



D1.4 – Risk Management Plan

Project name

Asset Level Modelling of RISKS In the Face of Climate Induced Extreme Events and ADAPTtation (RISKADAPT)

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List of Abbreviations and Acronyms

Abbreviation	Meaning
DoA	Description of Action
DoD	Department of Defense
IPRs	Intellectual Property Rights
PB	Project Board
PC	Project Coordinator
RM	Risk Manager
RMP	Risk Management Plan
WP	Work Package
WPL	Work Package Leader

Executive Summary

This document presents the Risk Management Plan (RMP) that has been developed for the implementation of the RISKADAPT project. The RMP constitutes the output of Task 1.4 “Risk Management” which is part of WP1 “Project Management”. The implementation of the procedures and guidelines described in the RMP will be supervised by the Risk Manager (RM) of the project.

More specifically, the RMP specifies the methodology and procedures for the identification, analysis (in terms of likelihood and impact) and mitigation measures for any potential events/issues (related to technical, cost, schedule or any other aspect), defined as risks, that may rise during the project’s life and have a negative impact on the project’s outcomes. Moreover, a RMP includes the risk registry and mitigation strategies. The RMP is usually developed at the beginning of the project and updated regularly throughout the project’s life.

Herein, the RMP that has been developed for the project RISKADAPT and shall be followed by the consortium partners is presented, including the risk registry of the identified (initial) risks at the beginning of the project along with the corresponding mitigation measures, as well as the roles and responsibilities of the RISKADAPT consortium members regarding the risk management of the project.

1. Introduction

During the implementation of a project potential risks causing a negative impact may occur. Therefore, in all projects, a risk management process that will identify any potential risk, its probability (likelihood) of occurrence and the corresponding consequence (impact) to the project's objectives should be established and followed throughout the whole project's life. The risk management process is based on a specific methodology which includes a number of steps that should be undertaken for each of the potential risks.

The outcome of the risk management process is the Risk Management Plan (RMP). The RMP is actually a set of procedures for identifying and analysing potential risks that may occur during the implementation of the project, including also all the mitigation strategies and measures that should be undertaken. The RMP is a living component of the project that should be updated regularly in order to include new risks or modify the existing ones and proposing the corresponding mitigation measures over the course of the project.

1.1 Purpose of the deliverable

The purpose of the current deliverable (D1.4) is to present the RMP of the RISKADAPT project. More specifically, D1.4 describes the risk management methodology that will be followed, presents the list of the risks that have been identified at the beginning of the project and the corresponding proposed mitigation measures. Finally, the deliverable specifies the roles and responsibilities of all involved parties in RISKADAPT with regards to risk planning and mitigation strategies.

1.2 Structure of the deliverable

The current deliverable consists of five chapters:

- Chapter 1 is the introduction.
- Chapter 2 describes the risk management methodology that will be followed.
- Chapter 3 specifies the roles and responsibilities of the consortium members.
- Chapter 4 presents the (current) project's risk registry.
- Chapter 5 states the conclusions of this document.

1.3 Intended audience

D1.4 is a public document according to the project's Description of Action (DoA). Thus, its intended audience is not limited only to project's partners and officer but it extends outside the consortium.

2. Risk Management

In general terms, a "risk" is defined as any event that may occur and have a (negative) impact on the project. An alternative definition of risk provided by the US Department of Defense (US DoD) in its Risk Management Guide for DOD Acquisition. According to US DoD: "a risk is a measure of future uncertainties in achieving program performance goals and objectives within defined cost, schedule and performance constraints".

A risk may be associated with all aspects of a project and has three main components:

- i. a “*root cause*”, which may occur in the future during the implementation of the project. If the root cause is eliminated or corrected, then the corresponding consequence may be prevented from occurring.
- ii. a “*probability of occurrence*”, which is the probability (likelihood) of the root cause to happen during the project course.
- iii. an “*impact*”, which refers to the consequence after the occurrence of the risk.

It is obvious that the successful implementation of a project’s objectives requires the appropriate identification and handling of all risky events that may occur during its whole lifecycle. Therefore, a well-structured and effective risk management process should be established from the beginning of the project.

According to the US DoD, risk management is “an overarching process that encompasses identification, analysis, mitigation planning, mitigation plan implementation, and tracking of future root causes and their consequence”.

Risk management requires a detailed planning which defines the risk management process that shall be followed by developing and documenting an organized, comprehensive, and interactive strategy which can identify and track future risks, developing risk-mitigation plans, performing continuous risk assessments to determine how risks and their root causes have changed, and assigning adequate resources for their mitigation. The result of risk management planning is the Risk Management Plan (RMP).

In practice, a RMP constitutes a set of tools and procedures for identifying and analysing potential risks that may occur during the implementation of the project. Furthermore, the RMP includes all the mitigation strategies and measures that should be undertaken in order to reduce or eliminate (if possible) any consequences and negative impacts associated with the identified risks that may affect the successful implementation of the project’s objectives. Thus, the role of the RMP is two-fold: first to analyse and (if possible) prevent a risk (i.e. the root cause) from happening during the project’s life, and secondly, to minimise the impact in case a risk happens.

The RMP usually follows a process model which include five key activities as shown in Figure 1:

- Risk Identification
- Risk Analysis
- Risk Mitigation Planning
- Risk Mitigation Plan Implementation
- Risk Tracking



Figure 1. Risk Management Process

Following Figure 1, risk management shall not be considered as a linear process but it constitutes an iterative cycle which extends throughout the whole project's life and requires continuous effort in order to ensure the timely identification of the risks and the appropriate application of mitigation strategies when necessary.

The following sub-sections presents each of the five key activities mentioned above.

2.1 Key Activity 1: Risk Identification

Risk identification is the first key activity in the risk management process. Risk identification intends to address the question: "What can go wrong?" during the implementation of the project.

In specific, risk identification examines each aspect of the project in order to identify any associated root causes of risks and prepare a framework for their effective management. For each risk a refined description should be made and the corresponding causes should be identified and isolated.

Two types of risks may occur during a project: internal and external. Internal risks can be minimised and managed inside the consortium by following standard and well-used methodologies for project management. External risks mainly refer to risks which stem from sources and causes outside the consortium. For instance, a possible external risk may be the lack of interest of potential stakeholders.

Furthermore, project risks may also be classified into the following three groups:

- a. Administrative and organisational risks that are related to administrative and management issues such as withdrawal of partner/key staff, delays in key milestones, etc.

- b. Technical risks that are related to technical aspects such as difficulties or delays in the integration of the project’s components (e.g., RISKADAPT platform), results of poor quality, etc.
- c. Business and exploitation risks such as no active participation of the stakeholders, low operational or commercial value of the developed applications, etc.

Based on the description of the groups, it is evident that the first two groups (administrative and technical) mainly include internal risks, while most of external risks belong to the third group.

Last but not least, it should be noted that risk identification should begin as early as possible during the project and continue until the end of the project for identifying any new root causes of risks that might not be present or ignored during the early stages of the project.

2.2 Key Activity 2: Risk Analysis

The second key activity in the risk management process is the risk analysis. Risk analysis aims to address the question: “How big is the risk?”.

Under risk analysis, first the likelihood (i.e., probability of occurrence) of the root cause of a risk should be estimated. Then, the consequence (i.e., impact) of that risk should be defined in terms of performance, schedule and cost. At the end, the risk level is estimated by combining the probability of occurrence with the level of the corresponding impact.

For estimating the probability of occurrence of a risk, a convenient approach is to define categorical levels of probability. For example, one could define three levels: Low, Medium, Large. Each risk may be classified in a specific level based on the probability of its occurrence. For the definition of the different levels of probability simple criteria such the ones that are listed in Table 1 may be followed.

Table 1: Criteria for levels of probability

Level	Criterion
Low	Less than 30% probability of occurrence
Medium	Between 30% and 70% probability of occurrence
High	More than 70% probability of occurrence

The second leg of risk analysis includes the assessment of the impact that a specific risk is expected to have in the project. The classification of impact may be made in a similar way as in the case of probability. For example, three levels (Low, Moderate, High) of impact may be considered as shown in Table 2.

Table 2: Levels of impact

Level	Criterion
Low	Risk has relatively little impact on the project’s technological and financial performance, as well as the schedule
Moderate	Risk may impact the project’s technological and financial performance, as well as the schedule
High	Risk will greatly impact the project’s technological and financial performance, as well as the schedule

Risks can be categorised into various levels by combining the level of the probability of occurrence with the level of the corresponding impact. For instance, a risk may have a “*Medium*” level of probability and cause an impact of “*High*” level (e.g., M/H risk). Following this classification all risks of the project can be included in the Risk Reporting Matrix.

A Risk Reporting Matrix is a $m \times n$ table, where m : is the number of the different levels (rows) of impact and n : is the number of different levels (columns) of probability (or likelihood). For instance, if one uses Tables 1 and 2 considering three different levels for likelihood and impact, the corresponding Risk Reporting Matrix will be a 3×3 table as shown in Figure 2.

IMPACT	High	Medium	High	High
	Moderate	Low	Medium	High
	Low	Low	Low	Medium
		Low	Medium	High
		LIKELIHOOD		

Figure 2. Risk Reporting Matrix

The Risk Reporting Matrix is a very useful tool for risk registering and tracking (as it will be discussed later) since all risks can be depicted in the corresponding cells based on the combination of the likelihood/impact. For instance, a M/H risk will be entered in the cell placed on the second column and the first row of the matrix of Figure 2. Based on that matrix the level of that risk can be considered as High.

Furthermore, following the risk reporting matrix, acceptable and non-acceptable levels may be established. For example, risks of a Low or Medium level (i.e., those that belong to green and yellow squares) can be acceptable, while risks of High level (those that belong to the red squares) may be considered as non-acceptable and thus appropriate proactive measures should be taken for their avoidance or migration to an acceptable level.

2.3 Key Activity 3: Risk Mitigation Planning

The third key activity in the risk management process is the risk mitigation planning. Risk mitigation planning is related to the question: “What is the program approach for addressing this potential unfavorable consequence?”

More specifically, risk mitigation planning includes the activities that identify, evaluate and propose options in order to set a risk at acceptable levels given the project’s constraints and objectives. Moving a risk from a non-acceptable level (e.g., red square in the Risk Reporting Matrix) to an acceptable one can be achieved by reducing the likelihood, reducing the impact or both.

Risk mitigation planning shall specify all the measures that should be undertaken, the appropriate timing, the partner who will be responsible to apply the measures and the associated costs (financial or schedule). In other words, following US DoD: “*risk mitigation planning includes the specifics of what should be done, when it should be accomplished, who is responsible, and the funding required to implement the risk mitigation plan*”.

Last but not least, it should be noted that a risk mitigation plan needs to be realistic, achievable and measurable.

2.4 Key Activity 4: Risk Mitigation Plan Implementation

The fourth activity is associated with the implementation of the risk mitigation plan. Risk mitigation plan implementation addresses the question: *“How can the planned risk mitigation be implemented?”*

Risk mitigation plan implementation has as objective to ensure that a successful mitigation of the risks will be performed. More specifically, the implementation of the risk mitigation plan specifies all the contractual changes in planning, budget and requirements that are needed. It also provides directions for the involved partners to execute the defined and approved risk mitigation plans and outlines, the risk reporting requirements for on-going monitoring while finally documents the change history (changelog).

2.5 Key Activity 5: Risk Tracking

The final key activity in the risk management process is risk tracking. Risk tracking addresses the question *“How are things going?”*

In specific, risk tracking refers to the systematic tracking and evaluation of the applied risk mitigation actions. Risk tracking activities are integral to a good project management. The RM should monitor the progress and regularly update risk status and related information.

It should be noted that risk tracking is a feedback process where initial decisions and plans may be revised or updated following any updates in the risk status. In case a risk changes significantly, the corresponding mitigation approaches should be adjusted accordingly. For instance, if a risk is found to be of lower level than initially was assessed then the corresponding mitigation actions should be adjusted or even canceled. In this case the risk may be moved to a new cell which will be closer to the lower left corner of the Risk Reporting Matrix (e.g., as risk R1 in Figure 3). On the other hand, if a risk turns to be of a higher level than was initially assessed, then new root causes should be investigated and appropriate mitigation options should be introduced. In this case, the risk should move to a new cell closer to the upper right corner (e.g., as risk R2 in Figure 3).

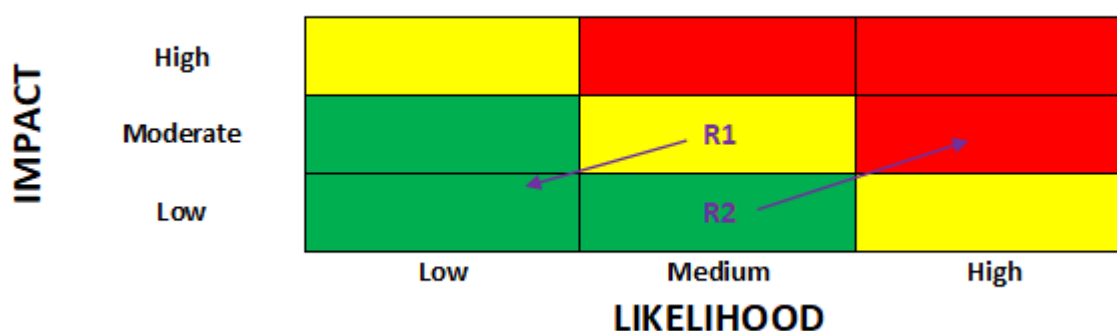


Figure 3. Changing levels in the Risk Reporting Matrix after risk tracking

3. Roles and Responsibilities

During RISKADAPT project, the consortium members will be responsible for implementing the RMP as presented in Chapter 2. All partners should report without delay any risky situation that may arise and

affect the project’s objectives. Any unexpected scientific findings, technical difficulties or any other issues that may induce changes in the work plan and time schedule of the deliverables or in the allocated budget should be reported immediately to the corresponding Work Package Leader (WPL).

Risks will be categorised based on the corresponding WP and a main responsible partner will be assigned to each identified risk. The WPLs are responsible for providing the RM with updated information on identified risks and proposed mitigation and contingency plans in their WPs, with the support and input from the partners involved in the respective WP. They will also supervise the implementation of the mitigation measures, take appropriate actions when needed, and report on the progress of the risk mitigation plan to the RM.

The RM will be responsible for supervising the implementation of the RMP and the regular updating of the risk registry and Risk Reporting Matrix. The RM will contact the Project Coordinator (PC) for any risks related to strategic, administrative and technical issues. The RM will also ensure the communication of the risks to the project teams and raise awareness of all partners on risk management processes. Identified risks and mitigation plans will be discussed regularly in WP Coordination Meetings among the PC, the project managers, and the WPLs. In case of an emerging risk with high probability and impact, which could severely affect project objectives or time plan, an extraordinary Project Board (PB) meeting may be convened.

4. Risk Registry

The RISKADAPT partners have already identified and assessed a number of possible risks that may affect the project objectives. These risks are presented in Table 3 along with the corresponding probability and impact levels, which enable risk prioritisation. Table 3 also presents the corresponding WP(s) for each identified risk, as well as the proposed mitigation measures. Furthermore, all the risks mentioned in Table 3 are depicted by their corresponding number in the project’s Risk Reporting Matrix (Figure 4).

It should be noted that the list of risks presented below is not exhaustive. Updating of the risk registry will be performed by the consortium partners on a regular basis over the course of the project following the procedures described in Chapter 2, under the supervision of the RM.

Table 3: Critical Risks and Mitigation Measures

Risk ID	Description	WP	Likelihood	Impact	Proposed Mitigation Measures
1	Integration of features intended for field testing takes longer than expected or some of these features cannot be integrated.	5	M	H	Integration needs are addressed early within WP2, so that individual applications are amenable to continuous integration. Applications/tools are based on standardized interfaces. RISA has significant experience in integrating similar systems
2	Difficulties to link RISKADAPT to C3S, GEOSS, Climate ADAPT	3	L	H	RISKADAPT uses standardized methods, data formats, and extracts the input data directly from quality-assured operational services (such as C3S etc.)

Risk ID	Description	WP	Likelihood	Impact	Proposed Mitigation Measures
3	Regarding hydrological and hydraulic modelling, the main risk refers to the accuracy of input data.	3	L	H	<p>River Floods:</p> <p>Climate data will be provided by the FMI, which has experience with producing high quality data. Furthermore, risk of ‘totally false’ input values for the future will be mitigated using specific multi-model climate projections, enabling the assessment of CC according to different scenarios and uncertainty.</p> <p>Buildings:</p> <p>The correct modelling of CC is intended as the “closest to reality” numerical modelling for the climate variables, which have to be downscaled at a spatial scale relevant to calculating the effects of CC on buildings. The use of the well-establish techniques of a multi-modelling ensemble (which consists of generating a climate projection using the output of multiple models) allows quantifying the uncertainty of the projected climate variables and highly reduces the risk for numerical modelling to predict future values that are not realistic.</p>
4	Difficulties in correct modelling of social/economic impacts involve the lack of suitable data and the possible lack of knowledge on interconnections between variables and/or choice of the most suitable modelling technique. In particular, spatial microsimulation models typically require the availability of suitable social survey microdata which are combined with	5	L	M	<p>It is envisaged that key microdatasets that will be considered and used include the European Union Survey on Income and Living Conditions (EU-SILC), which includes a comprehensive set of variables that will be relevant to RISKADAPT (including income and other socio-economic and demographic variables that can be used for economic impact assessment on local populations) as well as the European Social Survey and the World Values Survey. We expect that these datasets will be sufficient to produce a small area micro-dataset with relevant variables for the purposes of the project. Nevertheless, if there are missing values in these surveys for key variables and/or if it emerges that there is a need for additional variables that are not available in these datasets, we will consider the possibilities for variable estimation using datasets from other more specialized surveys and countries (such as the very comprehensive UK Understanding Society Household Panel Survey) to model interdependencies between variables (using suitable data fusion methods). In addition, a key challenge in the spatial microsimulation model specification is the choice of suitable and relevant</p>

Risk ID	Description	WP	Likelihood	Impact	Proposed Mitigation Measures
	small area data (from sources such as the census of population).				small area data that will be used as small area constraints. These are typically cross-tabulations of demographic and socio-economic variables from censuses of population (or similar sources) and a key criterion for their selection is their possible correlation with key variables in the social survey microdata which is reweighted using these constraints. It is also relevant to note that there are a wide range of reweighting methods that can be used to combine social survey microdata with small area data (typically referred in spatial microsimulation as ‘small area constraints’), ranging from iterative proportional fitting to hill climbing and simulated annealing. The RISKADAPT researchers at RUG who are leading on spatial microsimulation and relevant tasks have extensive experience with the development and use of these techniques and they are also in a very good position to make decisions on which would be the most suitable variables (as small area constraints).
5	Corona virus prohibits travel and meetings	1	H	L	The project includes digital means for meetings. The CoPs and focus groups and dissemination activities will take place virtually.
6	Envisaged applications have low operational value	5	L	H	A large no. of major stakeholders is involved in the specifications/validation of RISKADAPT through BIBM and SCN while the aim of T2.1 is to include input from all stakeholders and to ensure that their operational needs are addressed.
7	No active participation of stakeholders in the CoPs; Gender dimension neglected in CoPs	2, 5	M	H	Sociologists from the UU that lead in these respects, have extended experience on these matters. They will identify such issues early in the project and will introduce tools to activate the stakeholders and include the gender dimension.
8	Alternative solutions appear in the market before RISKADAPT products reach the market	7	L	H	Be vigilant towards product developments of possible competitors and if necessary hasten any planned market introduction or re-evaluate the market introduction strategy. The proposed solutions are field validated as soon as possible.
9	Project risks are neglected or not	1	L	M	Implementation of a project risk management with a Risk Registry and regular (quarterly) review of

Risk ID	Description	WP	Likelihood	Impact	Proposed Mitigation Measures
	adequately managed				project risks. Task 1.4 is devoted to risk management.
10	Exploitation targets are not clear/measurable/achievable in the given time	7	L	M	Clear exploitation goals are set early. The exploitation plan covers incremental improvements and significant development steps. The exploitation manager has extensive experience in the marketing of integrated IT solutions.
11	Withdrawal of partner/Key staff	1	L	M	Contact partners to seek similar competencies. Otherwise initiate adding a new partner to the consortium.
12	Delays in key milestones/critical deliverables	2-5	M	M	Carefully monitor progress, by means of project milestones and regular meetings, to quickly detect any delays. Prioritise workload and shift resources by reducing effort on non-critical tasks, even if this implies a shift of resources between partners.
13	The interface of PRISKADAPT is too complicated	5	L	M	ERRA has a lot of experience in user friendly interfaces. User interfaces will be continuously improved based on continuous feedback
14	Delays in climate data provision for CFD simulations, and issues in exchanging this data (inconsistent data format, etc.)	1	L	H	(a) The WP leaders/coordinator monitor the working flow to identify possible delays in deliverables submission. (b) The Data Manager works with the task leaders to homogenise the data format, exchange procedures and input-output chain. (c) All partners provide their experience in particular data sources/format.
15	Conflicts among the Consortium in terms of ownership, Intellectual Property Rights (IPRs) and obligations.	7	L	M	Partners have stated in the GA and CA information related to their background and foreground IPR. IPR will be continuously monitored during the life-span of the project through surveys re-iterated with the consortium partners.

Notes:

Likelihood: Low (L), Medium (M), High (H)

Impact: Low (L), Moderate (M), High (H)

IMPACT	High	2, 3, 6, 8, 14	1, 7	
	Moderate	4, 9, 10, 11, 13, 15	12	
	Low			5
		Low	Medium	High
		LIKELIHOOD		

Figure 4. RISKADAPT Risk Reporting Matrix (Note: the numbers correspond to the Risk ID of Table 3)

5. Conclusions

A Risk Management Plan (RMP) which will identify and register any potential risk that may occur during a project's life along with the corresponding mitigation measures is an essential tool of the project management required for the smooth and successful implementation of the project's objectives.

D1.4 presented the RMP for the RISKADAPT project. In specific, the steps for managing any potential risks related to the RISKADAPT project were presented in detail. Furthermore, the roles and responsibilities of the consortium partners with regards to risk management were specified. Finally, the risk registry and the corresponding Risk Reporting Matrix including all the potential risks that were identified during the early stages of the project along with their likelihood and impact levels and the corresponding mitigation measures were presented.

It is obvious that all consortium members shall adhere to the proposed RMP whose implementation and updating will be supervised by the RM.

References

US Department of Defense, “*Risk Management Guide for DoD Acquisition*”, Sixth Edition (version 1.0), August 2006.