

**INNOVATIVE GREENHOUSE SUPPORT SYSTEM IN THE
MEDITERRANEAN REGION: EFFICIENT FERTIGATION AND PEST MANAGEMENT
THROUGH IOT BASED
CLIMATE CONTROL — iGUESSMED**

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**Deliverable 1.2
Quality Assurance Plan**

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Dissemination Level

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D1.2 – Quality Assurance Plan

Abstract

This deliverable integrates the Project Coordination Procedure Manual (D1.1) and the Risk Management Plan (D1.3) and represents the monitoring and evaluation system, in order to ensure high quality in project implementation. The document also describes the measures for quality assurance of project results and documentation (also included in D1.1).

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1 Introduction



The iGUESS-MED project aims to develop a Decision Support System (DSS) able to effectively manage fertigation and prevent plant diseases and pests in tomato crops grown in soil and soilless in commercial greenhouses of the Mediterranean region. This innovative greenhouse DSS will be developed to (i) help greenhouse farmers to improve the management of fertigation in areas with low (saline) quality waters (ii) to reduce the use of chemicals by a sustainable and integrated pest and disease control and (iii) to improve the climatic efficiency in the existent greenhouse by low-cost climate actions. The DSS will allow obtaining healthier and higher quality productions and higher yields, while will reduce the use of water and the losses of nutrients and chemicals to the environment. iGUESS-MED will be able to manage efficient fertigation, to forecast diseases and pests, and to improve the climatic efficiency in tomato greenhouses, using only climate data acquisition and basic information on cropping system. The DSS will provide feedbacks and alerts about crop needs and real time recommendations to the farmers through friendly portable real time data visualization tools as PC, tablets or smartphones. To achieve this objective, new models for calculating crop evapotranspiration will be performed by integrating sensor data from plant, soil and climate, and forecasting models for assessing disease and pest risks will be developed by using the Integrated Pest Management.

The project consortium (research centers, SMEs and end-users of EU and non-EU countries belonging to the Mediterranean basin) will collaborate from the beginning to make the DSS marketable involving, end-users and stakeholders to validate the system in own greenhouses, reducing gaps between research, application developers and farmers. The application of DSS will benefit the workers and the consumers, providing better working conditions, crop healthiness and reduction of environmental impact.

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1.1 Summary of the deliverable

The Quality Assurance Plan includes all procedures undertaken within the iGUESS-MED consortium in order to assure high quality results for the project. This includes the monitoring and evaluation system for iGUESS-MED project, the applied quality assurance procedures and the project documentation.

Section 2 “Monitoring and Evaluation System” – this chapter details the Monitoring and Evaluation System adopted to manage the project and track its progress with respect to Work Plan, as well as to plan and undertake corrective actions and changes if necessary.

Section 3 “Configuration Management” – this chapter presents the configuration management rules. It defines the configuration items that are supposed to be identified within the iGUESS-MED consortium and provides rules for identifying those latter. In addition, it details the documentation management rules that apply to the project.

2 MONITORING AND EVALUATION SYSTEM



A monitoring and evaluation system (M&E) is adopted for the implementation of project activities. The activities to be followed are declined in this Monitoring and Evaluation Plan, agreed by Project Coordination Team. The aim of the system is to manage the project and track its progress with respect to the Work Plan, as well as to plan and undertake corrective actions and changes if necessary. Monitoring will be carried out through combined use of process indicators and result indicators. Thanks to monitoring the project, it will account what has been done during project life and if expected results are provided.

The overall organization of the project with regard to all the activities and operational steps to be performed requires the implementation of specific **quantitative** and **qualitative monitoring activities** in order to check periodically the progress of the work. These activities, on the one hand, will allow the applicants to exercise a constant and effective “governance” of the various activities; on the other hand, will allow the PRIMA Managing Authority and the other stakeholders to better appreciate the level of achievement of the same. The control of the monitoring activities and of the quality of the services provided will be guaranteed by the RQM figure.

Monitoring of projects involves a continuous and systematic collection of data, which is useful for subsequent analysis (review and evaluation) and for informed decision-making.

It focuses on the project’s inputs, activities and outputs, showing the impact which the project is aiming at. Furthermore, effective monitoring procedures ensure that the accountability of the project for the performance and results is properly emphasized.

More specifically, it has been considered important to develop an M&E plan before beginning any monitoring activities so that there is a clear plan for what questions about the project need to be answered. It will help project staff decide how they are going to collect data to track indicators, how

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monitoring data will be analyzed, and how the results of data collection will be disseminated both internally among the Consortium members and PRIMA Managing Authority and the other stakeholders. Such M&E plan is intended to help make sure data is being used efficiently to make the project as effective as possible and to be able to report on results at the end of the project.

In fact, the monitoring and evaluation plan for the iGUESS-MED project will serve two functions: first, **periodic assessment** of project implementation and performance of activities (**M&E of Project Performance**) and second, **evaluation** of their results in terms of relevance, effectiveness and impact in promoting the adoption of innovations developed towards future real environment application (**M&E of Project Impact**).

The M&E system of the project will provide answers on the progress and impact made by the Consortium and their partners in achieving the project’s outputs and outcomes.

Indeed, the M&E plan includes two components addressing the target indicators in the project log-frame:

- **M&E of project performance:** Monitoring focuses on the management and supervision of project activities, seeking to improve efficiency and overall effectiveness of project implementation. It is a continuous process to collect information on actual implementation of project activities compared to those scheduled in the project Work Plan, including the delivery of quality outputs in a timely manner, to identify problems and constraints (technical, human resource, and financial), to make clear recommendations for corrective actions, and identify lessons learned and best practices for scaling up, etc. Performance evaluation will assess the project’s success in achieving its objectives. **The project will be monitored closely by the Coordinator and by the Project Coordination Team through quarterly internal reviews/reports;**
- **M&E of project impact:** Evaluation of the project’s success in achieving its outcomes will be monitored continuously throughout the project. The key indicators can be found in the logical framework. The indicators have been further reviewed/refined during the development of this M&E Plan, and tools and methods and indicators for measuring impact have been determined and agreed to ensure that a standardized framework is shared by iGUESS-MED Consortium.

Both project performance and impact M&E aim to provide reliable and timely data on the project, to support not only the decision-making process but also to allow the immediate definition of improvements if necessary.

In particular, the **Mid-Term Evaluations** will determine progress being made towards achievement of outcomes and will provide constructive recommendations to address key problems identified. It will:

- review the effectiveness, efficiency and timeliness of the project implementation;
- identify issues requiring decisions and remedial actions;
- identify lessons learned about project design, implementation and management;
- highlight technical achievements and lessons learnt;
- analyse whether the project is on track with respect to achieving the expected results; and
- propose any mid-course corrections and/or adjustments to the work plan as necessary.

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Final Evaluation will take place at the end of the project and will focus on the same issues as the Mid-Term Evaluations. In addition, the final evaluation will review project impact, analyse sustainability of results and whether the project has achieved the outcomes and the development objectives.

2.1 M&E of project performance

The M&E of project performance focuses on the record of information related to the project implementation process (inputs), activities and outputs. A minimum data collection is required to enable the project management and stakeholders:

- to track the activities achieved (compare planned/versus achieved) and assess effects of both external factors and internal project operations;
- to assess results (outputs), lessons learnt and solutions to keep project on track.

2.1.1 Identification of Project Objectives

The scopes of the iGUESS-MED project will be achieved through a set of specific, measurable, achievable, realistic and time-constrained (SMART) specific objectives:

OBJECTIVE	DESCRIPTION
Objective 1	To develop a DSS in MED tomato greenhouses for fertigation and irrigation management, pests and diseases control and smart improvement of climate conditions, using climate data, IoT and Artificial Intelligence (AI) to turn high technological solutions into simple tools readily available at operational (farm) level.
Objective 2	To develop dedicated protocols to forecast the occurrence of plant pathogens and arthropod pests, boosting biological control in tomato crops grown in MED greenhouses.
Objective 3	To introduce innovative management (i.e. closed loop system with drip irrigation and gutter subirrigation; use of bio-based substrates) to facilitate the adoption of efficient fertigation strategies, particularly under conditions of low water quality to ensure limited (or zero) nitrate and phosphate leaching.
Objective 4	To create a mutual learning space and to facilitate technology exchange between EU and non-EU MED countries, for boosting capacity building locally, empowering a new generation of innovative and younger entrepreneurs, allowing for gender inclusiveness in working environments and promoting a circular and sustainable greenhouse farming in the MED Basin.
Objective 5	To assess the environmental and socio-economic impacts of innovative tomato cropping systems in commercial greenhouses, under a life cycle thinking perspective, thereby highlighting intervention’s cost-effectiveness and gender-related issues.
Objective 6	To spread project results and activities to the relevant stakeholders, for promoting lifelong learning for target groups, improving market competitiveness and boosting awareness and social acceptance of advanced and sustainable greenhouse cropping in Med countries.

Table 1 - iGUESS-MED specific objectives

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2.1.2 Milestones

The PCT will monitor the progress of the project carefully with the help of the defined milestones. In conjunction with the deliverables, the milestones provide a smooth and traceable means of tracking project progress and thus enable efficient decision making in a technical as well as administrative level, employing the management structure outlined above.

N.	Milestone name	Related WP(s)	Estimated date	Means of verification
MS1.1	Signed Consortium Agreement	WP1	M1	Document
MS1.2	Kick-off Meeting Performed	WP1	M2	Minute
MS1.3	Project Completed	WP1	M48	D1.7
MS2.1	Integration and installation of WSN connected to the IoT/BigData cloud platform in field trials	WP2	M3	D2.1, D2.2, D2.3, D2.4, D2.5
MS2.2	Developed IoT/BigData cloud platform for data management (field trials)	WP2	M3	D2.1, D2.2, D2.3, D2.4, D2.5
MS2.3	Defined pest protocols and biocontrol strategies	WP2	M17	D2.1
MS2.4	Defined forecasting models for disease management	WP2	M17	D2.2
MS2.5	Defined models for irrigation and fertilization management in soil and soilless tomato greenhouses	WP2	M17	D2.3, D2.4
MS2.6	Defined greenhouse climate control modifications	WP2	M17	D2.5
MS2.7	Implemented BigData algorithms and end-users interface for irrigation, fertilization, pest management and climate control services	WP2	M22	D2.6
MS2.8	PROTOTYPE: Intermediate IoT-based DSS	WP2	M24	D2.6
MS3.1	Integration and installation of WSN connected to the IoT/BigData cloud platform in pilot farms	WP3	M26	D3.1
MS3.2	Evaluation performance of greenhouse's farmers for prototype DSS	WP3	M34	D3.1
MS3.3	FINAL PRODUCT: Enhanced version of IoT-based DSS	WP3	M36	D3.1
MS4.1	Guidelines for harmonised data collection for environmental and socio-economic impact assessment	WP4	M6	Guidelines approved
MS4.2	Environmental and socio-economic impact assessment	WP4	M42	D 4.1
MS5.1	DECO plan document completed	WP5	M3	D5.1
MS5.2	Project logo, website and social media channels published	WP5	M3	D5.2

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N.	Milestone name	Related WP(s)	Estimated date	Means of verification
MS5.3	First Market Replication and business exploitation plans completed	WP5	M42	D5.10

Table 2 - List of milestones

In accordance with the above, milestones will be used as process indicators by iGUESS-MED Consortium in order to verify if the activities are being implemented as planned.

2.1.3 Data collection and reporting

In order to monitor project performance **periodic monitoring reports** will be realized, which will provide a summary of the activities carried out, taking into consideration the performance of some key performance indicators.

Ad hoc reports will be developed for monitoring the three typical sizes that describe the project progress:

- **the scientific monitoring**, which is focused on the state of project physical progress, whose performance is monitored on the basis of the predetermined indicators and indices, which will be compared with results planned;
- **the financial monitoring**, which is designed to assess the correct progress of the costs and payments;
- **the process monitoring**, which is aimed at checking the progress of activities, with respect to the timing defined in the Work Plan.

The monitoring occurs at different levels: at the **WP leaders level** and at the **Coordinator level**.

2.2 M&E of project impact

Measurable impact indicators are provided to demonstrate the extent of iGUESS-MED results.

EXPECTED IMPACT	Key Performance Indicator (KPI)	Expected Value
Improvement of ventilation in the greenhouse, by a greater number of windows, inserting deflectors, and using low pressure air humidification systems	Climate improvements in existing greenhouses Automation improvement	< 5 >20%
New protocols of IPM (and IDM) improved by forecast models and by biocontrol agents of pests and pathogens	Reduction of: <ul style="list-style-type: none"> • Fungicides Use • Insecticides Use • Biocontrol Increase 	30/40% 30/40% >50%
Bio-based material will be selected and tested as a substrate of soilless culture	Disposal residual reduction	<10%

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EXPECTED IMPACT	Key Performance Indicator (KPI)	Expected Value
Improvement of closed system cultivation with gutter subirrigation using good quality waters (rainwater recovery) and drip irrigation in semi closed system using low-quality waters (saline waters), maximizing the fertigation efficiency at low costs in low tech MED greenhouses	Incorporation of improved soilless systems	<5
New models of ETc using saline waters, including new equations for ETo suitable for greenhouses at different latitudes. Design, development, validation and market replication of a smart DSS able to manage efficiently fertigation, prevent diseases and pests, and improve climatic control procedures	New models of ETc	>5
	New DSS	1
	Pilot commercial greenhouses involved	8
	Market replication	<5
	Direct employments	10-15

Table 3 - Impact indicators related to iGUESS-MED specific objectives

2.3 Regular internal review and iGUESS-MED reporting

2.3.1 Internal review and reporting

The Coordinator will require a **6-monthly progress update from all WP leaders (due within 15 days after the end of report period)**. Each WP leader will coordinate this activity with the partners involved in the respective WPs. The 6-monthly progress update will summarise the advancement of the project activities and key achievements in a concise and simple manner. It will also provide an update on planned milestones and impacts relating to iGUESS-MED project.

Detailed explanations are in general not needed, as they will be required in the periodic and final report.

Partner 6-monthly reports about communication, dissemination and exploitation activities of the project will be drafted by WP Leader.

2.3.2 Reporting to PRIMA Managing Authority

Technical and financial reporting towards PRIMA is a responsibility of the Project Coordinator. Reporting to PRIMA should provide a periodic report and a final report.

A Periodic report at the month 24 of the project will be produce and will contain the following mandatory information:

- a **periodic technical report** containing an explanation of the work carried out, an overview of the progress towards the objectives of the action, including milestones and deliverables, a summary for publication by the Agency and answers to the questionnaire about the economic and social impact of the project;
- a **periodic financial report** containing an individual financial statement from each beneficiary, an explanation of the use of resources and the information on subcontracting and in-kind contributions provided by third parties for the reporting period concerned and a periodic

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summary financial statement, created automatically by the electronic exchange system, consolidating the individual financial statements for the reporting period concerned and including the request for interim payment.

The **final report** at month 48 summarises the achievements for the whole duration of the action in bullet points, such as work performed and the main achieved results. More specifically, the final report will have to include **final technical report** with a summary for publication containing an overview of the results and their exploitation and dissemination, the conclusions on the action, the socio-economic impact of the action and a **final financial report**.

The timing for producing periodic and final report is 60 days from the time of the reports. At least 1 month before reporting delivery stage all partners will be required to complete the technical report and financial statement contributions in order to allow the Coordinator to verify and submit the periodic report and final report.

Therefore, the monitoring system of the project will ensure that all the information required for preparing the periodic and final report are complete, correct, validated by the persons in charge and that they are correctly reported in the form established by the PRIMA.

3 CONFIGURATION MANAGEMENT



3.1 Configuration items identification

Here are two types of configuration items to be identified:

- the document items;
- the non-document items.

3.1.1 Identifying document items

Any document produced by a participant that should be shared among participant shall be identified by a unique reference made of:

- project Acronym;
- document ID: is used to uniquely identify a document within iGUESS-MED project;
- version number: is used to identify the different stages of the document.

e.g. <Project Acronym >_<Document ID>_<DocumentVersion>

This includes (but not limited to):

- all deliverables;
- all calling notices and minutes of meetings;

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- all WP reports;
- all technical notes;
- presentations made at the meetings.

The **<Document ID>** labelling convention will be:

- D + Project deliverable number: deliverable;
- TRP: Technical Report;
- MEM: Memorandum;
- MOM: Minutes of Meeting;
- PRS: Presentation;
- MNGT: for all management related documents;
- DISM: for all dissemination relation documents;
- OTHR: for any other document that doesn't fit into one of the types described above.

The **<DocumentVersion>** is made of the draft number of the document e.g. "Version 1.0".

All documents start with a first version called "Version 1.0". Following versions are Version 2.0, Version 3.0... up to the approval. The approved document then becomes "FINAL".

The **document file name** will be take the following form:

<project Acronym >_<Document ID>_<DocumentVersion>

3.1.2 Identifying non-document items

This includes identification of any hardware, software and any physical support such as CD-ROM.

3.2 Document Management

3.2.1 Definition and basic rules

A document is defined as a set of electronic data that needs to be exchanged (whatever the reason) with other participants.

In iGUESS-MED project a document:

- shall be uniquely identified;
- shall see its associated file identified;
- shall be compliant with a template. The word template to be used is enclosed in the Annex 1 of D1.1.

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Each document must be under the responsibility of a nominated person, called the Document Manager, who is in charge of ensuring the production of the document:

- in compliance with the schedule;
- as per the process described below.

For documents identified in the Work Plan, the document manager is the WP Leader.

For any other document, the default document manager is the WP Leader of the WP owner of the document, unless stated otherwise.

For each document, the document manager has the responsibility to produce or coordinate the production (in compliance with the template), issue, amend and finalize it. He/she must know the dates at which the document is due, anticipate the verification and approval process delay, control that the document is processed through the relevant verification and approval chain, and make sure that the deadlines for delivery are met.

However, the document managers can delegate their role of document manager to another iGUESS-MED member, provided the latter is made fully aware (such as decision in a meeting) of the time schedule and is given all information necessary to take that role.

The editor of a document will be responsible of any virus present in the soft copy of the document when delivered by any electronic means to other partners (the anti-virus application shall be frequently updated).

Should new versions of productivity software become available for handling documents during the course of the project, old agreed-upon versions should always accompany the distribution of new, although it might cause the loss of some formatting information, unless an agreement is led upon the partners to use newer versions of tools.

3.2.2 Production of documents and distribution

iGUESS-MED Consortium documents for electronic distribution must be storable/retrievable in an MS Windows XP or higher environment supporting long names.

3.2.2.1 Production Tools

For production tools, the following must be used:

- for word processing (.doc format): Microsoft Word. Exchange format “word 2013”;
- for tabular spreadsheet information (.xls format) and Graphs (.xls or included in .doc format): MS Excel. Exchange format “Excel 2013”; MS Word. Exchange format “word 2013”;
- for presentations: MS PowerPoint (.ppt format): Exchange format “PowerPoint 2013”;
- for Project Planning: Microsoft Project: Exchange format “Microsoft project 2013” (TBC);
- for Images (.jpeg format): any software tools that can produce .jpeg files;
- for compressed files (.zip format): any software tool that can produce .zip files;
- Portable Document Format (.pdf): any software that can produce .pdf files.

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If the participant responsible for the delivery of any document using one of these formats is using a higher version than the one mentioned, then the original version should also be included (preferably through a .zip format).

The partner shall ensure that the images are suitable for printing and especially those images could be embedded larger printing for dissemination purposes.

The use of the .pdf format is limited to its capability of obtaining files that are printable with the same layout regardless of the printer. This explicitly excludes the use of any modification capability that can be offered by a .pdf capable tool.

3.2.2.2 File Naming

Please refer to § 3.1.1

3.2.2.3 Electronic distribution

Documents may be exchanged and distributed by means of electronically either through e-mail or through a physical support (CD-Rom or USB key).

E-mail-systems used for document transfers/embedding, should be MIME-Version 1.0 compliant. This is the norm for most mailers (MS Exchange, MS Outlook, Netscape/Mozilla).

3.2.3 Documentation templates

Document templates is defined in the Communication, dissemination and exploitation plan in order to ease the writing of a document, enforce a common layout and structure of the document itself.

3.2.4 Language

All produced documents will be written in U.K English and will be spell checked before delivery.

3.2.5 Confidentiality

As a rule, it is considered that all technical documents and reports are confidential. However, they must be handled in compliance with the confidentiality principles and rules described in the Grant Agreement and Consortium Agreement documents.

Of course, dissemination data and public deliverables are considered as non-confidential documents.

3.2.6 Deliverables release procedure

All deliverables generated within the project under each WP are subject to an internal quality review process in order to ensure the quality and relevance of the document with respect to the project objectives and expected outcomes.

The WP Leader is responsible for producing the deliverable and milestones as presented in Annex 1 of the Grant Agreement, must ensure that it is of consistently high quality.

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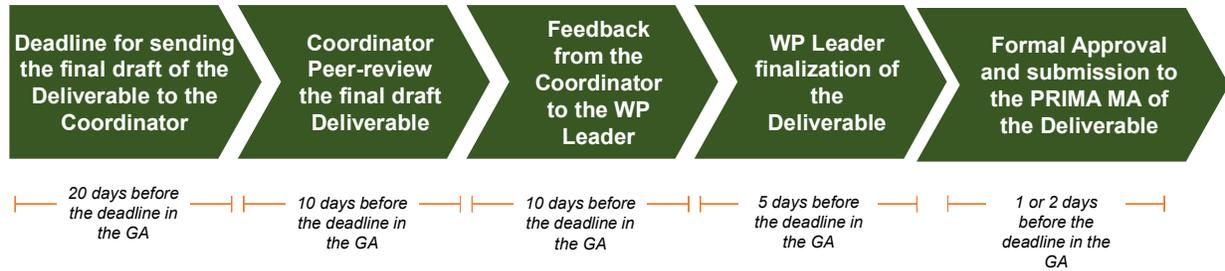
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A final draft shall be sent to the Project Coordinator normally about 20 calendar days before the deadline set in the Grant Agreement. Exceptions might be allowed under due motivation.

PCT is in charge of doing a Peer-Review on a draft deliverable.

The WP Leader will finalize the deliverable according to the remarks and further request of the Coordinator about 5 days before the deadline of the deliverable. After this step, the deliverable will be formally approved and submitted by the Coordinator.

The figure below represents an overview of deliverable approval and submission process.



3.2.7 Verification and approval procedure

There are basically three categories of documents:

- the contractual documents (i.e. the deliverables);
- the internal technical documents (such as non-contractual technical reports);
- other management documents (such as minutes of meetings).

In all cases, for each document, a document manager and a verification authority (Coordinator) are explicitly appointed.

However, the formal procedure for verification and approval of the documents detailed here is only valid for the first two categories.

The third category documents, e.g. Minutes of meeting, are not verified but discussed, amended if necessary and approved according to the rules above.

Moreover, for the technical documents circulating internally to a Work Package for working purpose no formal verification and approval is made by the WP leader.

The following authorities are defined for the verification and approval of documents:

Type of document	Verification Authority	Approval Authority
Periodic and Final report	Project Coordinator	Project Manager/Coordinator
Deliverables	WP Leader	Project Manager/Coordinator
Internal documents	Informal verification	N/A
Calling notices of Minutes of Meeting	Chairperson of a Consortium Body	N/A

Table 4 - Verification / Approval authorities

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4 Conclusions



The Quality Assurance Plan defines how the project will be monitored and evaluated during the implementation of the action in order to ensure the highest quality of the proposed research.

After each periodic review, the deliverable will be updated if necessary according to the new information available, in particularly referred to the project activities progress and results. New versions of the document will be released.

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