management on the customer side.

The proposed technology, VesperX™, is offered as a Product-as-a-Service (PaaS), also known as Product-Service Systems. This model, aligned with Circular Economy principles, combines products with accompanying services. Instead of traditional models where manufacturers sell their products and customers assume ownership and responsibility, customers subscribe to a service or group of services and receive the results of the technology's application.

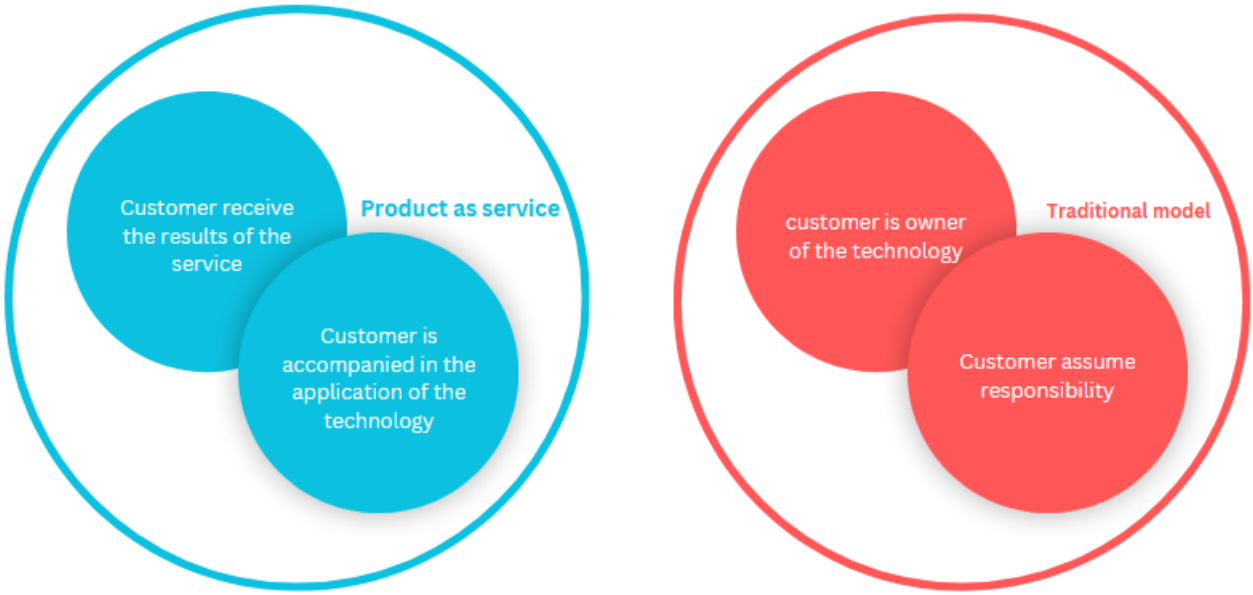

Figure 30 : Characteristics of the business model of Greener Than Green Technologies

Under this business model, industries subscribe to a flat fee for having VesperX installed on their premises. The system adsorbs value-added compounds (VACs) onto a solid support material and treats the remaining water to a reusable or agreed-upon standard. The adsorbed VACs are then extracted to produce what is referred to as the crude extract, which is delivered to the industry. Additional services, such as VAC profiling and quantity analysis, isolation and purification, and certificates of analysis, are available for a fee. Customers may choose to share ownership of the VAC, receiving a discount on services. At the end of the leasing period, the unit is uninstalled, serviced, and moved to the next industry. Throughout the leasing period, Greener than Green Technologies retains ownership and responsibility for the unit’s repair, maintenance, and good working order.

All units installed in a particular geographical area report to a decentralized business entity, the “hub.” The hub receives information from the units, converts it into business analytics, and processes the solid support for VAC extraction, purification, and certification. It is also responsible for monitoring the performance and health of each unit, supplying consumables, and handling logistics such as transportation and installation.

This business model makes the concept of Total Cost of Ownership inapplicable for the adopting industry, as they never assume ownership of any hardware. The only costs incurred are for the services to which they subscribe.

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5.2.4. Market potential in Europe

As described in sections 3.3.3 and 3.4.2, 3.3.3., many installations dedicated to the processing, preserving or manufacture of fruit and vegetable sourced products can use this innovation. We can quote the following industrial sectors:

- Growing of citrus fruits
- Growing of grapes
- Growing of pome fruits and stone fruits
- Growing of vegetables and melons roots and tubers
- Manufacture of fruit and vegetable juice
- Manufacture of wine from grape
- Other processing and preserving of fruit and vegetables
- Processing and preserving of potatoes
- Wholesale of beverages
- Wholesale of fruit and vegetables

As presented in the conclusion of section 3.3.3, countries counting the higher number of sites of these sectors are Italy, Spain, France and Benelux. Tests led in Greece and Israel are a strong reference to expand outside of these countries and strongly grow in Europe.

Polyphenols recovered from wastewaters thanks to the Greener Than Green Technologies units can then be sold all around Europe, with a specific focus in the Northern Italy, where the higher density of industrial sites using polyphenols can be found.

5.2.5. Business Plan

Thanks to ULTIMATE project and tests led in two case studies, Greener Than Green Technologies will be able to widely replicate its technology and strongly grow. The main principles of the business plan are explained below.

Greener Than Green Technologies has adopted a strategy of selling their technology as a service rather than as a product. This approach enables them to gather on-site data and manage maintenance, providing a more seamless experience for their clients. This model is particularly appealing to fruit and vegetable manufacturers, who typically experience seasonal fluctuations in water usage. By offering their technology as a service, Greener Than Green Technologies can better accommodate these varying demands.

The technology is provided in the form of modular units, with each group of 20 to 30 units connected to a centralized hub that oversees their operation. For a medium-sized industrial site, approximately five units would be required. This scalable solution allows manufacturers to adjust their water treatment capacity based on their specific needs, making it a more efficient and cost-effective option.

5.2.6. Conclusion for the Greener Than Green technologies exploitation path

Thanks to ULTIMATE project, Greener Than Green Technologies was able to test its innovative technology into 2 demo sites in Greece (CS4) and Israel (CS6), with the help of

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partners of the consortium. With positive technical feedbacks from these cases, it validated the technology and the business model of Greener Than Green Technologies. The group offers an innovative technology and an innovative business model, based on services instead of buying a product.

ULTIMATE project can then be seen as a strong support to the future growth of the company. Ultimate has been a significant asset for Greener Than Green Technologies throughout the project's duration. It enabled the company to validate its solution with the project partners and secured the necessary funding to help the startup become what it is today.

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5.3. SEITISS, a startup specialised in circular economy

5.3.1. Presentation

During the SCALER (Grant n° 679386) and EPOS (Grant n° 768748) projects, STRANE generated key results, databases and knowledge about circular economy to be transferred and exploited. In that sense, STRANE INNOVATION created the Seitiss concept in mid-2018 and the legal entity in 2021. **Seitiss is a spinoff of these 2 European projects.**

Seitiss transforms industrial waste into alternative raw materials. It provides an innovative IS toolbox to Industrial sites and local authorities. It then manages flow of waste, administrative procedures to to exit the waste status (REACH) and then sell materials as alternative raw materials. The first offers were initially based on the methodology, databases, and matching algorithms. Seitiss offered IS services to public actors and industrial sites: they made an assessment of the IS potential at a local authority scale and then studied numerous synergies for private companies. Seitiss also signed a strong partnership with Aquaminerals, a partner of the 2 previous European Research and Innovation projects.
Seitiss manages three different synergies, and plans to develop 5 more synergies in the next 3 years. Seitiss operates in French industrial territorial areas but aims to deploy its offers across EU. It brings a real added value to actors wishing to develop circular economy initiatives.

Seitiss aims at becoming a leading actor to find and manage industrial synergies.

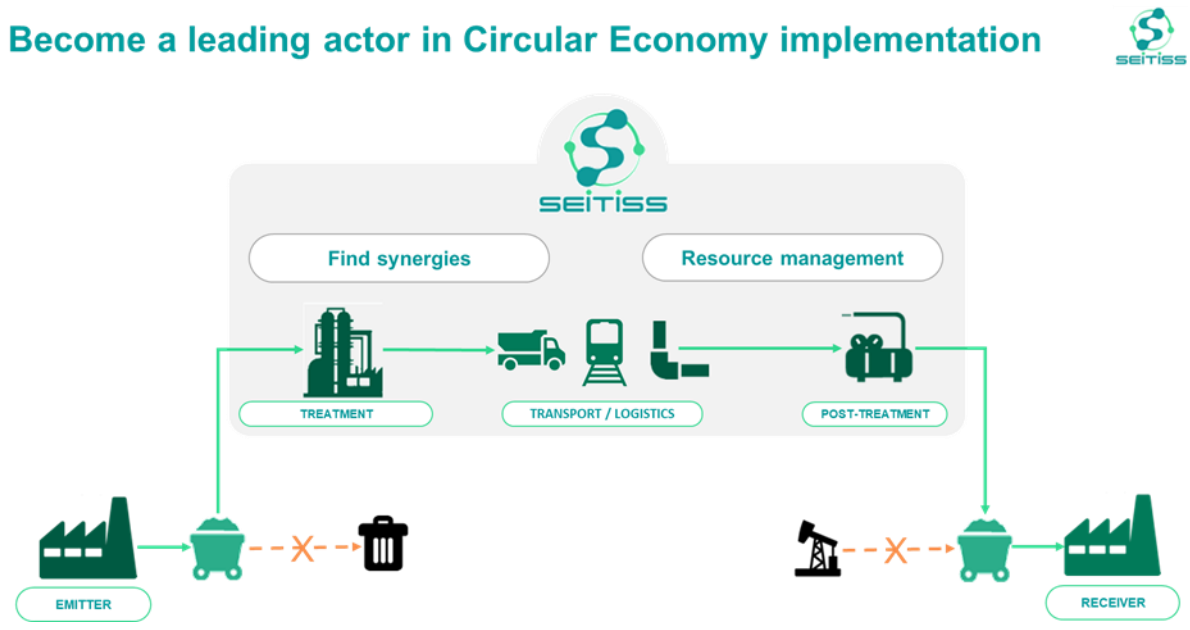

Figure 31 : Synergy implementation (Source: SEITISS)

Through ULTIMATE, Seitiss reinforced its network of industrial partners and developed their matching system with new models on water-specific industrial symbiosis, which will help them to sell services on other synergies.

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5.3.2. Technology to identify synergies

STRANE has developed a range of innovative tools for the creation of industrial synergies. Seitiss identifies alternative resources and waste valorisations through industrial synergies thanks to a unique automatic synergy identification system (models and algorithms), finds partners within an economically viable radius thanks to our database of geolocated sites, then sets-up/implements and manages the synergy. Tools are presented in the Table below.

I. The synergy identification is supported by the matchmaking tool. Other resources are used (synergies databases and knowledge repositories) to complete the matchmaking tool potential.
II. The research of potential partners within a viable radius is supported by all geolocated industrial sites database.
III. Business cases are provided to each individual stakeholder and are based on the framework developed within EPOS and SCALER, but also on business models identified in ULTIMATE in the T5.1. This method provides comprehensive business models to aid in decision making and implementation.

Creating an industrial synergy is a complex and iterative process starting with the identification of opportunities on-site and ending with a successful setup and operation. A synergy finds value by increasing the waste stream intrinsic value and diverting it from landfill, incineration or realising in the nature. To reach a maximum impact and quick synergies implementation, Seitiss proposes two business offers.

1 Research of valorisation routes or alternative raw materials deposits and synergy technical feasibility assessment: This service is mainly dedicated to industries and focus on a certain resource. It includes 1) a deep analysis of the resource of interest characteristics, 2) a synergy study step with the identification of valorisation routes and the research of nearby potential partners to implement the synergy confirmed by an on-field survey, 3) a setting-up of the value chain by selecting the most adapted synergy, providers, and intermediates.
2 Synergy implementation and resource management turnkey package: this offers build on the first one and corresponds to a full resource management package. Seitiss is the unique contact point for the industry and manage all aspects of the resource valorisation: logistics, providers and subcontractor’ s management, legal and administrative documentation, chartering, quality guarantee.

These two services are presented in the figure below.

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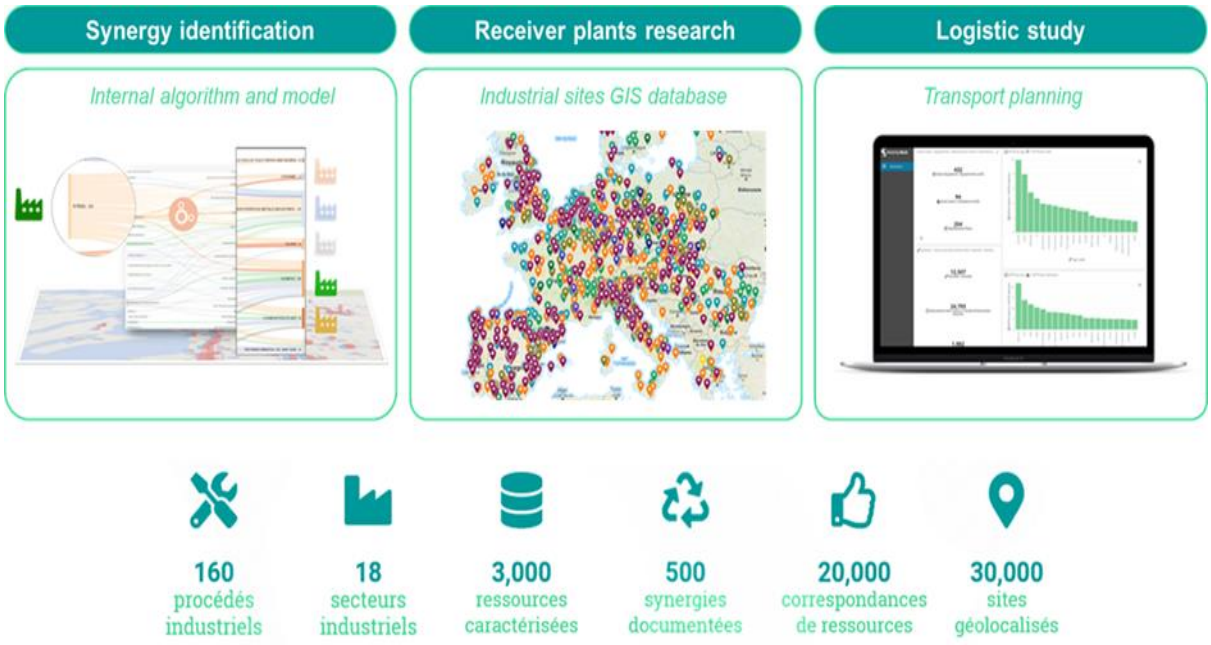

Figure 32 : Tools and skills (Source: SEITISS)

5.3.3. Use Cases

Seitiss has designed several offers according to the needs of each actor. These offers are presented through the following kind of stakeholder.

i. For territorial actors

Territorial actors (local and regional authorities) need to identify the strategic resources and potential synergies within their geographical area to wisely foster IS initiatives and increase their attractiveness. Seitiss proposes an identification of industrial plants that generate a certain amount of waste, lists and quantifies these resources and identifies all potential synergies that could be implemented:

- Identification of all actors within the territory
- Characterisation of all inputs/output flows, equipment, services, etc. available or under exploited at the territory level.
- Research of synergies related to the potential resource in the area and with neighbouring regions.
- Facilitation of the initiative through workshop and a collective intelligence platform to generate complementary synergies ideas, identify cross-interest and prioritise/select projects to implement.
- Report and summarise strategic synergy implementation with an associated action plan.

Seitiss can also stimulate the implementation process. These projects can often lead to feasibility study with industrial sites that have attended the workshops.

ii. Offers for industrial sites

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IS approach is an alternative solution for companies that pay taxes or which have the willingness to be more sustainable. Seitiss solution can be applied in many situations, in particular:

- Alternative raw materials research: the study proposed by Seitiss aims to find alternative raw materials compliant with the process and comparable in term of costs compared to the original raw materials.
- Alternative end of use for "waste resource": wastes that can be considered as resources become costly for companies to manage. Most of the time, Seitiss can find a solution to reuse it in another sector thanks to its database of resources and synergies.

These needs have frequently been met during events and meetings with industrial companies and managers. Offers have been made accordingly with the following common basis phases:

- Study of resource specifications (raw materials usually used or the waste resource characteristics)
- Research for synergies and relevant sectors to reuse/valorise it
- Prioritise the industrial sector interested in the resource
- Map and identify the corresponding installations at the regional scale
- Make a field survey and interview with technical expert
- Test the synergy by supplying samples to confirm the technical feasibility
- Find an intermediate actor that could treat the resource to make the synergy feasible (if needed) and find adapted conditioning and transport solutions
- Manage and operate the synergy flows on a daily basis: as the implementation remains difficult for industrial actors (managing waste is not the company's core business and the team lack the skills and time to manage it) Seitiss selects the most adapted intermediaries, the best packaging for the resource and the type of transport.

This service gives all keys to the industrial site for testing and implementing the synergy with its new partner. They have then the option to let Seitiss operate the synergy, which avoids a heavy burden to the industrial site.

Seitiss targets in priority the following industrial sectors: chemical, ferrous and non-ferrous metals, cement and construction, water treatment, agro-food industries, paper, glass, foundries and some manufacturing activities.

iii. For industrial parks

Seitiss developed an offer for industrial platforms/parks, also applicable to clusters and ports. It aims to identify and characterise all wastes streams generated at the platform level. An exhaustive review of wastes resources and characteristics is performed. Interviews are also planned with the industrial companies. Current valorisation routes are described (valorisation rate, final eliminator, final treatment mode, etc.) and improvements are discussed. At the end of the first phase, the platform and the decision-makers obtain a comprehensive view of circulating flows. The second phase of the project aims to search and define the best valorisation routes (at a local and regional level). Synergies between the platform's members but also with external solution providers are proposed and an action plan to reach the implementation is suggested. This action plan concerns quick wins options but also medium to long term structuring projects.

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Seitiss targets industrial areas (manufacturing, chemical Industries, cement Industries, steel Industries and petrochemical Industries) and chemical clusters.

5.3.4. Exploitation during the project lifetime

5.3.4.1. Background

Seitiss was developed within European projects related to Industrial Symbiosis. EPOS and SCALER enable to launch the activities and services. Other projects as ULTIMATE and AQUASPICE foster the fast deployment of the company, by reinforcing its network of industrial companies and identifying new synergies.

5.3.4.2. Analysis of additional synergies

Through ULTIMATE project, Seitiss carried out specific business exploration to accelerate its development. New relationships with major European industrial clusters within Ultimate enabled to get new business opportunities.

Seitiss especially analysed more in details a specific resource part on a case study and its potential synergies around the site of production. It generated a specific dedicated contract for Seitiss, outside of ULTIMATE project.

The technical feasibility of the process is still under investigation, but if feasibility is confirmed, a large replication to other locations in EU is envisaged. Seitiss will then be able to manage flows between the production site and the final users.

5.3.5. Exploitation after the end of the project

SEITISS expects a strong growth in the 3 next years, thanks to favourable environment and regulations. Industrial sites and territories are more and more interested in circular economy solutions.

The development plan of Seitiss for the next three years includes :

- **A strong focus on operating synergies already identified**. The challenge is to valorise all materials that have been secured in 2023 and 2024. Team dedicated to operations faces a strong ramp up in terms of tons per months to manage.
- **Research and Development** is still another source of revenues, as Seitiss continues to offer to industrial sites and municipalities its service to identify the strategic resources and potential synergies.

5.3.6. Conclusion about Seitiss

SEITISS is a startup created thanks to European projects (EPOS and SCALER). ULTIMATE, as other European projects (AQUASPICE, ONLYPLASTIC⋯), contributed to its development. Strong relationships with partners have been built during these projects and continue after their end.

SEITISS especially developed in ULTIMATE its matching system with new models on water-based synergies, and expanded its network to prominent industrial sites in EU. Seitiss

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generated additional revenues through a study dedicated to a resource on an ULTIMATE case study, which may then be replicated on several sites in Europe.

ULTIMATE then contributed to the strong growth of Seitiss over the last years and the recruitment of several team members. Seitiss will continue to grow and to exploit results of European projects.

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5.4. NEWASYS, a spinoff dedicated to REUSE consulting services

5.4.1. Context

As described in the Grant Agreement, one major objective of the ULTIMATE project is to maximise impact in terms of exploitation of results to **create jobs and value** at European level. Strane Innovation offered to use its entrepreneurial experience as startup factory, to test the potential for spinoff creation.

Indeed, creating startups can generate a high additional impact because their business models is tailored to their related commercial technologies or services. They can raise private funds (and therefore leverage EU funding), create jobs and economic activity, and deploy the solutions developed in ULTIMATE on the long-term based on an economically viable activity. Close interactions will be ensured with industrial partners to create maximal synergies among consortium partners

A rigorous methodology has been deployed to analyse all Key Exploitable Results and see those which can offer an opportunity to create spinoff. Alongside creation of the Water Europe Marketplace and a new activity by Greener Than Green Technologies, a potential has been identified for a consulting service firm, specialised in REUSE projects. Strane Innovation took the lead to analyse this opportunity and test the French market for such activity.

The market has been tested in a "pre-sell mode", that is to say by testing directly commercial offers. Building a completely new consulting activity from scratch took time, especially in a complex regulatory context in France. However, the intense work led by STRANE's entrepreneurial team showed a clear traction, as detailed in next sections. Several projects were sold (generating new revenues from ULTIMATE) and additional human resources were hired to support this launching activity. Organisation has been defined to pursue on a long-term basis this activity, and agreements with ULTIMATE partners are under discussion to continue collaboration after the end of the project.

5.4.2. Overview of the REUSE value chain

Through ULTIMATE project feedbacks on Case Studies, and commercial interviews led by Strane Innovation, a segmentation of the value chain of REUSE projects is presented on **Erreur ! Source du renvoi introuvable.**.

Figure 33 : overview of the REUSE value chain

(Source: STRANE INNOVATION)

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A REUSE project can be divided into 4 main blocks:

- **Instrumentation:** industrial sites are not fully equipped with flowmeters to measure consumption of their processes. Installing sensors and data visualisation software to get a vision of water consumption on site is a first critical step. Instrumentation is also needed to detect leaks in large water networks (on both large industrial sites and municipalities).
- **Consulting services:** industrial sites and municipalities need consultants to make audits of their water consumptions, identify potential REUSE projects, analyse water quantity & quality data, and recommend treatment trains and storage. Potential and feasibility studies are common deliverables for such phasis.
- **Engineering, Procurement and Construction** aims to design and build the additional treatments needed to reclaim water, alongside select the right suppliers and install treatments onsite.
- **Operation and Maintenance:** clients may need external partner to operate and maintain their REUSE treatment units. Some industrial sites and municipalities are open to directly buy m3 of reclaimed water, without operating the treatment installation. This opens up new opportunities in terms of business model.

5.4.3. NEWASYS concept and role on the value chain

Based on these 4 main blocks of the REUSE value chain, Strane led an iterative process to identify the better way to create a spinoff on this value chain to make the most of results generated during ULTIMATE project.

Strane decided to test the market potential of a consulting services firm. This activity requires little investment and is quite flexible. Strane organised the market test by creating a commercial name (*Newater Sources* at the beginning, which became *NEWASYS* in 2023 for IPR reasons), hired a staff of Water Treatment engineers and begun to test commercial offers. NEWASYS has been thought to accompany industrials and municipalities to reduce their water consumption and reuse their wastewaters. The market test has been led during the whole duration of ULTIMATE project (2020 to 2024). NEWASYS also builds on results of several other European projects dedicated to Water REUSE (NEXTGEN, between 2018 and 2022, and AQUASPICE between 2020 and 2025). The aim is to continue this activity after the end of ULTIMATE project, to maximise the impact of the project on job and value creation.

The concept of NEWASYS has been synthetised as follows on **Erreur ! Source du renvoi introuvable.**.

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Figure 34 : NEWASYS concept

In details, NEWASYS helps its clients to set up synergies between available unconventional water sources (especially industrial wastewaters and wastewaters form municipal WWTP) and authorized uses (for industrial processes, municipal uses…), as presented on **Erreur ! Source du renvoi introuvable.**. Uses are strictly regulated in France, and regulation has changed a lot in 2023 and 2024. The NEWASYS team is then obliged to make a constant regulatory watch.

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Figure 35 : commercial documentation of NEWASYS explaining how REUSE works

5.4.3.1. NEWASYS' activities

To begin its activities, NEWASYS focused on consulting services to foster REUSE projects in France. Three main offers have been developed, as presented on **Erreur ! Source du renvoi introuvable.**.

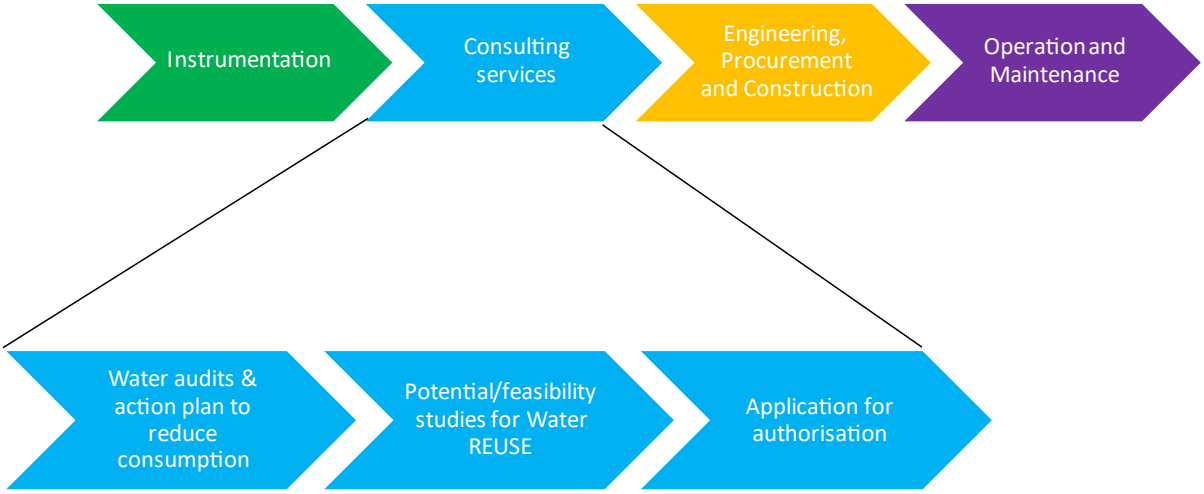

Figure 36 : Overview of NEWASYS' activities on the REUSE value chain

1. Water audits and action plan to reduce consumption aim to get an overview of water consumption and list potential optimisations. A site visit is always included to better understand how works the siteThis kind of mission is mostly contracted by industrial sites.

2. Potential and feasibility studies on REUSE projects firstly aim to analyse all wastewater sources and uses of water on a given territoryThis potential study primarily relies on a spatial analysis approach, which is complemented by interviews with potential users of reclaimed water located near the wastewater source.

After identifying potential REUSE projects (linking 1 source of unconventional water and 1 or more users), a feasibility study is led to analyse all technical, economic, environmental, organisational and regulatory aspects. A targeted water quality is defined for the reclaimed water, additional treatments are defined and pre-dimensioned, storage and required water networks are defined

This kind of mission is contracted by municipalities as well as by industrial sites. It requires on average 4 to 12 months.

3. Application for authorisation: after validation of the project by the client, NEWASYS writes all documents needed to apply for an operating authorisation.

This takes on average 2 to 4 months, with several meetings with the French administration (DREAL, ARS…).

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5.4.3.2. NEWASYS clients – market segments

NEWASYS addresses 5 main types of clients:

- **Industrial sites:** regulation published in June 2023 in France obliges most of industrial sites to reduce by up to 25% their water consumption is case of severe drought (which was the case in most French regions between June and October 2023). They have then a strong interest into analysing their consumption and finding ways to reduce their consumptions. Financial stakes are huge and sometimes jeopardises the future of the site (for instance a papermill cannot works without water available in large quantities). Industrial sites are then really interested by setting up internal water loops and/or water REUSE projects with neighbours. Most of companies have also a strong Corporate and Social Responsibility (CSR) policy, which include water and often gives quantified objectives in terms of reducing water consumption. REUSE projects are then a "sexy" subject, enabling sites to communicate with their employees, their clients and the general public. This market segment was the first segment targeted by NEWASYS, as most of case studies are linked to this market segment (CS1, CS3, CS4, CS5, CS6, CS7, CS8, CS9).
- **Municipalities:** they face also obligations to reduce their water consumptions which can have an impact on the quality of life of local residents (for instance they cannot irrigate green spaces, so local residents suffer from a lack of vegetation during heat waves). Municipal representatives also face a strong demand of their electors for sustainable and innovative projects. Elected people have to show that they take concrete actions against global warming effects. Moreover, the French government strongly supports REUSE project since March 2023 and the publication of the "Water Plan". This market segment is linked to some case studies in ULTIMATE project, especially CS3, CS6 and CS9.
- **Other economic actors:** some other economic actors face severe financial and image impacts during droughts. For instance, golf owners face more and more social protests due to the fact that golfs continue to irrigate their greens during droughts. At the same time, the lack of irrigation generates financial losses (golfers cannot play on a degraded green) and additional costs to install new greens. Swimming pools are also highly interested to reduce their water consumption, as public is more and more careful about environmental topics. These actors are then interested in finding innovative ways to meet their water needs.
- **Agriculture associations:** farmers face dramatic situations when they cannot irrigate their crops. Farmers are often gathered in local associations, which can promote REUSE projects at a large territory scale. This market segment can be found in ULTIMATE project through CS2.
- **Construction sector:** the impact of water consumption is more and more taken into account when planning new constructions. Recovering and reusing rainwater is encouraged by the Government, and construction actors try to include this opportunity in their new housing projects.

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5.4.4. Business model of NEWASYS

The business model for consulting activities is traditional and already initiated thanks to first contracts won during ULTIMATE project. The business model is presented in the following business model canvas.

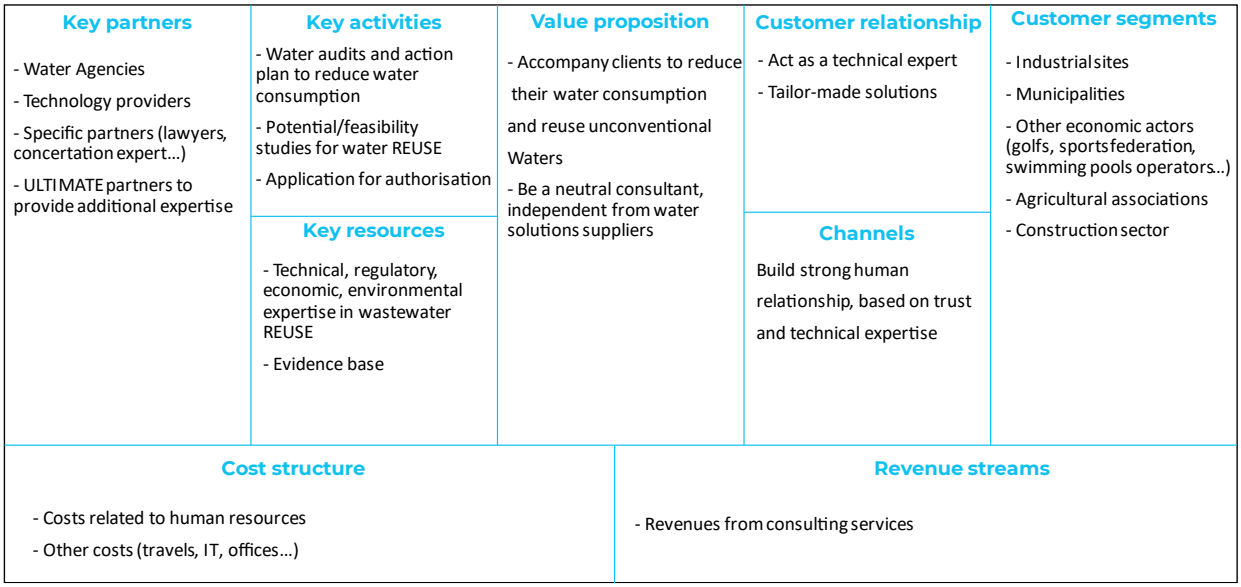

Figure 37 : Business model canvas of the consulting activity

NEWASYS value proposition is centered around helping clients reduce water consumption and reuse unconventional water sources. NEWASYS offers a range of services tailored to these goals.

In terms of competition, NEWASYS stands out due to its independence from water treatment suppliers, its focus on innovation, and its knowledge of European best practices. Competitors include consultancy firms like Ecofilae and DV2E, as well as larger companies like Veolia and Suez. However, NEWASYS distinguishes itself by operating in Northern France, where competitors are less active.

Building strong personal relationships through site visits is crucial for NEWASYS's sales strategy, although videoconferencing is also used when necessary. The company aims to be seen as an expert resource, providing tailor-made solutions to meet its clients' specific objectives.

NEWASYS generates revenue by selling studies. French Water Agency subsidies, which cover 40-60% of the costs, play a significant role in supporting these projects.

Key partnerships are critical to NEWASYS's operations. The company collaborates with various experts, including those from the ULTIMATE project, and plans to expand partnerships in areas such as instrumentation and maintenance. These collaborations allow NEWASYS to offer comprehensive solutions to its clients.

The core activities of NEWASYS include conducting water audits, feasibility studies for water reuse, and handling authorization applications. Human resources are the primary cost driver for the company, supplemented by expenses related to travel, IT, and office operations. Strong

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partner networks and data from reuse projects are essential resources for NEWASYS' s continued success.

5.4.4.1. Further development of NEWASYS activities

5.4.4.1.1. Offers to be developed to complement current NEWASYS activity

The first objective of NEWASYS during the duration of the ULTIMATE project was to determine if there was room for a consulting services actor dedicated to REUSE projects in France. After a successful market test during 4 years, the number of contracted offers shows a strong interest in such spinoff and encourage to see bigger.

In the future, NEWASYS plans to develop its activities upstream and downstream, in close collaboration with partners, especially from ULTIMATE consortium.

The objective of NEWASYS in a medium-long term perspective is to be able to offer services on the whole REUSE value chain. NEWASYS will also try to favour long-term and/or repetitive contracts to increase financial visibility of the activity. Additional expertise, knowledge and tools will then be integrated into NEWASYS offer to reach these objectives.

5.4.4.1.2. Creating partnership opportunities across ULTIMATE

STRANE analysed activities of all partners in the ULTIMATE project to identify partners that can complement the NEWASYS offer on the REUSE value chain. Through expertise of ULTIMATE partners, NEWASYS can benefit from additional expertise available when needed. The European vision of these partners are also a strong advantage, to make the most of existing good practices and disseminate them in France.

STRANE organised meetings with partners to discuss their respective visions, fields of expertise, and how these areas of expertise could be mutually beneficial.

The conclusion of each meeting was a proposal to sign a Memorandum of Understanding (MoU) between NEWASYS and the respective partner, with a defined perimeter of action and selected consulting services. An example of such MoU is given below:

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Memorandum of Understanding (MoU)

Between

Strane Innovation SAS, having its registered office at 2 route de la Noue, 91190 Gif-sur-Yvette, France, and lawfully represented by Olivier Vallet, General Manager (hereinafter referred to as "Strane" or "Newasys" or "Party") ...

AND

"Name of the partner group"

Taking into consideration that

- Strane and "the partner" are involved in ULTIMATE project (receiving funding from the European Union's Horizon 2020 research and innovation programme under agreement N° 869318), which aims to create economic value and increase sustainability by valorising resources within the water cycle. Wastewater is not only a reusable resource but also a carrier for energy and components that can be extracted, treated, stored, and reused. Drawing on "Water Smart Industrial Symbiosis" (WSIS), the project promotes wastewater recycling in various industrial settings.

- As part of its tasks in the ULTIMATE project, Strane Innovation developed a consulting service named "Newasys", which accompanies industrial sites and municipalities to reduce their water consumption and reuse their unconventional waters (industrial wastewater, wastewater from municipal WWTP, rainwater...). Strane led a market test of this activity by developing methodologies and submitting real offers to clients, in a "pre-sell mode". The market test has been successful and Strane plans to continue the Newasys activity after the end of Ultimate project.

- General purpose of the partner group

1. Purpose

This Memorandum of Understanding (MoU) is entered into by and between Strane and KWB (collectively referred to as the "Parties") for the purpose of collaborating on consulting assignments in the water sector. The Parties intend to combine their expertise, resources, and efforts to jointly provide high-quality services to clients.

This MoU is made in good faith and signifies the commitment of the Parties to explore and establish a successful collaboration in the water sector.

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2. Scope of Collaboration

The collaboration will focus on consulting services on water issues, provided to industrial sites and municipalities in France and in the rest of European Union.

3. Roles and Responsibilities

NEWASYS (activity of the Strane Innovation Group) will:

- Lead project management and oversee the execution of joint projects.

- Provide technical expertise and resources in water resource management.

- Manage client relationships and act as the primary point of contact for joint projects.

"Partner" (activity of the partner group) will:

-
-
-

4. Confidentiality

The Parties agree to maintain the confidentiality of any proprietary or sensitive information exchanged during the course of their collaboration. Such information shall not be disclosed to third parties without the prior written consent of the originating Party.

5. Term and Termination

This MoU will be effective from the date of signing and will remain in effect for a period of 3 years. It may be renewed or extended upon mutual agreement of the Parties. Either Party may terminate this MoU by providing thirty (30) days written notice to the other Party.

6. Non-Binding Nature

This MoU is intended to outline the mutual understanding and intentions of the Parties. It is not legally binding and does not create any enforceable rights or obligations. Any specific projects or engagements arising from this MoU will be subject to separate agreements.

7. Amendments

Any amendments or modifications to this MoU must be made in writing and signed by authorized representatives of both Parties.

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8. Dispute Resolution

In the event of any disputes arising out of or in connection with this MoU, the Parties agree to attempt to resolve the disputes through good faith negotiations. If the disputes cannot be resolved amicably, they may be referred to mediation or arbitration as agreed by the Parties.

Date: XX/09/2024

Signatures

For Strane Innovation SAS	**For the Partner**
Name: Olivier Vallet Title: General Manager Signature:	Name: Title: Signature:

Figure 38 : Example of Memorandum of Understanding proposed to ULTIMATE partners

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5.4.5. Conclusion for the NEWASYS spinoff

5.4.5.1. Potential of the spinoff

The initial objective of this task was to test the market traction for a consulting firm dedicated to REUSE projects, in a “pre-sell mode”. the spinoff appears to be highly promising, as the results in contracts won by NEWASYS attest. The French governmental “Water Plan” increases the need for consulting firms dedicated to REUSE projects.

The interest for the concept is then validated from the Strane Innovation’s perspective.

5.4.5.2. Risks and uncertainties

The regulatory context is a threat: the NEWAYS activity is highly dependent on regulations set up by the Government. From 2021 to 2023, needs were low due to high regulatory barriers. The Governmental “Water Plan” published in March 2023 kicked off the market demand. A change of Government and in Ecology Ministry priorities may jeopardize NEWASYS activity.

5.4.5.3. Go decision

Thanks to commercial activities developed within ULTIMATE project, Strane Innovation has been able to test the market during the project and is now able to support the future development of the spinoff. A legal creation of NEWASYS as an independent entity is planned in 2025 or 2026.

Strong relationships with ULTIMATE partners have been built during the project and will continue after the end of the project. Partners can be involved in some commercial offers, based on their specific expertise.

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6. Key performance indicators and achieving impact

This section outlines results of the plan for harnessing the impact potential of the exploitable results presented above and for measuring the success of the exploitation efforts.

6.1. Exploitation KPIs

ULTIMATE's success at reaching targets related to the exploitation objectives is evaluated using exploitation key performance indicators (KPIs). The main objectives include the successful adoption of results and benefits within emergency services, research communities and policy advisers and ensuring the longevity of the project's results through either policy uptake, further research, or commercial applications.

KPIs are set at multiple levels to ensure that the exploitation potential is considered thoroughly. Several exploitation KPIs have been defined and assessed, as presented in the following table.

Table 37 : KPI and results obtained through the duration of the ULTIMATE project

KPI	Result obtained
Percentage of KER reaching their expected TRL or overachieving it at the end of the project	74%
Number of new products, processes, and methods launched into the market	17
Number of technologies shared on the Water Europe Marketplace	88
Number of new activities launched by partners thanks to ULTIMATE	2 (WaterEurope Marketplace and new product line for GreenerThanGreen)
Number of start-ups or spin-offs created	1 (NEWASYS)
Expected job creation linked to new activities/spinoff (3 years after the end of ULTIMATE)	About 60 jobs
Expected value creation linked to new activities/spinoff	About **32 M€** of revenues over the next 3 years
Number of publications in peer-reviewed high impact journals	65 OpenAIRE publications and 43 project publications.
Number of patents under investigation	4

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6.2. Potential barriers for further exploitation of results

The deployment and uptake of WSIS depends also on potential barriers that could be encountered. For example, market barriers could be related to "absence of awareness about the need of such a product/service", "potential users not accepting it", "high costs of commercialisation" but also to the “high level of novelty of the product” in case of research breakthroughs or radical innovations. The identification of possible market barriers implies the need for the partner to identify suitable mitigation paths to overcome the barriers and check the efficacy of the actions undertaken.

The following table**Erreur ! Source du renvoi introuvable.** presents types of barriers that could encountered technologies developers and could impact the adoption of WSIS. Some have been taken from barriers faced on case studies, as presented in D5.2.

Table 38: Types of potential barriers

Type of barrier	Examples
Technical	▪ Encounter problems to reach expected TRL ▪ Adequacy of the technical response to the needs of the water sector and water intensive industries ▪ Possibility to the potential adopters to adapt their process for WSIS solutions implementation ▪ Proof of the technical benefit ▪ Technology integration problems
Market	▪ Reluctance to change existing practices for firms with a long history and stable contexts ▪ Restrictive market: not enough final users ▪ No replicable solution ▪ Too low margin ▪ Instability in demand factors (i.e. need) ▪ Market immaturity
Legal & regulatory	▪ Lack of regulation about water and waste reuse ▪ Broker with regulatory authorities do not lead to an exploitation position for water / energy / nutrients reuse ▪ Water treated by WSIS solutions do not reach the adapted threshold for irrigation or other use ▪ Regulatory issues due to threshold definition (g/L)
Policy to incentivise	▪ No financial incentive fostering the adoption of Ultimate technologies ▪ Uncertainty in the approach of future policies
Model	▪ Need for an innovative or non-conventional business arrangement or partnerships to make the technology exploitable
Economic and operational	▪ Technologies requiring massive investments and financial support ▪ Adequation costs /effort to implement / benefits expected ▪ Solution economically not acceptable for small-scale enterprises ▪ Lower, unclear or inexistent economic benefits ▪ Lack of funding
Overloading	▪ In the case of the adoption of a WSIS solution require time consuming operation compared to the current situation

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7. Conclusion

This deliverable provides an overview of the Key Exploitable Results (KERs) developed during the ULTIMATE project and outlines how they will be utilized after the project's completion. The report begins by gathering data on each KER and analyzing the market sectors they target, followed by the development of exploitation plans based on this information.

The deliverable was created using the following approach:

- **Context and Market Assessment:** A brief review of relevant literature and an analysis of KER characteristics were conducted to evaluate the current state of marketable solutions.
- **Market Identification and Sizing:** The markets for ULTIMATE technologies were identified and sized using European data, with key regions for implementation highlighted.
- **Strategy Development:** Actions and strategies were proposed to help these technologies penetrate the market and continue to evolve.

Wastewater technologies are in demand across various industrial sectors due to the need for efficient water treatment and reuse solutions. The ULTIMATE project has played a key role in advancing these technologies, which offer significant environmental and economic benefits.

The market assessment identified key regions for the deployment of ULTIMATE technologies, including Northern Italy, Central Spain, and Western Germany. In France, while the market is present, the opportunities are more dispersed. These technologies, supported by the ULTIMATE project, are now market-ready and offer substantial job creation and economic advantages, particularly in water, material, and energy recovery.

Three new products or companies, highlighted in the deliverable, have significantly benefited from the consortium's expertise and European Commission funding. These innovations represent a strong return on investment, positively impacting both industry and the environment. Other KERs, while not yet fully market-ready, have shown strong potential and are progressing well.

The ULTIMATE project has also strengthened partnerships among consortium members, fostering collaboration that may continue beyond the project. These relationships could lead to formal partnerships, ensuring ongoing cooperation and innovation.

In addition, the ULTIMATE project has made significant contributions to scientific knowledge across multiple disciplines. The research and technological advancements have expanded the understanding of water-smart industrial symbiosis and have practical applications for industries globally.

Overall, the ULTIMATE project demonstrates the value of European-funded initiatives in driving scientific progress, economic growth, and environmental protection. The knowledge and partnerships developed during the project are expected to have a lasting impact, paving the way for future innovations in sustainability and resource efficiency.

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