

RESERVOIR

Sustainable groundwater RESources managEment by integrating eaRth
observation deriVed monitoring and fLOW modelling Results

PRIMA

GA no. 1924



DELIVERABLE D1.4

Periodic Progress Report 1

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UNIPD	Università di Padova	Italy
IGME	Instituto Geológico y Minero de España	Spain
UA	Universidad de Alicante	Spain
DEU	Dokuz Eylul University	Turkey
UJ	The University of Jordan	Jordan
CER	Consorzio di Bonifica di secondo grado per il Canale Emiliano Romagnolo	Italy
RSCN-AWR	Royal Society for the Conservation of Nature - Azraq Wetland Reserve	Jordan

GLOSSARY

Acronym	Description
CA	Consortium Agreement
D	deliverable
EC	Economy/ competitiveness
EI	Expected Impacts
ENV	Environment
EO	Earth Observation
GRM	Groundwater Resource Management
KPI	impacts indicators
M	month of the deliverable



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PRIMA
IN THE MEDITERRANEAN AREA

PO	Project Objectives
SC	Science
SOC	Society
TP	Technological progress
WEI	Water exploitation index
WP	work package

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INTRODUCTION, GOAL AND PURPOSE OF THIS DOCUMENT

This report provides details of the work carried out by the RESERVOIR partners during the reporting period from 1st March 2020 to the 31st August 2020. The report summarises progress against the objectives listed in annex one of the RESERVOIR grant agreement and provides details of the Deliverables submitted during the reporting period.

1. Aim and Objectives of RESERVOIR

The aim of the RESERVOIR project is to provide new products and services for a sustainable groundwater management model to be developed and tested in four water-stressed Mediterranean pilot sites and then be applicable in other regions via an interdisciplinary approach.

The specific Project Objectives (PO) are the following:

PO1. Develop an innovative methodology for the hydrogeological characterization of large-scale aquifer systems using low-cost and non-intrusive data such as satellite-based Earth Observation (EO) techniques.

PO2. Integrate advanced EO techniques into numerical groundwater flow and geomechanical models to improve the knowledge about the current capacity to store water and the future response of aquifer systems to natural and human-induced stresses.

PO3. Enhance the knowledge about the impacts of agricultural and tourism activities on the water resources by quantifying the ground deformation during the monitored periods.

PO4. Engage water management authorities and provide models for optimal management of the aquifer systems. We have engaged water authorities in different countries. The water authorities will be involved in the conceptualization and design of guidelines for Groundwater Resource Management (GRM). Best practices of water management for agricultural and tourism purposes will be developed taking advantage of the knowledge and methodologies from the outputs of PO1, PO2, and PO3.

PO5. Dissemination and exchange of the generated knowledge among the experts and the managers in charge of land and groundwater management in the pilot sites to strengthen the aquifer resilience.

The four pilot sites are:

1. The coastal aquifer of Comacchio in Italy;
2. The Alto Guadalentín aquifer in Spain;
3. The alluvial aquifer of the Gediz River basin in Turkey;
4. The Azraq Wetland reserve in Jordan.

2. Progress on Objectives to date

During the reporting period work has principally been carried out on PO1 and PO4. In particular, preliminary retrieval of EO data and further preliminary analysis of DInSAR were assessed. Engage water management authorities was performed in order to provide models for optimal management of the aquifer systems.

- In order to achieve the the objective PO1, the activities of the EO processing of SAR images acquired by the Sentinel-1 radar satellite constellation using the A-DInSAR technique, has been started in some representative areas of each pilot site that were selected for preliminary testing purposes (WP3 – WP3 Leader: IGME).
- In order to achieve the objective PO4 the starting point of the RESERVOIR activities is the review of the background of the groundwater governance to identify the groundwater policies and regulation for each pilot site (Task T2.1 - Review of the groundwater regulation in the pilot sites - Task Leader: UNIPV) and the Development of a Stakeholder and end-user group and establishment user requirements for each pilot site (Task 2.2. Task Leader: UNIPV).

3. Expected Potential Impact

RESERVOIR project results will impact the following Sustainable Development Goals (SDGs) of Agenda 2030:

- SDG 6: Ensure availability and sustainable management of water and sanitation for all.
TARGET 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
TARGET 6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
TARGET 6.b: Support and strengthen the participation of local communities in improving water and sanitation management
- SDG 13: Take urgent action to combat climate change and its impacts.
- SDG 15: Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

RESERVOIR responds to the targeted research and innovation objectives of the PRIMA programme and its overall expected impacts. Particularly, in the area of Management of Water, the following impacts indicators (KPIs) are addressed: (i) Number of applied R&I solutions to the challenges of water management and (ii) SDG6 6.4.1 Water exploitation index (WEI). The modelling routines for determining basic components of the water cycle related to groundwater accumulation are the outcomes indicators KPIs named in the call which RESERVOIR will produce (see Tables 3.1. and 3.2.).

Several specific target impacts are required for projects under PRIMA Operational objectives 2/LAND and WATER SUSTAINABILITY (Table 3.1).

The RESERVOIR extents of benefits are for Science (SC), Environment (ENV), Society (SOC), Technological Progress (TP) and Economy competitiveness (EC) (Table 3.1).

Table 3-1 Contribution of RESERVOIR to the Expected Impacts (EI) mentioned in the PRIMA Work Programme. WP: work package, D: deliverable, M: month of the deliverable

Impact listed in the Call Topic 1.1.1.	How does RESERVOIR will achieve this?	Dimension of the impact	WP, D and M
Strengthening the understanding of the analysis of basic components of the groundwater cycle in the selected Mediterranean study areas, and their temporal variability, including hydrologic, environmental and socio-economic aspects. (EI1)	An innovative approach for the aquifer characterisation and monitoring using low- cost and non-invasive EO data (PO1).	TP for professional and private water companies and for SC to increase the EO-based approach for the aquifer characterisation and modelling.	WP4, D4.3 [M24]
	New methodologies to integrate global change pressures in hydrogeological models to assess the impacts of managing water resources on the ecosystem within the pilot sites (PO2 and PO3).	TP for policymakers to protect the groundwater resource and the ecosystem. Identification of future critical situations to develop irrigation strategies, management strategies of water level, and groundwater concessions.	WP7, D7.1 [M43], D7.3 [M47].
	New methodologies and tools for groundwater flow and geomechanical models (PO2 and PO3).	TP for water supply companies to assess aquifer storage.	WP5-6, D5.5 [M36]. D6.3 [M42].
Improved resilience and security for groundwater resources, both in coastal and in-land areas. (EI2)	Mapping of the land subsidence that can show to policymakers the seawater intrusion area in coastal aquifers, land loss, and the likelihood of flooding (PO3). • Subsidence risk index used as a decision tool.	SC, ENV and EC by providing products relevant for the policymakers' decisions to protect and maintain the ecosystem, human life, and activities. SOC: RESERVOIR will increase the resilience to subsidence in coastal areas.	WP7, D7.1 [M43].
	Best practises to protect eco- system services in order to maintain the touristic and agricultural incomes (PO4).	SOC, ENV and EC by supporting the policymakers decisions	WP7, D7.2 [M45].
Management strategies for sustainable exploitation of aquifer water sources. (EI3)	GRM to support the decision- makers (PO4 and PO5) • Groundwater management index.	SOC by supporting the policymakers to make the coastal and inland areas more climate-resilience.	WP7, D7.2 [M45].
New modelling routines for determining the basic components of groundwater cycle, including economic,	Groundwater level monitoring and modelling will be integrated using the	SOC, EC and TP for water supply companies and professionals.	WP5, D5.5 [M36].

social, and technical aspects (e.g. groundwater accumulation and storage). (E14)	EO-based approach (PO1 and PO2).		
	New tools (open-source software) for the automatic calibration of optimized groundwater flow models (PO3).	TP for professionals.	WP6, D6.3 [M42].

RESERVOIR innovation potential targets multiple markets (Table 3.2) of application for the developed services and products.

Table 3-2 Expected impacts on the identified market sectors

Market sector	Type	RESERVOIR further opportunities beyond the direct impact
Land use and regional planning	Public /private	EO products will provide ground deformation information to be added to the land use planning tools.
Risk management for environmental disasters	Public /private	HZ products and services such as the mapping of subsiding areas will be introduced in models devoted to prevention, risk assessment. The impact is related to regional authorities and environmental agencies (public sector) and potentially for insurance companies (private sector).
River basin water authorities	Public	GW products and services will provide a new tool for official policy and decision-makers that can be used in the development of river basin management plans.
Hydrogeology Companies	Private	GW products and services will stimulate private companies operating in the field of hydrogeology to complementarily use this EO-based technology in combination with traditional in-situ measurements for hydrogeological characterization.
Remote Sensing Companies	Private	GW products and services will stimulate the use of EO technology and the workflow developed in the project in a new market such as the hydrogeological field by increasing the benefit of these companies.
Municipal and industrial water supply economic systems	Public /private	GW products and services will provide information about the aquifer capacity to store water to support groundwater management. The workflow developed in RESERVOIR will be used to define the water costs.

4. Explanation of work carried out in each Work Package

The RESERVOIR project comprises eight Work Packages, four of which have been active during this reporting period.

In the first 6 months of the project three phases of the project has started:

- Phase 1 (Preliminary Scope Statement) kicks off the project and sets its agenda; in order to ensure a common framework for all participants, adjust management and coordination procedures and processes. It feeds into the work to be carried out in WP1. Furthermore, this phase was also aimed to plan a series of workshops involving interested stakeholders and end-user groups outside of the formal consortium partners. This activity feeds into the work to be carried out in WP2 (task 2.2).
- Phase 2 (Data collection) has effectively started at month 3 with the collection of data for each pilot site (task 2.3).
- Phase 3 is the phase of the research activities such as the EO processing to quantify the spatial and temporal evolution of land displacement using SAR acquisitions over the studied aquifers (EO monitoring). This activity feeds into the work to be carried out in WP3, and then the EO products will be validated and interpreted.

The following section summarises the work undertaken by each Work Package in this reporting period.

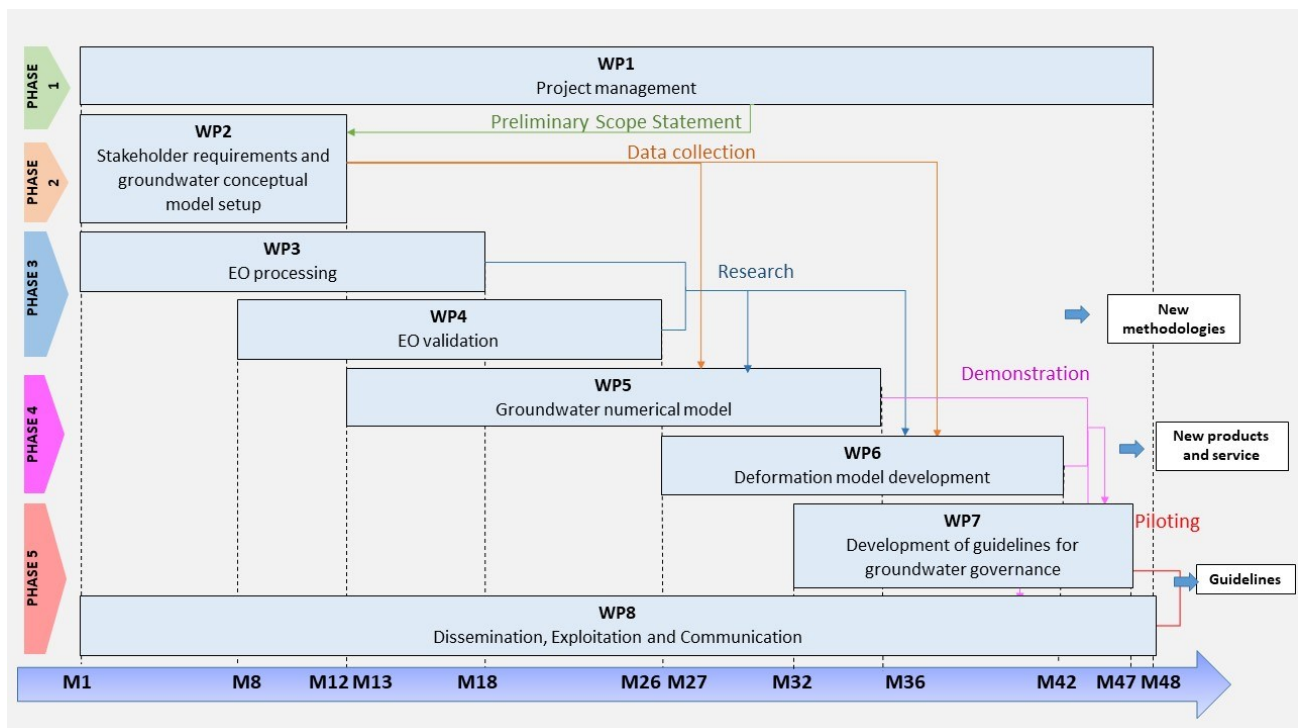


Figure 4-1 RESERVOIR workpackages.

4.1. WP1 (UNIPV – Leader. All other partners are Participants)

The aims of Work Package 1 are:

1. Management of the legal, contractual, ethical, financial, research/technical and administrative issues of the project, the grant, and consortium.
2. Coordination of knowledge management, deliverables, milestone reports, and cost statements.
3. Planning and organisation of consortium meetings and collaboration activities.
4. Guarantee that liaison with the PRIMA Foundation is carried out appropriately.

Since project commencement in March 2020, the members of the project coordination team at UNIPV have been diligently working to support project partners in the facilitation of budgetary and time management processes concerning pre-financing payments and deliverable progress.

This Work Package is ongoing.

4.1.1. Results from Work Package 1

Table 4-1 Status of the tasks of the workpackages started in the reporting period

Tasks	Status	Outcomes
Task 1.1, 1.2, 1.3, 1.4, 1.5	Ongoing	Deliverable 1.1, 1.2, 1.4 completed in the reporting period.
Task 2.1, 2.2, 2.3, and 2.4.	Ongoing	Deliverable 2.1 completed in the reporting period. Deliverable 2.2. is ongoing
Task 3.1., 3.2, 3.3, 3.4, 3.5	Ongoing	No deliverables due in the reporting period
Task 8.1, 8.2, 8.3	Ongoing	Deliverable 8.1 and 8.2 completed in the reporting period.

Due to COVID-19 pandemic, two changes to the Reservoir Project Gantt chart have been approved by the Project Officer:

- The due date for deliverable D2.2 has been extended to Month 8 to enable a more efficient timing of activities.
- The due date for deliverable D8.2 has been extended to Month 6 to enable a more efficient timing of activities.

Milestones MS1 (Scoping project established) have also been postponed to Month 8.

These changes had no financial implications for the project.

4.1.2. Summary of Activities in Work Package 1 completed in Reporting Period:

T1.1 – Management of the consortium agreement (Task Leader: UNIPV)

This task is ongoing.

T1.2 – Project Management Meetings (Task Leader: UNIPV)

Due to COVID-19 pandemic, the kick-off meeting was held by videoconference on 26th March 2020. RESERVOIR Kick-Off Meeting successfully engaged all project partners to build personal and professional relationships amongst work package leaders and provide the opportunity to discuss and plan for project reporting and work package tasks across the first 4 months of the project.

Ongoing, regular internal management meetings with all UNIPV project staff have enabled clear lines of communication and support amongst researchers and management members, and this has been additionally replicated in the organization of monthly project consortium meetings via web conferencing software to enable consistent updates amongst partners. Regular recurring meetings have been scheduled via Google Meet at the same time (every first Monday of the month at 15:00 GMT).

The following meetings were organized:

Table 4-2 Meetings in the Reporting Period

Meeting Title	Ordinary meeting
General Assembly	4 May 2020 6 July 2020
Project Board	4 May 2020 8 June 2020 6 July 2020 3 August 2020

T1.3 – Communication with the PRIMA Foundation (Task Leader: UNIPV)

This task is ongoing.

T1.4 – Steering and monitoring of the project implementation (Task Leader: UNIPV)

The previously submitted deliverable D1.2. aimed to provide a detailed account of the Project Management Plan (WP1). Following the management information included in the Consortium Agreement (CA) this manual highlights important procedures to be carried out to monitor, coordinate, and evaluate the management activities of the project.

T1.5 – Quality management (Task Leader: UNIPV)

Data and documents produced in the project are stored and archived in a Google Drive folder (cloud), with a folder for each work package and a folder for the general documents and the mailing list of the RESERVOIR

team, as decided in the kick-off meeting. Within each work package folder there are subfolders for Final Deliverables, working reports, and documents related to meetings.

Document templates have been produced with a standard format including defined styles, page layout, and content structure. These templates have been prepared by the Project Management Team and are available on the Google Drive RESERVOIR under General Documents/Templates.

T1.6 – Coordination of payments (Task Leader: UNIPV)

A pre-financing distribution of 60% of the total budget has been done to the partners.

T1.7 – Management of legal, ethical, security issue (Task Leader: UNIPV)

This task is ongoing.

4.2. WP2 (UNIPV – Leader. All other partners are Participants)

The aims of Work Package 2 are to:

1. Understand the groundwater regulation at the pilot sites;
2. Identification of the stakeholder and their requirements for each pilot site;
3. Establish a common working practice to ensure that activities and products are understood and directly useable for the consortium and stakeholders;
4. Establish the conceptual model for each pilot site.

4.2.1. Results from Work Package 2

The objective of the work package 2 (WP2) of the RESERVOIR project is the identification of the stakeholder requirements and the setup of the groundwater conceptual model for each pilot site. WP2 activities are aimed to assess the preliminary scope statement and data collection for the RESERVOIR implementation. Therefore, the starting point of the RESERVOIR activities is the review of the background of the groundwater governance to identify the groundwater policies and regulation for each pilot site (Task T2.1 - Review of the groundwater regulation in the pilot sites - Task Leader: UNIPV).

Each partner involved in this activity has reviewed the groundwater policies and regulations for the pilot site for which was responsible.

For each of the four pilot sites the geographical, geological, and hydrogeological settings and the groundwater policies and regulation were described.

As far as concerning the last point (groundwater policies and regulation), the following information has been collected:

- Groundwater use.
- Groundwater laws and regulations.
- Groundwater management tools:
 - Technical instruments (e.g. surveying, groundwater quantity and quality monitoring and modelling, other diagnostic analyses);
 - Managerial and planning instruments (e.g. land use and spatial planning, environmental impact assessment, groundwater protection zoning, the definition of responsibilities and roles of various groundwater resources management entities);
 - Regulatory instruments (e.g. groundwater property and rights, well licensing and registering, drilling accreditation, water legislation);
 - Economic instruments (e.g. groundwater pricing, environmental taxes, tradable rights, and groundwater markets).

4.2.2. Summary of Activities in Work Package 2 completed in Reporting Period:

The University of Pavia lead Work Package 2.

T2.1 - Review of the groundwater regulation in the pilot sites (*Task Leader: UNIPV*)

A review of the background of the groundwater governance has been performed to identify the groundwater policies and regulations for each pilot site. The results were delivered as D2.1. (GROUNDWATER REGULATION IN THE PILOT SITES) at the end of May 2020.

T2.2 - Development of a Stakeholder and end-user group and establishment user requirements for each pilot site (*Task Leader: UNIPV*)

In this task, a large number of stakeholders have been involved in order to create an internationally proficient group, which will help to address the RESERVOIR activities.

The engagement of the stakeholders in each pilot site aims to:

- (i) discuss the research gaps with regard the sustainable groundwater management through interviews with the local authorities, farmers, and technicians and to perform user requirements analysis through direct distribution of the questionnaires,
- (ii) communicate them the preliminary requirements identified through review undertaken in Task 2.1 and get their feedback,
- (iii) disseminate the project objectives by starting a framework for communication and collaboration during the lifetime of the project.

Once the stakeholders have been identified the consortium has to answer the following questions:

1. What is their role in the project?
2. What do they want to get out of it? What are their expectations?
3. How important is the project to them?
4. What is their power and impact on the project?
5. What are their priorities?

In order to answer these questions in task T2.2. workshops should be organized in each pilot site to discuss the research gaps with regard the sustainable groundwater management through interviews with the local authorities, farmers and technicians and to perform user requirements analysis.

The aims of the workshop are the following:

- (i) to present the project, its objectives, activities and outputs;
- (ii) to perform user requirements analysis through direct distribution of the questionnaires to answer the questions described above;
- (iii) to present them the preliminary requirements identified through review undertaken in Task 2.1 and get their feedback.

Due to the COVID-19 pandemic measures (lockdown, travel restrictions, social distancing and other measures adopted to limit the spread of the virus) most of the physical meetings have impeded. The project had to adapt to new ways of working. Therefore, information has been collected through:

- one-to-one interviews;
- online meeting with a limited number of stakeholders. Webinars have been organized the 13th July in Spain (with 43 participants, 20 of them have responded to an online questionnaire), and the 16th July in Italy (with 11 participants, 2 of them have responded to an online questionnaire).

The questionnaire for the stakeholder has been developed using Google Forms that allow free online surveys (Figure 4.2).

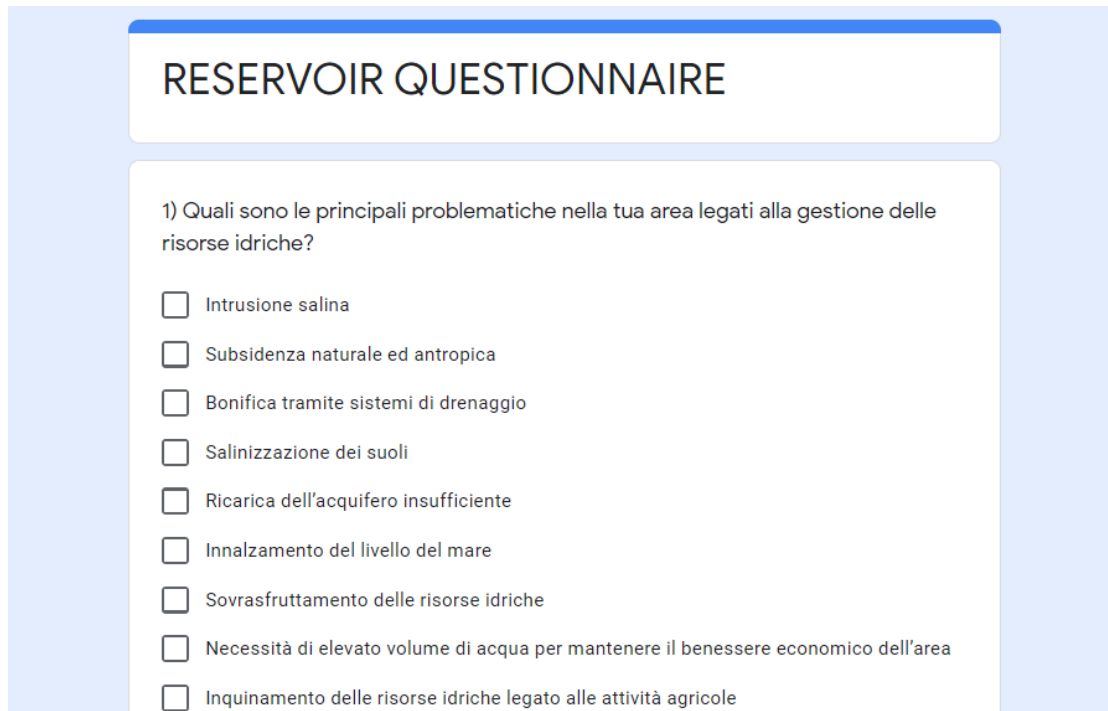


Figure 4-2 Example of a question of the RESERVOIR questionnaire translated in Italian for the stakeholder engagement in Italy.

T2.3 - Collection of geological, hydrogeological and geomechanical data at the pilot sites (Task Leader: UNIPV)

A Mendeley reference database has been created in order to collect all the bibliographic data of the pilot sites. The link has been shared with all the partners and the responsables of the pilot sites were invited to add the references of the test sites.

A list of the data necessary for the project in each studied area was created.

An extensive work has been started focusing on the study of the geological, geomorphological, hydrogeological settings of the studied areas. A Google Drive folder has been created to collect and share among the partners the collected data for each pilot site.

T2.4 - Development of conceptual model at the pilot sites (Task Leader: UNIPV)

This task has just started during the writing of this report.

4.3. WP3 (IGME – Leader. All other partners are Participants)

The objective of WP is the EO processing of SAR images acquired by the Sentinel-1 radar satellite constellation using the A-DInSAR technique, in some representative areas of each pilot site that were selected for preliminary testing purposes.

4.3.1. Results from Work Package 3

For the A-DInSAR processing the InSAR processing tools of the Geohazards Exploitation Platform (GEP), funded by the European Space Agency, have been used for the first assessment of ground deformation in each pilot site. At the present stage of the project, further processing with this tool is still necessary to obtain robust subsidence assessments and to look for stable areas and seeds. In future steps, the coherent pixel technique (CPT) developed by the Remote Sensing Laboratory (RSLab) at Universitat Politècnica de Catalunya (UPC) and provided by Dares Technology will be used in smaller areas where important subsidence is detected by GEP results.

4.3.2. Summary of Activities in Work Package 3 completed in Reporting Period:

IGME lead Work Package 2. Tasks T3.2 to T3.5 will allow the evaluation of the spatial and temporal evolution of land displacement and velocity using SAR acquisitions over the four test sites. They consist of processing the Sentinel-1 catalogue over the pilot test areas using GEP tools (i.e. FASTVEL and CNRIREA P-SBAS Sentinel-1). Task T3.1 (A-DInSAR processing using CPT, Task Leader: IGME) will include the A-DInSAR processing of Sentinel-1 catalogue using CPT to calculate the deformation time series within the observation period in all the test sites over the zones where clear GEP tools identify a clear subsidence. In the following paragraphs, advances corresponding to tasks T3.2 to T3.5 are described.

T3.2 – A-DInSAR processing in Alto Guadalentín aquifer (Spain) (Task Leader: IGME)

This task will allow the evaluation of the spatial and temporal evolution of land displacement and velocity using SAR acquisitions over the Alto Guadalentín aquifer. In the Spanish pilot site the following A-DInSAR successfully processed information is available:

- Historical ERS, ENVISAT and ALOS images processed with STAMPS
- PSBAS from Sentinel-1
- CSK 2011-2017 processed with CPT
- Sentinel-1 2014-2016 + 2014-2019 processed with CPT

This information should be further treated to put it in an adequate format for the first deliverable in Month 10 (end of December 2020).

T3.3 – A-DInSAR processing in the coastal aquifer of Comacchio (Italy) (Task Leader: IGME)

This task will allow the evaluation of the spatial and temporal evolution of land displacement and velocity using SAR acquisitions over the Comacchio aquifer. This test site seems to be the most complicated to obtain robust results from A-DInSAR processing because there are plenty of agricultural areas where the SAR data are not available and due to the difficulties to find a stable area (i.e. the seed). This issue has been corroborated looking at old available information. ERS 1992-2000 has plenty of PS points with VLOS of more than 5 mm/year, also Envisat-Radarsat 2002-2006. However, for RSAT 2011-2016 subsidence detected is much smaller. At the moment, one FASTVEL and two PSBAS processes have been run in the Comacchio area using GEP, but only one of them finished. Preliminary results from PSBAS show an average displacement of -0.58 cm/year, but this value is still unreliable as it is difficult to find a stable area. A wider area could be tested to look for a stable area out of the aquifer, but computing costs will be difficult to handle, as well as bigger errors will be accumulated. Further investigations using GEP tools are necessary in this pilot site.

T3.4 – A-DInSAR processing in Gediz River Basin (Turkey) (Task Leader: IGME)

This task will allow the evaluation of the spatial and temporal evolution of land displacement and velocity using SAR acquisitions over the alluvial aquifer located in the Gediz River Basin. Two PSBAS and five FASTVEL processes have been run in the Gediz area. The tool is sensitive and sometimes unstable, that is the reason why several attempts must be conducted. Only one PSBAS has finished. The displacements distribution lead to a stability range of ± 0.7 cm/year, where rates below that value are considered stable. The noise is slightly high because the processing is not completely fitted. These results are now being compared with available GNSS velocities. There are zones without points because the cultivated areas generate a low coherence response with a low density of distributed scatters (DS). Usually, these areas are related to reservoirs (water is always “invisible” for SAR) and densely cultivated areas (plants growing and change decorrelate the SAR response making it impossible to find good measurement points). It would be possible to improve the point density in those areas with advanced processing.

Over the Cigli area, observations indicated that there is a maximum displacement that could be related to a highway, bridges or industry. In fact, a large industrial organized district, recently constructed highways and junction structures are located in this area. The study time period needs to be defined. This will be done when in-situ measurements of land subsidence will be available. It is also important to make sure that the time series of piezometric head data are available for the same period.

T3.5 – A-DInSAR processing in Azraq Wetland Reserve (Jordan) (Task Leader: IGME)

This task will allow the evaluation of the spatial and temporal evolution of land displacement and velocity using SAR acquisitions over the Azraq Wetland Reserve aquifer. One FASTVEL and one SBAS processes have been run for the Azraq pilot site. PSBAS results must be improved because there is a drift in the seed point that must be corrected. In any case, it looks like results are going to have a high density and even there are points in the wetland itself and around the area.

4.4. WP4 (UA – Leader. All other partners are Participants)

This Work Package had no activity in reporting Period

4.5. WP5 (DEU– Leader. All other partners are Participants)

This Work Package had no activity in reporting Period

4.6. WP6 (UNIPD – Leader. All other partners are Participants)

This Work Package had no activity in reporting Period

4.7. WP7 (UA – Leader. All other partners are Participants)

This Work Package had no activity in reporting Period

4.8. WP8 (UJ – Leader. All other partners are Participants)

The main goal of WP8 (Dissemination, Exploitation, and Communication) is to disseminate and exchange knowledge among relevant stakeholders, including but not limited to project partners, experts in water resources management, and managers in charge of land and groundwater management in the pilot sites. Ultimately, this WP aims is to foster the aquifer resilience and maximize the impact of the project during its lifetime and beyond. WP8 extends over the lifetime of the project, starting at the beginning of M1 and finishing at the end of M48. Some activities within this WP have been completed while others are still ongoing.

4.8.1. Results from Work Package 8

WP8 extends over the entire lifetime of the RESERVOIR project, and several tasks and activities of this WP have been completed, some are still ongoing, while others did not begin yet. A summary of the completed tasks along with the descriptions and deliverables are presented in Table 4.3.

Table 4-3 Tasks of the WP8

Task	Description	Status	Deliverable
T8.1	The dissemination and exploitation strategy for the RESERVOIR project was developed along with progress and performance indicators. This strategy sets the stage for all dissemination activities aiming to communicate the project activities and findings and	Completed	D 8.1 – Initial Dissemination Plan and Strategy

	increase their visibility among the target audience.		
T8.2	Developing the project website and social/professional networking profiles to promote the project strategy, activities, findings, and other relevant information. These channels will be continuously updated and revised based on the project partners' input and stakeholders' feedback.	Ongoing	D 8.2 – Reservoir social and professional media profiles (e.g. Facebook, e-mail, ResearchGate).
T8.3	Communication tools to deliver the project's outcomes and messages to the target audience and engage many stakeholders through different communication channels. These tools include newsletters, webinars, promotional materials, scientific publications, etc.	Ongoing	-

It is worth mentioning that the project website (part of D 8.2 deliverable) has been delayed to Month 6 due to the recent COVID-19 lockdown in Jordan, which has restricted UJ's ability to procure the website development and maintenance services. UJ has prepared the technical specifications and the tendering process is underway. Several technical and financial offers were submitted for the website design and maintenance services, and those offers are currently being evaluated. A supplier will be selected, and it is anticipated that the website will be developed by the end of Month 6. After that, the project's LinkedIn page will be created and will be linked with the website, rather than creating a new personal LinkedIn profile for the project. On the other hand, project profiles on different social and professional networking platforms such as ResearchGate and Facebook were created as shown in Figures 4.3 and 4.4.

Project

RESERVOIR: Sustainable groundwater RESources managEment by integrating earth observation deriVed monitoring and fIow modelling Results

Massimiliano Ferronato · Gerardo Herrera · Pablo Ezquerro · [Show all 32 collaborators](#)

Goal: The main aim of RESERVOIR project is to provide new products and services for a fruitful and sustainable groundwater management model which will be developed and tested in four water-stressed Mediterranean pilot sites in Italy, Spain, Turkey and Jordan, and then be...

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Updates 0 new 3

Recommendations 0 new 4

Followers 0 new 12

Reads ⓘ 6 new 145

Overview

Project log

References

Questions

Add research

Add update

▼

Figure 4-3 Networking platforms of ResearchGate.

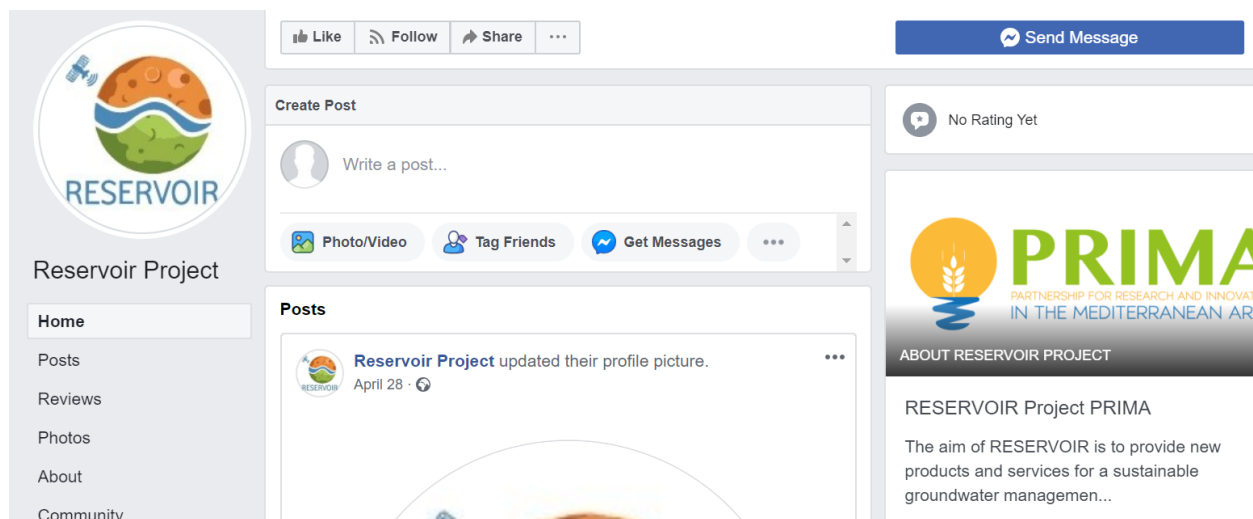


Figure 4-4 Networking platforms of Facebook.

4.8.2. Summary of Activities in Work Package 8 completed in Reporting Period:

Several dissemination activities took place during this reporting period with the aim to communicate the project's vision, results, products, and services to the target audience the beyond. Most of the activities were electronic due to the lockdowns in many countries around the globe. The completed activities were grouped based on the communication channels and summarized as follows:

Stakeholder/end-use workshops (preparation): these workshops are planned to be conducted at each partner country at the end of Month 4. However, due to the strict social distancing rules or even the lockdowns in many countries, conducting face-to-face workshops is not viable at the moment. UJ plans to host a face-to-face workshop at its campus per the Ministry of Health social distancing rules which mandate that no more than 20 persons can gather in one place. UJ prepared a stakeholder list (which includes policymakers from national and local authorities, water companies and service providers, environmental

agencies, etc.), and those stakeholders were informed on the workshop plan. The logistic arrangements with the UJ administration are ongoing and the local media representatives will be invited to cover the workshop.

Dissemination videos: several videos were produced by CER (Italy) and were shared on RESERVOIR's social media profiles.

Media-based communications: CER published project news on May 9, 2020 under the title "Il Progetto Reservoir per combattere la risalita del cuneo salino parte da Comacchio" in the Italian Newspaper "RASSEGNA STAMPA QUOTIDIANA ANBI EMILIA ROMAGNA". However, this article was not shared on the project's social and professional networking platforms because it is entirely in the Italian language.

Similarly, UA and IGME published news in several Spanish newspapers on the project and the planned activities in Alto Guadalentín site. The news articles were in the Spanish language and were not shared on the project's social and professional platforms. Examples of these articles can be accessed through the following links:

- <http://www.intercomarcal.com/noticias/UA/la-universitat-d'alacant-participa-en-el-projecte-horitz%C3%B3-2020-de-la-uni%C3%B3-europea-reservoir-per-a-millorar-la-gesti%C3%B3-dels-aq%C3%BC%C3%ADfers/108444.html>
- <https://web.ua.es/en/actualidad-universitaria/2020/mayo2020/18-24/la-universidad-de-alicante-participa-en-el-proyecto-horizonte-2020-de-la-union-europea-reservoir-para-mejorar-la-gestion-de-los-acuiferos.html>
- <https://novaciencia.es/optimizan-la-gestion-sostenible-de-los-acuiferos-del-guadalentin/>
<https://www.ecoticias.com/medio-ambiente/202048/Optimizar-gestion-sostenible-acuiferos-asegurar-futuro-hidrico>
- <https://revistaecociencias.cl/2020/05/18/optimizar-la-gestion-sostenible-de-los-acuiferos-para-asegurar-el-futuro-hidrico/>

Scientific publications: a research article titled "Vulnerability Assessment of Buildings due to Land Subsidence Using InSAR Data in the Ancient Historical City of Pistoia (Italy)" by IGME and UA researchers and in collaboration with researchers from the University of Florence (Italy) and CTC (Spain) was recently published in the open access journal Sensors (Ezquerro et al., 2020). The authors acknowledged the support by the PRIMA program under grant agreement No 1924 (project RESERVOIR). The abstract will be shared on the project's ResearchGate profile.

Additionally, an abstract of the project has been submitted to the online conference "Addressing Groundwater Resilience under Climate Change" which will take place 29-30 October 2020. This conference is organized by IWRA in partnership with IAH and UNESCO IHP.

Webinars: RESERVOIR's Spanish partners (IGME and UA) organized a webinar "Presentation of RESERVOIR project: Alto Guadalentín pilot site (Spain)" on July 13, 2020, in the framework of the project's engagement process. The goals of this webinar were to enhance the participation of potential stakeholders who are directly or indirectly involved in the project's activities and applications and explore interests to make the project's results openly available. A brief overview of the project and its objectives were presented, and the activities related to Alto Guadalentín site were explained in more detail. The webinar was well-received, and

participants were enthusiastic about the RESERVOIR project. The webinar was recorded and can be accessed through this link <https://vertice.cpd.ua.es/225186> and the presentations were facilitated to all participants.

Paper- and electronic-based communications: UJ prepared draft project brochures (Figure 4.5) for the planned workshop and the final brochure design will be approved by all partners and will be translated in the language of each partner country. The brochure will be printed and distributed to the workshop attendees and an electronic version will be published on the project website and social/professional networking platforms. Additionally, the RSCN published news about the project progress on the RSCN and Azraq Wetland Reserve Facebook pages.



Figure 4-5 RESERVOIR brochure.

5. Critical implementation risks and mitigation actions

A detailed risk assessment was carried out to identify and analyse the major risks and to develop appropriate risk responses. Some of the most important risks and corresponding mitigation measures are summarized in Table 5.1. This Table will be a living document that will help the Consortium in monitoring, assessing and re-assessing risks throughout the project.

Table 5-1 Critical risks for implementation

L: Likelihood; I: Impact; RF: Risk Factor <4 (low), >8 (high).

N°	Description of risk	WPs	Proposed risk-mitigation Measures	L	I	RF	Responsible
1	Potential conflicts among partners	All WPs	The Project Board Level will discuss the problems, the decision will be made by a majority of vote.	2	5	2	General Assembly

2	Scarce participation of external experts and end users	WP2, WP7, and WP8	Ad-hoc Meetings with involvement of national and local experts will be organized.	2	5	2	DL, RRIM and Project Board level
3	Lack of reliable data in the pilot sites to perform full validation and analysis of the project results	WP2, WP3, WP4	Any problem with the quality or non-availability of data will be detected in the early stage of the project to proceed to alternative sites/case studies.	2	1	2	SR
4	Due to the COVID-19 pandemic measures (lockdown, travel restrictions, social distancing and other measures adopted to limit the spread of the virus) impede most of the physical meetings. This can cause some problems in the implementation of the project. This event could cause delays at least in task 2.2.	WP2 (in the task T2.2. workshops would be organized in month 4 of the project in each pilot site to discuss the research gaps with regard the sustainable groundwater management through interviews with the local authorities, farmers and technicians and to perform user requirements analysis) WP8	The project has to adapt to new ways of working. The members of the consortium work from home. The kick-off meeting was held through Google Hangouts Meet. Meetings and events will be moved online if possible. During the kick-off meeting consortium has evaluated if remote workshops could impact the quality of the work. Nevertheless, in the next months, the General Assembly with the support of the Project Board will decide if it would be better to postpone the conduction of the	10	5	5	General Assembly, Funding Authority

			workshops, for the quality itself of the deliverable.				
5	Underestimation of time and effort needed to complete activities	All WPs	Continuous monitoring of progress status together with recovery activities will be carried out and resource consumption reallocating work if necessary	4	5	5	General Assembly
6	Insufficient resources and/or personnel committed to the project by partners	All WPs	Ensure that the assigned persons are of an adequate profile and will be adequately committed to the project.	4	5	5	General Assembly
7	Lack of quality of partner contributions	All WPs	Draft versions of all documents must be shared as early as possible with a rigorous review process following.	4	4	4	WP leader

6. Deliverables

Table 6-1 Deliverables in the Reporting period

Deliverable (number)	Deliverable Name	WP	Lead participant	Type	Dissemination level	Delivery date (in months)	Date of submission
D1.1	Consortium Agreement	WP1	UNIPV	OTHER	CO	M2	
D1.2	Project Management Plan	WP1	UNIPV	OTHER	CO	M2	30/04/20
D1.4	Periodic Project Progress Reports	WP1	UNIPV	R	PU	M6	31/08/20
D2.1	Groundwater regulation in the pilot sites.	WP2	UNIPV	R	PU	M3	31/05/20

D2.2	Proceedings of the first stakeholder/end-user workshop: including the workshop presentations and Stakeholder requirements list	WP2	UNIPV	R	PU	M4	Postponed to 31/10/20
D8.1	Initial dissemination plan and strategy	WP8	UJ	R	CO	M2	30/04/20
D8.2	RESERVOIR website and social media	WP8	UJ	DEC	PU	M3	Postponed to 31/08/20

7. Dissemination and exploitation

Publications, conference papers, and journals submitted during this reporting period.

A research article titled “Vulnerability Assessment of Buildings due to Land Subsidence Using InSAR Data in the Ancient Historical City of Pistoia (Italy)” by IGME and UA researchers and in collaboration with researchers from the University of Florence (Italy) and CTTC (Spain) was recently published in the open access journal Sensors (Ezquerro et al., 2020). The authors acknowledged the support by the PRIMA program under grant agreement No 1924 (project RESERVOIR).

An abstract of the project has been submitted for the Online Conference “*Addressing Groundwater Resilience under Climate Change*” that will be organized 29-30 October 2020. The Online Conference is organized by IWRA in partnership with IAH and UNESCO IHP.

8. Responsible Research and Innovation

The Responsible Research and Innovation (RRI) framework consists of six keys, as shown below.

1. Public engagement.
2. Gender equality.
3. Science education.
4. Open access.
5. Ethics.
6. Governance.

Regarding the RESERVOIR activities related to the public engagement, two webinars have been organized for stakeholders involvement. Furthermore, a project profiles on different social and professional networking platforms such as ResearchGate and Facebook have been developed. Up to now, the ResearchGate profile of the project has reached 15 followers, 156 reads and 4 recommendations. The Facebook profile of the project shows 188 followers and 171 likes. A gender analysis has been performed for the RESERVOIR team

and the results are shown in table 8-1. The percentage of women that are first authors on research papers and abstracts described in paragraph 7. is 50%.

Table 8-1 Gender distribution

Beneficiary	Number of female researchers	Number of male researchers	Number of females in the workforce other than researchers	Number of males in the workforce other than researchers
Università degli studi di Pavia UNIPV	2	2	1	1
Università di Padova UNIPD	2	2	2	0
Instituto Geológico y Minero de España IGME	2	2	0	2
Universidad de Alicante UA	1	7	2	0
Dokuz Eylul University DEU	0	2	0	1
University of Jordan UJ	1	4	0	1
Consorzio di Bonifica di secondo grado per il Canale Emiliano Romagnolo CER	0	8	2	0
Royal Society for the Conservation of Nature - Azraq Wetland Reserve RSCN-AWR	1	2	0	0
Total	9	29	7	5

Science education activities, governance and ethics issues had no activity in this reporting Period.
One open access article has been published as described in the paragraph 7.