



Project deliverables

Deliverable #D6.4a

Minutes of the AGREEMAR kick-off meeting,
5-8 September 2022, Dresden, Germany

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AGREEMAR

Adaptive agreements on benefits sharing for managed aquifer recharge in the Mediterranean region

Deliverable #D6.4a

Minutes of the AGREEMAR kick-off meeting

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Executive summary

This report summarizes the AGREEMAR kick-off meeting that took place between 5-8 September 2022 at the main Campus of Technische Universität Dresden, Germany. In total 11 participants from all six project partners gathered to discuss the coming three years of work. The kick-off meeting was divided into four parts: a) Preliminary bilateral workshops, b) Presentations on the main project objectives, working packages and demo sites, c) Three workshops on the methodologies used in AGREEMAR: MAR feasibility mapping, MAR modelling and stakeholder engagement and d) Field trip on the Elbe River.

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V1.0	27.09.2022	Catalin Stefan (TUD)	Final version

Abstract

This report summarizes the kick-off meeting of the AGREEMAR project that took place on 5-8 September 2022 at the main Campus of Technische Universität Dresden, Germany. In total, 11 participants representing all six project partners gathered to discuss the coming three years of work.

The kick-off meeting was divided into four parts:

- a) Preliminary bilateral workshops
- b) Presentations on the main project objectives including working packages and the demo sites
- c) Three workshops on different methodologies used in the AGREEMAR: MAR feasibility mapping, MAR modelling and stakeholder engagement
- d) Field trip on the Elbe River

The four days spent together in Dresden helped to provide a better understanding of the purpose, structure and expected outcomes of each work package, enabled the identification of main methodologies to be used in the project, validated the general project timeline and strengthened the collaboration between the partners. The report includes a detailed description of the agenda with summaries of the presentations and brainstorming sessions, together with the conclusions and outcomes resulted from the workshops and discussions.

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Minutes of kick-off meeting

1 Introduction

AGREEMAR is a research project funded by national funding agencies from five countries under the Partnership for Research and Innovation in the Mediterranean Area (PRIMA). The PRIMA Programme is supported under Horizon 2020 by the European Union's Framework for Research and Innovation. The project proposes an improved and integrated management of water resources centred on optimizing the storage of water in the subsurface with the aim of increasing water security in the Mediterranean region.

1.1 About the AGREEMAR project

The AGREEMAR project will develop an integrated, participative and coordinated methodology to assess and map the feasibility of nature-based groundwater solutions such as managed aquifer recharge (MAR) for climate change adaptation in alignment to the IWRM principles. The project methodology includes several components:

1. development and demonstration of a combined mapping approach that integrates the demand for aquifer-dependent services, a realistic hydrological assessment of conventional and non-conventional water sources for MAR, and a GIS-based analysis for the selection of intrinsic sites suitable for MAR application;
2. development of a general participatory governance framework at regional level based on the results from the feasibility mapping and national policy analysis;
3. validation of the feasibility maps through numerical models at watershed and local scale to assess the improvements in reliability, vulnerability and resilience provided by the inclusion of MAR schemes in water management schemes;
4. implementation of co-created location-specific agreements for MAR benefits sharing, supported by scientific evidence (feasibility maps and modelling) and endorsed by cross-sectoral stakeholder groups;
5. a participative multi-actor approach for fostering the engagement of stakeholders from different societal sectors and actor groups in all stages of project development.

The applicability of AGREEMAR governance framework will be demonstrated at island, regional and local scale on four case study areas from Tunisia, Cyprus, Portugal, and Spain. By selecting regions from EU and non-EU countries on both shores of the Mediterranean basin, AGREEMAR will foster intercultural and multidisciplinary collaboration and transfer between countries. The developed solutions are expected to close the gaps in the hydrological cycle and fulfil optimal water provisions for food security, domestic services and preservation of natural ecosystems in the Mediterranean region.

1.2 The project kick-off meeting

1.2.1 Meeting objectives

The first meeting of the project consortium took place in Dresden between 5-8 September 2022. The meeting was organised by the project coordinator at the main campus of Technische Universität Dresden (TUD). The main scope of the meeting was to create a common understanding of the project objectives and aims, to foster cohesion between the project work packages and to promote the development of a detailed work plan.

The expected outcomes of the meeting included:

1. clear understanding of the purpose, structure and outputs resulted from each work package;
2. identification of adequate research methodologies to meet the project objectives;

3. validation and (if needed) adjustment of the overall project timeline, especially regarding joint activities at demo sites and stakeholders' engagement;
4. strengthening the collaboration between partners and development of the AGREEMAR team spirit.

In order to achieve the proposed goals, the activities of the kick-off meeting were organized in different formats: bi-lateral meetings between work package partners (to achieve the meeting objectives 1 and 2), presentation of project work plan in plenary session (to achieve the objectives 1 and 3), detailed research approach introduced by work package leaders and interactive workshops (objectives 1 and 2), field trip for team building and follow up activities (to support and achieve objective 4). All the slides presented during the meetings and a selection of photographs are available to consortium partners in the project SharePoint platform.

1.2.2 Meeting agenda

The kick-off meeting was divided into four parts, each taking place in one day:

- **Day 0:** partners' arrival and a preparatory workshop jointly organised by ECoE and INAT
- **Day 1:** plenary presentation of the general concept of the AGREEMAR project (by TUD), introduction to detailed workplan of AGREEMAR work packages (by WP leaders) and the project demo sites in Spain, Portugal, Cyprus and Tunisia (by partners UPV, LNEC, ECoE and INAT)
- **Day 2:** three interactive workshops about the research methodologies to be used in the project (jointly organised by ECoE/INAT, adelphi/UPV and TUD/LNEC)
- **Day 3:** field trip on Elbe River and synthesis of kick-off activities

The detailed agenda is presented in the following:

DAY 0

Venue: Hotel, Café in Dresden
Date: Monday, 5 September 2022

Time	Topic	Participants
12:00 – 16:00	Pre-kick-off workshop on Work Package 2 “MAR feasibility mapping”	INAT, ECoE

DAY 1

Venue: Technische Universität Dresden, CHE building, room 184, Bergstrasse 66, 01069 Dresden
Date: Tuesday, 6 September 2022

Time	Topic	Presenter
09:00 – 09:15	Welcome, introduction of participants	All
09:15 – 10:15	The AGREEMAR project	TUD
10:15 – 10:30	<i>Coffee break</i>	
10:30 – 11:30	AGREEMAR work packages (part 1)	WP Leaders
11:30 – 11:45	Introduction to PRIMA Programme	PTKA
11:45 – 12:30	AGREEMAR work packages (part 2)	WP Leaders
12:30 – 13:30	<i>Lunch break (Alte Mensa)</i>	
13:30 – 15:30	AGREEMAR demo sites	LNEC, ECoE, INAT, UPV
15:30 – 15:45	<i>Coffee break</i>	
15:45 – 16:00	Conclusions Day 1	All
19:00 – 21:00	Joint dinner in Dresden Historical Old Town	

DAY 2

Venue: Technische Universität Dresden, CHE building, room 184, Bergstrasse 66, 01069 Dresden
Date: Wednesday, 7 September 2022

Time	Topic	Presenter
09:00 – 10:30	WORKSHOP 1: MAR feasibility mapping	INAT, ECoE
10:30 – 10:45	<i>Coffee break</i>	
10:45 – 12:15	WORKSHOP 3: Stakeholders' engagement	adelphi, UPV
12:15 – 13:15	<i>Lunch break</i>	
13:15 – 15:00	WORKSHOP 2: MAR modelling and software	TUD, LNEC
15:00 – 15:15	<i>Coffee break</i>	
15:15 – 16:00	Wrap-up and summary	All

DAY 3

Venue: Field trip on Elbe River
Date: Thursday, 8 September 2022

08:30 -13:00	Paddling boat trip on the Elbe River	All except UPV
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2 Presentations on the AGREEMAR project

2.1 Welcome and introduction to the project

2.1.1 Presentation of AGREEMAR project (*by Catalin Stefan, TUD*)

The day 1 of the kick-off meeting started with a round of introductions and a welcome addressed by Catalin Stefan, the coordinator of the AGREEMAR project. The project partners were introduced to the historical landmarks of Dresden city and learned about the history and research facilities of the host institution, Technische Universität Dresden. After a short presentation of the research group INOWAS, Dr Stefan explained the motivation of the project, anchored in the current challenges of the Mediterranean basin: uneven spatio-temporal distribution of water availability, agricultural intensification, population growth and extensive tourism in coastal areas. The presentation included key aspects of the project such as the main approach and research methodologies, specific objectives, project timeline with important milestones and deliverables, an introduction to each work package, and the distribution of resources and expected outcomes. The objective of this introductory talk was to create a common understanding of the project background, objectives, methodologies and its impact, and to set the scene for the following discussions.

2.1.2 Introduction to PRIMA Programme (*by Anne Petzold, PTKA*)

The meeting was also attended by a representative of Projektträger Karlsruhe (PTKA), the German funding agency. Dr Anne Petzold shed light on the background of the PRIMA Programme, its scope, structure and annual work plans. Since the establishment of the PRIMA Foundation in June 2017, the programme provided financial grants to 168 projects in three thematic areas: Water Management, Farming Systems and Agro-food Value Chain. In total, 1571 institutions benefited of 225.7 m Euro. The AGREEMAR project is one of only 3 projects selected in 2021 in Section 2, thematic area Water Management (in total 140 proposals were submitted for the three sections, with 28 projects being approved for funding).

2.2 Presentations of work packages

Day 1 continued with the detailed presentation of all six work packages by work package leaders (about 15 min each). The aim of this session was to enhance the understanding of the research methodology, propose implementation approaches, distribute tasks among project partners, validate and update the list of expected results, and identify dependencies and synergies within the project. The expected outcome of the session is a more detailed, consolidated work plan with a clear road map, deadlines and distributed responsibilities for tasks implementation.

2.2.1 WP1: Fostering stakeholders' engagement (by Anika Conrad and Ronjon Heim, adelphi)

Short description:

The needs, capacities, roles, responsibilities and commitment as well as engagement of stakeholders from four Mediterranean case studies will be mapped at national/regional/local level and analysed for the development of the feasibility maps, the elaboration and endorsement of adaptive agreements, and their implementation for a local MAR system. The presentation included an introduction to adelphi's water programme, an overview of the relevance of stakeholder engagement in joint research projects, the detailed work plan of work package 1, an initial list of engagement activities planned in AGREEMAR, a list of services offered to project partners, and the preliminary results obtained so far (see D1.1a Preliminary stakeholder analysis).

Specific objectives:

- To identify roles, responsibilities and the required commitments of stakeholders in MAR systems for the preparation of the MAR agreements
- To increase the awareness of stakeholders and local/regional decision makers and the acceptance of the public about MAR and to further develop their capacities
- To develop and follow a participatory approach in order to stimulate the involvement of relevant stakeholders from the early project stages of design up to the implementation generating ownership for the project outcomes

Key statements:

- WP1 will support stakeholder engagement in all project activities, starting with cross-sectoral assessment of stakeholder needs, information collection through surveys and questionnaires, as well as practical engagement with important drivers
- The detailed work plan of WP1 includes a step-wise approach:
 - identification and grouping of relevant stakeholders according to their needs
 - analysis and categorisation of identified stakeholders according to their interest and importance for the project
 - engagement and outreach to derive specific strategies and support project activities
- Interaction with other work packages and support for activities at demo site level is paramount
- Detailed list of engagement activities planned in AGREEMAR, including scope and target groups

Preliminary results (see: D1.1a preliminary stakeholder analysis):

- Relevant stakeholder groups and their competences and needs related to MAR (initial results) were identified and mapped for each demo site laying the ground for future stakeholder engagement
- There are many different interests and needs related to MAR - partly contradicting - that increase the pressure on limited groundwater resource and need for an equitable governance framework
- Classification according to the three MAR feasibility topics ensures that at least one representative of each group is involved in the planning and feasibility mapping of MAR

Upcoming activities:

- Stakeholder engagement missions of 5 days each planned in Spain/Portugal/Cyprus in November and in Tunisia in December 2022

2.2.2 WP2: MAR feasibility mapping (by Anis Chkirbene, INAT, and Constantinos Panagiotou, ECoE)

Short description:

A set of methodologies for MAR feasibility assessment at regional level will be developed, including a comprehensive matrix of feasibility criteria and considering biophysical, technological, social, economic, environmental, hydrological, institutional, and financial indicators. The presentation focused on breaking down the WP2 in individual sub-tasks and introducing the consequent working steps and responsibilities for implementation in accordance with the deadlines of the project.

Specific objectives:

- To develop and validate a participative methodology for the delineation of areas that are potentially feasible for the application of MAR
- To apply the methodology for feasibility mapping to the project demo sites

Key statements:

- WP2 has a very important role in the project and is very well connected to the other work packages
- The methodology proposed for feasibility mapping follows the general approach adopted in the literature but it is extended by the inclusion of water demand and water availability
- Information relevant to MAR implementation has been collected from different sources of data, such as journal publications, conference papers, technical reports of on-going MAR projects around the world. The collected information will be supplemented/calibrated with expert interviews and discussions with key stakeholders
- A classification system was proposed for the compilation of feasibility criteria matrix whereby the main challenge consists in the definition of guidelines for a semi-automatic criteria selection system (see workshop 2 on feasibility mapping on day 2 for more details)
- A sunburst chart has been used to visualize the collected information, and will be used as a database during the criteria selection process
- The GIS-based mapping methodology implies the selection of thematic layers, collection of relevant data, criteria standardisation and weighting, compilation and validation of final map

Preliminary results:

- A first draft of the criteria matrix for MAR feasibility mapping has been presented

2.2.3 WP3: Adaptive governance framework (by Joaquin Andreu, UPV)

Short description:

The feasibility maps will be used for the elaboration of an adaptive governance framework for MAR benefits sharing. This will include drafting country-specific multi-sectorial, multi-stakeholder agreements on water allocation plans for MAR implementation. The general objective is to provide draft agreements for MAR among stakeholders from different societal sectors, integrating the general, regional and local scales. The presentation of Prof. Andreu reviewed the WP3 objectives, the research methodology and tasks, the work plan and deadlines for the submission of deliverables, the list of contributions expected from project partners, as well as the expected outcomes resulted from WP3.

Specific objectives:

- Incorporate indicators and operating rules in the agreements, which will facilitate decision making with integration of water quantity, quality, and environmental objectives for sustainability and climate change adaptation (CCA)
- Definition of a general draft governance framework for MAR, applicable to the Mediterranean region
- Identification of the specific requirements for setting up regional draft agreements tailored to the four project case studies

Key statements:

- Detailed governance agreements need to be tailored to the particularities of each demo site. For this, several contributions are needed from project consortium:
 - Analysis of relevant stakeholders at each demo site (link to WP1)
 - MAR feasibility maps for each site (WP2)
 - Data and assistance for development of AQUATOOL (<https://aquatool.webs.upv.es>) simulations (link to WP4)
 - Co-participation and engagement at demo sites in Cyprus, Portugal and Tunisia (WP1, WP5)
- Generation of water resources system at each case study: how does the MAR project fits into the entire basin? This will be assessed using AQUATOOL and will include:
 - Testing different scenarios for each case study
 - Indicators to assess the impact of MAR on demand and environment

- Conjunctive use of groundwater and surface water → proposal of sustainable strategies for climate change mitigation and adaptation → combination with MAR
- Aquifer recharge (unmanaged) contributes significantly to the water resource system and needs to be taken into consideration
- Better understanding of demo sites will be needed for the development of research methodologies and approaches in WP3

2.2.4 WP4: Validation through numerical modelling (by Jana Glass, TUD)

Short description:

The governance scenarios will be supported at local scale by groundwater flow models that will help to understand the response of the aquifer to the proposed interventions and to discuss with stakeholders' alternative scenarios including the no-action impacts. In her talk, Dr Glass proposed a general scale-dependent methodology for groundwater modelling of MAR impact at demo sites.

Specific objectives:

- To validate the suitability of selected areas for implementation of MAR schemes using a participative, web-based modelling approach
- To assess the impact of MAR on the local water budget as a scientific basis for the negotiation of MAR agreements

Key statements:

- Two scales are considered in the modelling part considering different modelling approaches
 - Basin scale: analysis of regional water budget, influence of MAR on basin water management using AQUATOOL (<https://aquatool.webs.upv.es>)
 - Local scale: setup of groundwater flow model for case study sites (at least one per country) to test different MAR methods, operational scenarios, and other management options including the impact of a business-as-usual approach using the web-based INOWAS platform (<https://www.inowas.com/>)
 - Optionally, BALSEQ¹ modelling approach can be used to quantify the natural recharge as input for the groundwater flow model and for the feasibility mapping
- The finalization of detailed modelling objectives for the case study sites will be done together with the stakeholder consultations of WP2 (Task 2.6 Validation of MAR feasibility maps)

2.2.5 WP5: Agreements implementation at local scale (by Ronjon Heim, adelphi)

Short description:

A general costs-benefits analysis for areas selected for implementation will assess the economic impact of the MAR schemes. The governance framework will be refined based on groundwater flow simulations and economic valuation, and specific agreements will be negotiated with local stakeholders.

Specific objectives:

- To conclude fitting MAR agreements and reinforcing their mandate within the local communities for specific MAR systems
- To establish follow-up committees for the respective agreements to ensure the sustainability of the just and efficient benefit sharing

Key statements:

- WP5 starts in 2024 so no detailed work plan can be developed yet in advance of the general governance framework

¹ Ferreira, J.P.L., Rodrigues, J.D. (1988). BALSEQ — A Model for the Estimation of Water Balances, Including Aquifer Recharges, Requiring Scarce Hydrologic Data. In: Simmers, I. (eds) Estimation of Natural Groundwater Recharge. NATO ASI Series, vol 222. Springer, Dordrecht. https://doi.org/10.1007/978-94-015-7780-9_19

- Local agreements will be implemented for specific MAR sites → should be legally binding as it could involve compensation
- Participatory approach will be enforced, building up on the outcomes from WP1
- Training activities will help to streamline the general understanding for MAR benefits
- Follow-up committees → regular meeting

2.2.6 WP6: Project management (by Catalin Stefan, TUD)

Short description:

The project will be managed and coordinated by TUD together with the Principal Investigators (PI) from each partner institution and with direct collaboration with the WP leaders to ensure the successful implementation and the completion of milestones and deliverables.

Specific objectives:

- To fulfil the grant agreement with the funding agencies
- To ensure best possible project performance, including internal and external communication
- To successfully steer the consortium in compliance with the consortium agreement

Key statements:

- Although the project for German partners started one month later (1 July 2022), we will work according to the original time plan
- Project website already online → D6.1 → www.agreemar.inowas.com
- Data management and detailed project action plan planned to be finished by November 2022
- SharePoint system was setup as collaboration platform for project management and data sharing
- Twitter account: <https://twitter.com/agreemarPRIMA>
- Summary of communication and outreach (link to WP1)
- Risk management and contingency plan will be continuously updated
- Data management plan → in collaboration with SLUB and ZIH

2.3 Presentation of demo sites

In the second part of day 1, project demo sites including the site-specific objectives that will be analysed throughout the project were presented. A detailed description of each case study site including a map can be found here: <https://agreemar.inowas.com/demo-sites/>.

2.3.1 Republic of Cyprus (by Constantinos Panagiotou, ECoE)

Introduction:

The feasibility mapping for MAR will include the entire island of Cyprus (Republic of Cyprus). Nevertheless, the geo-spatial delineation will be sensitive to the political situation regarding the Northern Cyprus (36 % of the entire island), the UN buffer zone (3.7 %) and the Sovereign Base Areas (2.7 %). The coastal aquifers of Akrotiri and Yermasoyeia are primarily considered as potential local MAR demo sites, both located at the southern part of Cyprus. An existing MAR system using a series of infiltration ponds enriches the Akrotiri aquifer with tertiary treated water from the urban Waste Water Treatment Plant, which will be optimized with regard to land use changes, urbanisation and climate variability. Regarding Yermasoyeia aquifer, dam water is released for recharging the groundwater system and preserving the ecosystem, the project aiming at tailoring the system to stakeholders needs.

Main characteristics:

- Mean temperatures are increasing, mainly due to the increasing minimum temperatures (minimum temperatures are increasing)
- Extreme water stress due to the combined effect of climate changes and over-exploitation of the water sources, presence of seawater intrusion at different coastal aquifers within the entire island, including the demo sites
- Bad quantitative and qualitative status at case study sites

- Illegal abstraction of water through wells throughout the case study area, especially Akrotiri → need to be considered in the assessment
- Akrotiri and Yermasoyeia are two of the major groundwater bodies used for water supply
- Irrigation demands are increasingly satisfied by water reuse

2.3.2 Chiba watershed, Tunisia (by Anis Chkirbene, INAT)

Introduction

Chiba watershed is the proposed demonstration site in Tunisia for the AGREEMAR project. It belongs to Cap Bon peninsula which is one of the most productive agricultural areas in Tunisia. Major crops include citrus and olive as well as market garden crops such as strawberry, tomato and potato, which require a significant amount of relatively good quality irrigation water. Groundwater plays a critical role in sustaining irrigated agriculture in the Cap Bon Peninsula by buffering surface water variability and shortages during prolonged droughts. Chiba watershed is lodging the largest groundwater table decline and associated saltwater intrusion within the Cap Bon peninsula. Transferred water from the north-western part of the country constitutes a necessary complement to ensure crop water needs. A MAR project was implemented in the region based on the infiltration of treated wastewater (soil aquifer treatment concept). Unfortunately, its lifetime didn't exceed 7 years (2008 - 2015) because of clogging, lack of treated wastewater and limited size of the MAR infrastructure compared to the existing piezometric depression. The learned lesson from this project is the ineffectiveness of top-down decision while planning MAR projects. AGREEMAR project is proposing an innovative planning framework fully based on participatory approach to guarantee water resources sustainability in Chiba watershed.

Main characteristics:

- Severe groundwater drawdown especially in coastal areas including seawater intrusion
- In Tunisia, 62 MAR sites in total: poorly monitored, strictly dependent on available resource, practice without scientific or technical optimization
- Cap-Bon peninsula, Chiba watershed with Chiba dam
 - Very productive agricultural area
 - 16% total agricultural production
 - Administrative boundary in the northern part (limit of shallow aquifer?) → needs revision
 - Regional groundwater depression in Chiba watershed
 - Seawater intrusion due to groundwater overexploitation
 - Receives external water from Northern Tunisia
 - Increasing water demand due to changing agricultural activities to intensification
 - Illegal drilling of wells must be taken into account (location and abstraction rate)
 - WEAP model for Chiba watershed already exists (use in addition AQUATOOL)
 - Former MAR infiltration ponds: 2008-2015
 - Abandoned due to clogging, lack of maintenance, limited size (maps and models)
 - Modelling needed to be done with grid resolution as small as possible to see an Effect on the local water system
 - Ineffectiveness of top-down approach
 - Chiba dam
 - Irrigation, protection against flooding, surplus for aquifer recharge
 - Some farmers store irrigation water quota in their own wells → unintentional recharge

2.3.3 Alentejo and Algarve regions, Portugal (by Teresa E. Leitão and Tiago N. Martins, LNEC)

Introduction:

For MAR feasibility mapping at regional scale, the Alentejo and Algarve administrative regions will be considered (about 80% of Alentejo and the entire Algarve region), consisting of three hydrographic subregions: Sado-Mira, Guadiana, and Ribeiras do Algarve. Two main local MAR demo sites (one existing and one being a potential site to be built in the future) having two different recharge water sources (secondary treated wastewater and flash flood water) and using two different MAR techniques (infiltration basins and

surface/underground dam) will be considered for the validation of the feasibility maps (numerically modelled): Comporta (1) and Furta Galinhas (2). The Comporta WWTP-MAR site is fully functional but rather new; the aim of the project is to optimise the operation scenarios and provide for climate-proofing solutions. At Furta Galinhas, the water stored in the surface reservoir suffers important losses to the underlying karstic structures, reducing significantly its availability for downstream users. To tackle this, agricultural return flow and other potential surpluses are investigated for potential upstream MAR implementation.

Main characteristics:

- Decrease in average rainfall but higher runoff events
- Continuous increase in water demand
- Important points for stakeholders:
 - Spatial feasibility of MAR
 - Guarantee of water quality: issue of reusing wastewater
 - Performance optimization
 - Building trust in MAR as currently rather low accepted by Portuguese Environmental Agency due to quality concerns

2.3.4 Júcar Water District, Spain (by Joaquín Andreu, UPV)

Introduction:

At regional scale, the Júcar Water District will be considered for MAR feasibility mapping. Two main local MAR demo sites using two different MAR techniques (infiltration pond and surface dam) will be considered as potential Spanish demonstration sites: the Belcaire pond and the Algar reservoir. The purpose of the Belcaire Pond, which belongs to the *Mijares-Plana de Castellon* Water Resources Systems, is storing water from peak surface flows in order to recharge the Rambleta aquifer at a suitable rate. The Algar Reservoir, which belongs to the *Palancia-Los Valles* Water Resources System, allow retaining water during peak flows and infiltrating it in order to recharge the *Fuente de Quart* and *Plana de Sagunto* aquifers. The effects on the environment and reliability of water demands will be assessed to provide useful information and indicators to the stakeholders. The final goal will be the optimization of the conjunctive use of groundwater and surface water to reduce the overexploitation of aquifers, increase the reliability of water demands during drought periods, and meet the water quality and environmental flow restrictions.

Main characteristics:

- High water stress in Júcar Water District
- Seawater intrusion, groundwater overexploitation, depletion of groundwater levels, reversal of river-aquifer relationship
- Low reliability of water demand during drought periods

3 Workshops

The day 2 of the AGREEMAR kick-off meeting was dedicated to three workshops concentrating on the three core methodologies used in the project: feasibility mapping for MAR sites, numerical modelling and stakeholder engagement. Common to all three workshops was that first, the intended methodology was presented. In the first workshop about feasibility mapping, a brainstorming session followed about further methodology development. The second workshop on stakeholder engagement put an emphasis on group work to better understand the needs of stakeholders and respective outcomes at the various demo sites. In the third workshop on modelling, it was agreed to apply a multi-scale modelling approach at all demo sites.

3.1 Workshop 1: Feasibility mapping

(by Constantinos Panagiotou, ECoE, and Anis Chkirbene, INAT)

The first workshop dealt with the evaluation of the methodology to be used in the project for MAR feasibility mapping. In the first part, Anis Chkirbene proposed a strategy based on multi-criteria decision analysis of MAR-relevant thematic GIS layers. The MAR feasibility mapping study of the Enfidha plain in Northeast

Tunisia² was used as basis for the identification of open research gaps and conceptual limitations of the existing mapping practices. The methodology developed in this study will also be applied in AGREEMAR with intended improvements especially with regard to criteria choice, as well as the delineation of water availability and demand.

In the second part of the workshop, the participants joined a brainstorming session aimed at the further development of the methodology used for MAR feasibility mapping. During the discussion, a special emphasis was laid on how to determine the criteria used for MAR feasibility mapping and how to connect the specific MAR objectives with the developed criteria matrix. A large number of recharge objectives has been already derived from MAR projects currently in operation or in various stages of development around the world. An intense and fruitful discussion was conducted to investigate different ideas for selecting a subset of the criteria from the criteria matrix (see Section 2.2.2) according to the local MAR objectives. Special focus was given on how to assign the weighting system internally, e.g., for the intrinsic MAR suitability, or externally, among the three thematic maps, to construct the overall feasibility map.

Key statements:

- The scope of the feasibility maps must be very well defined and explained to potential users
- The mapping methodology needs to be adapted to the project objectives and MAR technology
- It is crucial to engage stakeholders during the different stages of the feasibility mapping, especially at criteria weighting stage
- The time scale for determination of both water availability and water demand thematics needs to be carefully considered and associated with the modelling work (especially regarding the temporal variability of the water surplus)
- The inclusion of social, economic and policy-related criteria in the overall feasibility maps is debatable as these aspects might fall in the final responsibility of stakeholders
- Enabling conditions are conceptual ideas that link feasibility criteria to MAR objectives. Further concepts will be reviewed, including derivations from risk assessment approaches
- The criteria matrix need to be comprehensive in order to cover all aspects relevant for MAR but the maps at demo site level must be site-specific with a smaller set of criteria and more detailed scale
- A draft concept was suggested for weighting the three components of the final feasibility map in cases when one of the components is very close to zero
- A draft methodology was conceptualised with contributions from LNEC, ECoE and INAT to support recommendations for the criteria selection (further work needed)
- An initial set of ten criteria are to be selected for each case study to be discussed in-depth with main stakeholders.

3.2 Workshop 2: Stakeholders engagement

(by Anika Conrad, Ronjon Heim, adelphi, and Joaquin Andreu, UPV)

The stakeholder engagement workshop was divided into two parts: the first part gave insights into the methodology to engage stakeholders within the AGREEMAR project which includes:

- 1) Identify and group relevant stakeholders:
 - a. through screening at different levels and sectors
 - b. desk research, validated by site partners, interviews and workshops
 - c. identification of relevant stakeholders will define the system boundaries
- 2) Analysis of relevant stakeholders:
 - a. analysis criteria: interest in the project and influence on decision making
 - b. objectives: prioritization in engagement groups
 - c. useful for the selection of appropriate engagement strategy
- 3) Engage and outreach:
 - a. forms of engagement: consultation, informing, representation, co-creation etc.

² Aloui, D., Chekirbane, A., Stefan, C., Schlick, R., Msaddek, M.H., Mlayah, A. (2022) Use of a GIS-multi-criteria decision analysis and web-based decision support tools for mapping and sharing managed aquifer recharge feasibility in Enfidha plain, NE of Tunisia. *Arabian Journal of Geosciences*, 15, 658. <https://doi.org/10.1007/s12517-022-09893-8>

b. set of principles for successful engagement

The features and capabilities of the integrated water resources management (IWRM) decision support system (DSS) shell AQUATOOL (<https://aquatool.webs.upv.es>) were introduced by Joaquin Andreu. The software will be used to evaluate the complex relationships that affect water availability both in space and time for the case study basins; to assess the consequences of different MAR strategies and operating rules, as well as to design the operating schemes at the case study sites, and will help to discuss the proposed opportunities with the local stakeholders.

The second part covered an interactive brainstorming session with two group work assignments:

1. Brainstorming on cost and benefit categories

The scope of this exercise was to get a better understanding on the economic drivers and barriers of the stakeholders on participation in operating/setting up a MAR scheme and their general potential interest in joining a MAR agreement.

Four groups were formed and important stakeholder groups selected to which the participants had contacts to in the past or had a good idea on their involvement in MAR schemes. The type of costs and benefits were brainstormed for each of the four selected stakeholder groups, followed by a presentation and discussion of the results to the entire project team. Apart from generating content the exercise format of forming small groups and physically designing a flipchart intended to energise the project team and provide opportunities for network personally.

2. Addressing the needs of the stakeholders

This exercise had the intention to change the point of view on the project results to looking at them from the point of the needs of the stakeholders.

In five small groups the WP leader together with a partner from a different organization collected needs of the stakeholders which their project deliverable would address. This process was supported with the provision of the most important needs which were assessed during the mapping of the stakeholders in D1.1a Preliminary analysis of project-relevant stakeholders.

Pictures of the results are given in the Annex 3.

Main outcomes:

- The stakeholder engagement workshop was helpful to better understand the methodology but also the role and needs of stakeholders in the AGREEMAR project. It further contributed to rethinking project deliverables in taking into account stakeholder needs.
- The results of the exercise on cost and benefit categories will now also feed into the drafting of compensation categories of the MAR agreements. A first idea for potential net beneficiaries and net compensators could be developed for river basin organisations, farmer associations, water utilities and environmental NGOs. The collected information also gave an indication of the type of stakeholder group in relation to the influence/interest matrix used in the stakeholder analysis.
- The view on the external relevance of the project deliverables in the second exercise provided the opportunity to rethink on the specific design on the deliverables in order to better tailor them to the requirements of the stakeholder. In this way the MAR feasibility maps (deliverable D2.3), governance framework (D3.2) the analytical and numerical models for different MAR scenarios (D4.1) and the local agreements (D5.1) were analysed.

3.3 Workshop 3: MAR modelling

(by Jana Glass, TUD, and Tiago N. Martins, LNEC)

The modelling workshop was designated to introduce the participants to the various modelling approaches developed and utilized by the project partners. Jana Glass (TUD) presented the web-based groundwater modelling platform INOWAS (<https://www.inowas.com>) and introduced some representative tools for MAR modelling. The main focus was laid on the numerical, MODFLOW-based tools, their characteristics being

presented in more detail. The presentation was rounded up with examples of applications using the INOWAS platform in France and Cyprus. In continuation, Tiago N. Martins presented the daily sequential water budget model BALSEQ for the evaluation of water availability in present and future scenarios.

Key statements:

- For consistency reasons and to validate the main research approach, the same modelling approach shall be applied at all demo sites; nevertheless, the scale and objectives will be site-specific
- On basin scale, AQUATOOL will be applied for watershed planning and management of the water resources
- The INOWAS platform, a web-based decision support system for MAR, will be used to setup numerical groundwater flow models at the case study sites (to be further discussed, given the characteristics of the local numerical models and INOWAS limitations)
- BALSEQ modelling approach will be used to calculate the natural recharge rate as an input to the numerical groundwater flow models where applicable.

4 Field trip

A paddling boat trip on the Elbe River was organized on day 3 of the kick-off meeting. The excursion was intended to strengthen and deepen the professional relationship among the project partners and improve team building. The paddling required quite some cooperation among the team to reach the destination safely. The boat trip along the Elbe River was also intended to show the participants one of the most important water resources for water supply by riverbank filtration in Dresden (characteristic for water supply systems of most towns and cities in Germany). The breaks and the train ride were effectively used to continue discussions which evolved during the previous two-day kick-off sessions.

5 Conclusions

The kick-off meeting was very important for the successful start of the AGREEMAR project. The team engaged in detailed discussions on the objectives, case study sites and methodologies which will be applied during the next years. The project tasks became much clearer for all participants, although several issues need further discussions at work package level. For this, the momentum will be used to discuss the open questions and push the stakeholder involvement at the project demo sites. After two years of pandemic and so many online discussions, the reunion in Dresden was very effective in strengthening the collaboration in the project. For this reason, it was agreed that extra consortium meetings for all project partners will be organized in addition to the kick-off, mid-term and final meetings.

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Annex 1. List of participants

Name	Institution
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Anne Petzold**	Projekträger Karlsruhe (PTKA), German funding agency

* only present during DAY 1 and 2 (6-7 September 2022); ** only present during DAY 1 (6 September 2022)

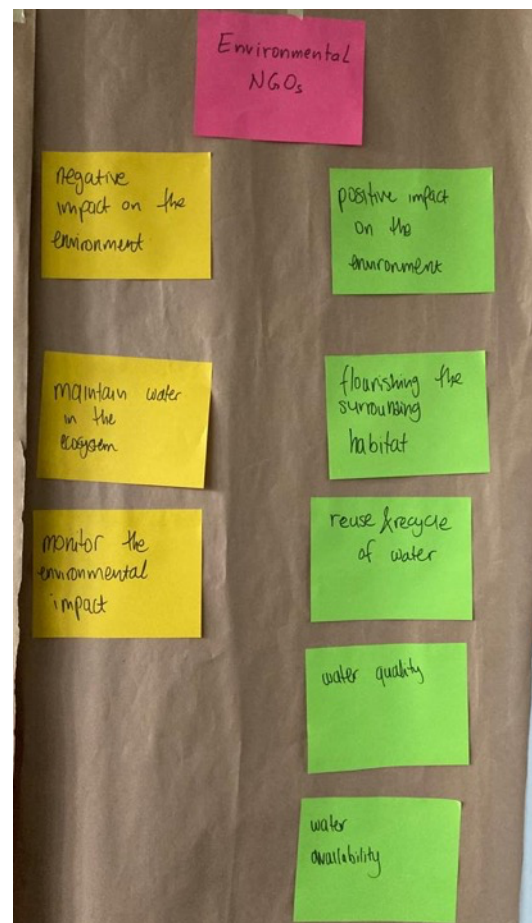
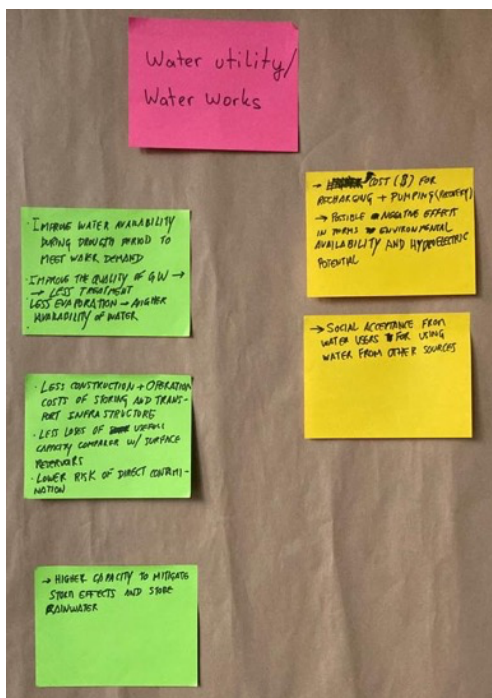
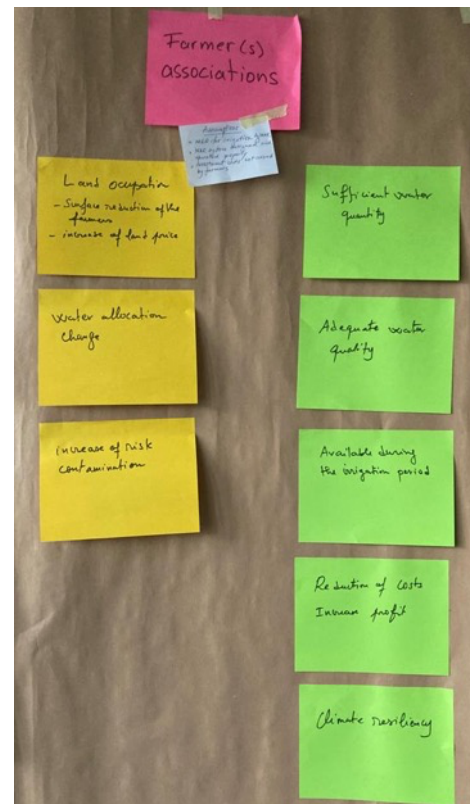
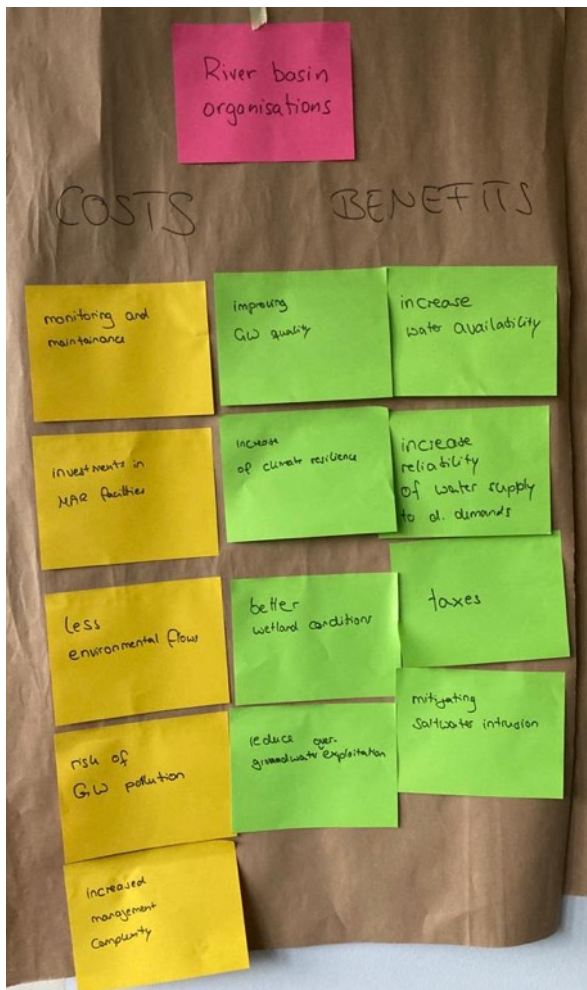
Annex 2. Photographs of the meeting

(more photos from the kick-off meeting are available for internal use in the project SharePoint)



Annex 3. Photographs of the group exercise results

In the first exercise on assessing costs and benefits for the stakeholder groups (Workshop 2: Stakeholders engagement), costs were noted on the yellow papers, while the benefits were noted on the green paper.



Picture of the results of the second exercise on addressing the needs of the stakeholders

