

# Deliverable 7.9

Risk Management Plan – updated (2<sup>nd</sup>)

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

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Date: 29/10/2024





## Technical References

Project Acronym	ULTIMATE
Project Title	ULTIMATE: indUstry water-utiLiTy symblosis for a sMarter wATer society
Project Coordinator	Gerard van den Berg KWR
Project Duration	01.06.2020 – 31.10.2024 (53 months)

Deliverable No.	D7.9
Dissemination level <sup>1</sup>	PU
Work Package	WP7
Task	7.6
Lead beneficiary	KWR
Contributing beneficiary(ies)	KWR
Author(s)	Joep van den Broeke (KWR)
Quality Assurance	Gerard van den Berg (KWR)
Due date of deliverable	31/10/2024
Actual submission date	29/10/2024

<sup>1</sup> 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)

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## Document history

V	Date	Author(s) /Reviewer(s) (Beneficiary)	Description
0.1	22/10/2024	Joep van den Broeke (KWR)	First Draft
0.2	27/10/2024	Gerard van den Berg (KWR)	Quality Assurance
0.3	28/10/2024	Joep van den Broeke (KWR)	Addressing QA comments
1.0	29/10/2024	Joep van den Broeke (KWR)	Final Version





## Executive Summary

Risk management is the process of identification, analysis, monitoring and control of internal and external risks. The risk management process also identifies mitigation and corrective actions and their implementation, in case of risk materialization, at the earliest possible moment. To manage risks that arise during the project a Risk Management Plan (D7.4) has been prepared which defines the processes, tools and procedures that will be used to identify, manage and control risks. It also defines the roles and responsibilities of the consortium partners in the risk management processes in the project. Risk management is a continuous process throughout the lifetime of a project. This process involves the risk management chain that includes the identification, analysis, monitoring, controlling, and reporting the potential technical and management risks. The strategy also covers other issues that might affect the project progress towards its objectives, including potential mitigation actions to act as early as possible. The risk assessment process is continuous, and therefore the risk management plan is updated throughout the entire lifetime of the project. An updated version of the Risk Management Plan (D7.8) was produced in M30.

The current document is the third (updated) and final version of the Risk Management Plan. Building on the previous version (D7.8), this deliverable reiterates the processes, tools and procedures used for risk management in ULTIMATE in the period between M30 and M53. In addition, it describes the risks identified up until the end of the project (M53), and the final assessment of these risks and their impact on the project and preventive actions and mitigation measures taken to prevent such an impact.

Throughout the project, 25 foreseen risks and 25 unforeseen risk were identified. The foreseen risks were defined during the proposal submission based on previous experience with similar research project and on developments within the consortium during the Grant Agreement preparation. The unforeseen risks primarily resulted from major regional and global events, such as the COVID-19 pandemic and the conflicts in Ukraine and the Middle-East. Mitigating actions have been taken to limited the impact of these risks. As a result, they have resulted in delays in the realisation of some of the activities in ULTIMATE, but they did not jeopardise the project outcomes.

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## List of Abbreviations

<b>AnMBR</b>	Anaerobic Membrane Bioreactor
<b>AOP</b>	Advanced Oxidation Process
<b>CoP</b>	Community of Practice
<b>CA</b>	Corrective Action
<b>CS</b>	Case Study
<b>ELSAR</b>	Electrostimulated Anaerobic Reactor
<b>HT-ATES</b>	High temperature aquifer thermal energy storage
<b>M</b>	Project month
<b>MS</b>	Milestone
<b>OBS</b>	Open Broadcaster Software
<b>PM</b>	Preventive Measure
<b>PMT</b>	Project Management Team
<b>PO</b>	Project Officer
<b>PSB</b>	Project Steering Board
<b>RMP</b>	Risk Management Plan
<b>RMR</b>	Risk Management Register
<b>RO</b>	Reverse Osmosis
<b>SCADA</b>	Supervisory control and data acquisition
<b>STC</b>	Scientific and Technical Committee
<b>SCWE</b>	Subcritical Water Extraction
<b>ULTIMATE</b>	indUstry water-utiLiTy symbiosis for a sMarter wATEr society
<b>UV</b>	UV-disinfection
<b>WP</b>	Work Package
<b>WPL</b>	Work Package Leader
<b>WSIS</b>	Water Smart Industrial Symbiosis
<b>ZLD</b>	Zero liquid discharge





# 1. Introduction

Risk management is the process of identification, analysis, monitoring and control of internal and external risks. This process covers any other issues that might affect the project progress towards its objectives. Moreover, the risk management process also identifies mitigation and corrective actions and their implementation, in case of risk materialization, at the earliest possible moment. Risks can arise from unexpected technical and managerial issues within the project. Examples of such issues include unexpected scientific findings, poor communication or co-operation between the partners, resource shortage by partners, human operational errors, planning errors, poor quality, and incomplete tasks. As these risks can occur throughout the project, and cannot always be foreseen, risk management is a continuous process throughout the entire lifetime of a project. This Risk Management Plan outlines policies and procedures for identifying and mitigating the potential risks that can occur in the project.

It is the objective of the Risk Management Plan (RMP) to decrease the probability and impact of events adverse to the project.

In ULTIMATE (indUstry water-utiLiTy symbiosis for a sMarter wATer society) 28 project partners, and 2 linked third parties, worked together over a period of 53 months to build an evidence base for industrial symbiosis based on real-world, large-scale demonstrations. The project hinged upon the case studies, located in nine different countries across Europe and Israel, in which large demonstrations of symbiosis solutions took place.

The nine large-scale demonstration cases covered the four most important industrial sectors in Europe: Agro-food processing, Beverages, Heavy chemical / petrochemical and Biotech industry. The cases demonstrated technologies for turning wastewater into a resource, recovery, refining and reusing wastewater, and for extracting and exploiting energy and materials contained in industrial wastewater. Figure 1 provides a schematic overview of parties involved in the industrial symbioses, Figure 2 provides a schematic representation of the processes covered by ULTIMATE.







# 9 SYMBIOSIS BETWEEN:

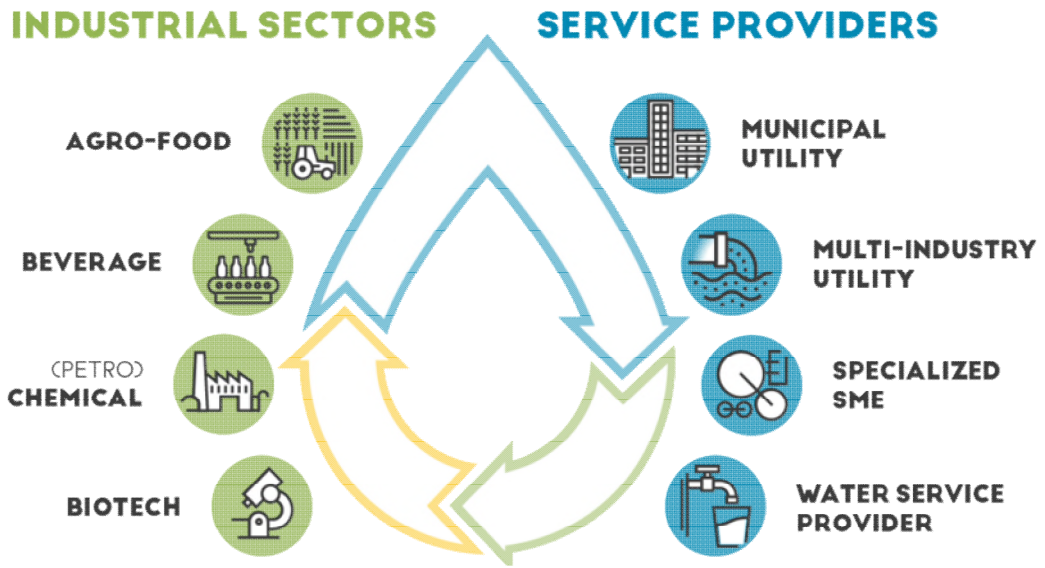


Figure 1 - Overview of ULTIMATE project main components

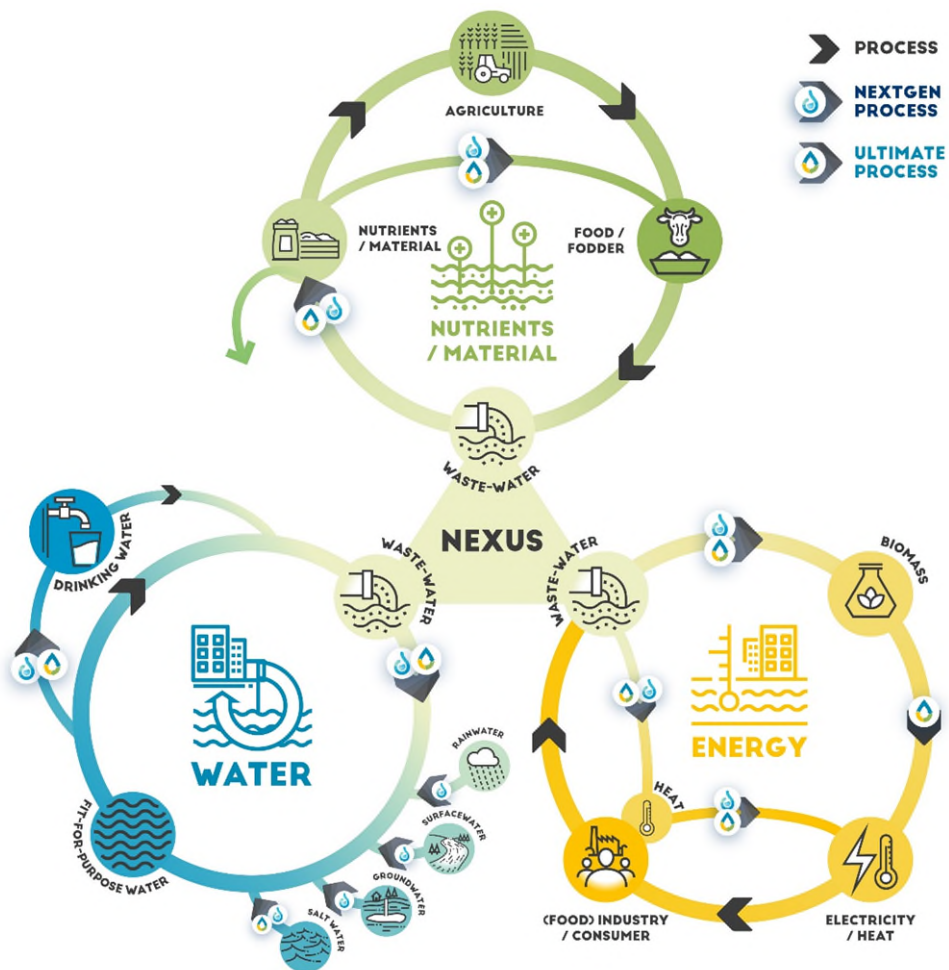


Figure 2 - Schematic overview of the processes covered by ULTIMATE





The other work packages built upon the outcomes from the case studies and worked closely together with the case study participants as well as external stakeholders. Therefore, the project was characterised by interdependencies the different tasks and work packages. Furthermore, ULTIMATE was positioned in the midst of society with case studies being performed in operational industrial setting and engagement of a wide range of stakeholders including citizens and businesses. Because of this, ULTIMATE activities were influenced by legislation (European, national, regional), economic factors, pandemics, and many other external factors. In addition, the project faced the unforeseen effects of the SARS-CoV-2 (COVID-19) pandemic and ensuring lockdown and logistics crisis, as well as the impact on the Russian-Ukraine conflict and its effects on materials availability and prices and in particular its impacts on the energy supply. Because of this complexity, an active risk management approach was essential to guarantee the successful completion of the project within the agreed framework.

To monitor and minimize the project risks, the consortium prepared a list of risks and proposed contingency plans in the proposal elaboration (project inception phase). This list is part of the Grant Agreement (GA), and contains the major perceived risks related to the project work plan, a classification of their probability and a description of contingency measures envisaged by the consortium. The RMP is a dynamic and continuous document that was updated throughout the lifetime of the project, and therefore it has been complemented by information from the project partners collected during the start-up phase of project (M1 to M53), e.g. the risks ensuring from the COVID-19 pandemic. This collected information is included in this RMP. The final revised versions of this document is included in this Deliverable 7.9 (Risk Management Plan updated (2nd)).

This RMP is structured as follows: Section 2 details the Risk Management Procedure, in two main themes: Process (Section 2.1) and Roles and responsibilities (Section 2.2). Section 3 presents the final Risk Management Register, followed by Conclusions (section 4).





## 2. Risk Management Procedure

### 2.1. Process

For the identification, monitoring and mitigation of risks, a standardised management process is defined. This process is followed throughout the project lifetime and irrespective of the nature of the risk or the level at which it affects the project (operational, executive, and strategic). Figure 3 summarises the risk management process, which is explained in more detail in this chapter.

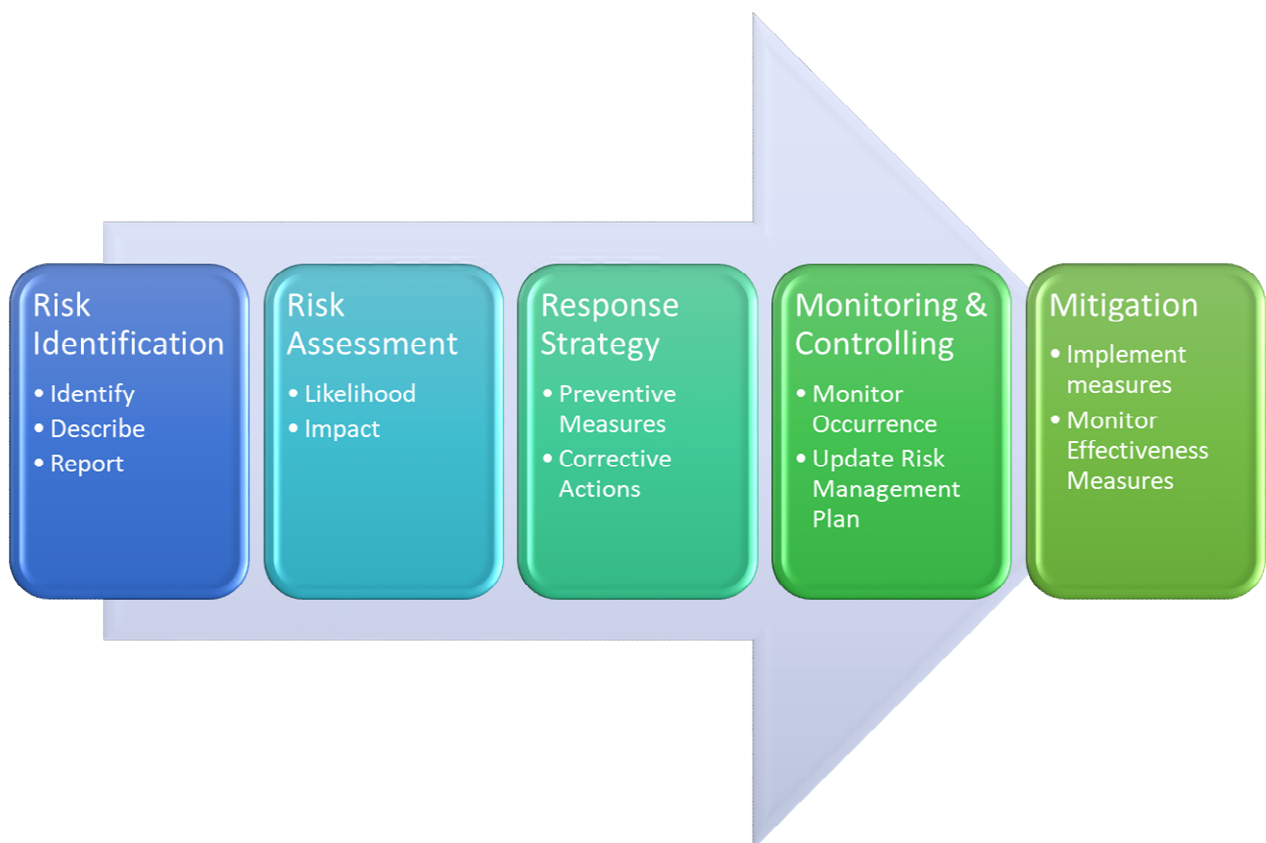


Figure 3 - Risk Management Process

The identified risks are recorded in the Risk Management Register (RMR). This register contains the following information: risk number, nature of threats, description and likelihood, WP affected and proposed risk management mitigation measures. This register will be accessible to all consortium members through the ULTIMATE SharePoint environment (\Documents\WP7\Risk Management Plan).

#### 2.1.1. Risk Identification

The process of risk identification is a continuous process throughout the life cycle of the project. It consists of the identification of issues that might affect the project progress towards its objectives. Once a risk is identified it will be described (nature and





potential consequences) and will be reported to the work package leader of the work package concerned and/or directly to the Project Management Team and Risk Officer in case of it concerns a risk at a strategic level. The WP leader has the responsibility to report new risks identified to the Risk Officer.

The following actions will be used as tools and techniques for risk identification:

- Analysis of actual vs. planned deliverable status
- Analysis of WP schedules and scopes
- Regular communication of the WP leaders with the task leaders / case study leaders
- Regular communication of the Project Management Team with the WP leaders (monthly meetings)

### 2.1.2. Risk Assessment

The risk assessment step will determine the exposure to a given risk. The exposure is estimated using the risk matrix in Figure 4.

Concerning each of the risks, the Risk Officer, in collaboration with the WP leaders, will estimate the probability that the risk will materialise (Low/Medium/High) and the impact of the risk when it materialises (Low/Medium/High).

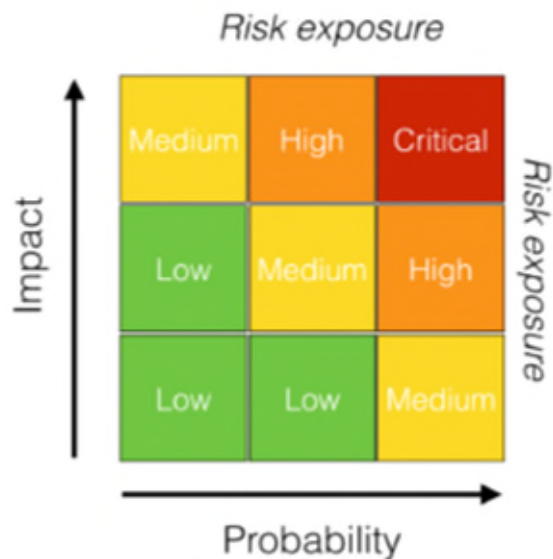


Figure 4 - Risk Matrix

Figure 4 is a standard Qualitative Risk Management Matrix, which can be found in numerous [publications](#) and [web-tools/websites](#). It has been widely in use for similar projects and project management.





### 2.1.3. Response Strategy

Once a risk has been identified and has been assessed, the response strategy is defined. The response strategy consists of two elements: preventive measures and corrective actions.

**Preventive measures** will reduce the likeness of the issue occurring. Most of the preventive measures are already defined and documented in the mentioned Risk Management Register. **Corrective actions** are measures to be taken to reduce the impact on the project in case of risk materialisation. These measures ensure a suitable strategy for achieving the proposed project objectives despite the consequences of the risk.

At this stage, the Risk Officer, in collaboration with the WP leaders and consortium partners affected, is responsible for defining preventive measures and corrective actions. Both preventive measures and corrective actions are documented/updated in the Risk Management Register.

### 2.1.4. Monitoring, Controlling and mitigation

The risk monitoring process is an ongoing and continuous process that will be carried out throughout the project. The identified risks, together with the risk assessment and response strategy are documented in a risk table inside the RMR. The RMR is accessible to all partners through the SharePoint project environment. The RMR forms the basis for the risk monitoring and controlling. For each risk included in the table, the following is performed:

On project partner is assigned the role of monitoring the risk (occurrence, changes in circumstances that need adjustment of risk assessment and/or response strategy).

1. In case a risk is identified as high or critical, it will additionally be monitored by the Risk Officer.
2. In case of an alteration of the risk status or level, the responsible partner should update the risk table and report this to the Risk Officer and the WP leader of the WP concerned.
3. In case of substantial change in the risk status or level, the Risk Officer and Project Management Team (PMT) will assess the risk and, in cooperation with the responsible partners, will define the response strategy.
4. In case the risk occurs, the partner informs the Risk Officer and the WP leader of the WP concerned, and mitigation measures are implemented by involved partner(s).
5. The WP leaders meet each month to discuss progress in the WPs including potential issues that have been identified. In case an identified issue cannot be solved in the WP leader meeting, it can be escalated to the Project Management Team (PMT) (see next bullet point).
6. The Project Coordinator organises monthly meetings of the PMT. In these meetings, one of the discussed aspects (included in the agenda as a separate





point) relates to issues that may have arisen within a month<sup>1</sup>. Hence, all potential issues that occur as a result of the project execution can be discussed and resolved in the mentioned meetings.

7. The STC and PMT may establish task forces to take the necessary actions according to the directions provided by the PSB. In case no resolution is reached, the PSB will be consulted and will establish mitigation plans to reduce the impact of the risk occurring. Responses may include increased supervision, adjustments to the project strategy, changes to implementation arrangements, and/or changes in budget allocations.
8. In parallel to the abovementioned aspects, the Risk Officer performs a 6-monthly review of all the risks in the RMR together with the responsible project partners.
9. An item can be considered closed when the following criteria are brought together: the risk-mitigation measures have been implemented and a new exposure risk is estimated as low using the Risk Matrix.

## 2.2. Roles and Responsibilities

### 2.2.1. Consortium Partners

Risk management is a responsibility of all consortium partners. Each partner has the responsibility to report immediately to their respective WP Leader (WPL) about any risky situation that may arise and may affect the project objectives or their successful completion. Any change in the time schedule of deliverables or in the allocated budget must be reported to the corresponding WP Leader. At this point, the WPL will report the Risk Officer, the project coordinator and, in case of necessity it will be informed the Project Officer (PO).

### 2.2.2. Work Package Leaders

The WPLs are responsible for the coordination and monitoring of the activities within their work package. Furthermore, they are responsible for synchronisation between the task leaders in their same WP and will support the PMT in co-ordination of all horizontal activities among the WPs. In this role, they are the first level of the risk management process. They are responsible for the identification and management of the risks within their work package. Moreover, they have the responsibility to report new risks identified and, report on changes in the situation concerning identified risks to the Risk Officer (RO), who is a member of the PMT.

The WPL and partners in charge of the WPs are defined in the following table. In this table it is included the contact points and, the PMT members:

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<sup>1</sup> As detailed in the Project management handbook, the PSB meetings are organized once a month in order to monitor the project and minimize the effects of potential risk materialization.







Table 1. WPL responsibilities and contacts

WP	Partner	Contact
WP1	KWB	Anne Kleyböcker
WP2	EUT	Eloy Hernandez-Busto
WP3	NTNU	Andrew Perkis
WP4	KWR	Raul Glotzbach
WP5	STRANE	Olivier Vallet
WP6	ESCI	Kristine Jung
WP7	KWR	Lydia Vamvakeridou-Lyroudia

### 2.2.3. Project Management Team

The Project Management Team (PMT) formed by the Project Coordinator and the Administrative, Innovation and IPR, Quality Control, Risk and Ethics Officers, is the organisational body responsible to the overall management of the project. As such, the PMT is responsible for the definition and implementation of the risk management process. Moreover, this team has the final responsibility for the monitoring and control of risks of all project activities. The PMT appoints a dedicated Risk Officer to lead this important activity.

In this regard, the PMT, as reported in the project management handbook, it is composed by the following members:

Table 2. PMT composition including partners and contacts

Role	Partner	Contact
<b>Project Coordinator</b>	KWR	Gerard van den Berg
<b>Project co-coordinator</b>	NTUA/KWR	Christos Makropoulos
<b>Risk Officer</b>	KWR	Joep van den Broeke
<b>Administrative Officer</b>	KWR	Bianca van der Wolf
<b>Innovation and IPR Officer</b>	UNIVPM	Francesco Fatone
<b>Quality Control Officer</b>	EUT	Andrea Naves Arnaldos
<b>Ethics Officer</b>	NTNU	May Thorseth
<b>WP7 leader</b>	KWR	Lydia Vamvakeridou-Lyroudia

### 2.2.4. Risk Officer

The Risk Officer is a member of the PMT and is the primary contact point concerning risk management and mitigation. The Risk Officer leads the writing and maintaining of the Risk Management Plan. Moreover, the Risk officer also coordinates the operationalisation of the risk management strategy. The Risk Officer will communicate to Project Management Board the risks and their implications to find common solutions and impact minimizations in the project execution.

In ULTIMATE, the Risk Officer (as mentioned in Table 2) is Joep van den Broeke (KWR).





### 2.2.5. Scientific and Technical Committee

The Scientific and Technical Committee (STC) is the executive body where the progress of the overall project is monitored and managed. The STC consists of the WP leaders and is chaired by the Project Coordinator (see Table 1 for the details about their composition).

Its main responsibility is to ensure that the scientific and technical activities of the project are accomplished successfully. The STC discusses and proposes solutions in case a risk materialises. The STC decides whether an issue can be tackled within the context of the task or work package, or whether it must be communicated to the Project Steering Board (PSB) or the European Commission (EC). In the latter cases, the STC will develop a proposal to be communicated to the PSB for decision.

### 2.2.6. Project Steering Board

The PSB (chaired by the coordinator) is a representative body of all the partner organisations in ULTIMATE. The PSB discusses and decides on issues related to the general progress of the project. When the resolution of an issue is not possible within the task or work package affected, and necessary mitigating measures do not fall inside the mandate of the STC, the PSB will be consulted. The PSB can decide on plans to mitigate the impact of the risk occurring. Responses may include increased supervision, adjustments to the project strategy, changes to implementation arrangements, and/or changes in budget allocations. In the unlikely event of a project objective being unachievable, it could require a removal from the Description of Activities in the interest of the project. This kind of measure should be agreed previously by the consortium and the EC Project Officer (PO).







### 3. Risk Management Register

The following tables provide the final risk inventory. The tables include the risk identified by the Consortium up until the signature of the agreement on the Grant Agreement (foreseen risks) and the risks identified up until M53 of the project (unforeseen risks). In addition, it presents an overview of the impact of COVID-19 restrictions and supply chain issues that have occurred since the start of the project and the delays ensuing from this developments on the progress of the Case Studies in Work Package 1.





Table 3 - Critical Implementation Risks and Mitigation Actions as included in Grant Agreement Annex 1 (foreseen risks).

Risk Number*	Description of Risk Risk Type / Risk Assessment**	WP Number	Risk Management Measures PM – preventive measures, CA – corrective actions	Did the risk materialise	Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)	Did you <u>apply</u> risk mitigation measures? (Yes/No)	If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.
1	Project execution failure, technical problems, and delays (key milestones or deliverables delayed)  <i>Risk Type: Management</i>  <i>Probability/Impact: M/H</i>	WP 1 - 7	<b>PM:</b> PC and PMT will conduct strict monitoring of tasks against the allocated time and monitor progress closely. Milestones and deliverables with a critical path will be handled with special attention.  <b>CA:</b> Progresses and issues will be discussed regularly within the consortium and necessary schedule adjustments will be made. In the event of technical problems and time delays, we will produce a priority list working with the Project Officer (PO) and the end-users to adjust the project to achievable timescales and objectives.	Yes, see also table 4 for details	<b>WP1:</b> Delays between 2 and 12 months were encountered in the case studies and construction of pilot plants due to delays in delivery of material for the pilot plants, corona restrictions etc. The led to delays in MS15, MS19, D1.2.  Due to preventive measures and corrective actions, all activities could be completed by the end of the project (M53).	Yes: * the CS considered long delivery times and plan accordingly * Project was extended by 5 months * CS studies facing delays were monitored closely by the WP1 coordination team and asked to report every 3 months until pilot plants were operational and case studies back on track.	
2	Limited coordination and communication among partners / WPs / tasks  <i>Risk Type: Management</i>  <i>Probability/Impact: L/H</i>	WP 1 - 7	<b>PM:</b> The Coordinator and all the WP leaders have extensive experience in coordinating/ leading cooperative projects. Thus, they will ensure continuous support of project developments. Regular meetings using known communication methods will facilitate the processes.  <b>CA:</b> Effective coordination will be fostered by the proper management structure set for the project. Regular online meetings will facilitate the processes. PMT will timely intercept problems and discuss individually with concerned partners.	No			
3	Low commitment of the partners to the project plan and deadlines	WP 1 - 7	<b>PM:</b> All partners of the consortium are familiar with this type of project activities. Clear responsibilities are allocated for every task in the WPs.	No			





Risk Number*	Description of Risk Risk Type / Risk Assessment**	WP Number	Risk Management Measures PM – preventive measures, CA – corrective actions	Did the risk materialise	Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)	Did you <u>apply</u> risk mitigation measures? (Yes/No)	If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.
	<p><i>Risk Type: Management</i></p> <p><i>Probability/Impact: L/M</i></p>		<p><b>CA:</b> When needed, WP leaders directly address partners' lack of commitment. If unsuccessful, the STC will contact the relevant partner and, if necessary, re-allocate tasks and resources.</p>				
4	<p>Administrative delays in start-up of case studies (e.g., obtaining working &amp; building permits, site access, health and safety validation of operators)</p> <p><i>Risk Type: Management</i></p> <p><i>Probability/Impact: M/M</i></p>	WP 1	<p><b>PM:</b> Project activities primarily revolve around existing facilities and/or works that are already planned. Furthermore, there is an existing close working relationship, including deployment of on-site personnel, of technical partners with the site owners (case-studies). This minimizes the administrative issues that need to be clarified. All WP1 partners are requested to report up to M6 which constraints might be relevant for the individual site and how to address them appropriately and in time.</p> <p><b>CA:</b> Liaise with local partners to speed-up the administrative processes. In case of delays, the timeline and experimental planning at the demo site will adapted in a way that still ensures reaching the projects targets.</p>	Yes	<p>CS5: waited 13 months for the building permit for ELSAR provided by the local government of the city of Lleida.</p> <p>The permit was received by 2023 and allowed for completion of the pilot plant in time for all the planned activities at the site to be completed as planned.</p>	The permits were requested as early as possible. CS5 conducted lab and pilot tests in parallel to reduce the time lost and investigate optimal operation conditions for of the full-scale reactor.	
5	<p>Inadequate coordination of activities at case study level.</p> <p><i>Risk Type: management</i></p>	WP 1	<p><b>PM:</b> The responsible partner for the deliverables will at an early stage communicate an overview of the deliverable so that any disagreements are identified early. Local staff will be involved in day-to-day management, to keep communication lines short, and interact directly with local stakeholders not part of the consortium.</p> <p><b>CA:</b> Coordination will be ensured by proper management structure, including a case study committee focussing on monitoring/management of cases, including the WP1 leader and all CS leaders. Local personnel will always be involved; regular on-site meetings will take place. Local</p>	No			





Risk Number*	Description of Risk Risk Type / Risk Assessment**	WP Number	Risk Management Measures PM – preventive measures, CA – corrective actions	Did the risk materialise	Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)	Did you <u>apply</u> risk mitigation measures? (Yes/No)	If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.
	<i>Probability/Impact: M/H</i>		management will report frequently to the WP coordinator to timely intercept problems.				
6	Low interest from local stakeholder to participate in CoPs  <i>Risk Type: Technical</i>  <i>Probability/Impact: H/M</i>	WP3	<b>PM:</b> The design of the CoPs starts with an inquiry of important stakeholders, most of them already involved in the local cases.  <b>CA:</b> The agenda and goals of the CoP meetings can be altered to increase the benefit for all stakeholders, including those who lost interest.	Yes	CoPs have been established in all CSs, and all CSs have held at least 1 meeting with their CoP stakeholders.  Initial inability to meet physically (COVID-19) hindered the establishment of the CoPs. In addition, in some CS, already existing industry working groups decreased the added value of setting up CoPs specifically for ULTIMATE. Connection with existing platforms/networks was preferred in such cases.	During lockdown, online CoP meetings were organised.  Connection with existing platforms/networks was preferred in such cases where these were identified to prevent stakeholder-fatigue.	
7	Failure to set up the multi-use play-spaces in city close areas  <i>Risk Type: Management</i>  <i>Probability/Impact: L/M</i>	WP3	<b>PM:</b> The play-spaces can be moved closer to areas owned and controlled by the stakeholders in collaboration with existing Living Labs mediated through WE.  <b>CA:</b> The play-spaces can be placed in easily accessible places, e.g. in reception areas or other public related areas at the stakeholder premises.	No			
8	Loss of key staff	WP 1 - 7	<b>PM:</b> There is no critical task that is dependent on a specific individual. It will be policy to spread knowledge throughout the team.	No			





Risk Number*	Description of Risk Risk Type / Risk Assessment**	WP Number	Risk Management Measures PM – preventive measures, CA – corrective actions	Did the risk materialise	Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)	Did you <u>apply</u> risk mitigation measures? (Yes/No)	If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.
	<i>Risk Type: Management</i> <i>Probability/Impact: M/L</i>		<b>CA:</b> Most of the partners are large organisations and will be able to replace staff as needed. If necessary, tasks will be re-assigned by the STC.				
9	Loss of key partner <i>Risk Type: Management</i> <i>Probability/Impact: L/H</i>	WP 1 - 7	<b>PM:</b> Effective management procedures to timely intercept problems, and/or reallocate partners. The CA will govern the policies behind.  <b>CA:</b> If needed, replace with new partners with suitable skills and profiles in collaboration with the PO. In the eventuality that the exit of the partner will mean a case study cannot be performed successfully, the PMT together with the STC and PAB will look proactively for another case in the same region and of a similar nature using our networks and present alternatives to the PO for decision making.	No			
10	The UK leaves the EU without a deal <i>Risk Type: Management</i> <i>Probability/Impact: H/H</i>	WP 1, 2, 4	<b>PM:</b> There is no prevention measure for this event. It is beyond the control of the consortium. <b>ULTIMATE</b> , however, is being submitted before the deadline on withdrawal from the EU (October 31, 2019). UK partners are not leading any WP, to minimise potential risks to the management of the project.  <b>CA:</b> The UK has pledged to fund UK partners submitting proposals before Brexit, if these are successfully evaluated. In this event, the UK partners would effectively be self-funding using UK funds. Project budget will be adapted according to the (forthcoming) instructions from the Commission pertaining to the budgets of UK partners in consultation with the PO.	No	EU and UK reached a deal on Brexit.		





Risk Number*	Description of Risk Risk Type / Risk Assessment**	WP Number	Risk Management Measures PM – preventive measures, CA – corrective actions	Did the risk materialise	Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)	Did you <u>apply</u> risk mitigation measures? (Yes/No)	If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.
11	The UK leaves the EU with a deal <i>Risk Type: Management</i> <i>Probability/Impact: L/L</i>	WP 1, 2, 4	<b>PM:</b> There is no prevention measure for this event. It is beyond the control of the consortium. <b>CA:</b> The Withdrawal Agreement makes provision for UK partners to continue to be funded under the Horizon 2020 programme in the normal way.	Yes	CA in effect, UK partners can continue to work as foreseen on the project	No	No prevention measures possible, beyond control of the consortium
12	Disputes over the ownership of IPR among partners <i>Risk Type: management</i> <i>Probability/Impact: L/M</i>	WP 7	<b>PM:</b> IPR and access right clauses will be integrated in the consortium agreement (DESCA based). The documents will be signed before the start to avoid potential disputes. <b>CA:</b> Legal procedures will be followed, but the PMT will try to resolve the matter first internally with help from the EAB.	No			
13	Lack of consensus on scientific or technological approach <i>Risk Type: Management</i> <i>Probability/Impact: L/H</i>	WP 1 - 6	<b>PM:</b> The responsible partner for the deliverables will at an early stage communicate an overview of the deliverable so that any disagreements are identified early. Diverse and highly expert PAB members have been selected from the start, to act as advisors. <b>CA:</b> Discuss and agree on a common standing in the STC, and seek input from the PAB, as external advisors. If necessary other specific experts will be sought and added to the PAB.	No			
14	Unacceptable quality of results <i>Risk Type: technical</i> <i>Probability/Impact: L/M</i>	WP 1 - 7	<b>PM:</b> The reviewing process for all project deliverables and reports, plus the contribution of the PAB, will ensure the acceptability of project results. <b>CA:</b> The STC (with the QA Officer) decides on corrective measures to be taken to improve the quality of results, and if necessary, to re-allocate this responsibility to another partner.	No			





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15	<p>The solutions developed are too case specific</p> <p><i>Risk Type: technical</i></p> <p><i>Probability/Impact: L/M</i></p>	WP 1, 3, 6	<p><b>PM:</b> The variety of end users, country, and domain wise (WP1), and the CoPs cross-fertilisation (WP3), will ensure a wide view and adoption of the proposed innovations.</p> <p><b>CA: <i>ULTIMATE</i></b> will consider, and connect to, existing EU and International generated knowledge and initiatives (WP6).</p>	No			
16	<p>Data from Cases are sparse and are not enough to apply all methods and tools</p> <p><i>Risk Type: technical</i></p> <p><i>Probability/Impact: L/M</i></p>	WP 1, 2	<p><b>PM:</b> The preparation for the description of the Demo Cases has been done with active participation and consent of the partners involved. Parties involved at each case have been collaborating for years and know each other and the status of the existing infrastructure. Furthermore, WP2 is designed to allow different tools to be applied to different cases. The tools are flexible to work with as much data as available and key cases where we know a lot of data exist are identified to demonstrate the tools.</p> <p><b>CA:</b> If a case has less data than we need to provide even basic assessments, we will target data collection there, in collaboration with the CoPs and if needed shift resources in WP2 and WP7 (project management) to solve the problem.</p>	No	<p>Delays are encountered on acquiring CS data. In particular the pilot facility in CS8 did not become operational until year 4. With the 5 month project extension sufficient time was created for all CS to produce the necessary data to demonstrate and validate the technical solutions.</p>	<p>The corrective action applied was the development of solutions with synthetic data and advance on the WP1 activities and WP2 tools, until real data became available.</p>	
17	<p>There is less interest than anticipated in uptake of the <i>ULTIMATE</i> products and tools</p> <p><i>Risk Type: dissemination and exploitation</i></p> <p><i>Probability/Impact: M/M</i></p>	WP 2, 5, 6	<p><b>PM:</b> The tools will be housed with the CE Marketplace originally developed by NextGen which guarantees a large and diverse end-user membership as part of WE's infrastructure.</p> <p><b>CA:</b> As part of WP5 and WP6 we will target relevant audiences and pro-actively demonstrate the solutions and</p>	No			





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			tools – and modify based on feedback if needed to enhance uptake.				
18	Stakeholders outside the project are not interested  <i>Risk Type: dissemination and exploitation</i>  <i>Probability/Impact: M/L</i>	WP 1 - 6	<b>PM:</b> Stakeholders will be contacted early in the project to participate in CoPs (WP3). Various communication activities to raise interest are foreseen in WP6. The PAB consists of internationally renowned leaders in the area, who will act as ambassadors.  <b>CA:</b> Communication tailored to target audience to gain (renewed) interest, working bottom up with key audience members (e.g., engage our links to local authorities, leveraging e.g. Global City networks such as the 100 Resilient Cities).	No			
19	Market demand for the project outcomes is lower than expected  <i>Risk Type: Dissemination and exploitation</i>  <i>Probability/Impact: M/M</i>	WP 5	<b>PM:</b> We will specifically initiate market uptake activities and target reasons for delay or barriers to implementation in several WPs (e.g., WP3, 4 and 5) to identify specific ways forward to the market (see WP5 description).  <b>CA:</b> Reasons for low interest in specific innovations will be analysed in the CoPs (WP3) and assessed in terms of legal barriers (WP4) and business perceptions (WP5). We will focus more on those solutions that are taking off much faster than the others	No			







Risk Number*	Description of Risk Risk Type / Risk Assessment**	WP Number	Risk Management Measures PM – preventive measures, CA – corrective actions	Did the risk materialise	Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)	Did you <u>apply</u> risk mitigation measures? (Yes/No)	If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.
20	<p>Limited visibility of the project</p> <p><i>Risk Type: dissemination and exploitation</i></p> <p><i>Probability/Impact: L/M</i></p>	WP 6	<p><b>PM:</b> WP6, led by an experienced partner (ESCI) is dedicated to ensuring effective communication, dissemination, and outreach of the project towards targeted stakeholders. The consortium has an extensive network of contacts and connections that can increase the visibility of the project. Of particular note is partner WE, the recognized voice and promotor of water related Research and Innovation in Europe.</p> <p><b>CA:</b> The Plans for the Exploitation and Dissemination of Results (see WP5-6) will be monitored and regularly updated. Moreover, it will also consider adapting activities if necessary. The communication strategy deployment will make sure <b>ULTIMATE</b> is visible online and during expert/international events. In case of low interest, additional, targeted communication channels will be used.</p>	No			
21	<p>Policy recommendations not incorporated</p> <p><i>Risk Type: dissemination and exploitation</i></p> <p><i>Probability/Impact: H/L</i></p>	WP4, WP6	<p><b>PM:</b> Insights into supportive governance arrangements and the related policy recommendations will be brought into our extensive network of decision-makers considering policy and industry organisations through interactive meetings.</p> <p><b>CA:</b> <b>ULTIMATE</b> cannot impose policy recommendations to regulatory organisations, but by managing it as an ongoing relationship, a step-by-step approach will be envisioned.</p>	No			





Risk Number*	Description of Risk Risk Type / Risk Assessment**	WP Number	Risk Management Measures PM – preventive measures, CA – corrective actions	Did the risk materialise	Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)	Did you <u>apply</u> risk mitigation measures? (Yes/No)	If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.
22	<p>Insufficient access to horticultural facilities, in particular drain water from greenhouses, and data on water quality and water &amp; energy consumption</p> <p><i>Risk Type: management</i></p> <p><i>Probability/Impact: L/H</i></p>	WP1, WP2	<p><b>PM:</b> CVGNP, in a letter of commitment, has indicated it will support the project by providing this access.</p> <p><b>CA:</b> KWR has relations with other horticulture organisations in the Netherlands, e.g., through its collaborative work in H2020 projects SUBSOL and NEXTGEN, as well as national projects. KWR will timely connect with this existing network to obtain the required water and information in case this risk materialises.</p>	Yes	<p>A second location was been found, and a collaboration agreement with this location was put in place. Work on water and material reuse/recovery was executed at this location.</p> <p>For work on energy component an alternative solution in combination with geothermal heat supply to greenhouses in Westland region has been found.</p>	Yes, so information in column to the left.	
23	<p>Access to demo-greenhouse, required to perform plant-studies, is not available.</p> <p><i>Risk Type: management</i></p>	WP1	<p><b>PM:</b> The work in the demo-greenhouse was planned to be performed at a service provider with such facilities, and not on-site at CVGNP facilities. The connection with a specialised service provider has been established, and associated costs included in the proposal. No risk ensues from withdrawal of CVGNP.</p> <p><b>CA:</b> Capacity in demo-greenhouses needs to be planned well in advance – as business is strongly aligned with the growing seasons of crops. Timely contact will be established with the specialised service provider to ensure the needed capacity is available when needed in <b>ULTIMATE</b>. In case of insufficient capacity being available in the foreseen months for this activity, the plant growth experiments, foreseen for year 1 – 2, can be moved backwards by 1 year. This will allow sufficient time for planning at the specialised service provider ensuring the required capacity is available. This will not affect other activities in WP1, as this is a stand-alone activity, with no connected activities in subtasks.</p>	No			





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	<i>Probability/Impact: L/H</i>						
24	Difficulty to access stakeholders in the agriculture, specifically horticulture, sector  <i>Risk Type: Management</i>  <i>Probability/Impact: L/M</i>	WP3	<b>PM:</b> CVGNP, in a letter of commitment, has indicated it will support the project by supporting KWR in its interaction with relevant stakeholders.  <b>CA:</b> KWR has relations with other horticulture organisations in the Netherlands, e.g., through its collaborative work in H2020 projects SUBSOL and NEXTGEN, as well as national projects, KWR will timely connect with this existing network to establish access to relevant stakeholders.	No			
25	Difficulty in communicating with stakeholders online and getting additional information needed to iterate prototyping of the immersive art installation / experience.  <i>Risk Type: Management</i> <i>Probability/Impact: L/M</i>	WP3	<b>PM:</b> proactively decide on the technology that will be used and implemented to implement the narrative experiences that the stakeholders ideated. This will not be an optimal way to co-create ideas and solutions but will fast track the prototyping process. Which we can later show to the stakeholders for feedback and potential improvement of solutions.	No			

\*: the colour indicates the risk category, the colours referring to the Risk Matrix in Figure 2.

\*\*: L/M/H – low, medium, high







Table 4: Critical Implementation Risks and Mitigation Actions identified since M1 of the project (unforeseen risks).

Risk Number*	Description of Risk Risk Type / Risk Assessment**	WP Number	Risk Management Measures PM – preventive measures, CA – corrective actions	Did the risk materialise	Please provide a short update of the risk: (e.g.: What has happened? , Why is it (not) relevant at the moment?, etc.)	Did you <u>apply</u> risk mitigation measures? (Yes/No)	If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.
U1	<p>The impacts of the COVID-19 pandemic continue to expand. This can impact the project lifecycle in terms of reduced capacity of the project to implement actions and timely produce some of the deliverables. Budget allocated to tasks might also be impacted becoming either insufficient or excessive against the change of the action plan due to the implementation COVID-19 restrictions and constraints.</p> <p><i>Risk Type: Management</i></p> <p><i>Probability/Impact: H/M</i></p>	WP 1 - 7	<p><b>PM:</b> Considering that travel is difficult in Europe (October 2020) and quarantines are imposed from member states, resorting to online tools and activities replacing the planned activity in presence might not meet the expectations concerning the intensity of the interaction and cooperation between project's partners and stakeholders. Some related outcomes require more time or develop alternative action plans. Budget allocated to tasks might also be impacted becoming either insufficient or excessive against the change of the action plan due to the implementation COVID-19 restrictions and constraints.</p> <p><b>CA:</b></p> <ul style="list-style-type: none"> <li>flexibility will be given in relation to the action implementation in coordination with the project coordinator and the partners of the affected tasks:</li> <li>Whenever possible, we will use to telework or other forms of remote working.</li> <li>Tasks where physical presence is needed on the ground will be postponed after confinement/restriction measures are over. In the meantime, ULTIMATE will promote and perform remote work. Planning will be adjusted accordingly.</li> <li>The EC stated that costs will still be eligible for the work carried out under the action even if such shifting entails deviations from the initial timing set out in Annex 1.</li> </ul>	Yes	<p>WP1: most of the CS had delays due limited access to facilities (in particular in 2020 and 2021) due to lockdowns, and experienced delays in the delivery of material due to the pandemic situation and ensuing global logistics crisis.</p> <p>Also, the prices for pilot plant elements increased significantly, and led to re-design of the construction to remain in the budget frame where possible, and additional investment from partners beyond those foreseen in the project budget in order to realise the CS objectives.</p> <p>By 2022 access to facilities was possible and all pilots were operational by early 2024. Due to the extension, all work was completed by M53.</p>	<p>During the lockdown – as much work as possible was performed remotely.</p> <p>CS considered long delivery times in their plans.</p> <p>A project extension of 5 months was requested.</p>	





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U2	<p>Delays in the actions of WP1 related the COVID-19 restrictions.</p> <p>Risk Type: Management</p> <p>Probability/Impact: H/M</p>	WP 1 – all case studies	<p><b>PM:</b> The risks are monitored by the Case Study leaders and reported in the living documents describing their current status. The living documents are stored and continuously updated in the WP1 folder of the SharePoint domain.</p> <p><b>CA:</b> Every 3 months, the delays and the contingency plans are monitored. In the case of delays, the timeline and experimental planning will be adapted to still achieve successfully the project goals. This will be presented and discussed with the PMTs.</p>	yes	The delays were reported in D7.8. By M53 all CS had been able to catch-up and had completed their foreseen activities.		
U3	<p>It might not be possible to realise all elements of the ZLD pilot plant in time for MS15 (M18). The definition of the operation mode of the brine treatment scheme might not be totally finalized at bench scale and thus, operation scheme of MD can still be pending.</p> <p>Risk Type: Technical</p> <p>Probability/Impact: H/L</p>	WP 1 – case study 1	<p><b>CA:</b> the core part of the pilot plant (pre-treatment (UF/MF) + Advanced Reversed Osmosis and zeolites) will be operational in time for MS15 (M18), and additional features (Membrane distillation) will be added in time for D1.2 (M24).</p>	yes	The delay was reported in D7.8. By M53 the CS had been able to catch-up and had completed its foreseen activities.		





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U4	<p>Access to the CVGNP facilities and their contribution to WP1/WP3 will be very limited.</p> <p>Risk Type: Management</p> <p>Probability/Impact: H/L</p>	WP 1	<p><b>CA:</b> Finding an additional partner who can take over the contribution of the cooperative in WP1 and WP3.</p>	yes	<p>Collaboration with the Cooperatieve Tuinbouw Water Zuivering De Vlot provided access to a site for pilot testing. The contribution to WP3 was also supported by De Vlot, and KWR has taken over the responsibility of the IMX development in WP3.</p>	<p>Yes, a substitute site was found and a collaboration agreement with this site put in place.</p>	
U5	<p>The project to construct the residual heat pipeline to CVGNP has been cancelled. A pilot HT-ATES at the location, without a heat source, is therefore not meaningful.</p> <p>Risk Type: Management</p> <p>Probability/Impact: H/M</p>	WP1 – case study 2	<p><b>CA: ULTIMATE</b> will find an alternative location for performing the HT-ATES related work.</p>	yes	<p>A feasibility study was performed in connection with another distributed heating network with horticulture end-users to substitute this pilot. This change has been included in the amended Grant Agreement.</p>	<p>Yes, a substitute study was defined.</p>	





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U6	<p>The components of the Subcritical Water Extraction (SCWE) system cannot be acquired before the second round of financing. There is a risk this round of funding will not be out in time for the pilot facility to be completed in time for D1.2 (M24).</p> <p>Risk Type: Management</p> <p>Probability/Impact: H/L</p>	WP3	<p><b>CA:</b> The extraction will first be demonstrated in lab scale using alternative techniques such as pressurized hot water (as in CS6) and organic solvents for the purpose of showing the principle. As soon as the SCWE components are acquired and the system assembled and tested, the pilot unit will be finalized.</p>	Yes	<p>Acquiring some parts for the pilot units were delayed, but the systems were operational in M24 (CS4) and in M30 (CS6) respectively.</p>	No	<p>There was sufficient time in the project to allow completion of the work despite this delay.</p>
U7	<p>2nd batch of pre-financing is required before the pilot facility to be provided by GtG can be completed. There is a risk this round of funding is not available in time to allow for completion of this part of the pilot in Case Study 6 for completion of D1.2 in time (M24).</p> <p>Risk Type: Management</p> <p>Probability/Impact: H/L</p>	WP1 – case study 4	<p><b>CA:</b> the pilot site will be operational in time for D1.2 (M24), but the GtG component will be added as soon as possible after the D1.2 deadline.</p>	Yes	<p>See above, but pilot units were operational in time to complete the foreseen demonstration activities.</p>	No	<p>There was sufficient time in the project to allow completion of the work despite this delay.</p>







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U8	<p>Low performance and accuracy of the simulation and optimization models</p> <p>Risk Type: Technical</p> <p>Probability/Impact: L/M</p>	WP1, WP2, WP3	<p><b>PM:</b> In ULTIMATE, the selected data-driven models, modelling algorithms, simulation algorithms will be benchmarked and assessed considering the case-studies information, needs and requirements.</p> <p><b>CA:</b> If a case of low performance and accuracy of the algorithms, ULTIMATE will analyse the problem case-by case and, will provide a combination of different AI modelling and design to acquire desirable performance and accurate rates.</p>	No			
U9	<p>Delays in the deployment of the ICT solutions.</p> <p>Risk Type: Technical</p> <p>Probability/Impact: L/L</p>	WP 1 - 7	<p><b>PM:</b> In ULTIMATE, the development, testing and deployment of ICT technologies will be defined under a Continuous Integration methodology. Thus, the proposed development and deployments will be automated and configured since the beginning. Therefore, the timely deployment of the solutions for their demonstrations is facilitated.</p> <p><b>CA:</b> In case of difficulties to provisioning of servers in specific partners of ULTIMATE (to be decided which partner will be responsible of deployments), cloud services will be used (e.g., Amazon Web Services) accomplishing EC recommendations of hosting the information in European cloud servers.</p>	No			





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U10	<p>The implications of travel and meeting restrictions due to COVID-19 will impact the start-up and running of various activities in WP3. Wide collaboration in development of the playbook in Task 3.1 would require physical meetings with stakeholders and lab/field visits especially for case studies, which is not possible.</p> <p>Risk Type: Technical</p> <p>Probability/Impact: H/M</p>	WP 1, 2, 4	<p><b>CA D3.1:</b> Online collaboration between NTNU and WE for finalizing the Deliverable on time.</p> <p><b>CA D3.3:</b> Due to COVID-19, we cannot meet the key players in WP3 for detailed collaboration in the development of the playbook. The quality of the playbook is decreased due to the lack of visits and personnel engagement of the chosen case study locations. To allow for sufficient quality, the proposed solution will be followed: <b>D3.3 intermediate version M18 (as planned)</b> An intermediate version of D3.3 will be delivered as planned. This deliverable will contain the framework of the ULTIMATE Playbooks, the selection criteria for choosing the 3 use cases to be implemented and initial play books for each of them. <b>D3.7 final M27</b> An updated and revised version will be delivered in M27 with updates from the physical places of the 3 selected use cases to be implemented. Moreover, it will include the final Play books with the detailed Place by design elements. By having an update and revision of D3.3 in M27 we will have an overlap between T3.1 and T3.3 by 4 months to be able to catch any changes or required revision thus ensuring high quality and on time delivery of D3.6</p>	Yes	The results to be reported in D3.3 were divided over an intermediate D3.3, which included Playbooks for Understand and Imagine. The remaining activities were reported in a separate updated deliverable D3.7.	Yes, the reporting was split into two deliverables, which allowed for more time to complete the work.	
U11	The implications of travel and meeting restrictions due to COVID-19 will impact the start-up and running of various activities in WP3.	WP3 – task 3.2.1	<p><b>CA D3.5:</b> All CoPs can be conducted on-line. KWR is developing new capacity to work with different tools for on-line engagement and co-creation. We will share this experience and the tools with case studies in the guidance for CoPs that we are developing. We expect a</p>	Yes	By the end of the project, all CS's had organised at least one CoP meeting. The organisation of follow-up meetings was primarily	All CoPs moderators and other supporting people have been trained on how to host online meetings and how to host their 1st	





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	<p>The work on communities of practice in Task 3.2.1 will be less effective if physical meetings with stakeholders are not possible.</p> <p>Risk Type: Technical</p> <p>Probability/Impact: H/M</p>		<p>first draft of the guidance to be shared with WP3 lead by M5 and to be ready for sharing with case studies in M7.</p> <p>Also, KWR can train CoP coordinators and moderators to the use of the tools. However, KWR cannot train multiple moderators for 9 case studies over 4 years due to the amount of required effort. It would be important that each case study has one designated CoP moderator who remains the same for the whole project. This person needs to have "people skills", i.e., need to have interest, capacity and possibly already experience with stakeholder co-creation and learning. This person, ideally, could also be the same that conducts (as needed) interviews, and other interaction activities with CoP stakeholders.</p> <p>KWR will organize a one-time training of CoP moderators within M6. If case studies have not identified, they can select one/two selected people to join the training and these people will then internally train the CoP moderators as needed.</p>		<p>dependent on the needs identified in the first CoP meetings, and not on the impact of the COVID-19 restrictions.</p>	<p>CoP meetings. Some of the CoPs were delayed and waited longer than anticipated to host their first meetings due to COVID, as they wanted to host them in person. CoPs have been hosted online and in person, and results of these two types of meetings will be investigated to ensure improvements in future CoP meetings.</p>	
U12	<p>The implications of travel and meeting restrictions due to COVID-19 will impact the start-up and running of various activities in WP3. The work on B2B engagement will be less effective virtually rather than physical meetings with stakeholders were not possible.</p> <p>Risk Type: Technical</p>	WP 7	<p><b>D3.4</b> Co-creation requires some form of social communication and creating empathy with people involved in the process of collaboration and "making/doing" that enables other participants to a shared solution. Some co-creation exercises can be done online but some that involves "design thinking" that focuses on human beings, on creating empathy with people, reframing challenges in a way that enables people, stakeholders to contribute to a unified solution is simply very challenging, unproven, and maybe ineffective in an online scenario.</p> <p><b>CA:</b></p>	No			





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	Probability/Impact: H/M		<p>- NTNU to design a playbook for facilitators and organise trainings of stakeholder / co-creation moderators.</p> <p>- NTNU to design a playbook for online training of co-creators requires more effort than preparing a training presentation.</p> <p>These tasks require important dedicated time and preparation to ensure unity in results, training of co-creation moderators in "design thinking", empathy, and prototyping approach. Moreover, it requires several full days with group and field work trainings (out of the box perhaps from their own environment).</p>				
U13	<p>The implications of travel and meeting restrictions due to COVID-19 will impact the execution of various activities in WP4. Focus groups with the public (i.e., with visitors to the demonstration sites) aren't possible since the sites are closed to the general public, and physical meetings are not allowed. Face-to-face interviews with key informants and key industries to examine the societal expectations and discuss (the evolution and upscaling of) WSIS aren't possible.</p> <p>Risk Type: Technical</p>	WP4 – task 4.1	<p><b>CA:</b> Instead of focus groups with visitors, UCRAN and KWR will conduct a number of follow-up interviews with T4.1 survey respondents (i.e. members of the general public) in which the basic CE structure of the site will be introduces, and hereafter discussed.</p> <p>The foreseen face-to-face interviews with key informants and key industries will be conducted online.</p>	No			





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	Probability/Impact: H/M						
U14	<p>The implications of travel and meeting restrictions due to COVID-19 will impact the execution of various activities in WP4.</p> <p>The work on communities of practice (Subtask 4.2.2, in collaboration with Task 3.2.1) will be less effective when using virtually rather than physical meetings with stakeholders.</p> <p>Face-to-face interviews to discuss governance challenges and means to overcome these challenges aren't possible.</p> <p>Risk Type: Technical</p> <p>Probability/Impact: H/M</p>	WP 1 - 7	<p><b>CA:</b> As elaborated on un U11, all CoPs can be conducted on-line. KWR is developing new capacity to work with different tools for on-line engagement and co-creation</p> <p>The foreseen face-to-face interviews with key informants and key industries will be conducted online.</p>	No			





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U15	<p>The implications of travel and meeting restrictions due to COVID-19 will impact the execution of various activities in WP6. No personal interview, face-to-face meetings or big conferences can take place. The ensuing risk is weak stakeholder engagement (connected to risk U12) and limited opportunities to communicate and disseminate results.</p> <p>Risk Type: Management</p> <p>Probability/Impact: H/M</p>	WP 1, 3, 6	<p><b>CA</b></p> <p>The following corrective actions are being undertaken to collect the required input for communication materials:</p> <ul style="list-style-type: none"> <li>- video recording via OBS, but the resulting quality is not the same as filming on location would be.</li> <li>- instead of visits to the case studies to produce film and photo footage, the partners are requested to share materials from their archive/produce materials themselves</li> <li>- Use of digital meetings to replace face-to-face meetings and seminars/conferences. However, an event booth for promoting the project is not possible in such cases, nor is distribution of material or creating additional film footage for producing the inspiring video profiles.</li> </ul>	No			
U16	<p>The exploitation strategy might be impacted by the global economic crisis (company bankruptcy, budget/investment limitations) as the result of the COVID-19 pandemic.</p> <p>Risk type: Dissemination and exploitation</p> <p>Probability/Impact: M/M</p>	WP 5	<p><b>PM:</b> We will contact as much potential clients as we could during the timing of the project and identify the ones are willing to develop their investments in the near future.</p> <p><b>CA:</b> The market status and evolution post COVID-19 will be thoroughly analysed in the different European countries to map the best opportunities of exploitation and commercial development.</p>	No	There has been a brief market literature review corresponding to most ULTIMATE results and there doesn't seem to be an important market change for commodities or needs related to the KERs.		





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U17	<p>The pilot unit for the reclamation of the greenhouse drain water and for the recovery of nutrients won't be operational until M18 (MS15) and M24 (D1.2)</p> <p>Risk Type: Technical/Management</p> <p>Probability/Impact: H/M</p>	WP 1 - CS2	<p><b>CA:</b> For MS15 and D1.2, results from the laboratory experiments will be shown and the progress of the pilot plant construction.</p>	Yes	<p>The pilot unit was operational in M30 and demonstration activities were completed by the end of the project.</p>		
U18	<p>The industrial scale unit for sulphur recovery won't be operational until M18 (MS15) and M24 (D1.2)</p> <p>Risk Type: Technical/Management</p> <p>Probability/Impact: H/M</p>	WP 1 – CS5	<p><b>CA:</b> For MS15 and D1.2, results from the laboratory pilot plant will be shown</p>	Yes	<p>The industrial scale unit was operational in M40 and demonstration activities were completed by the end of the project.</p>	<p>Yes, .lab scale experiments were conducted until the pilot unit was available to gain initial insights.</p> <p>Active monitoring of progress was instituted by the WP1 coordinators to follow progress and support CS8 in realisation of the pilot unit and completion of the activities in time.</p>	





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U19	The ELSAR unit won't be operational until M18 (MS15) and M24 (D1.2)  Risk Type: Technical/Management  Probability/Impact: H/M	WP1 - CS5	<b>CA:</b> For MS15 and D1.2, the water system (post-treatment for water reuse: UF&RO) will be operational in time. The AnMBR, ELSAR and AOP&UV will follow in M23. Due to an upscaling of the system, the reactor design and construction needs more engineering work than originally planned for the smaller system and special building licences, because the height of the reactor will be 15 m.	Yes	The AnMBR, ELSAR and AOP&UV were operational in time to complete all the activities foreseen.	No	There was sufficient time in the project to allow completion of the work despite this delay.
U20	Case Studies suffer delays due to the pandemic and are not able to provide concrete results for exploitation activities.	WP5	<b>PM:</b> WP5 will make a selection of technologies demonstrated in WP1 to focus on for the exploitation activities. A limited number of candidates will be selected from a longlist of technologies. In case one or more technologies do not advance to a stage where exploitation can be investigated, the longlist will be shorter. However, there will remain sufficient technologies that reach a TRL suitable for the exploitation activities in ULTIMATE.	No			
U21	The RO, heat recovery and ammonia recovery units won't be operational until M18 (MS15) and M24 (D1.2)  Risk Type: Technical/Management  Probability/Impact: H/M	WP1, CS7	<b>CA:</b> For MS15 and D1.2, the systems will be operational in M23. There is a risk due to long delivery times, that parts of the systems won't arrive in time and a further delay will occur.	Yes	The RO, heat recovery and ammonia recovery units were operational in time to complete all the activities foreseen	No	There was sufficient time in the project to allow completion of the work despite this delay.
U22	SUEZ is involved in a merger with Veolia. Potentially SUEZ IWS (all or part of it) will join Veolia and 3S will remain outside of the new Veolia	WP1, CS8	<b>PM:</b> work at lab scale in CS8 at SUEZ IWS continues independently of 3S.	Yes	The relationship between IWS and 3S was clarified and collaboration continued as planned. 3S was		







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	<p>organisation. The collaboration between the partners needs to be approved by both parties. The merger process is currently ongoing. Delays may occur if approval to continue the collaboration is delayed.</p> <p>Risk Type: management</p> <p>Probability/Impact: H/H</p>				<p>provided with access to the IWS data which facilitated the development of the software tools that 3S is responsible for.</p>		
U23	<p>Fall-out of Ukraine war has an impact on the project, e.g. due to increased costs, spill over of conflict to other areas, limited access to required resources..</p> <p>Risk Type: management</p> <p>Probability/Impact: M/H</p>	WP1, WP6, WP7	<p><b>PM:</b> The risks are monitored by the Case Study leaders and reported in the living documents describing their current status. The living documents are stored and continuously updated in the WP1 folder of the SharePoint domain.</p>	No	<p>No specific issues were encountered due to the war in Ukraine. Although materials prices increased further, as well as costs for financing, the design and construction of the pilot plants was already advanced at the time of the outbreak of this conflict.</p>		
U24	<p>Access to SCADA system/Historian IWS is not provided to 3S, which will mean the software tools to be developed will not have access to real-time data.</p> <p>Risk Type: Technical</p>	WP1, CS8	<p><b>PM:</b> The tools will be built in such a way that they can handle various data-types and protocols. Furthermore, the use of connections to other IWS sites than the CS8 site at Rousillion was explored.</p>	Yes	<p>Access to the SCADA system was not achieved. The tools could be developed using offline datasets downloaded by IWS from the SCADA system and provided to 3S as datafiles.</p>	<p>Yes, the tools and associated dashboard were designed and validated with offline data.</p>	





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	Probability/Impact: H/L						
U25	<p>Fall-out of Israeli – Gaza war has an impact on the project, e.g. due to restrictions in access to or damage to, the case study sites in Israel.</p> <p>Risk Type: technical, management</p> <p>Probability/Impact: H/M</p>	WP1, CS6	None possible.	Yes	<p>No damage to the pilot installations was reported. However, access to the case study sites at Karmiel and Shafdan was prohibited directly following the October 7, 2023, attack on Israel. Access to Karmiel was restored, access the Shafdan remained limited.</p> <p>As the pilot work was very advanced by that time, all foreseen work was completed.</p> <p>A CoP meeting for CS6, which was scheduled for October 10, 2023, was cancelled.</p>	Yes, final experimental work was performed at laboratory scale.	

\*: the colour indicates the risk category, the colours referring to the Risk Matrix in Figure 4.

\*\* : L/M/H – low, medium, high





## 4. Conclusion

This deliverable described the risk management approach that was implemented during the execution of the ULTIMATE project. This approach consisted of pro-active identification of risk as a continuing activity throughout the project, which involved not only the coordinators of the project and the work-package but all project partners. Identified risks were classified and strategy and relevant procedures to overcome the risk and minimise their effects on the project were defined. The appropriate procedures were been established, which depended on the severity of the risk, their likelihood, and their repetition within the project execution and the possibility of the project and the consortium partners to influence the event responsible for the risk.

This final version of the risk management plans consolidates the risk management table and provides an overview of all risks identified, their status and the end of the project and the mitigation measures taken. Throughout the project, 25 foreseen risks and 25 unforeseen risk were identified. The foreseen risks were defined during the proposal submission based on previous experience with similar research project and on developments within the consortium during the Grant Agreement preparation. The unforeseen risks primarily resulted from major regional and global events, such as the COVID-19 pandemic and the conflicts in Ukraine and the Middle-East. Mitigating actions have been taken to limited the impact of these risks. As a result, they have resulted in delays in the realisation of some of the activities in ULTIMATE, but they did not jeopardise the project outcomes, which could be achieved as a result of a project extension by 5 months.

