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D1.2 – Quality Assurance and Risk Management Plan

WP1: Management & Dissemination

Under Review

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Executive Summary

This document builds on D1.1 – Management plan, where we presented the operational structure, and discusses the overall quality monitoring process for the project. Particular attention is given to the review process of deliverables and annual reports as well as milestone completion. Success criteria and KPIs are described, and their status will be followed-up in the management reports. An additional section covers the overall contingency strategy where potential risks are identified for monitoring and regular assessment in the periodic management reports.

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1 Introduction

The objective of the quality assurance and risk management plan is to define the processes, plans and metrics that shall apply throughout the GANANA project in order to monitor the activities, to identify and eliminate potential risks, and to ensure the successful execution of the project. Deliverable review procedures and reporting timelines are also defined to guarantee the quality aspired for. The guidelines apply to all work packages.

2 Quality Assurance Action Plan

The quality assurance action plan addresses establishment of 1) an operational structure, 2) processes for monitoring of activities and their results, 3) mitigation strategies of potential risks.

In D1.1 we have described in detail the project organization and management structure (Figure 1). Here we first give a brief overview followed by elaboration on the operational processes and assessment of results along main lines of project activities.

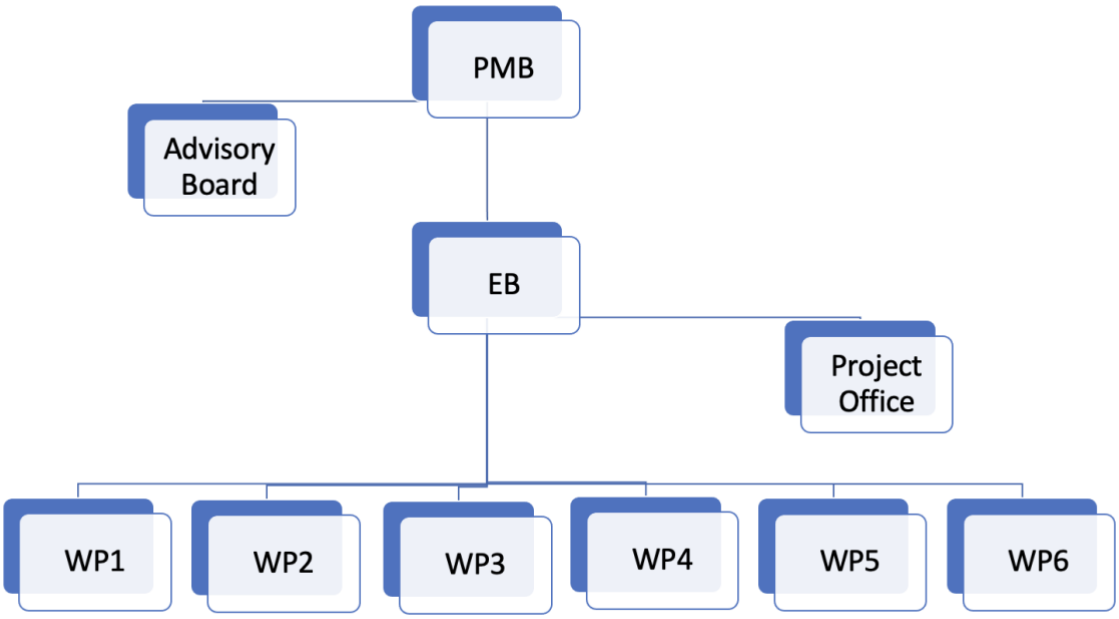


Figure 1. Organizational Chart of the Project

2.1 Operational Structure and general processes

The main driving body of the project activities is the Executive Board (EB) team. It is composed of the Project Director, all WP leaders and their deputies. To ensure appropriate

involvement and communication channels, all consortium partners are thus represented in the EB either as WP leaders or deputies.

EB videoconference meetings are organized twice per month. During the meetings, each WP leader (or deputy in the event of absence) presents the status of ongoing activities and the plans for future ones. The Project Director and EB members ensure that those activities are in line with, and work towards the objectives described in the project workplan. Each of the WP leaders is responsible for monitoring and meeting the metrics (Table 2. Key Performance Indicators), the milestones, preparing the deliverables and managing potential risks (Table 3)

All partners submit project internal reports to the Project Director. The reports include:

1. description of accomplishments along the tasks assigned to the partner,
2. issues that are being observed
3. recommendation for improvement of the operations and
4. consumed effort during the reporting period.

Issues, which cannot be resolved at the operational EB level such as insufficient staff, consistent underperformance of personnel, global dangers for success of the project etc. are brought up to the corresponding PI, a member of the Project Management Board (PMB), or the whole PMB, where applicable.

The Project Director and the project office analyse the consumed effort and in the case of discrepancy the issue is discussed directly with the corresponding partner.

In the following sections we elaborate on some of the main procedures that have been established to ensure success of the project.

2.2 Deliverable review process

Every deliverable has a designated person responsible for its preparation, and that is typically the leader of the corresponding WP. The rest of the partners with effort in the given WP provide input to the leader for preparation of the document. The draft document is reviewed by at least two different partners who have relevant competencies but have not participated in the preparation of the document (Table 1).

Table 1. Leaders and reviewers of deliverables.

WP#	Lead beneficiary	Main contributors	Reviewing partners
WP1	KTH	CMCC	BSC, CSC, CDAC
WP2	CSC	BSC, CINECA	KTH, UU, CDAC

WP3	UU	KTH, JYU	BULL, BSC, CSIC, UMA, CDAC
WP4	GUF	BSC, UMA, CSIC	CMCC, BULL, JYU, CDAC
WP5	BSC	CMCC, BULL	GUF, UMA, CSIC, CDAC
WP6	KTH	BSC	CSC, CINECA, CDAC

The review process is as follows:

1. Deliverable leaders collect material from partners and provide the first draft for review 4 weeks before submission deadline.
2. Iterative reviewing process continues for the following two weeks.
3. Second draft is submitted to the Project Management Board (PMB) two weeks before submission deadline.
4. Comments are addressed, and final version is ready 1 week before submission deadline. The last week is used for final formatting changes and document is submitted to EC.

Important issues with deliverable preparation and submission are discussed within EB or raised to PMB, if needed.

2.3 Periodic reports and Milestones

In addition to the main deliverables, the project produces the following outcomes:

- Activity reports – internal, every six months
- Periodic reports – to be submitted to EC at PM120 and 38
- Financial reports – internal, every six months
- Financial periodic reports – to be submitted to EC at PM120 and 38
- Milestones

Activity reports are produced by each partner and serve as base for deliverables as well as annual reports.

Periodic reports are prepared according to the same process used for the deliverables described above.

Financial reports are prepared by the Project Office. The bi-annual reports are used for internal monitoring of effort expenditure, while the annual ones (or as requested) are submitted to EC.

Milestones have clearly identified due dates in the DoA and responsible partners. When a milestone has been reached, the partner responsible needs to inform the EB and provide

sufficient documentation which proves that the milestone has been reached. This documentation will subsequently be included in the next periodic report.

2.4 Software development

The consortium includes core developers of the main software applications as well as experts in HPC software engineering and development. The quality assurance process for the developed codes and the adoption of best practices are based on the practices in the respective Centres of Excellence, i.e. BioExcel CoE for WP3, CHEESE for WP4 and ESIWACE for WP5.

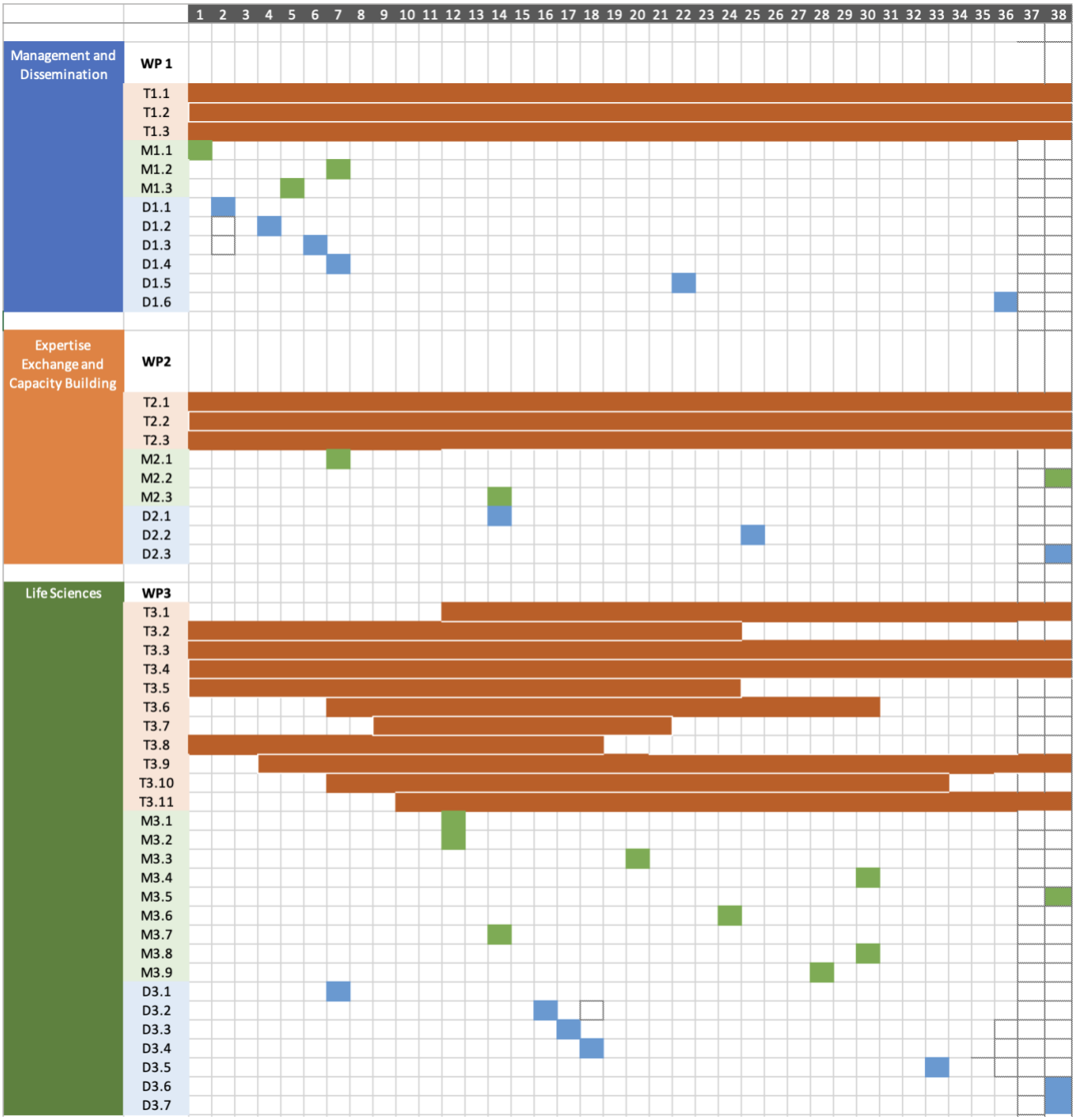
2.5 Dissemination and outreach

Adequate dissemination of the results and outreach to the communities is of vital importance. The process for ensuring success includes:

- Social media strategy
  - Full exploitation of the social channels (Twitter and LinkedIn).
  - A dedicated person is responsible for monitoring of the website content and the status of the social media channel engagement and development.
- Web content
  - Web content creation is divided in several topical categories, in general corresponding to the different activities in project. Content will be created regularly in the respective categories as the project evolves and results are produced.
  - Web content addition is overseen by the web curator who is also responsible for monitoring of the social media channel activities.
- Promotion material
  - Updated promotion material (such as flyers, poster, roll-up) will be updated and distributed to partners. Once per year we are planning to revise the content and update according to the progress in the project activities.

3 Timeline of activities

The following Gantt chart shows the timing of the work packages and their deliverables and milestones.


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
Management and Dissemination
WP 1
T1.1
T1.2
T1.3
M1.1
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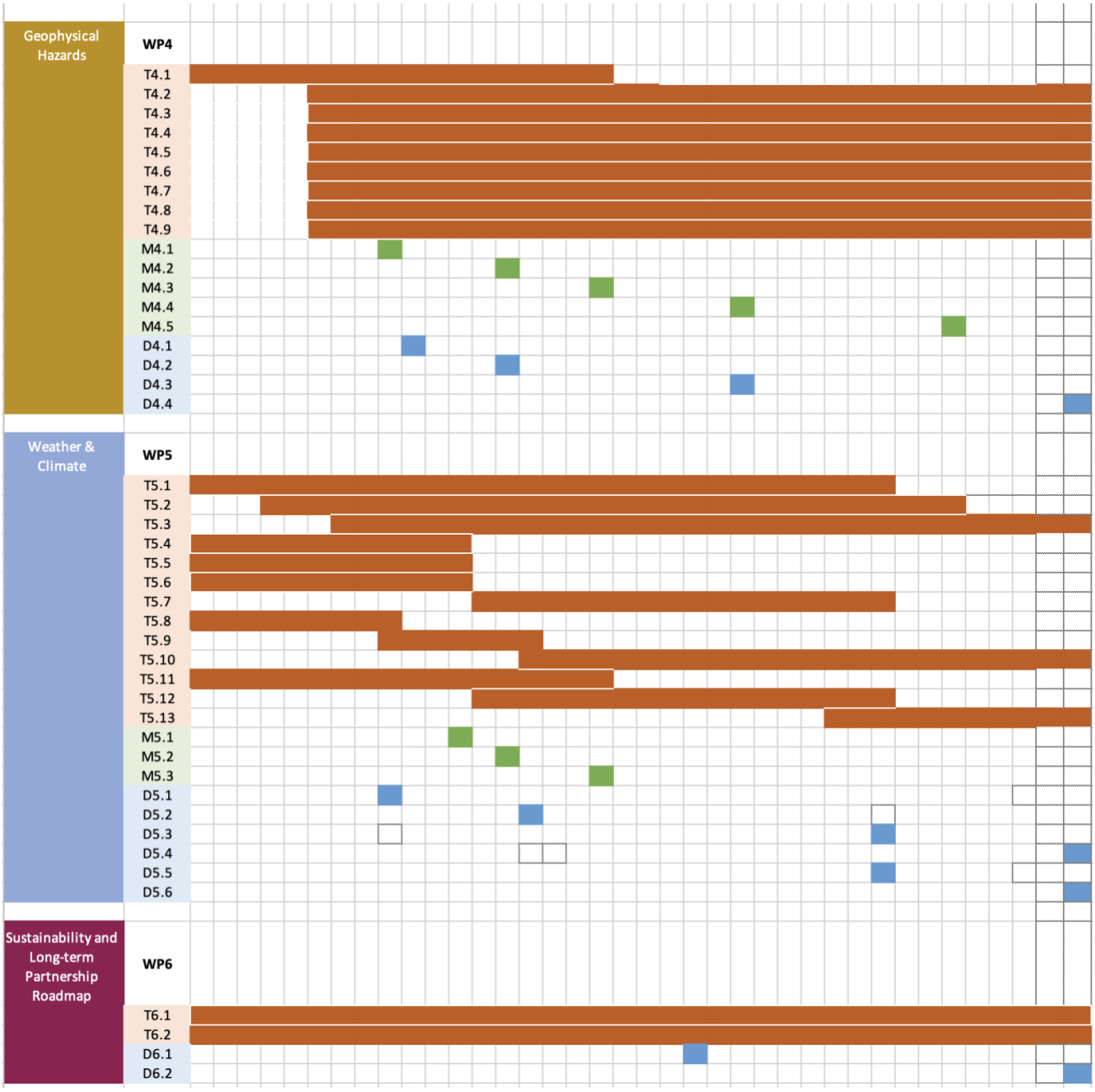

4 Success Metrics and KPIs

Achievement of scientific excellence and impact are at the core of GANANA and as such they underlie the performance indicators that will be used to monitor the success of project.

In the following sections we will give a brief overview of the metrics for success in each of the core activities, while in section 4.4 we provide a more detailed description of the associated KPIs.

4.1 Software Excellence

Our software activities aim to improve the availability, efficiency, scalability and usability of the selected software packages of high importance and usage in the three priority domains.

Maintenance and possibly increase of scaling and efficiency on modern hardware will be demonstrated by regular benchmarking, measured as absolute performance and relative scaling. This will depend heavily on the characteristics of next generation hardware. Depending on the availability and usefulness of new platforms we aim to deploy the applications on both EuroHPC as well as Indian (CDAC) systems.

4.2 Expertise exchange and mobility program

To ensure quality and effectiveness, the expertise exchange activities are structured through joint workshops, annual symposia, and a dedicated mobility program. Quality assurance is embedded in the planning and execution of each activity: all visits under the mobility program—approximately 13 short-term exchanges over the project's duration—will be guided by well-defined agendas and post-visit reporting. These ensure alignment with project goals and measurable outcomes.

Risk management includes regular evaluation checkpoints, participant feedback loops, and contingency planning for travel disruptions or mismatched expertise. A steering group within the consortium will oversee the selection and approval of exchange visits, monitor progress, and intervene if objectives are not being met. This framework ensures that collaboration is not only effective but resilient, supporting both the immediate goals of GANANA and its long-term impact.

4.3 Outreach and Dissemination Excellence

Online platforms and communication channels offer unprecedented opportunities for outreach to ever wider audiences. At the same time, the flood of information makes it very challenging to "break through the noise" to get users' attention. To address this challenge, we will be developing and applying high standards in dissemination processes by preparing high quality promotional and marketing material, designing activities based on user feedback etc.

4.4 Key Performance Indicators (KPIs)

To assess the impact of the project, Key Performance Indicators have been defined and will be monitored and reported in the management reports. Table 2 provides an extensive list of the metrics, their likelihood, impact etc.

Table 2. Key Performance Indicators.

	KPI	Justification	Additional details (if needed)	Reachable target	Stretch target

	Dissemination and outreach				
KPI_01	Social media - X	Regular engagement and updates are needed for social media channels		12 per quarter	20 per quarter
KPI_02	Number of new X followers	Determine whether our reach on twitter is increasing		30 new followers per quarter	50 new followers per quarter
KPI_03	Social media - LinkedIn	Regular engagement and updates are needed for social media channels		6 update per quarter	9 update per quarter
KPI_04	Number of users of the GANANA website	This KPI helps to determine whether we are increasing our reach as well as when peak interaction periods are		200 per quarter	500 per quarter
KPI_05	Newsletter	A regular newsletter to broadcast the main activities and opportunities generated by the project,		2 per year	3 per year
KPI_06	Number of people subscribed to the general GANANA mailing list	Determine whether our reach is increasing		30 per quarter	45 per quarter
	Software development - Life Sciences				
KPI_07	Number of workflows generated for HADDOCK3	During the course of the project new workflows corresponding to specific/new modelling scenarios will be added to HADDOCK3	Those workflows will result from new features implemented in the code (related to KPI_06)	3 over the entire project	6 over the entire project
KPI_08	Growth of the HADDOCK Indian user community	The new features and workflows should ideally translate in an increased usage of HADDOCK (including its web services) in India	The baseline will be defined by the number of new Indian users in the previous year	5% increase in yearly number of new registered users	10% increase in yearly number of new registered users
KPI_09	GROMACS-Single-simulation scaling & performance	Efficiency of single simulations to use large parallel hardware	Reported as one of the GROMACS KPIs	Relative scaling has not deteriorated	Both relative scaling and absolute performance per node should increase
	Software development - Geophysical Hazards				
KPI_10	Increase the capabilities and functionalities of the WP4 codes	The incorporation of the codes and workflows proposed in WP4 must be consistent with the Indian counterpart requirements	Different improvements on the codes must be consistent with the Indian proposed codes for modeling the geohazards proposed by counterpart	UCIS4EQ: increase the frequency simulation up to 2 Hz through the GPU usage in the solver FALL3D: add wildfire smoke functionality. HySEA: Prototype of a computational component for a TEWS for India. New tool for deterministic high-resolution	UCIS4EQ: increase the frequency simulation up to 5 Hz FALL3D: Proof of concept of the forecast system tested. HySEA: Further reducing computing times in the TEWS prototype improving parallelization and increasing number of GPUs. Increasing numerical resolution up to the limits for high-resolution inundation in

				tsunami hazard assessment for the Indian coasts SAIPy: Achieve the accuracy for earthquake identification for 50Hz data upto 98%. Reduce the error for high magnitude estimation to ±1.2	selected areas (1-2 meters). SAIPy: Achieve the accuracy for earthquake identification for 50Hz data upto 99%. Reduce the error for high magnitude estimation to ±0.8
KPI_11	Validation of the codes using use cases for different regions	For each area we test different geohazards	Report the validation with real data	Report 1 use case per year	At least 2 use cases per geohazard
KPI_12	Portability of codes/workflow, usage of Indian counterparts	The portability and usage of the codes and applications are an important indicator of the collaboration of this proposal.	Reporting on new users, and especially how these tools will be kept for end users' interest in risk management	Installation on the CDAC infrastructures three WP4 codes, and increase the users in at least one institution	End users to grow to 2 institutions
	Software development - Weather & Climate				
KPI_13	HPC tools deployment	A wider deployment of HPC tools on the C-DAC computing infrastructure is the key factor to strengthen the EU-India collaboration	Not all the tools have to be installed in the same machine. For example, profiling tools and auto submit might be installed in different C-DAC platforms	1 C-DAC supercomputer	At least 2 C-DAC supercomputers
KPI_14	Profiling analysis	The number of Indian weather and climate applications to be profiled using European performance analysis tools	As a service, this will depend on the requests received from Indian partners	1 per year	2 per year
KPI_15	Optimizations proposed or applied	The number of optimizations applied (if minor) or proposed (if major) after analyzing the Indian weather and climate applications	This can vary due to the nature of the KPI itself. Depends on how well optimized are Indian applications	2 per year	3 per year
KPI_16	EC-Earth deployment	Deployment of the EC-Earth model on the C-DAC computing infrastructure is the key factor to strengthen the EU-India collaboration		1 C-DAC supercomputer	At least 2 C-DAC supercomputers

KPI_17	C-DAC customised WRF deployment support	Deployment support of the C-DAC customised WRF on the EuroHPC computing infrastructure is the key factor to strengthen the EU-India collaboration		1 EuroHPC supercomputer	At least 2 EuroHPC supercomputers
KPI_18	Climate use cases	Design and definition of climate use cases, including EC-Earth, urban studies with ICON-CLM and support to run the C-DAC customized WRF	Use cases will be ready to be used by scientists, but not all of them need to be run in GANANA	3 climate use cases r	2 additional CMIP-based climate uses cases covering different scenarios. r
KPI_19	ICON-CLM deployment			1 C-DAC supercomputer	At least 2 C-DAC supercomputers
KPI_20	New Indian dwarf in HPCW and associated test cases	Number of dwarf incorporated in HPCW framework / Number of associated test cases		1 dwarf with 1 small test case (single node)	1 dwarf with small and medium test cases (single and multi-nodes)
KPI_21	Deployment of HPCW Indian dwarf on India HPC systems	Number of Indian HPC systems where HPCW Indian dwarf is deployed		1	3
KPI_22	Deployment of HPCW Indian dwarf on EuroHPC systems	Number of EuroHPC systems where HPCW Indian dwarf is deployed		2	4
	Expertise exchange				
KPI_23	Researcher and/or engineer exchanges from GANANA to India	These exchanges can take various forms, including participation to workshops, training, and lectures, given as part of a short visit programme or a longer stays hosted by an Indian organisation. This KPI focuses on the frequency of exchanges but will also assess the quality and impact of collaborative interactions, with a short report made after each exchange.		12	15
KPI_24	Researcher and/or engineer from India hosted by GANANA members	These exchanges can take various forms, including participation workshops, training, and lectures hosted by a GANANA consortium member. This KPI focuses on the frequency of exchanges but will also assess the		10	15

		quality and impact of collaborative interactions, with a short report made after each exchange.			
KPI_25	Number of participants in the symposium hosted in Europe	Participation level to the symposium measures the level of impact and interest towards the EU-India collaboration		80	100
KPI_26	Number of participants in the scientific workshops hosted in Europe	Participation level to workshops measures the level of impact and interest towards the workshop topics and towards the collaboration		15	20

5 Risk Management

GANANA brings together partners of established European Centres of Excellence, who have run successfully during the past decade challenging technological, scientific and community projects. All members of the consortium thus have the necessary experience to execute the workprogram while properly managing potential risk.

Based on our experiences through the years, we have improved the risk monitoring system and put in place necessary measures against potential undesired outcomes. In Table 3 we present a list of identified potential risks for the execution of the project and the long-term success of the initiative. We have put in place the following methodology for monitoring, analysis and action plan regarding those risks:

- WP leaders are responsible for continuously monitoring the progress along the objectives in their work packages. The monitoring relies on sufficient communication with the corresponding WP members. Identified issues are brought up at the next executive board (EB) meeting. If there's been a consistent problem with intra-work package communication, the case is escalated to the responsible partner PIs, which are members of the project management board (PMB).
- During EB meetings the issues are brought up and their scope, severity of impact, priority for resolving and suggested action plan are discussed. If the risk concerns a single WP, its leader will be in charge to execute actions, as agreed by the board. If the scope covers more than a single work package, leaders of all affected work packages are required to implement coordinated efforts and the necessary actions for resolving them.
- In case of conflicts, the issues are raised to the PMB and dealt with according to the conflict resolution strategy based on the Consortium Agreement, as outlined in D5.1 "Management plan".

- Risks with high rating (= Likelihood x Impact > 10, see Table 3), are noted as "high risk factors" and are given special attention for monitoring and implementation of preventive or counteractive measures.

Table 3. Risk evaluation matrix.

	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
Likelihood		1	2	3	4	5
		Impact				

The risk management plan thus ensures that risks are identified, brought to the attention of concerned personnel and counter measures are put in place. Close interactions between WP leaders and their deputies within the EB, as well as at the higher management level of PMB, will guarantee that mitigation strategies are executed in due time. Monitoring and planning are supported by the roadmap (based on the description of work) of milestones and deliverables, as well as the internal periodic reporting. We have also setup a database for tracking issues that have arisen, the actions taken and their outcome. In Table 4. Below we show all identified risks.

Table 4. Risk management.

§	Description	WP	Likelihood	Impact	Risk score	Proposed Mitigation actions
Risks for the project execution					**(Likelihood x Impact)**	
Management & Dissemination						
R1	Partner is not competent to carry out allocated tasks.	1	1	5	5	Partners have been carefully selected based on different required expertise (high performance and high throughput computing, biomolecular life science, software development, scientific & industrial applications), track record in their field (number of scientific publications and citations for research partners; level of innovation; academic excellence) and balance of the consortium. The consortium agreement includes measures to be taken if a partner still would not deliver for some reason, such as replacement of this partner by another one and a corresponding budget reallocation.
R2	Key staff leave or are unexpectedly absent (WP leaders, EB/PMB members etc)	1	3	4	12	Regular communication, deputies if applicable and in case of resignation a hand-over period will be used to facilitate a smooth transition. Staff might be more likely to leave towards the end of funding (e.g. for new projects) - to mitigate more than 1 staff at each partner should be kept in the loop (e.g. lurk on mailing lists, local update meetings).
Expertise Exchange						
R3	Researcher / engineer exchanges not fulfilling the purpose of widening networks or deepening collaboration due to host entity's other urgencies	2	2	4	8	An exchange program will be detailed before the visit with the host organisation involved in the preparation to ensure commitment from the host. In addition, a mentor/host person will be assigned in the plan to ensure the host entity has a designated person taking care of the visitor.
R4	Impact and results of the visit remains unclear	2	2	5	10	A report will be asked from all persons who have been on an exchange detailing the results and impact of the visit. These reports will be compiled into deliverable XX
Life Sciences						
R5	Applications cannot efficiently exploit/scale on new hardware		2	4	8	The current code versions efficiently exploit and are scalable on a wide range of architectures. Through our co- design activities we ensure that future hardware developments take our requirements into account.
R6	Computational engine of HADDOCK3 (CNS - third party software) no longer developed / supported on new architectures	3	2	5	10	CNS is still under development and the modularisation of HADDOCK3 will allow to replace some components if needed.
R7	Software alternatives to those at the core of the Life Sciences WP become dominant user choices	3	2	5	10	If we identify a rapid growth in popularity of software offering similar functionality to the main applications in this project, we will reconsider development plans. This might include implementing comparable features, porting to new platforms, or in highly unlikely extreme cases ceasing development.
R8	Discovery of missing requirements or finding of unsolvable steps during development.		2	5	10	The development of the core applications is guided by concrete use cases and requirements. The modular nature of the computational framework used will ease adaptation to new requirements.
Geophysical Hazards						
R9	Codes dependencies that will make BSC codes incompatible	4	2	4	8	In the case of UCIS4EQ we want to leverage this workflow as a WaaS (Workflow as a Service). For other codes we count with CDAC support.
R10	Computational resurces and access to MN5	4	1	3	3	The exchange can be limited by computational resources, we plan to ask for EuroHPC resources for CDAC-BSC projects.
R11	Workflow exchange and exploitation delays. For example, wildfire data formats.	4	2	3	6	The first nine months are reserved to describe, align and test such requirements
R12	Data aquisition: data restrictions	4	2	2	4	We rely on real data to test and validate models, if not the case, and we have restricted data, we plan to generate synthetic data
Weather & Climate						
R13	European profiling tools, such as BSC tools, cannot be deployed on the C-DAC computing infrastructure due to different issues: lack of hardware counters permissions, support for the installed software stack, etc.	5	2	3	6	try to address the issues in collaboration with the tools' developers and/or C-DAC support. If this does not prove effective, the second step would be to make use of alternative profiling tools.
R14	EC-Earth and Autosubmit cannot be deployed on the C-DAC computing infrastructure due to unsupported HW and SW environment	5	1	3	3	select a suitable HPC system that is available and compatible with EC-Earth and Autosubmit
R15	C-DAC customised WRF cannot be deployed on a EuroHPC machine due to unsupported HW and SW environment	5	1	3	3	select a suitable EuroHPC system that is available and compatible with C-DAC customised WRF
R16	the storage capacity or the budgeted corehours needed for the climate use-cases can not be granted on the target architecture	5	3	3	9	evaluation of the model performance to accurately set up the simulation configuration. If it is not enough, adjust the simulation length to complete before the end of the project.
R17	ICON-CLM can not be deployed on the target computing infrastructure due to unsupported HW and SW environment	5	1	3	3	select a suitable machine with the same configuration of an architecture where ICON-CLM is currently deployed

§	Description	WP	Likelihood	Impact	Risk score	Proposed Mitigation actions
R18	storage capacity or the budgeted corehours needed for the urban model simulation can not be granted on the target architecture	5	3	3	9	evaluation of the model performance to accurately design the simulation setting (task 5.9). Configure the job scheduler (with a dedicated job queue) on the target architecture to ensure that the simulation can be completed before the end of the project
R19	the licence of the model from which the dwarf is extracted can not be compliant with its use with HPCW	5	1	3	3	identification of a dwarf from a model with a licence compatible with its use with HPCW
R20	HPCW can not be deployed on HPC system (EuroHPC and C-DAC) due to unsupported HW and SW environment or unavailability	5	1	3	3	select a suitable HPC system that is available and compatible with HPCW
	Roadmap for Partnership					
R21	Misalignment with other key initiatives for global collaboration in HPC	6	2	3	6	GANANA future collaboration roadmap will be developed in close interaction with other EuroHPC international cooperation initiatives like HANAMI or other future projects. CSC is in the lead of WP7 in HANAMI project focusing on collaboration roadmap, and will ensure the alignment with the investigations of possible cooperation and funding structures, and alignment of future roadmap.
R22	Lack of support for long-term sustainable operations	6	4	5	20	It is difficult to assess the availability of targeted long-term funding for operations of the partnership. Mitigation actions will stem from the very success of the project itself. Achieving the objectives will exemplify the impact and the benefits of additional investments, not only by EC but by national funding bodies. The established strong collaboration links between EU and Indian researchers, if proven beneficial, will continue to persist and provide basis for raising additional funding from various funding sources. Finally, we will engage closely with related initiatives such as HANAMI for sharing experiences and joining efforts towards long-term sustainability.