Sustainable Water Storage and Distribution in The Mediterranean

First Living Lab for Problem Identification

VERSION 1.0

Acknowledgment: This project is part of the PRIMA Programme supported by the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 2222.

DOI: 10.5281/zenodo.11401627

Project Information

Project Title	Sustainable water storage and distribution in the Mediterranean		
Project Acronym	OurMED	Grant Agreement Number	2222
Program	PRIMA Section Management of Water 2022 under Horizon 2020		
Type of Action	Water IA – Innovation Actions		
Start Data	June 1, 2023	Duration	36 months
Project Coordinator	Helmholtz-Zentrum für Umweltforschung (UFZ), Germany		
Consortium	Remote Sensing Solutions GmbH (RSS), Germany Universitat Politècnica de València (UPV), Spain Global Omnium Idrica, SLU (IDRICA), Spain Euro-Mediterranean Information System on know-how in the Water sector (SEMIDE), France La Tour du Valat, (TdV), France Technical University of Crete (TUC), Greece Università di Parma (UNIPR), Italy University of Sassari (UNISS), Italy University of Naples Federico II (UNINA), Italy Royal Society for the Conservation of Nature (RSCN), Jordan Living Planet Morocco (LPM), Morocco AgroInsider (AGRI), Portugal Higher School of Engineering of Medjez El Bab (ESIM), Tunisia Boğaziçi University (BU), Turkey		

Document Information

Deliverable Number	M3.1	Deliverable Name	First Living Lab for problem identification	
Work Package number	WP3	Work Package Title	Water and ecosystem governance and socio-economic assessment	
Due Date	Contractual	May 31, 2024	Actual	May 31, 2024
Version Number	1.0			
Deliverable Type	Report	Dissemination Level	Open access	
Authors	İrem Daloğlu Çetinkaya Cem İskender Aydın Cenk Ceylan Elif Bal Ali Kerem Saysel Nadim Copty			
Reviewer(s)	Amir Rouhani and Seifeddine Jomaa			

Document History

Version	Date	Stage	Reviewed by
1.0	23/05/2024	First draft to Project Coordinator	Seifeddine Jomaa

Table of Contents

List of Tables

List of Figures

Acronyms

DMP	Data Management Plan
WP	Work Package
CO	Consortium
PU	Public
R	Report
O	Other
DEM	Demonstrator
PT	Platform
NbS	Nature-based solution
MED	Mediterranean
UFZ	Helmholtz Centre for Environmental Research
RSS	Remote Sensing Solutions GmbH
UPV	Universitat Politècnica de València
IDRICA	Idrica
SEMIDE	Euro-Mediterranean Information System on know-how in the Water sector
TdV	La Tour du Valat
TUC	Technical University of Crete
UNIPR	Università di Parma
UNISS	University of Sassari
UNINA	University of Naples Federico II
RSCN	Royal Society for the Conservation of Nature
LPM	Living Planet Morocco
AGRI	AgroInsider
ESIM	Higher School of Engineering of Medjez El Bab
BU	Boğaziçi University
BMP	Best Management Practices

Executive summary

The overall objective of the "Sustainable Water Storage and Distribution in The Mediterranean" (OurMED) project is to design and explore innovative and sustainable storage and distribution systems tightly integrated into ecosystem management at the river basin scale. This is achieved by the combination of scientific and local knowledge, emerging from new and long-lasting spaces for social learning among interdependent stakeholders, society actors and scientific researchers in eight local and one regional MED demo sites. OurMED calls for a transition from a mono-sectoral water management approach based on trade-offs, to equitable multi-sectoral and integrative management that addresses all water bodies' capabilities and needs towards sustainability.

This Milestone document is for reporting on the process and results of conducting the first living lab in OurMED demo-sites. The objective of the first living lab workshop was to identify problems in the basin with stakeholders and propose initial solutions.

1. Introduction

1.1. Purpose

This is the documentation of M3.1 of the "Sustainable Water Storage and Distribution in the Mediterranean" Grant Agreement Number 2222.

This document provides information on the intellectual basis, organization, implementation and outcomes of the milestone M3.1 "First Living Lab guiding problem identification".

1.2. Living labs and workshops

The OurMED – "Sustainable Water Storage and Distribution in the Mediterranean" project employs the Living Lab methodology, which involves collaborating with stakeholders such as government bodies, NGOs, local communities, and academic institutions. This approach focuses on co-creation workshops where stakeholders actively participate in identifying challenges, generating ideas, and developing solutions. The methodology promotes collaboration, discussion and open innovation. By engaging stakeholders in this way, the project aims to harness their collective intelligence and expertise to develop effective and sustainable solutions for water storage and distribution.

1.3. Demo sites

The main characteristics of the eight demo sites are summarized in Table 1. The demo sites show diverse differences in size, population, and location (inland/coastal) of the groundwater basins. The basin sizes range from 250 to 50,000 km² and the population from 7,000 to 6,200,000 people. The climatic properties are also different with various key problems and unique features (Table 1).

Table 1 Summary of the demo-sites.

Demo site	Size (km^2), location	Pop.	Climate[a]	Unique feature	Key problems
Agia, Crete Greece	250, Island, North MED	0.07	Mild temperate, dry summer	Important for flora and fauna	Seawater intrusion
Arborea, Italy	854, Island, North MED	0.07	Mild temperate, dry summer	10 areas for conservation, 3 Ramsar sites	Water distribution, pollution and energy
Bode, Germany	3300, Inland, North MED	0.37	Mild temperate and dry winter	Drinking water reservoir, droughts, deforestation	Water quantity, quality deterioration
Jucar, Spain	22200, Coastal, West MED	1.0	Mild temperate, dry summer	Albufera Natural Park, Ramsar	Sedimentation, Eutrophication
Konya, Turkey	50000, Inland, East MED	3.2	Mild temperate, dry summer	Restoration of dry wetlands	Overexploitation
Medjerda, Tunisia	23700, Coastal, South MED	2.2	Mild temperate, dry summer	Transboundary, 2 Ramsar sites, 1 Ramsar City	Sedimentation and water distribution
Mujib, Jordan	6600, Inland, East MED	0.56	Dry and desert	Key Biodiversity for the Dead Sea	Water quality and distribution
Sebou, Morocco	40000, Coastal, South MED	6.2	Mild temperate, dry summer	39 wetlands, 7 Ramsar sites, 2 National parks	Water distribution, biodiversity
MED regional	2 Million, diverse landscape	480	MED climate	Biodiversity hotspot worldwide	Water scarcity, climate change

2. Agia, Greece

2.1. Introduction

The 1st Living Lab in Agia case study in Crete, Greece was organised on Friday, March 20, 2024.

2.1.1. Short demo-site description

The study area of Agia in Chania, Crete, is located 3.5 km west of the Chania city, in the central part of Keritis river drainage basin. The total study area is about 210 km^2 and characterised by a rather gentle topography. The water demand is high mainly due to the agricultural and touristic activities in the study area. Specifically, water is allocated across:

- The agricultural sector, which is the primary water consumer in the area and the irrigation methods play a crucial role for the sustainability of crop growth and productivity.
- Domestic consumption sector, for the covering of households and local communities water requirements.
- Industrial sector, which includes olive processing industries in the region, which use significant water amounts in the various olive oil production phases.
- The tourism sector, both domestic and international, is constantly expanding in the study area and requires a substantial amount of water, especially during the summer months.

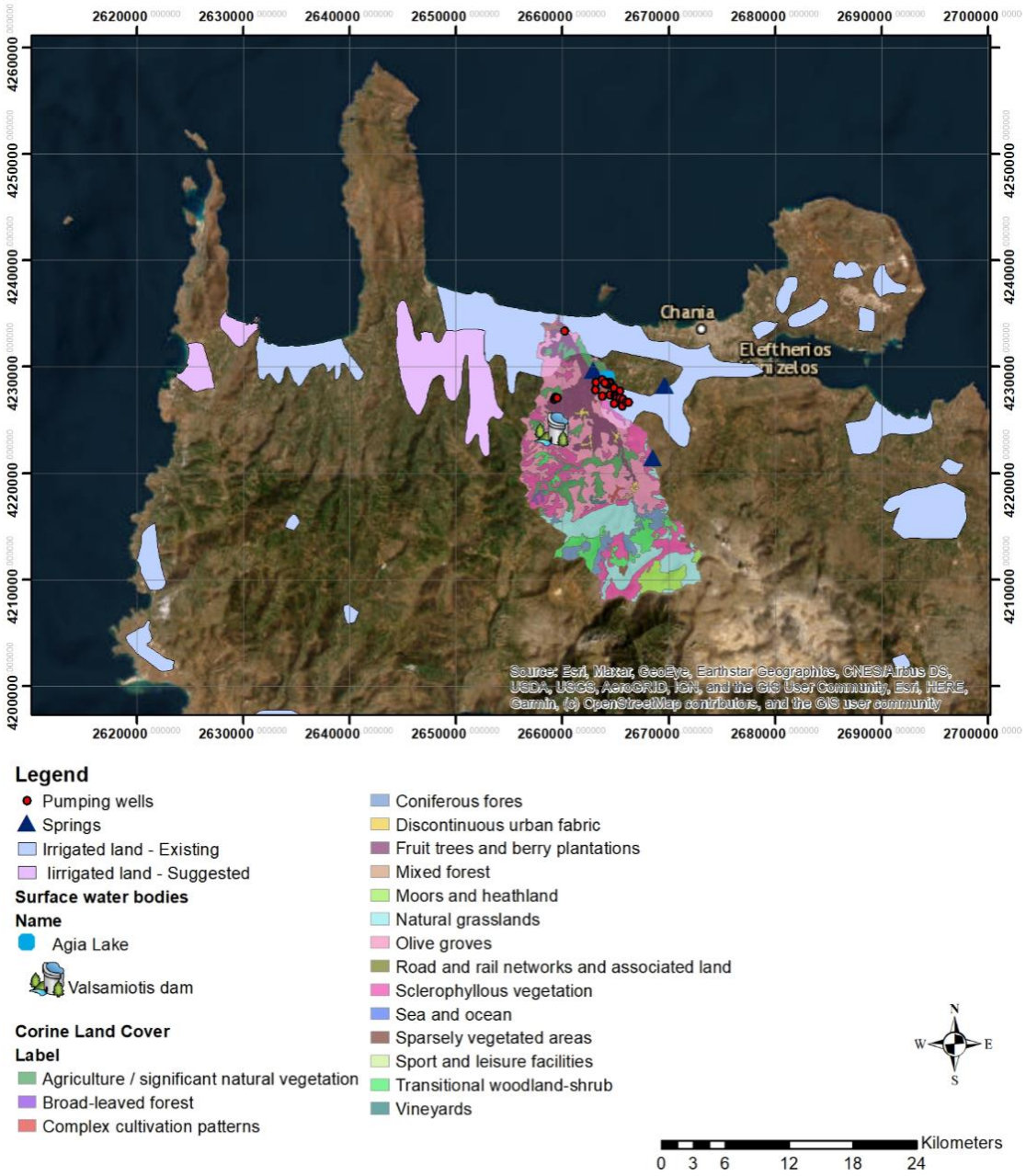

Figure 1 Geographical location and Corine land cover map of the Agia Basin.

The continuous growing water demands make the ration water resources management imperative in the area, to ensure water resources system sustainability. The Keritis-Therissos basin, known for its copious water reserves, plays a pivotal role in meeting the aforementioned irrigation and domestic water requirements of a substantial area within the Chania Prefecture. Most of the water comes from the karst aquifer of Agia, which is the main source of water in the area. Water is extracted from the Platanos, Kolympa and Kalamionas springs as well as from pumping wells, located 2 km south of the Agia springs and supervised by the Municipal Enterprise for Drinking Water Distribution and Sewerage Management of Chania (DEYACH), the Organization for the Development of Crete S.A. (OAKAE) and the Local Organization of Land Reclamation (TOEB). The pumping wells are

mainly operated from May to November each year extracting about 14 Mm3 of water. The management of the aforementioned water sources is crucial for the future of the area. Although the amount of water is plenty for the time being, a serious issue in the area is the multiplicity and polyphony of water managing agencies when allocating water to the different sectors trying to efficiently meet the existing needs.

In addition, the water management strategy initiative in the area includes the management of the Agia Lake, a small water body approximately 0.2 km^2 and an average depth of 4 m. Originally a marshland, it was converted into a reservoir as part of the Comprehensive Water Management Plan for Crete (GR13), started in 1927, under the auspices of the Public Power Corporation Of Greece (DEH) to enable the construction of a hydroelectric power plant. The operation of the power plant was later discontinued, but the lake has evolved into a natural reservoir characterised by a remarkable bird population, diverse ecosystems and its designation as a Natura 2000 site. Human activities, in particular the water abstraction below the ecological regeneration threshold, for irrigation purposes during periods of low rainfall, has led to eutrophication issues and water quality deterioration of Agia Lake. The management of Lake Agia must comply with the environmental conditions approved by the Ministerial Decision EPO 125585/24.1.2007. This legal framework provides for a number of measures that are essential for the management of the lake to ensure the preservation of Agia Lake ecological integrity and the sustainable utilisation of its resources.

2.1.2. Background on workshop preparation

The research team organised several meetings to define the objectives, the methodology and the activities taking place with the stakeholders during the meeting. In addition, a special poster for the event was designed with the help of WP8 partners and a multi-stakeholder engagement in the meeting was attempted.

Figure 2 Poster for the announcement of the event.

Stakeholders were, at first, approached by phone calls so as to be informed of the project objectives and were invited to the meeting. Individuals replied directly about their availability, while public servants asked for an official invitation to their organisations. During the phone calls, it was emphasised that the stakeholders were invited in order to express their thoughts on the issues of their area and that their contribution would be valuable. An invitation was prepared and sent by email to the stakeholders along with the OurMED brochure and the link for the project's website. The invitation text was also shared through the Facebook and linked-in pages of the project and was reposted by the personal accounts of the TUC team members.

2.2. Methodology

2.2.1. Workshop program and summary

The Living Lab was organised to bring together multi-sectoral stakeholders and involve them in interactive participatory activities in order to capture the critical issues and needs of the study area as well as the required actions to be taken to effectively manage the available water resources of the study area. The 1st Living Lab event took place on March 29, 2024, at "Limni Kafe" in Agia, 10:00 - 14:00 (Local Time). The agenda of the workshop was:

Table 2 Workshop schedule.

Time	Activity
10:00 - 10:15	Attendance and registration of participants
10:15 - 11:30	Welcome, getting to know the participants Presentation of the OurMED program in Agia (Presentation: Prof. George Karatzas and Assist. Prof. Emmanouil Varouhakis)
11:30 - 11:45	Presentation of the General Management Plan of the Lake Agia area, Programming Agreement of the Region of Crete, the Municipality of Chania, OFYPEKA and the Technical University of Crete (Presentation: Assist. Prof. Maria Mandalaki)
11:45 - 12:45	Interaction among stakeholders - Exercises on maps
12:45 - 13:00	Interaction among stakeholders - Creation of collaboration maps
13:00 - 13:30	Open discussion and overall conclusions
13:30	Lunch

2.2.2. Characteristics of the participants

In total, 47 participant stakeholders (47% male and 53% female) attended the meeting, among them were farmers and water users active in Agia, local and regional authorities, water management organisations, decision makers and policy makers, scientists, etc. The participating stakeholders and parties were related to water management and represented the Regional Units of Chania and Heraklion of the Region of Crete, the Decentralised Administration of Crete, the Municipalities of Chania and Platanias, the

Municipal Water Supply and Sewerage Companies of Chania and North Axis, the Development Organization of Crete S.A., the Local Organization of Land Reclamation of Varipetro (TOEB of Varipetro), the Regional Development Company of Crete S.A. (P.AN.ETAI.K.), the Small Hydroelectric Station (M.Y.H.S.) of Agia, the Cultural Association of Agia and several individual farmers, active water users in the area.

Table 3 Stakeholder of the 1st Living Lab in Agia case study, Crete.

Stakeholder Category	Male	Female
Region of Crete	6	9
Decentralised Administration of Crete	0	2
Municipality of Chania	1	0
Municipality of Platanias	0	1
Municipal Water Supply and Sewerage Company of Chania (D.E.Y.A.CH)	2	1
Municipal Water Supply and Sewerage Company of North Axis (D.E.Y.A.B.A.)	2	4
Development Organization of Crete S.A. (OAKAE)	1	0
Local Organization of Land Reclamation of Varipetro (TOEB of Varipetro)	1	0
Regional Development Company of Crete S.A. (P.AN.ETAI.K.)	1	0
Small Hydroelectric Station (M.Y.H.S.) of Agia	0	1
Cultural Association of Agia	2	1
Farmers	4	2
Scientists/Researchers	2	4
Total	**22**	**25**

2.2.3. Questions discussed in the workshop

At first the participants were asked to complete a questionnaire/survey about their expectations from the workshop as well as the Strengths, Weaknesses, Opportunities and Threats of the current water resources system in Agia. In addition, they were asked for their contributions and suggestions for the optimal water resources management in the area and their intentions to cooperate or not with the rest of the stakeholder parties. Afterwards, interactive activities took place among the participant stakeholders, where they were asked to plot the significant water resources information in the map of the study area as well as to describe in a collaboration map the kind of potential collaborations that may be developed among the participants.

2.2.4. Photos from the workshop

Figure 3 OurMED project in Agia case study.

Figure 4 Prof. George Karatzas presenting the scope and actions of OurMED project in Agia.

Figure 5 Assist. Prof. Emmanouil Varouchakis presenting the scope and actions of OurMED project in Agia.

Figure 6 Participatory activities among the stakeholders of the 1st OurMED Living Lab in Agia.

Figure 7 Lunch with stakeholders.

2.3. Conclusion

All stakeholders found the OurMED program very interesting and they positively commented on the approaches of Nature based Solutions (NbS), Living Labs (LL), Digital Twins (DT) and sensors. They all expressed their willingness to collaborate with the research team as well as the rest of the stakeholders to achieve better and comprehensive results for the project.

2.3.1. Main take-aways from the workshop

The main issues defined in the study area by stakeholders were:

- Too many and different water resource management agencies are involved in the area, which leads to a multiplicity and plurality/diversity/polyphony of management agencies. Their interests are often different, so are priorities (farms, hotels, etc.). Sometimes there is also a lack of willingness to cooperate with each other or even competition between the management bodies → They proposed one single integrated water management body.
- The water distribution network and infrastructure are outdated or of poor quality. There are many leaks and losses both in drinking and irrigation water along the network and too much water is lost. After all, the hydro-irrigation system is mixed and it is difficult to separate it → They proposed the improvement and maintenance of the network.
- Fragmentation of agencies, unsystematic management of agencies, which are increasingly understaffed. There is a lack of human resources to organise systematic data collection, monitoring of the water resources systems and check for the data accuracy in the existing water management bodies → They proposed the reinforcement of agencies with new personnel properly trained by the old employees.

- Lack of adequate and accurate water consumption data and actually the absence of real data both for the tourism sector and agriculture. There are too many private wells and thus a non-socially fair way of water distribution is formed. On the one hand, there is hyper tourism and there are no limits on water consumption by hotels. Generally, tourism development is happening without central planning. On the other hand, there is reckless use of irrigation water since there is no proper information or training of farmers on the necessary/optimal amount of water depending on the crop needs → They proposed the reduction of private wells due to the inability to control and record the actual consumptions systematically, the training of farmers regarding irrigation systems according to their crop needs and different pricing of water intended for tourism or taking retaliatory measures.

It is also notable that the participant farmers were silent during the workshop, off the record they expressed their difficulty to express their opinion in front of the representatives of the local or regional management bodies. Finally, the absence of any representative from the Chania Hotels' Association, who were also invited in the meeting, was negatively commented from the management bodies and generally stakeholders.

2.3.2. Future directions and plans

Along the way, the process of one-to-one interviews of the scientific team with the stakeholders will be continued. Another Living Lab is going to be organised next year and the participants were positive to attend the progress of research in the study area and assist the research team in this direction.

3. Arborea, Italy

3.1. Introduction

3.1.1. Short demo-site description

The Italian demo site is located in the rural district of Arborea (about 60 km2), central-western Sardinia (Italy). This district comprises the villages of Arborea, Marrubiu and Terralba with a population of approximately 18,800 and is included in the irrigation and land reclamation consortium of Oristano (85,363 ha overall, of which approximately 36,000 served by irrigation and 15,000 actually irrigated). The Arborea Plain has undergone a remarkable transformation from a once malaria-infested swamp to one of the region's most productive agricultural districts. The period between 1920 and 1930 witnessed extensive land reclamation efforts, involving the flattening of sand dunes and drainage of brackish wetlands, thereby creating fertile agricultural land. This initiative attracted immigrant farmers, predominantly from northeastern Italy, who formed a tightly-knit community and established a cooperative system that has endured and evolved over the decades. Today, the cooperative system comprises over 200 farms

managing 30,000 dairy cattle across 6,000 hectares of irrigated land. The farming practices in the irrigated plain of Oristano are diverse, encompassing the cultivation of paddy rice, artichokes, winter cereals, and forage crops. The plain is surrounded by protected marsh wetlands, which cover around 50% of the island's wetland heritage and are designated as Sites of Community Importance under the EU Natura 2000 directive and protected under the Ramsar Convention.

The agricultural activities are supported by the Eleonora d'Arborea dam, which provides ample water resources for irrigation purposes, while groundwater is used for non-drinking purposes (washing livestock facilities, cattle watering, and industrial processes). However, Arborea faces significant challenges concerning water quality. Groundwater pollution with nitrates and eutrophication caused by phosphorus are pressing issues attributed to the intensive dairy cattle system and agricultural practices. In 2005, following the implementation of the Nitrate Directive 91/676, the Arborea district was designated as a "Nitrates Vulnerable Zone" (NVZ). Despite efforts to comply with the EU Nitrate Directive, nitrate levels remain high, exceeding the recommended threshold of 50 mg L-1 (ARPAS, 2017). The long-term turnover of the aquifer, estimated to be 20 to 30 years, exacerbates this issue (ARPAS, 2023; Ghighlieri et al., 2016).

Figure 8 Arborea demo site Zone and adjacent wetlands.

3.1.2. Background on workshop preparation

The research team held several preparatory meetings to define the workshop's objectives and methodology. Moreover, through an iterative process, stakeholders' inputs were integrated into the workshop design. In line with OurMED commitment to collective

action and innovation, the workshop was organised in synergy with other relevant initiatives in the area (including the PRIMA-funded NATMED project[1]).

3.2. Methodology

Below is a summary of the methodology used during the workshop, which primarily relied on 2 tools: surveys and Miro's mind map maker to create collaborative digital mind maps.

3.2.1. Workshop program and summary

The workshop was designed with the aim to foster multi-stakeholder partnership and co-design sustainable, actionable pathways to address nitrate pollution.

Table 4 Workshop schedule.

OurMED workshop Agenda	
Date: 05/04/2024 Location: Hotel Le Torri	
Program	
9:30	Institutional Greetings
9:40	Introduction and Meeting Objectives
10:20	Mapping Needs and Response Strategies – Part One
11:10	Coffee Break
11:30	Mapping Needs and Response Strategies – Part Two
12:30	Open discussion
13:00	Conclusions: Ambitions and Future Activities of the Living Lab
13:15	Light Lunch

3.2.2. Characteristics of the participants

The workshop witnessed active engagement from a diverse array of stakeholders, including water agencies, regional and local authorities, farmers and fishermen cooperatives, and research institutions. A total of 51 stakeholders attended the workshop (66% male and 34% female).

Table 5 Stakeholder category and gender distribution.

Stakeholder category	Male	Female
Sardinia Water Authority	1	1
Regional Council of Agriculture	1	1
Local authority	3	3
Land Reclamation Consortium	2	
Regional Agency for the Implementation of Regional Programs in Agriculture and Rural Development	3	3

[1] https://www.cartif.es/en/natmed-en/

Regional Agency of Environmental Protection	1	1
Forestry corps	2	-
Environmental CSO	1	-
Farmers cooperative	2	-
Dairy production cooperative	2	-
Fishermen cooperative	1	-
Horticultural farmers organisation	1	-
Start up	1	-
Research institutions	13	8
TOTAL	**34**	**17**

3.2.3. Questions discussed in the workshop

Prior to the workshop, participants were requested to complete a survey, outlining ongoing or recently implemented initiatives in the demo site. This survey aimed to map the diverse array of initiatives related to sustainable water management and pollution mitigation in the area.

In the first part of the meeting, attendees had the opportunity to present key initiatives, whether concluded or in progress, highlighting how they addressed the specific needs/challenges of the area. This phase was pivotal for gaining a comprehensive understanding of the current landscape of actions and pinpointing potential areas of alignment and collaboration. During the workshop, Miro's mind map maker was used to create a collaborative digital mind map capturing stakeholders' ideas in a structured way.

In the second part of the workshop, a facilitator mediated a debate to co-design sustainable, actionable pathways to address water quality challenges, particularly nitrate pollution.

3.2.4. Photos from the workshop

Figure 9 Participatory workshop activities.

Figure 10 Participatory workshop activities.

Figure 11 Participatory workshop activities.

Figure 12 Collaborative digital mind map.

3.3. Conclusion

Here are the conclusions:

3.3.1. Main take-aways from the workshop

The main outcomes of the workshop included:

- Mapping priorities and needs, as well as existing response strategies and initiatives.
- Integrating local and scientific knowledge.
- Increasing awareness and promoting collaborative attitude among stakeholders.
- Developing a roadmap for the co-designing sustainable, actionable pathways to address nitrate pollution.

The discussion highlighted a high sense of urgency among stakeholders to address water quality concerns, particularly nitrate pollution. This was instrumental in developing a shared sense of purpose among stakeholders and increasing their willingness to participate in the living lab.

The discussion also highlighted the complexity of the addressed water challenge, with stakeholders recognising the importance of a systemic, holistic approach encompassing not only technical and scientific innovations but also new forms of collaboration and multi-scale, multi-stakeholder governance models.

3.3.2. Future directions and plans

At the end of the workshop, participants agreed on a roadmap for the co-designing sustainable, actionable pathways to address water quality concerns, particularly nitrate pollution.

4. Bode, Germany

4.1. Introduction

Despite being outside the Mediterranean region, The Bode catchment area with the Rappbode Dam, located in central Germany, is of particular interest because, as it includes Germany's largest drinking water reservoir and the most fertile soils for agriculture, but also because it is one of the most highly studied river basins in Central Europe. The Bode catchment area has been affected by a prolonged drought in recent years, which has adversely affected both water quantity and quality due to the simultaneous occurrence of heavy deforestation. The findings from this area can provide an example for other project sites with diffuse pollution problems where innovative monitoring and scientifically sound solutions are lacking. At the same time, the Bode basin can benefit from the results obtained in the other areas, such as Júcar demo site in Spain. For instance, the Júcar local water authorities have succeeded in stopping the decline of the groundwater table in some of their aquifers and in developing expertise in water management under extremely difficult semi-arid conditions. The reversal of the negative groundwater trend in the largest aquifer within the Júcar catchment shows that it is possible to provide for greater sustainability in water management. These good groundwater management practices can be transferred to the Bode basin, which is gradually transitioning towards groundwater abstraction to supplement irrigation water demand. OurMED will collaborate with the Júcar River Water Authority in passing on their insights to the other project areas.

4.1.1. Short demo-site description

Spanning approximately 3300 km^2 in central Germany, the Bode catchment is meticulously monitored, serving as a valuable repository of hydrological and hydro chemical data (Wollschläger et al., 2016). Extending from the Harz Mountains, characterized by low, rugged terrain, to the northeastern lowlands of central Germany, the catchment encapsulates diverse landscapes and climatic conditions.

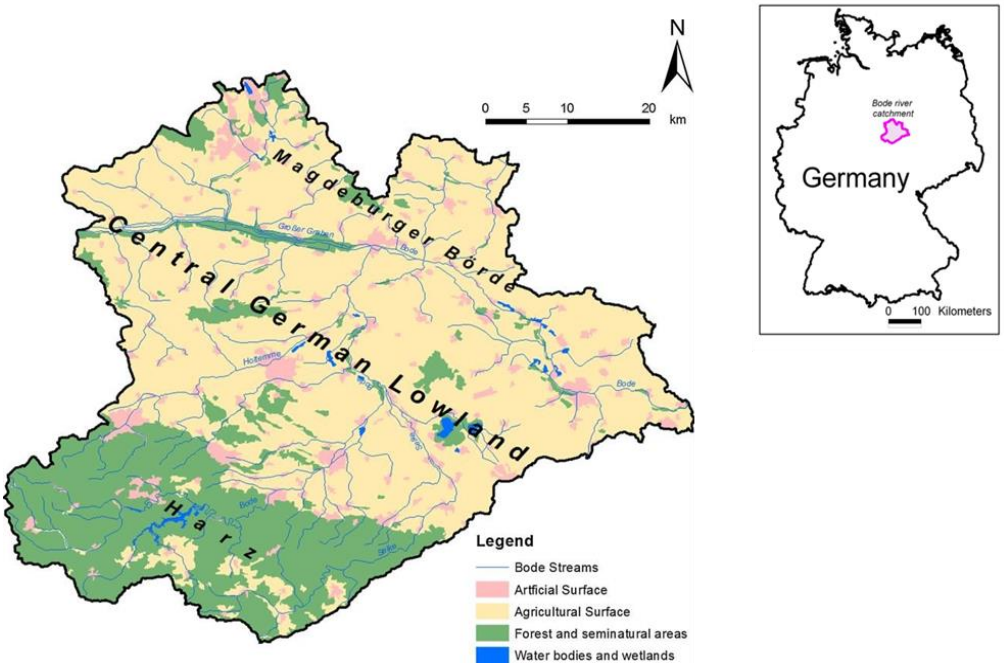

Figure 13 Bode catchment map as part of the Central German Lowland Observatory (TERENO Harz) taken from Wollschläger et al. (2017). Large red labels denote the locations of intensive research sites.

Annual precipitation within the catchment follows a distinct elevational gradient, ranging from over 1500 mm in the upper reaches of the Harz Mountains to less than 500 mm in the expansive lowland plains. Mean annual air temperature exhibits a similar pattern, ranging from 5°C at the summit of Brocken, the highest peak in the Harz, to 9.5°C in the eastern Magdeburg Börde region (Wollschläger et al., 2016).

The Harz Mountains feature steep slopes and shallow, less fertile soils, predominantly blanketed by forests. In contrast, agricultural activities are primarily concentrated on the plateaus and lower-elevation areas of the region. Within the catchment, 70% of the land is designated as arable, while 26% is forested or comprises semi-natural habitats. Urban areas and open-cast mining sites collectively cover 7% of the land, with water bodies and wetlands occupying the remaining 1% (CORINE 2012 land cover map). This diverse landscape mosaic underscores the intricate interplay between natural and anthropogenic factors shaping the Bode catchment.

4.1.2. Background on workshop preparation

To start the series of Living Lab workshops on the Bode River basin, a preliminary meeting was organized with the key stakeholders involved in water management in the basin. The meeting was an opportunity to discuss the project objectives and to help select the key stakeholder groups that should be considered in the stakeholders mapping. The effects of drought conditions on food production, drinking water availability, and ecosystem services were discussed among the participants. It was noted that the topics raised are interesting and should be discussed in greater depth at a future meeting. Maintaining this exchange is important. The three stakeholder workshops should be revived but organized

in such a way that greater added value is created for all participants, e.g., by focusing on specific points of contact and current research projects. To ensure that the "right people" are at the table, topics should be identified in advance and the group of participants defined accordingly.

4.2. Methodology

The stakeholder workshop will follow a participatory approach aimed at gathering input and fostering collaboration among diverse stakeholders. The workshop will begin with an introduction to the project objectives and agenda. This will be followed by interactive sessions designed to facilitate discussion on key topics, such as the impact of drought conditions on various sectors and the identification of regionally differentiated measures. Breakout groups will be formed to encourage focused discussions, and participants will have the opportunity to share their expertise and insights. Feedback and suggestions from stakeholders will be documented for further analysis and integration into project planning and decision-making processes that will be presented and discussed in the following workshops.

4.2.1. Workshop program and summary

The first stakeholder workshop will be organized on June 12, 2024, at the UFZ Magdeburg, in person, to discuss the OurMED project with multiple stakeholders. The main agenda points for the meeting are the following:

1. Development of measures to increase water retention in the area (damming small bodies of water, promoting the infiltration of sealed surfaces, etc.),
2. Analysis of the ecological minimum runoff, regionally differentiated,
3. Influence of droughts on the development of the water flow of watercourses/water networks; temporal and spatial changes in the dry fall of watercourses,
4. Short and medium-term forecasting and prediction of water conditions (flow, soil moisture, groundwater levels, temperature, nitrate) using digital twins,
5. Methodologically, a coupled groundwater (Modflow) and hydrological catchment model (mHM Nitrate) is used for the Bode catchment area.

4.2.2. Characteristics of the participants

The list of stakeholders is not finalized at this stage. The potential stakeholder groups expected to attend the meeting are as follows:

1. Offices for Agriculture, Land Reform and Forests Center, Promotion of Rural Development (Plant Protection),
2. State Department for flood protection and water management of Saxony-Anhalt (LHW),

3. District of Harz, Lower Nature Conservation Agency,
4. District of Harz, Lower Water Authority,
5. Helmholtz Centre for Environmental Research UFZ, Magdeburg,
6. Farmer Association.

4.2.3. Questions discussed in the workshop

In the preparatory meeting of the workshop different questions were discussed among the different stakeholders, including stakeholder mapping and its alignment with the project objectives, data availability, digital twin system etc. Different stakeholders noted that postdocs and doctoral students are still making inquiries about data sharing that has already been made available. It was reported that the data repository and portal are apparently not well enough known. Water authorities would like to disseminate information about the data portal at future meetings: what data is available and how the data download works. In the future, data requests should only be made if the data is not available in the database.

Taking into account future climate developments, the project team would like to incorporate the suggestions and expertise of the stakeholders for the development and evaluation of regionally differentiated measures.

4.2.4. Photos from the workshop

Figure 14 Bode catchment gauging stations.

4.3. Conclusion

The preparatory meeting with stakeholders was a valuable opportunity to efficiently organize the first workshop, ensuring that all key stakeholders relevant to the project objectives are considered.

4.3.1. Main take-aways from the workshop

After the preparatory meeting, the first in-person stakeholder workshop will be organized on June 12, 2024, at the UFZ Magdeburg, to discuss further the OurMED project with multiple stakeholders.

4.3.2. Future directions and plans

The preparatory meeting showed promise in initiating a mutual and long-lasting dialogue between the project team and stakeholders in the corresponding Bode basin. The purpose of the meeting was to understand the expectations and needs of various stakeholders and align them with the project targets. Subsequently, key stakeholder groups were identified to be invited to the first in-person meeting, scheduled to take place on June 12, 2024, at UFZ in Magdeburg, Germany.

4.4. References

Pütz, T., Kiese, R., Wollschläger, U. *et al.* TERENO-SOILCan: a lysimeter-network in Germany observing soil processes and plant diversity influenced by climate change. *Environ Earth Sci* **75**, 1242 (2016). https://doi.org/10.1007/s12665-016-6031-5

Wollschläger, U., Attinger, S., Borchardt, D. *et al.* The Bode hydrological observatory: a platform for integrated, interdisciplinary hydro-ecological research within the TERENO Harz/Central German Lowland Observatory. *Environ Earth Sci* **76**, 29 (2017). https://doi.org/10.1007/s12665-016-6327-5

5. Jucar, Spain

5.1. Introduction

5.1.1. Short demo-site description

The Jucar basin in Spain is located in the coastal region of the West Mediterranean. Spanning an area of 22,200 km^2, it is characterised by a mild temperate climate with dry summers. It is home to the Albufera of Valencia. The Albufera of Valencia, also known as Albufera Lake, is Spain's demo site for the OurMED project. Located 15 kilometres from the southern end of Valencia along the Mediterranean coast, it's the largest natural lake on the Iberian Peninsula, covering 24 km^2 with an average depth of 1.0 m. Surrounded by towns, industries, rice fields, orchards, mixed crops, and a 30 km long, 1 km wide sandbar, it has been significantly shaped by both natural forces and human activities.

Originally brackish, centuries of irrigation agriculture transformed it into a freshwater ecosystem, reducing its open water surface from over 30,000 hectares in Roman times to 2,433 hectares today. The lake's water quality declined in the mid-1970s due to untreated sewage and agrochemicals, leading to its unintentional use as a wastewater treatment site. Despite this, it was designated a Natural Park in 1986 and holds special protection status at both community and international levels. Recognised as a Special Protection Area for Birds and listed in the Ramsar Convention's Wetlands of International Importance, it also features habitats and species protected by the Habitats Directive. It is part of the Natura 2000 Network. Managing its water quality and ecological status remains a challenging yet crucial task.

Various stakeholders are involved in water management and environmental conservation in the study area. State Actors like the Valencian Government (GVA) oversee decisions, with bodies such as the Public Wastewater Sanitation Entity of the Valencian Community (EPSAR) handling sanitation projects. The Valencia City Council owns the lake, managed by the Oficina Técnica Devesa-Albufera. Market Actors engage in agriculture, tourism, and fishing, some supporting environmental initiatives. NGOs collaborate with authorities and companies on programs and monitoring. Successful models like land stewardship involve landowners and managers, while the Governing Board and committees like the Scientific Committee address specific challenges.

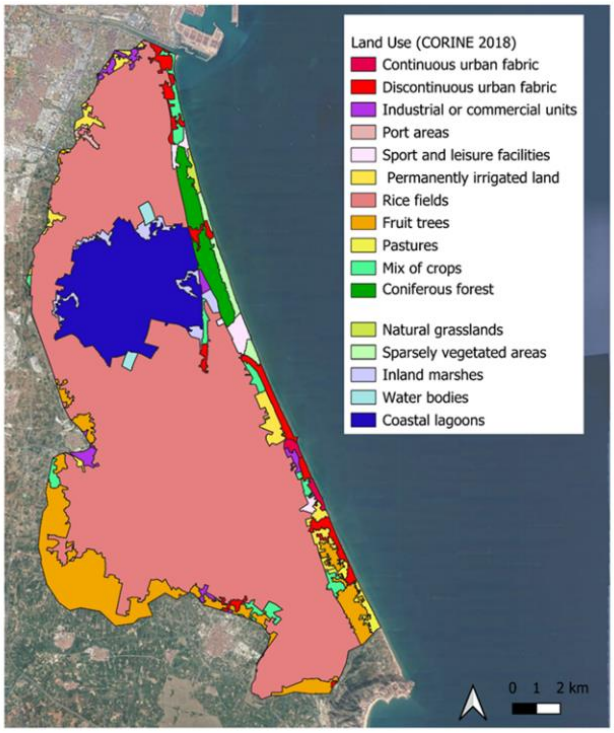

Figure 15 Distribution of land use within the Albufera Natural Park.

5.1.2. Background on workshop preparation

Numerous participatory processes have been carried out in the Albufera de Valencia Natural Park, in which the different social and economic agents and administrative bodies have collaborated to identify the main problems and propose solutions.

5.2. Methodology

In this first report, a compilation is made of the main forums where the problems of the Albufera of Valencia and the main lines of action to solve them have been discussed. This shows that carrying out this first living lab is unnecessary since its objectives are already known.

First, the main stakeholder body is the Governing Board, which meets at least once a year. It is a consultative body within the Natural Park's management framework. The members are defined by law, and all stakeholders are represented. Many aspects related to the natural park are discussed at these meetings. As a result, there is already a knowledge base on identifying problems and lines of action.

There is a Scientific Committee associated with the Governing Board, made up of members from universities and research centres. This committee provides analyses and opinions when the Governing Board needs information on a specific subject. In this regard, two reports have been issued in the last two years: one on the effect of the expansion of the Port of Valencia on the Natural Park and the other on the dredging of the lake sediments.

The president of the Governing Board is Carles Sanchis, a researcher at the UPV and collaborator of Jaime Gómez in previous projects. Members of IIAMA-UPV as Eduardo Cassiraga, Miguel Martín, Carmen Hernández-Crespo and Ignacio Andrés-Doménech are members of the Scientific Committee.

On the other hand, numerous European LIFE - INTERREG Med projects have contributed to improving the environmental quality of the Natural Park, and in all of them, participation actions have been carried out with the interested agents.

Two of them are worth mentioning. Within the framework of the LIFE Albufera project (2013-2016), meetings and interviews were held with the agents involved to analyse and evaluate the problems of Albufera. A very important aspect was to know their perception of the artificial wetlands that had been built in the Natural Park a few years ago.

Figure 16 Meeting with the rice sector, February 2016 (Source: Life+ Albufera).

Of particular importance was the meeting of European projects in rice-growing territories in April 2016. In addition to the LIFE+ Albufera project, the projects LIFE+ Sostrice, LIFE+ Ebroadmiclim, LIFE+ Segurariverlink participated with farmers' associations from Catalonia, Andalusia and Valencia.

Figure 17 Meeting with rice farmers around Spain, April 2016 (Source: Life+ Albufera).

The document elaborated in the framework of the Project on public participation (in Spanish) can be found at[2]. Miguel Martín and Carmen Hernández-Crespo from IIAMA-UPV coordinated this project.

Some LIFE Albufera project partners subsequently participated in the INTERREG Mediterranean WETNET project, "Coordinated Management and Networking of Mediterranean Wetlands", between 2016 and 2019[3]. In which several participatory processes were carried out. The main result was the "Wetland Contract", a collaboration agreement between stakeholders to provide solutions to the main problems of the wetland. It includes a series of lines of action at three levels:

- Strengthening Governance.
- Promotion of Biodiversity.
- Sustainable Development.

To be developed in the coming years.

The Wetland Contract (in Spanish) can be found here[4].

The basin organisation, Júcar Water Authority (CHJ), also carries out participatory processes related to the preparation of basin plans every six years. To discuss the plan, meetings (called Territorial Tables) are organised with interested agents and open to the public in which the concerns of society on water issues are gathered. In 2020, there were 11 Territorial Tables spread throughout the CHJ territory (Teruel, Castellón, Albacete,

[2] https://lifealbufera.webs.upv.es/download/herramientas-para-la-gestion-de-la-participacion-en-humedales/
[3] https://biodiversity.uma.es/wetnet-project/
[4] https://seo.org/wp-content/uploads/2022/06/Contrato-firmado-2019_12_17.pdf

Alicante.) to discuss the Scheme of Important Issues. Among them is a specific one to address the problems of the Albufera de Valencia (26/10/2020, El Palmar, Valencia). The summary document of the day can be downloaded (in Spanish)[5]. Several members of the IIAMA-UPV group, such as Eduardo Cassiraga and Jaime Gómez, have been collaborating with the CHJ to elaborate the plans.

5.3. Conclusion

5.3.1. Main take-aways from the workshop

As an example, some of the comments collected by the different agents about their perception of artificial wetlands as NbS in the LIFE+ ALBUFERA Project are shown.

Rice agricultural sector:

- They express problems of predation of rice by birds from artificial wetlands.
- They believe that the best green filter is the rice field.
- Their opinion has not been taken into account when installing the wetlands.
- They do not know the wetland management processes.

Fishing sector:

- Diverse opinions: some are unaware of the project; others believe that the presence of wetlands and their management can help improve fish biodiversity.

Nature tourism:

- Very high valuation of wetlands for the improvement of biodiversity.
- Positive for the sector by increasing the spaces where you can work.

Other services:

- Boat trips (tourism). Highly positive assessment as trips increase. Great tourism potential.

Managing bodies/public administration:

- Positive assessment: impact on biodiversity.
- Necessary to increase surfaces.
- It is necessary to discuss the location of these spaces in the Natural Park (further or closer to the lake?).

[5] https://www.chj.es/es-es/ciudadano/participacion_publica/Documents/Plan%20Hidrol%C3%B3gico%20de%20Cuenca%202021-2027/Mesas%20territoriales%20EpTI/Albufera/InformeResumenAlbufera.pdf

As final conclusions, some of the key aspects that the different agents interested in the Natural Park field highlight to improve public participation in artificial wetlands as nature-based solutions are:

- Encourage public use.
- Great interest in ornithological tourism.
- Align the objectives of the NbS with those of the various sectors: improvement of water quality, promotion of biodiversity, improvement of the guarantee of water resources.
- Learn to share spaces: the NbS are the newcomers to the agricultural world of the natural park.
- Learn to use socialisation spaces: bars, for example.
- Flexibility in finding meeting spaces: Move to where they are.
- Provide results that may be useful to them.
- Thank them for their participation.

- Share and make field work visible so that we are not seen as office people.

5.3.2. Future directions and plans

Therefore, it is considered that in the framework of the OurMED project, the objective of the first living lab has been achieved thanks to these historical processes of participation, and carrying out the first session to identify the problems would bring nothing new.

In the OurMED project, we will focus on the perception of Nature-based solutions to improve biodiversity, water quality and water security and their agri-environmental integration.

Now, after 10-15 years of operation of the constructed wetlands, it is time to receive information on the current perception of these spaces in the Natural Park, especially if this perception has changed.

To prepare a joint meeting, the next step will be to prepare sectoral meetings to:

- Evaluate the historical perception of the wetlands that exist in l'Albufera NP.
- Propose new implementations of Nature-Based Systems.
- Establish/identify funding and management mechanisms.

Later, we will prepare a joint meeting with all sectors. The list of starting agents to organise the meetings will be the members of the Governing Board, to which other agents considered convenient will be added. A meeting will also be held with the members of the scientific committee.

5.4. References

https://lifealbufera.webs.upv.es/download/herramientas-para-la-gestion-de-la-participacion-en-humedales/

https://seo.org/wp-content/uploads/2022/06/Contrato-firmado-2019_12_17.pdf

6. Konya, Turkey

6.1. Introduction

The purpose of the first living lab workshop (M3.1) held on the 25th of April, 2024 in Konya city centre was to foster a mutual understanding regarding the vital problem of unsustainable surface water use in the Konya Closed Basin and conduct an initial analysis of proposed solutions to the problem by the relevant stakeholders.

Prior to the first living lab workshop in April, two field trips were made, the first one in November 2023 and the second one in February 2024 to understand the governance structure and the dynamics of the stakeholder network supplemented with desktop analysis. Prior field trips and engagement with the relevant stakeholders were essential for trust-building and building the community bases of the participatory activity to be conducted in WP3.

6.1.1. Short demo-site description

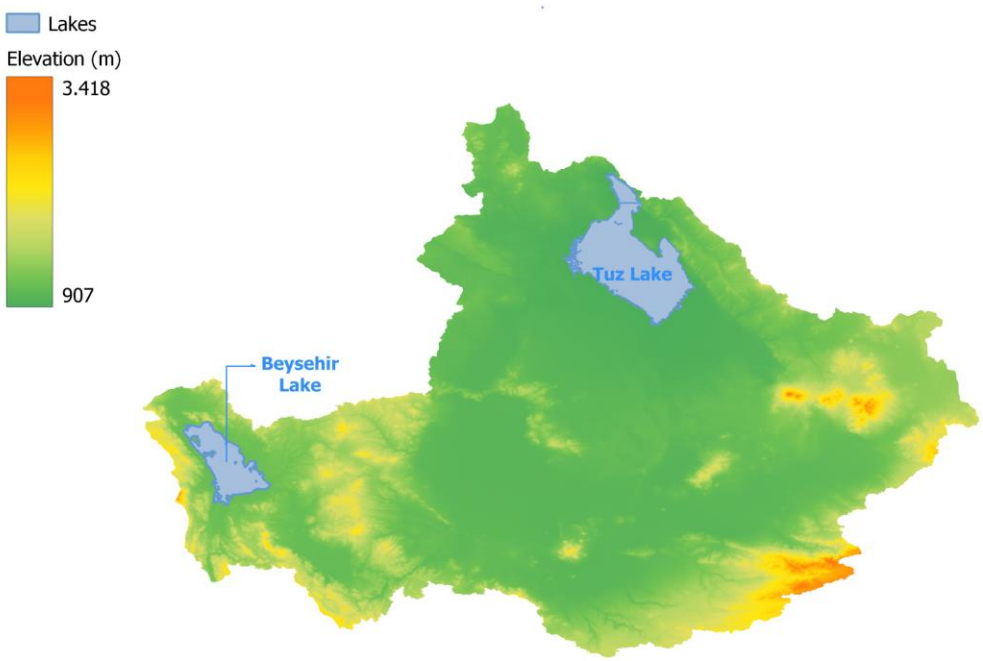

Figure 18 Digital Elevation Map (DEM) of KCB, including the water bodies of the basin.

The Konya Closed Basin (KCB) in Central Anatolia, Turkey, covers 49,963 km^2, or 6.4% of Turkey's land area. It includes Lake Beysehir in the west and Lake Tuz in the north (Figure 14). Despite being historically known for wheat production, the water-intensive crop patterns have increased due to economic incentives since the early 2000s. Annual precipitation ranges from 280 to 350 mm, mostly falling in winter and spring, with limited

or no rainfall in summer. The surface water resources are limited in the basin exacerbating the stress on groundwater resources. This deficit, exacerbated by the basin's semi-arid climate, has led to water scarcity issues, affecting agricultural producers among many others. The State Hydraulic Works (DSI) has constructed channels and tunnels to transport water from Lake Beysehir and the Goksu Basin for agricultural and domestic use, but sustainable water management remains a critical concern for the basin's future.

6.1.2. Background on workshop preparation

The aim of the workshop was designated as (1) bringing relevant stakeholders together and enabling them to meet and exchange views, (2) establishing a relationship of trust between stakeholders and researchers. For this end, the purpose and the boundaries of the project should be well-communicated and a good understanding of why the workshop is being carried out should be fostered within the team to better design the workshop. This way, creation of a mutual learning opportunity can be ensured.

6.2. Methodology

The Living Lab methodology was central to our approach in engaging multi-sectoral stakeholders in the Konya Closed Basin on surface water governance, use, and distribution. Through this methodology, we transformed the workshop into a collaborative platform where stakeholders actively participated in identifying the problems in the basin, co-creating solutions and exploring innovative approaches to address water governance challenges. By integrating stakeholders directly into the process, we were able to gather real-time feedback, insights, and suggestions, ensuring that the outcomes of the workshop were informed by the collective expertise and local knowledge of the participants. This approach facilitated a deeper understanding of the complexities surrounding surface water governance and ecosystem services in the Konya closed basin and enabled us to develop more context-specific and sustainable solutions.

6.2.1. Workshop program and summary

The workshop was designed as a total of 4 complementary sessions (Table 6). Each session had an objective and was conducted with break-out groups.

Table 6 Daily Schedule.

Time	Activity
09:30	Welcome – Coffee
10:00 10:20	PRESENTATION ACTIVITY (20 min) Introduction • who we are, who is who, who is here • our previous engagement in Konya based projects • What is the project? • What is the aim of the workshops, what is the particular aim of the 1st workshop?
10:20 – 11:20	1st session – Spelling out the problems and problem prioritisation • Intro plenary • Break out (listing the problems around food-water-conservation issues) – • Prioritize the issues • Reporting back plenary
11:20 – 11:40	Break
11:40 – 12:30	* shuffle the participants, assign them new break-out groups 2nd session - plotting dynamic issues (historical trends) • Intro plenary – (introduce the top issues compiled by us during the break, ask for missing/underrepresented issues) • Break out Goal: Past development until today - building the narrative and understanding the historic progress (collect narratives and stories)
12:30 – 13:30	Lunch
13:30 – 14:10	3rd session - focus on future (business as usual and desirable futures) and interventions • Intro plenary • Break out
14:10 – 14:30	Break
14:30 – 15:20	4th session - what kind of alternatives would take you to the desirable future and discuss policy options and interventions - no breakout groups • Presentation by facilitator • Plenary
15:20 – 15:30	Closing

Starting with an introductory plenary presentation of the workshop, we introduced the OurMED project, our aims throughout the project duration and the scope of workshops planned to build the living lab workshop (Figure 15). We communicated the ultimate aim of the living lab workshop and the goals of the first workshop.

Figure 19 Plenary introduction.

Session 1: Problem Identification

In the first session, the main objective is to determine the problems of the basin related to surface water use, management, and associated economic, social, and environmental issues. Stakeholders who are from the same or similar sectoral backgrounds were grouped together for the first session. Facilitators briefly introduced the session, outlining its objectives. Participants then took part in a group exercise to list problems, focusing on the intersection of food, water use, governance and nature conservation. Each participant had the opportunity to contribute, and one person from each group was selected to present their group's findings. Following this, participants voted to prioritize the most important three issues, with facilitators recording the votes on the whiteboard. The breakout groups had common issues and also issues specific to their expertise areas. For example, State Hydraulic Works officials were observed to be mainly concerned about mal irrigation infrastructure, engineering and construction issues of tunnels and dams whereas stakeholders from nature conservation NGOs put forward more diverse issues such as biodiversity loss and degradation of wetlands.

The session concluded with a group feedback session, where volunteers summarized their group's discussions and similar issues were grouped based on common themes.

Figure 20 Group discussion at the first session.

Figure 21 A group member presenting their group's list of problems.

Session 2: Historical Trends of the Identified Problems

During the break, the Boğaziçi team compiled all the problems listed in each group and synthesized them, ensuring that highly prioritized issues across groups were represented. Following the break, the groups were shuffled after the first session to ensure that all sectors were represented in each breakout group. The session commenced with an introduction outlining the scope, which is to discuss the historical trends of the top 5 prioritized problems. Facilitators began by introducing the key issues identified in the previous session, seeking feedback for any missing or underrepresented topics. Participants then worked in groups to plot historical trends on pre-printed graphs for selected problems and indicators, without facilitator's interference. They were guided to consider how each indicator changed since 2000s, when the change started, the unit of measurement, and how the indicator changed initially and in recent years.

Figure 22 Group discussion over past trends of selected indicators.

Session 3: Focus on Future and Expectations

Session 3 shifted the focus to the future, with participants projecting future trends based on current conditions (business as usual scenario) and desired future scenarios. Facilitators recapped the discussions from the previous session. Participants then projected future trends both for the business-as-usual scenario and the desired scenarios.

Session 4: Solutions, Alternatives & Recommendations

The final session wrapped up the workshop by discussing solution alternatives and recommendations. Facilitators presented a summary of the discussed issues and led a sequential discussion of intervention points for each issue. Participants engaged in a plenary discussion focusing on interventions discussed in the session 3, identifying and grouping conflicting and aligning interventions for future steps.

Figure 23 Plenary discussion at the fourth session.

6.2.2. Characteristics of the participants

There were 25 stakeholders present in the workshop. 7 people from State Hydraulic Works and Konya Plains Project Regional Development Administration; 6 people from Agricultural Chambers and District Agriculture and Forestry Offices; 6 people from irrigation unions and Farmer Associations; 6 people from NGOs and Universities.

6.2.3. Questions discussed in the workshop

The basin has multi-sectoral dynamics regarding water use and governance. Therefore, it was anticipated that the problems and stakeholders' perception of those problems would be diverse in nature depending on the background of each stakeholder group. The questions asked in the workshop were carefully crafted beforehand to maintain neutrality and prevent facilitators from influencing the discussions. They were designed to uncover stakeholders' genuine perceptions of the problems, historical trends, future-oriented anticipations, and desires for the basin.

In the first session, the main goal was the problem identification by stakeholders. The question asked to catalyze the discussion is as follows: What are the economic, social and environmental problems related to water use and water management in the Konya closed basin? After each stakeholder was given the chance to offer their insights, the problems and indicators uttered were carefully listed on a whiteboard for stakeholders to see. Later, they were asked to prioritize 3 most important problems out of the list of

problems discussed in the group. The votes cast by closed ballot were counted in a way that stakeholders could see and the top 3 problems were identified. A final confirmation about the prioritized problems was asked.

In the second session, the selected problems from all groups were chosen to continue the discussion over the past trend of change in selected indicators of those problems. The group members were asked "How and towards which direction do you think the Indicator X changed until now?". They were then asked to draw the discussed trends on the graph.

In the third session, the participants were asked about the business as usual (BAU) scenario and their desired future scenario for each selected indicator. They drew both the BAU and their desired future scenarios on the graph. The questions asked in this session are as follows: How would these indicators change in the future (e.g. the next 15-20 years) if the current situation remains the same? And how would you like these indicators to change?

Later in the third session, the participants were asked "What kind of interventions and/or policies will lead us to the desired future?". The group started brainstorming on the possible intervention points and policy changes that they think would lead to their desired futures. In the last session, the outputs from the second and third session were presented to all of the stakeholders and a plenary discussion was carried out.

6.2.4. Photos from the workshop

Figure 24 Team coordinator presenting the team and the project.

Figure 25 Stakeholders listening to the plenary introduction.

Figure 26 Outputs of groups' work are exhibited.

Figure 27 Group photo at the end of the living lab workshop.

6.3. Conclusion

The workshop gave many valuable insights into surface water governance, use and distribution in the basin as well as ecosystem benefits of surface water bodies in the basin. The perceived problems, their historical trends and future projections were discussed. Possible intervention strategies and needs were also discussed to improve the conditions of surface water resources in the basin as well as to have a better surface

water governance. Stakeholders' perceptions and insights regarding surface water governance will be a key component of the progress of the project in Konya Closed Basin.

6.3.1. Main take-aways from the workshop

Many valuable insights were garnered from the discussions during the workshop. The first session was to understand what the relevant stakeholders were perceiving as a problem and how they were perceiving those problems.

- Inefficient and ineffective agricultural policies and planning are major issues affecting surface water resources in the basin.
- Stakeholders highlighted issues in inter-institutional communication and cooperation, calling for improved governance mechanisms.
- Ambiguity in tasks and responsibilities of policy-making institutions, along with fragmentation, is a vital issue in surface water governance on both basin and national scales.
- Lack of basin-specific crop planning is a significant problem.
- Central organizations of relevant ministries and their regional officials are not engaged with the basin enough, leading to a superficial understanding of its dynamics.
- Lack of coordination between central and local governance institutions is a significant problem.
- Inefficient irrigation infrastructures, such as old and soil irrigation channels, are key problems.
- Slow adaptation of new technologies and inefficiency regarding farmers' use of new technologies are also important issues.
- Emphasis on basin-specific agricultural policy improvements, promoting crops suitable for geophysical conditions and with low water demand through state subsidies.
- Importance of advanced monitoring systems for biodiversity conservation and control of fertilizer use to prevent water contamination.
- Discussion on the strict implementation of pasture law and radical improvements in water law.
- Proposal for the establishment of a supra-institutional water authority to avoid fragmentation and foster effective coordination.
- Recognition of human pressures on the environment as a complex issue intersecting with diverse sectors, with suggestions for population control, improved urbanization management, and policy changes. However, stakeholders did not reach a consensus on clear intervention points due to the complexity of the issue.

There seemed to be a consensus to a certain extent among the stakeholders on the problems listed. The group which included representatives of NGOs mentioned many vital nature conservation and biodiversity loss issues in the basin due to ineffective policies and mismanaged surface water resources which was not as thoroughly discussed in any other stakeholder groups.

6.3.2. Future directions and plans

We aim to build upon the insights gained from the first Living Lab workshop to deepen our understanding of surface water governance and stakeholder dynamics. We will be in the field with diverse motivations and in close contact with the stakeholders to maintain a long-lasting social learning environment. In our future plans, we are preparing for two important Living Labs. The second workshop, (will be presented in M3.2), will focus on bridging expert and local knowledge. This session will be crucial for integrating the insights and perspectives of both experts and local stakeholders, enriching our understanding of water governance and management in the Konya Closed Basin.

Following this, the third workshop, (will be presented in M3.3) will be dedicated to deliberating stakeholder-suggested solutions. This session will allow stakeholders to discuss and refine proposed solutions, ensuring that they are feasible, acceptable, and beneficial for all involved parties. Through these workshops, we aim to foster meaningful dialogue, co-create sustainable solutions, and strengthen multi-stakeholder collaboration in the basin.

7. Medjerda, Tunisia

7.1. Introduction

7.1.1. Short demo-site description

The Medjerda basin, spanning across Northern Tunisia and North Eastern Algeria, is a crucial transboundary river system that plays a significant role in the agricultural and water supply sectors of the region. Covering an area of 23 700 km² (Boulmaiz et al., 2022) and considered as the largest catchment in Tunisia, the basin contributes substantially to the national cereal yield (more than half) and freshwater reserves (around 25% of the total freshwater of the country) (Fehri et al., 2019). More than 70% of the watershed is cropped, with a production system largely dominated by rainfed crops, mainly cereals and fodders. Irrigated crops, vegetables with more or less fruit, are generally limited to the vicinity of dam reservoirs and the lower valley. A little more than a quarter of the surface area of the Medjerda corresponds to wooded and pastoral lands, indicating the strong anthropization of the watershed. With a trend of decline in natural vegetation, there is a pressing need for sustainable management practices to ensure the long-term health and productivity of this vital ecosystem. The planned construction of new dams underscores the importance of strategic water resource management in balancing agricultural needs with environmental preservation in the Medjerda basin.

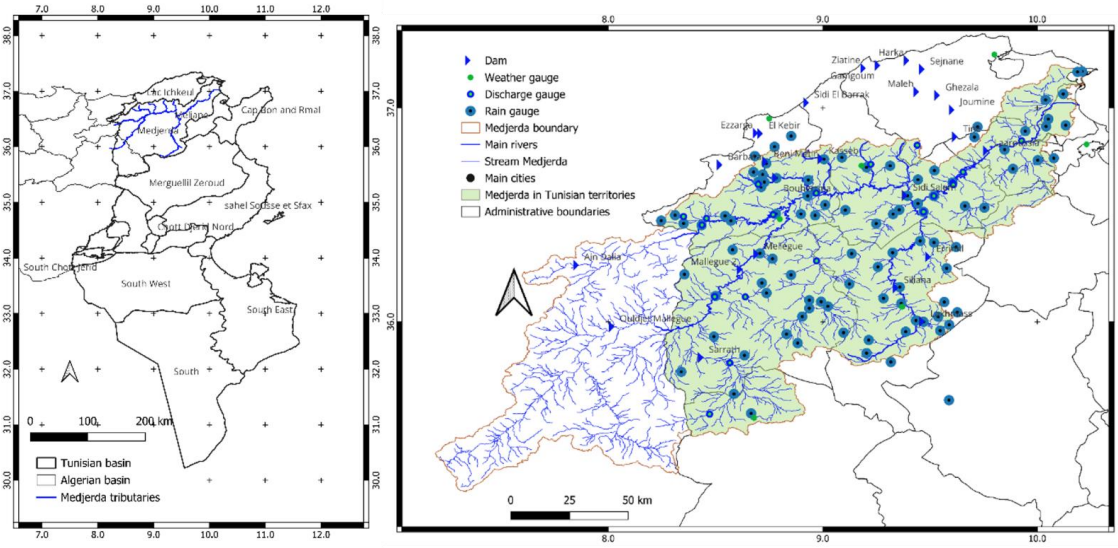

Figure 28 Location of the Medjerda basin in the Northern Tunisia and Northeastern Algeria and location of rain and flow gauges as well as climate gauges and dams.

7.1.2. Background on workshop preparation

To implement the Medjerda living lab, the ESIM research team of OurMED project organised several meetings and interviews with regional authorities (CRDAs) in upstream,

center and downstream of Medjerda watershed to raise the stakeholders' awareness, to define the objectives, the methodology, the engagement in the Living lab process and the main concerns related to water resources in Medjerda watershed.

The national and regional authorities in the Medjerda watershed were, at first, approached by phone calls, fax and email to inform them about the OurMED project objectives, and to coordinate a visit. The meetings are carried out between 15th and 31th of January 2024 (Table 7).

Table 7 Meeting and interview schedules.

Regional Authority	Date	Participants' number
CRDA Beja	The 15th of January 2024	7
CRDA Jendouba-	The 17th of January 2024	6
CRDA Kef	The 17th of January 2024	8
CRDAMannouba	The 22nd of January 2024	7
CRDA Ariana	The 22nd of January 2024	10
CRDA Siliana	The 24th of January 2024	10
CRDA Bizerte	The 31st of January 2024	9

In addition, a special poster for the OurMED project objectives, methodology, partners and demo-sites was attempted for participants in all meetings and interviews. OurMED project flyers were handed to all participants in these meetings.

Figure 29 Poster for the announcement of the OurMED Project.

When engaging with regional authorities in the Medjerda watershed, discussions often revolve around the identification of issues and challenges within the watershed area.

During the interviews, various topics were raised and discussed. These topics likely included water governance, water access, water quality and soil and water conservation issues, which will be addressed in upcoming workshops.

At the end of the meetings, regional authorities were invited to the workshops and were called to mapping out relevant stakeholders who have a vested interest in management, storage, distribution and use of water resources in the Medjerda watershed that could be invited to the different workshops. Regional authorities in upstream, center and downstream Medjerda replied directly about their availability, while an official invitation was sent to the proposed list of stakeholders.

Invitations were prepared and sent by fax and email to the stakeholders along with the OurMED brochure and the link for the project's website. The invitation text was also shared through the ESIM official site and Facebook page.

7.2. Methodology

7.2.1. Workshop program and summary

Three workshops were organised to bring together multi-sectoral stakeholders and involve them in interactive participatory activities in order to capture the critical issues and needs of the Medjerda watershed as well as the required actions to be taken to optimally manage the available water resources. The workshops took place between 14th and 22nd of February 2024 for upstream at University of Jendouba, for center at ESIM and for downstream Medjerda at Institut National Pédagogique et de Formation Continue Agricole (INPFC) of Sidi Thabet (Table 8).

Table 8 Living Lab participants.

Location	Date	Number of participants
ESIM	February 14th, 2024	51
University of Jendouba	February 21st, 2024	25
INPFC Sidi Thabet	February 22nd, 2024	49

The agenda of each workshop is presented in the table 9:

Table 9 Workshop Schedule of Tunisian demo site.

Time	Activity
09:00 - 09:30	Attendance and registration of participants
09:30 - 10:00	Welcome speech of the ESIM General Director (Prof. Hassan Kharroubi)
10:00 - 10:15	Presentation of OurMED project (Prof. Slaheddine Khlifi)
10:15 - 10:30	Presentation of the Medjerda's Living lab: Objectives and approach, (Dr. Imen Souissi)
10:30 - 11:00	**Coffee break**
11:00 - 12:15	Working groups by topic moderated by:Prof. Slaheddine Khlifi, Dr.Imen Souissi, Dr. Khalifa Riahi, Dr. Ahmed Skhiri, Dr.Oussama Rhouma, Dr. Siwar Ben Nssir. Topic 1: Water governance Topic 2: Water access Topic 3: Water quality Topic 4: Soil and water conservation
12:15 - 12:45	Open discussion and overall conclusions
12:45 - 13:00	Prioritisation of identified problems and evaluation of the workshop
13:00	**Lunch**

7.2.2. Characteristics of the participants

The workshops aimed to engage all stakeholders in the water sector within the Medjerda basin. Participants could be grouped into four categories:

1. Administration: which includes the CRDA (Regional Commission for Agricultural Development), the local authority, SONEDE (National Company of Water Exploitation and Distribution), ONAS (The National Sanitation Office) and ODESYPANO (Western North Sylvo-Pastoral Development Office).
2. Farmers.
3. Professionals mainly agricultural service companies.
4. Academics (teachers and researchers).

The number of participants per category is summarised in table 10:

Table 10 Characteristics of participants in Medjerda basin.

Category of stakeholders	Number of participants			Total
	Workshop 1 ESIM	Workshop 2 University of Jendouba	Workshop 2 INPFC Sidi Thabet	
Administration	23	12	35	70
Farmers	5	5	4	14
Professionals	3	3	2	8
Academics	20	5	8	33
Total	**51**	**25**	**49**	**125**

7.2.3. Questions discussed in the workshop

After a brief presentation of the objectives, the methodology, demo sites and the main concerns related to water resources in Medjerda watershed, the participants were asked for their contributions and suggestions for the optimal water resources management in the Medjerda and their intentions to cooperate or not with the rest of the stakeholders. Afterwards, interactive activities took place among the participants, where they were asked to plot the significant water resources information in the map of the Medjerda as well as to describe in a collaboration map the main problems identified in Medjerda watershed that may be developed among the 4 working groups for the 4 Topics already identified during the meeting with regional authorities:

1. Water Governance
2. Water Access
3. Water Quality
4. Water and Soil Conservation

Following the working groups, stakeholders were asked to prioritise the identified problems within the area. This prioritisation process likely involved ranking the issues based on their importance and urgency.
At the end of workshops participants were invited to give, using stickers, their appreciation regarding their expectation and needs from the living lab workshop and the used methodology.

7.2.4. Photos from the workshop

Figure 30 Meetings with regional authorities.

Figure 31 Presentation of OurMED Project, Medjerda Living lab objectives and methodology during workshops.

Figure 32 Working groups by Topic.

Figure 33 An overview of the outcomes of working groups.

7.3. Conclusion

7.3.1. Main take-aways from the workshop

Raised problems during the 3 workshops are:

Topic 1. Water Governance

The challenges surrounding water resources in relation to the existing water legislation in the Medjerda watershed are complex. The main issues highlighted are:

- Regulation not in line with the situation (water code)
- Non-enforcement of the law
- Absence of Police of water
- Absence of specific structure for the management of the Medjerda
- Unqualified managers in the Medjerda watershed
- Centralised management by excluding stakeholders from decision making processes (no participatory approach)
- Lack of financial resources
- Lack of monitoring and control tools
- Large number of stakeholders and lack of coordination between the ministry and the other stakeholders
- Lack of coordination between research projects and administration
- Agricultural policies not adapted to water stress
- The water pricing does not cover management costs for irrigated areas
- Policy contradiction between promotion of intensification and water resource conservation
- Lack of laws to manage conflicts between the national and regional authorities and farmers
- Lack of trust between farmers and the government.

Topic 2. Water Access

The challenges associated with water access in the Medjerda watershed can be summarised as follow:

- Transfer of water resources from the north of Tunisia to the center without achieving self-sufficiency in the north regions.
- Conflicting water uses.
- Lack of wastewater treatment or non-rehabilitated networks.
- Absence of a comprehensive hydric balance assessment.
- High energy costs to mobilise water resources.
- Elicit pumping and drilling due to lack of coordination among different stakeholders involved in water resource management.
- Water wastage: water losses from distribution and irrigation networks.
- Unequal water distribution among water resources' users.
- Urbanisation and fragmentation of agricultural lands.
- Out-dated and non-participatory agricultural mapping.
- Non-strategic use of water resources (virtual water).
- Change in land use and the expansion of the area allocated for fruit trees that relatively have high water requirements (for example orange trees) at the expense of annual crops mainly cereals.
- Non-optimal irrigation management at plot level.

Topic 3. Water quality

The main problems identified for Water Quality of the Medjerda are:

- Water pollution of the Medjerda watershed due to the discharges of urban and industrial wastewater treatment plants
- High water salinity
- Non treated and poorly treated wastewater discharged into the stream network of Medjerda
- Drainage of agricultural land
- Impact of climate change and draughts on water quality of Medjerda
- Increased use of chemical fertilizers in agriculture.

Topic 4. Soil and water Conservation

According to stakeholders, Soil and Water Conservation problems can arise from various factors such as:

- Erosion and high siltation rate of dams
- Lack of maintenance of Soil and Water Conservation (SWC) structures
- Low commitment from farmers when implementing SWC
- Lack of logistics and personnel
- Climate change and flooding
- Soil salinization
- Urbanisation and illegal construction
- Unsuitable and unsustainable water network

- No monitoring information of groundwater recharge following the implementation of the SWC network
- Lack of awareness among farmers
- Under-exploitation of hill reservoirs
- Lack of funding for SWC networks
- Degradation of plant cover and deforestation

Prioritisation of problems:
Prioritising problems by topic can help focus resources and efforts on the most critical issues facing water resource management. For each topic, some challenges were mapped by stakeholders as more relevant and should be addressed with high priority.

Topic 1. Water Governance

The challenges identified in water governance in the Medjerda watershed highlight several critical issues that need to be addressed for effective management of water resources. The regulatory framework, as outlined in the water code, needs to be updated to better align with the current situation and address gaps in enforcement. The absence of monitoring and control tools, coupled with centralised management, calls for a more participatory approach to decision-making and improved coordination between water users, research projects and administration. Additionally, the lack of qualified managers, financial resources, and adaptive agricultural policies underscores the need for capacity building, increased funding, and policy reform to better manage water stress in the watershed.

We note that the prioritisation exercise has identified water governance as the principal problem that requires immediate attention and action.

Topic 2. Water Access

The problems related to water access in the Medjerda watershed highlight critical issues such as the scarcity of water resources, particularly at the watershed level, and recurring droughts that underscore the importance of prioritising water allocation and enhancing water productivity. The current structures, including the Agricultural Development Group (GDA), need to improve their water management practices to address issues such as the inefficiency of water distribution networks and the management of irrigation practices at the plot level. Additionally, addressing the debt of farmers to management structures can help improve access to water resources and promote sustainable agricultural practices in the watershed.

Topic 3. Water Quality

The main problems identified for Water Quality of the Medjerda and mapped as more important are the pollution from domestic and industrial wastewater treatment plant

discharges, as well as the high water salinity levels in the river, that pose serious threats to water quality. Also, the drainage of agricultural land contributes to water pollution, while the impact of climate change and droughts further compounds the challenges faced.

Topic 4. Soil and Water Conservation

The problems faced in soil erosion and water conservation highlight the urgent need for interventions to address soil erosion and to control the high siltation rate of dams. Furthermore, improvements in the maintenance of Soil and Water Conservation (SWC) structures, increased commitment from farmers in implementing SWC practices, and better allocation of logistics and personnel are crucial for sustainable conservation efforts. Climate change impacts, such as increased flooding, exacerbate the challenges faced in soil and water conservation.

Evaluation of workshops:

It was encouraging at the end to see that the majority of stakeholders appreciated the methodology used for the living lab workshops. Their positive feedback indicates that the workshop was successful in achieving its objectives and engaging participants effectively. This feedback can be valuable for future workshops helping to ensure continued support and participation from stakeholders in addressing shared challenges and finding innovative solutions.

Figure 34 Evaluation of the workshops by stakeholders.

7.3.2. Future directions and plans

The living lab approach is essential for fostering effective communication and promoting stakeholder involvement for a sustainable management of water resources. The future directions aim to continue understanding the characteristics of stakeholders, such as their priorities, concerns, resources, relationships, and potential conflicts of interest, for effectively engaging with them, building partnerships, and addressing their needs in a collaborative and inclusive manner.

Other workshops will be held next year with the objective of identifying solutions as a second step towards progressing from problem identification to actionable outcomes in the water resource management context. These workshops will probably include a presentation of identified problems raised during the first living lab workshops followed by brainstorming of best practices that already exist at local level and could be replicated to other regions. Then, stakeholders would be invited to propose new ideas that can lead to effective solutions that may enhance the water resource management at the Medjerda watershed.

7.4. References

Boulmaiz, T., Boutaghane, H., Abida, H., Saber, M., Kantoush, SA and Tramblay, Y (2022). Exploring the Spatio-Temporal Variability of Precipitation over the Medjerda Transboundary Basin in North Africa. Water 2022, 14(3), 423. https://doi.org/10.3390/w14030423

Fehri, R., Khlifi, S., Vanclooster, M (2019). Disaggregating SDG-6 water stress indicator at different spatial and temporal scales in Tunisia. Science of the Total Environment 694 (2019) 133766. https://doi.org/10.1016/j.scitotenv.2019.133766

8. Mujib, Jordan

8.1. Introduction

Water governance in the Mujib River basin is handled mainly by three main governmental institutions: The Ministry of Water and Irrigation (MWI), which is responsible for overall Policies, strategic direction, and planning; the Water Authority of Jordan (WAJ), which is in charge of water and sewage systems, and the Jordan Valley Authority (JVA) which responsible for the socio-economic development of the Jordan Rift Valley, including water development and distribution of irrigation.

Despite the great importance that governmental institutions represent as core stakeholders in the Mujib Basin, reaching integrated management is not possible except in the presence of other influential potential, critical, and marginal stakeholders.

Based on the efforts made by the Royal Society for the Conservation of Nature in the past five years Mava funded projects, the informal "integrated River Basin Management Committee" was scaled up to formal and national committee. This national committee, formed in May 2023 and approved by the Prime Minister, comprises thirteen members representing all institutions (=Stakeholders) responsible for managing the Mujib River Basin (MRB).

The formation of a national committee will help RSCN in the OurMED Project to facilitate access to available information, ensure the preservation of ecological values, and achieve Integrated Water Resources Management (IWRM) of the basin.

The Royal Society for the Conservation of Nature and the OurMED Project, under the guidance of the University of Sassari (UNISS) and Boğaziçi University (BU), started Stakeholder mapping and governance analysis by applying the Living Lab (LL) methodology. This inclusive approach aims to identify all stakeholders and classify their roles, ensuring that integrated management is a collective effort.

8.1.1. Short demo-site description

The Mujib River Basin (MRB) is located on the eastern slopes of the Rift Valley Region, flowing westward from the peripheries of the Jordanian eastern desert, gradually then rapidly accelerating through the eastern highlands to finally discharge in the Dead Sea Basin at the junction joint with Wadi Al Walah Basin in Al Malaqi point located at the heart of the Mujib Biosphere Reserve. The Wadi Al Mujib Basin lies within the larger Mujib and Walah Basin, which covers 6,586.76 km^2 and includes two sub-basins: Wadi Al Mujib Sub-Basin with an area of 4,449 km^2 and Wadi Al Walah Sub-Basin with an area of 2137.76 km^2.

The integrated management of the MRB presents many challenges considering the presence of different anthropogenic activities including large scale industrial activities such as mining, quarrying, in addition to the unsustainable use of surface and groundwater, water treatment, poorly managed dump sites. localised activities include

urban activities, mainly grazing. Climate change effects, soil salinity, and illegal hunting are not excluded.

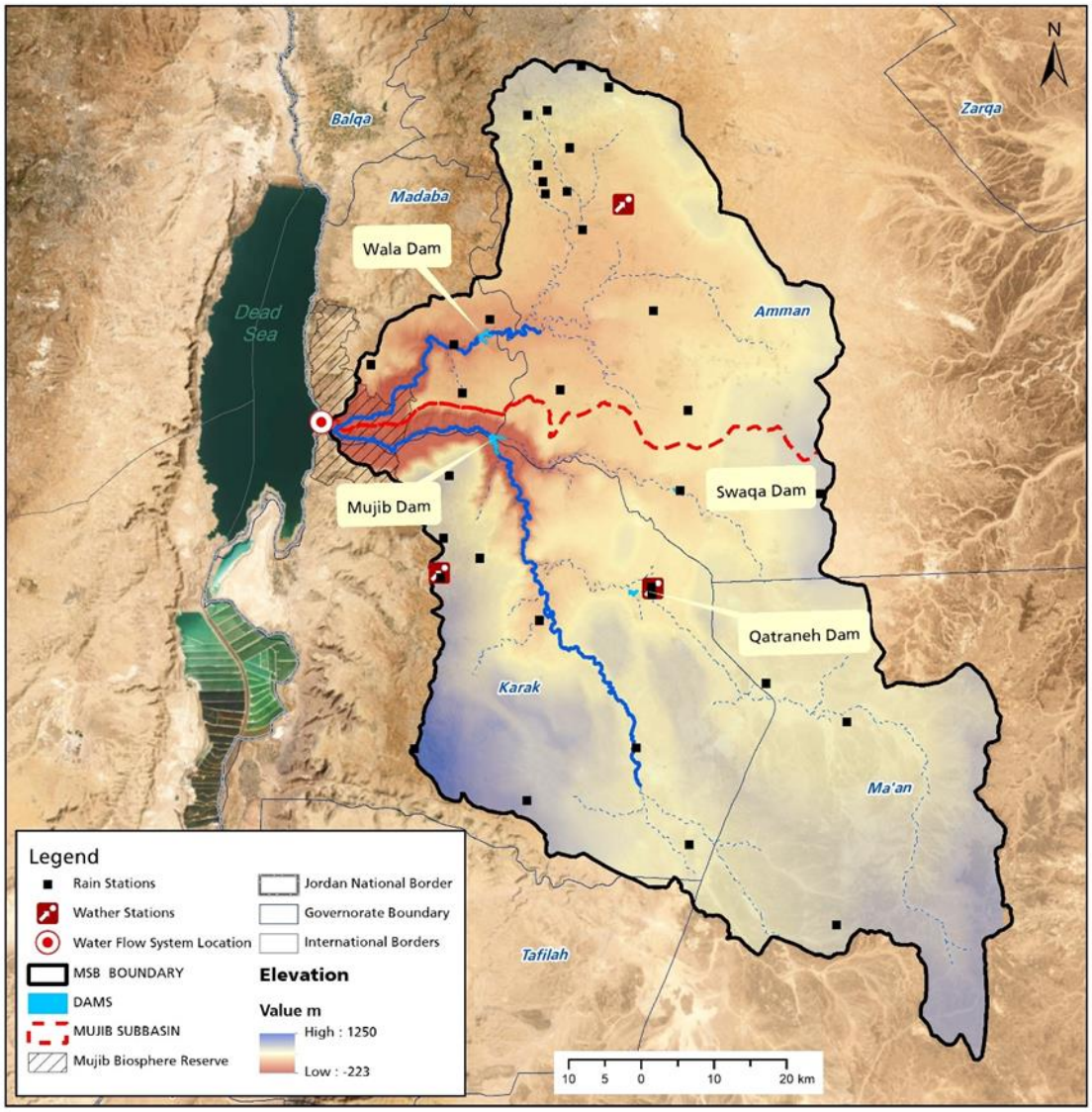

Figure 35 Mujib demo-site.

8.1.2. Background on workshop preparation

To prepare for the first lab session, meetings were organized with the Secretaries-General of each governance institution, field visits to farmers and the Dams Directorate in the Mujib River region were conducted, and the first kickoff meeting for the national committee took place in August 2023. The purpose of the meeting was to introduce the PRIMA project for the committee, and to introduce the Living Lab concept for the committee, then agree on the time for the first living lab workshop.

The Living lab workshop was held in February 2024 under the title of “Identifying the problems and challenges facing the Mujib River Basin (MRB) from the stakeholders’ perspective.”

The workshop was arranged in the Landmark Hotel/Amman. RSCN handled all the technical and logistical preparations, inviting all stakeholders from various sectors, following up with speakers, and formatting the presentations.

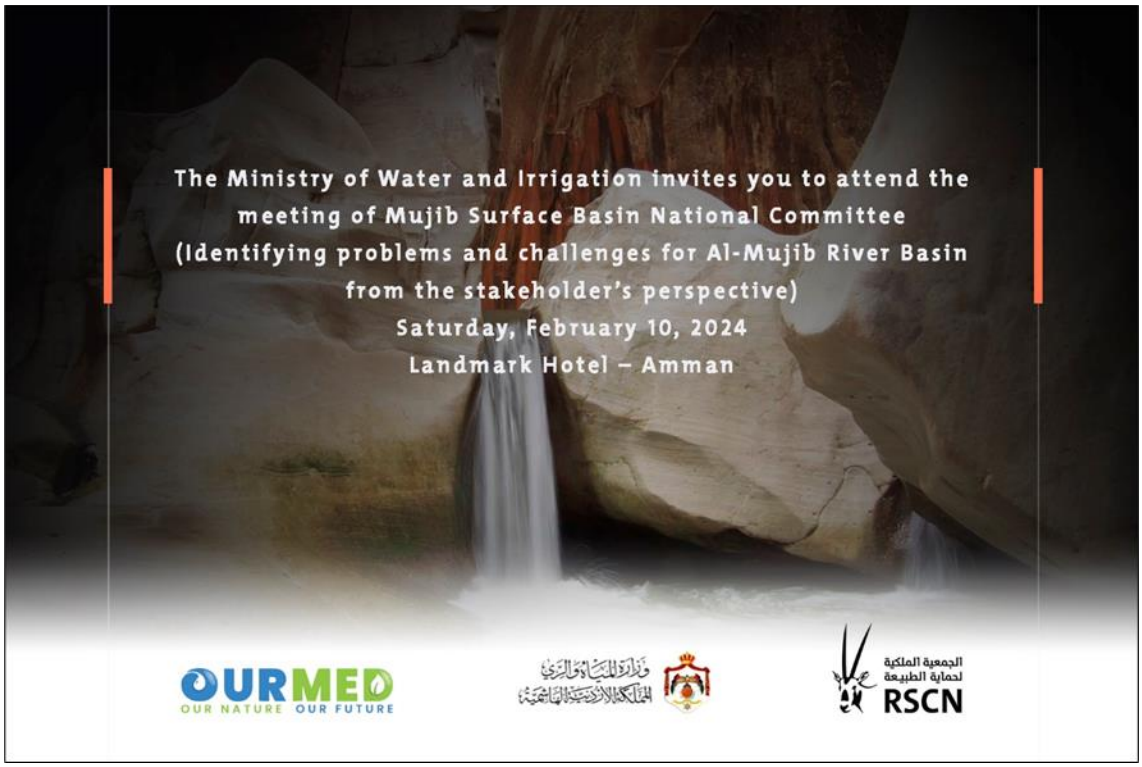

Figure 36 Workshop invitation.

8.2. Methodology

RSCN followed the methodology of direct communication and active listening, exchanging information based on experience and opening the door to discussion based on questions.

8.2.1. Workshop program and summary

The workshop started by presenting the general characteristics and available data and evaluating stakeholders' involvement in the MRB decision-making process. Then, continue to identify and discuss the most important challenges from the perspective of the Mujib National Committee (MNC) members. networking among committee members, focusing on the OurMED project, and how to achieve the participatory approach required in the project work. The agenda of the workshop was:

Table 11 Workshop agenda of the workshop in Mujib basin.

Time	Subject	Speaker
10:00 – 10:30	Registration and welcome speech	Dr. Jihad Al-Mahamid *Secretary General of the Ministry of Water and Irrigation*
10:00 – 10:30		Dr. Nashat Hmidan *Conservation & Monitoring Centre Director and OurMED Project Manager - RSCN*
10:30 – 11:00	Sustainable water storage and distribution project in the Mediterranean region OurMED	Eng. Qamar Al-Mimi *GIS Specialist and OurMED Project Coordinator -RSCN*
The characteristics of the MRB and data availability		
11:00 – 11:15	The physical characteristics of the Mujib Basin	Prof. Dr. Rakad Al-Taani *Professor at Al Balqa' Applied University*
11:15 – 11:30	The Geographical layers, maps, and water features in the MRB	Eng. Elham Al-Hadidi *Director of the GIS Unit - the Ministry of Water and Irrigation*
11:30 – 11:45	Central problems in the Mujib basin from the decision-maker's perspective	Eng. Hisham Al-Haisa *Secretary General of the Jordan Valley Authority*
11:45 – 12:00	Coffee Break	
Uses, challenges, and suggested solutions to improve management in the MRB		
12:00 – 12:15	Water demand management within the Mujib basin	Eng. Amani Al-Ta'ani *Director of water demand management in all sectors - the Ministry of Water and Irrigation*
12:15 – 12:30	The Main problems in the MRB from the User's perspective	Mr. Odeh Al-Rawashdeh *General Union of Jordanian Farmers*
12:30 – 1:00	Discussion and recommendations	
1:30 – 2:30	Lunch Break	

8.2.2. Characteristics of the participants

This workshop was attended by 15 people representing the government and academic sectors, farmers, the private sector, and civil society institutions, with a total of 26% females and 74% males. Their areas of specialization have varied between water management, ecological, agricultural, geological sciences, and water demand management.

Table 12 List of stakeholders, Mujib Case Study, Jordan.

No.	Sector	Entity	No. of participants	Gender	
				M	F
1	Water Sector	the Ministry of Water and Irrigation	4	2	2
1	Water Sector	Jordan Valley Authority	1	1	-
1	Water Sector	Geologist	1	1	-
2	Academic	Mutah University	1	-	1
	Academic	Balqa' Applied University	1	1	-
3	NGO	The Royal Society for the Conservation of Nature	2	1	1
4	Energy Sector	Energy and Minerals Regulatory Authority	1	1	-
5	Tourism Sector	Ministry of Tourism	1	1	-
6	Public Security	Ministry of Interior	1	1	-
7	Farmers	General Union of Jordanian Farmers	1	1	-
9	Agriculture Sector	Ministry of Agriculture	1	1	-

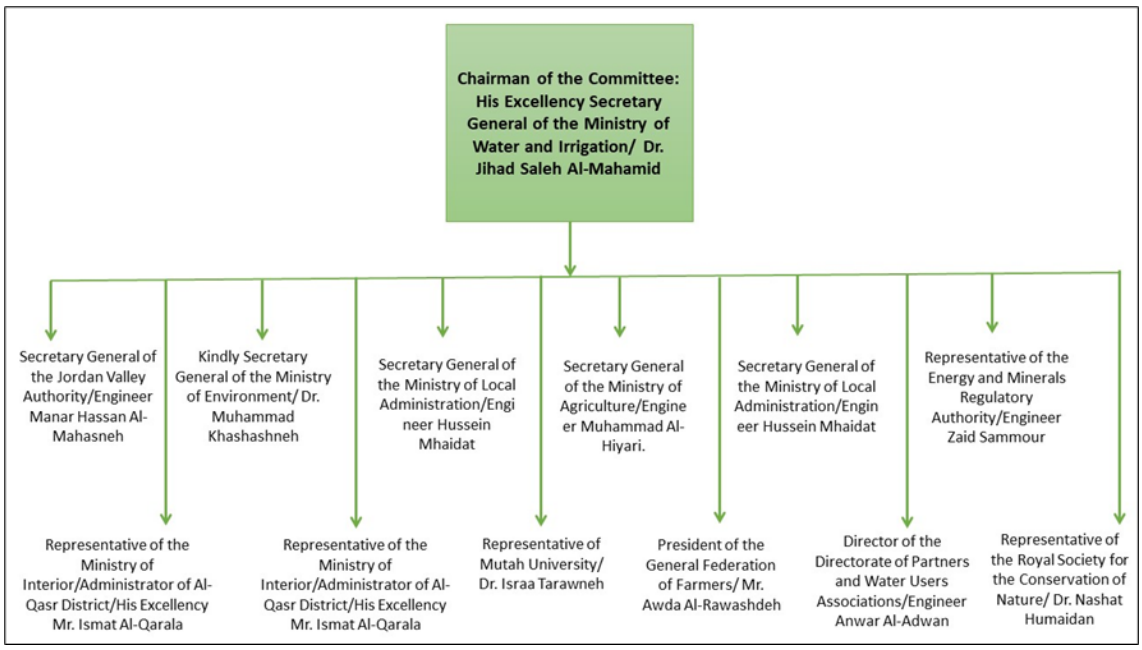

Figure 37 Mujib National Committee (MNC) Members Structure.

8.2.3. Questions discussed in the workshop

The questions were divided into two parts: the questions that show the general characteristics, current projects, and stakeholders involved in managing the study area, and the questions that show the most important challenges, strengths, and sustainable solutions that can be applied within the MRB demo site.

8.2.4. Photos from the workshop

Figure 38 The MRB National Committee Members.

Figure 39 LL Workshop Entrance (on the left) and The Ministry of Water and Irrigation General Secretary, His Excellency Dr. Jihad Al Mahamid, Welcome Speech (on the right).

Figure 40 The RSCN Filed Visit to the Jordan Valley Authority (JVA) Dams Department.

Figure 41 OurMED Jordanian kickoff meeting for MRB national committee members.

8.3. Conclusion

The Mujib National Committee has praised the OurMED project concept, object, and methodology. The chairman of the committee, who is the secretary general of the Ministry of Water, Dr. Jihad Al-Mahamid, stressed on the importance of supporting the OurMED project, whether by providing the necessary information and data or any

logistical support that will achieve the project's outcomes. He also stressed on the willingness to cooperate with all other members toward the OurMed project goals and objectives.

- The dissection table includes many challenges, starting with securing drinking water for people, reducing the amount of water loss, increasing water harvesting projects, finding the best NBS implementation, updating policies related to water demand management, and studying the flash floods alarming system in the MRB.
- Facing the increase of farmers complaints through the coming period due to frequent water shortages and obliging the industrial sector to follow instructions to reduce pollution and rationalize water use.

8.3.1. Main take-aways from the workshop

The main outcomes of this living lab were:

- It is important to understand that addressing Jordan's water situation is effective if taken in collaborative efforts between all related institutions, that can cooperate to develop sustainable and effective solutions for water management.
- The living lab is important in facilitating discussions and recommendations that benefit the basin management, and alighting the objective of OurMed project goals.
- The living lab is important to enhance committee members to share different data and help in the analysis toward effective implantation of the project tasks.
- The basin is playing a critical role as a vital water source of drinking, and agriculture that is emphasizing its' significance as a sustainable source of livelihoods and ecosystem.
- Erosion issue should be addressed in Wadi Mujib, and linked to the possible impact of climate change. A comprehensive assessment and nature-based solution to mitigate the flooding risk, and sustain the ecological values is strongly recommended.
- Advocate toward a broad application of this committee findings to all water basin in Jordan, supported by collaboration of stakeholders and their contribution in hydrological data for better decision-making processes.
- While assuring the need to support sustainable agriculture in the context of water scarcity, rising cost, and climate-induced soil degradation, the committee acknowledged the Integra and effective role of the Jordanian farmers union as a key committee member.

8.3.2. Future directions and plans

RSCN and the Jordan Valley Authority will arrange a field visit to the MRB in May 2024 to the main features, including the dams, climate stations, Mujib biosphere reserve, and farms.

9. Sebou, Morocco

9.1. Introduction

The Sebou basin features a sophisticated water system characterised by its numerous tributaries, extensive wetlands, and significant water bodies essential for the region identity and functionality. These resources are crucial for the basin agricultural sector, the primary consumer of water, and also support critical services such as drinking water supply, industrial usage, and hydroelectric power generation.

However, this vital basin is facing escalating challenges that jeopardise its ecological integrity and water security. Issues such as rapid urbanisation, intensive agricultural practices, industrial expansion, and the impacts of climate change exert severe pressures on its water resources and ecosystems. These pressures lead to significant problems including water quality degradation, habitat loss, and biodiversity decline, compelling the need for sustainable management strategies that are a priority for both local and national authorities.

In response, concerted efforts have been mobilised to tackle these environmental challenges through Integrated Water Resource Management (IWRM) approaches. Among these initiatives, the establishment of the Sebou Water Fund and the organisation of the Living Lab Sebou stand out as proactive measures. These platforms are designed to foster multi-stakeholder engagement and leverage both scientific research and community input to develop effective strategies that enhance water governance, ecosystem preservation, and sustainable development.

The Living Lab Sebou, in particular, offers a revolutionary approach to ecological management within the basin. Utilising the DPSIR (Drivers, Pressures, State, Impact, and Response) framework, this initiative is crucial for identifying key problems and understanding the dynamic interactions between human activities and the natural environment. This structured approach facilitates informed decision-making and effective policy implementation. The annual workshops and gatherings organised under this framework do not only serve as forums for exchanging knowledge but also act as catalysts for developing actionable solutions tailored to meet the unique challenges faced by the Sebou basin.

This section of the report delves deep into these endeavours, spotlighting the collaborative efforts undertaken, addressing the problems and challenges, and proposing innovative solutions highlighted during the 1st Living Lab Sebou to ensure the resilience and sustainability of the Sebou basin water resources and ecosystems.

9.1.1. Short demo-site description

Located at the heart of Morocco, the Sebou basin is a cornerstone of Morocco hydrological framework, spanning an impressive area of 40,000 km². It is not merely one of the largest river systems in the country but also a crucial element of the northern hydrological network, supporting an intricate web of biodiversity and underpinning the

socio-economic activities of more than 6 million inhabitants. This region, with its varied landscapes ranging from rugged mountains to fertile plains, is home to a plethora of biologically rich and ecologically significant ecosystems.

As the third-largest river system in Morocco, the basin comprises the main Sebou River and its vital tributaries, such as the Ouergha and Inaouene. These waterways traverse through varied terrains, supporting a vibrant mosaic of life forms. The region experiences a Mediterranean climate, with annual rainfall that varies significantly across different areas, profoundly influencing the lifestyle and agricultural practices of the local populations.

The ecological importance of the basin is further highlighted by its extensive network of wetlands, which includes several Ramsar sites recognized globally for their biodiversity conservation value. These wetlands are indispensable for their roles in water purification, flood control, and as habitats for numerous species of flora and fauna. Yet, these sensitive ecosystems currently face threats from over-extraction of water resources, pollution, and the impacts of climate change.

In terms of usage, the Sebou basin is critically important for agriculture, which dominates its landscapes and economy. It also plays a key role in supporting industrial activities and providing essential water resources for domestic use across several major cities and numerous smaller communities. The interdependence of these uses with the ecological health of the basin underscores the urgent need for a balanced approach to water and resource management, aimed at sustaining the basin's health and productivity over the long term.

This demonstration site epitomises the challenges of managing a major water system in a way that harmonises ecological integrity with human needs. It serves as an ideal focal point for initiatives like the Living Lab Sebou, which strives to promote sustainable water management practices through collaborative, science-based approaches. This holistic

view is crucial for formulating strategies that will effectively address the complex interplay of environmental dynamics and human impacts within the basin.

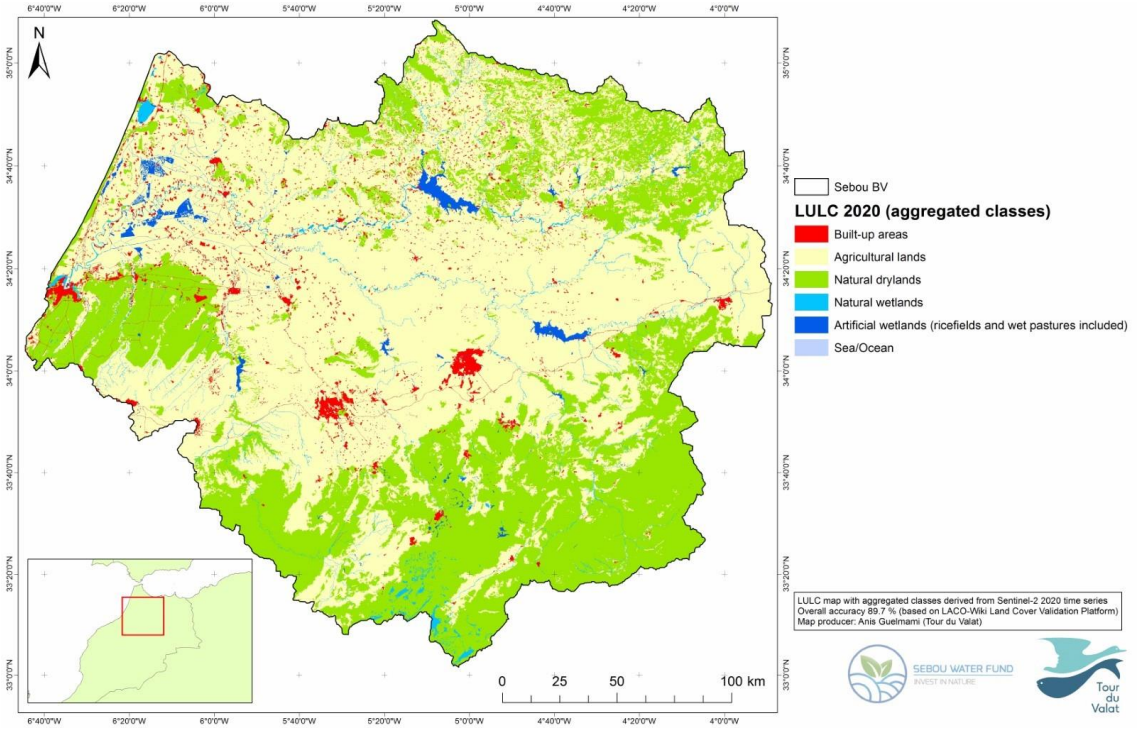

Figure 42 LULC Map of Sebou Basin with aggregated classes (TdV, 2021)

9.1.2. Background on workshop preparation

The preparation for the Living Lab Sebou workshop was a meticulous process designed to ensure a productive and impactful gathering of key stakeholders involved in the management and conservation of the Sebou basin. The workshop was conceptualised as part of a broader initiative to promote IWRM and sustainable practices in the basin, leveraging the diverse expertise and perspectives of various actors.

- Planning and Coordination:
    - Initial meetings: The planning phase began with a series of initial meetings involving primary stakeholders including representatives from Living Planet Morocco (LPM), Tour du Valat (TdV), and the Sebou Hydraulic Basin Agency (ABHS). These meetings served to outline the main objectives of the workshop and establish a foundational framework for discussion and interaction.
    - Stakeholder Mapping: A comprehensive stakeholder mapping exercise was conducted to identify all relevant parties, ranging from local government officials, NGO representatives, environmental scientists, community leaders, to industry stakeholders. This ensured a diverse and representative mix of viewpoints and expertise, critical for the holistic understanding and management of the basin resources.
- Logistics and Venue:

- Venue selection: The conference room of the Ibis Fez hotel was chosen for its central location in relation to the basin, its facilities suitable for hosting large gatherings and its reputation for its location close to the administration headquarters and the train station.
- Facilities and equipment: Arrangements were made to ensure that all necessary facilities and equipment were available. This included logistical considerations for breakout sessions, multimedia presentations, and interactive discussions.

- Communication and Engagement:
  - Invitations and confirmations: Formal invitations were sent out well in advance by LPM and ABHS, with follow-ups to confirm attendance.
  - Pre-workshop surveys: To tailor the workshop to participant needs and expectations, an online pre-workshop survey was designed to gather insights from participants regarding their expertise, expectations, and priorities for the Living Lab Sebou workshop. The majority of participants indicated expertise in Water Management, Sustainable Development, and Agriculture/Agronomy. These areas are crucial for addressing the complex challenges in the Sebou Basin. The majority of respondents expressed a desire to learn everything about water management and the wetlands ecosystems of Sebou. This indicates a high level of interest in comprehensive and detailed information. The top three priority themes selected by the participants were: Water Management, Climate Change, and Biodiversity Conservation.
  - Information packs: Prior to the workshop, information packs (Agenda, Notebook, Pen, etc.) were distributed to all confirmed participants.
- Outreach and Publicity:
  - Publicity strategy: A targeted publicity strategy was implemented to raise awareness about the workshop. This included press releases to local and national media, posts on social media platforms, and announcements through professional and academic networks.
  - Engagement with the media: Media engagement was planned to ensure coverage of the event, aiming to highlight the collaborative efforts towards sustainable management of the Sebou basin and to bring broader attention to the issues at stake.
- Workshop Execution:
  - Agenda development: A detailed agenda was developed to ensure a logical flow of activities, including plenary sessions, group discussions, and interactive exercises.
  - Facilitation and moderation: Facilitators and moderators from LPM and TdV were appointed to guide the discussions, ensuring that all voices were heard and that the sessions remained focused and productive.

- Documentation: Arrangements were made to document the proceedings comprehensively, including taking detailed notes, and collecting feedback from participants.

9.2. Methodology

The preparation for the Living Lab Sebou workshop was a meticulous process designed to ensure a productive and impactful gathering of key stakeholders involved in the management and conservation of the Sebou basin. The workshop was conceptualised as part of a broader initiative to promote IWRM and sustainable practices in the basin, leveraging the diverse expertise and perspectives of various actors.

- Planning and Coordination:
  - Initial meetings: The planning phase began with a series of initial meetings involving primary stakeholders including representatives from Living Planet Morocco (LPM), Tour du Valat (TdV), and the Sebou Hydraulic Basin Agency (ABHS). These meetings served to outline the main objectives of the workshop and establish a foundational framework for discussion and interaction.
  - Stakeholder Mapping: A comprehensive stakeholder mapping exercise was conducted to identify all relevant parties, ranging from local government officials, NGO representatives, environmental scientists, community leaders, to industry stakeholders. This ensured a diverse and representative mix of viewpoints and expertise, critical for the holistic understanding and management of the basin resources.
- Logistics and Venue:
  - Venue selection: The conference room of the Ibis Fez hotel was chosen for its central location in relation to the basin, its facilities suitable for hosting large gatherings and its reputation for its location close to the administration headquarters and the train station.
  - Facilities and equipment: Arrangements were made to ensure that all necessary facilities and equipment were available. This included logistical considerations for breakout sessions, multimedia presentations, and interactive discussions.
- Communication and Engagement:
  - Invitations and confirmations: Formal invitations were sent out well in advance by LPM and ABHS, with follow-ups to confirm attendance.
  - Pre-workshop surveys: To tailor the workshop to participant needs and expectations, an online pre-workshop survey was designed to gather insights from participants regarding their expertise, expectations, and priorities for the Living Lab Sebou workshop. The majority of participants indicated expertise in Water Management, Sustainable Development, and Agriculture/Agronomy. These areas are crucial for addressing the complex challenges in the Sebou Basin. The majority of respondents expressed a desire to learn everything

about water management and the wetlands ecosystems of Sebou. This indicates a high level of interest in comprehensive and detailed information. The top three priority themes selected by the participants were: Water Management, Climate Change, and Biodiversity Conservation.

- Information packs: Prior to the workshop, information packs (Agenda, Notebook, Pen, etc.) were distributed to all confirmed participants.

- Outreach and Publicity:
  - Publicity strategy: A targeted publicity strategy was implemented to raise awareness about the workshop. This included press releases to local and national media, posts on social media platforms, and announcements through professional and academic networks.
  - Engagement with the media: Media engagement was planned to ensure coverage of the event, aiming to highlight the collaborative efforts towards sustainable management of the Sebou basin and to bring broader attention to the issues at stake.
- Workshop Execution:
  - Agenda development: A detailed agenda was developed to ensure a logical flow of activities, including plenary sessions, group discussions, and interactive exercises.
  - Facilitation and moderation: Facilitators and moderators from LPM and TdV were appointed to guide the discussions, ensuring that all voices were heard and that the sessions remained focused and productive.
  - Documentation: Arrangements were made to document the proceedings comprehensively, including taking detailed notes, and collecting feedback from participants.

9.2.1. Workshop program and summary

The Living Lab Sebou workshop was structured to provide a comprehensive platform for knowledge exchange, collaborative problem-identification, and the development of actionable strategies for the sustainable management of the Sebou basin. The program was designed to balance informative presentations with interactive sessions, ensuring active participation and engagement from all stakeholders.

Workshop Program

The workshop was held on May 2, 2024, at the conference room of the Ibis Fez hotel. The detailed agenda included a mix of plenary sessions, group discussions, and interactive activities.

- 9:30 - 10:00 AM: Registration and Welcome
  - Activity: Participants registered and received their information packs.
  - Objective: Facilitate networking and ensure all participants are prepared for the day's activities.

- 10:00 - 10:20 AM: Introduction to the Living Lab Sebou
  - Speakers: Yousra Madani and Oussama Belloulid (LPM), Laila Misane (ABHS), and Anis Guelmami (TdV)
  - Content: Welcome remarks, context setting, and workshop objectives.
  - Objective: Set the tone for the workshop, emphasising the importance of the Sebou basin and the goals of the Living Lab initiative.
- 10:20 - 10:40 AM: Participant Expectations
  - Facilitators: Anis Guelmami (TdV), Rania Cheikh (TdV)
  - Activity: Collection of participant expectations and interests.
  - Objective: Ensure the workshop content is aligned with participant needs and expectations.
- 10:40 AM - 1:00 PM: Session 1 – Implementation of the DPSIR Framework for the Sebou Basin
  - Speaker: Anis Guelmami (TdV)
  - Content: Overview of the DPSIR framework, presentation of preliminary results from the DPSIR analysis.
  - Objective: Provide a comprehensive understanding of the current state of the Sebou basin and the pressures it faces.
- 1:00 - 2:00 PM: Lunch Break
  - Activity: Lunch was provided, allowing participants to network and discuss the morning's sessions informally.
- 2:00 - 3:30 PM: Session 2 – Prospective Analysis and Prioritization of Conservation Efforts
  - Facilitators: Anis Guelmami (TdV), Rania Cheikh (TdV), Oussama Belloulid (LPM)
  - Content: Presentation of success stories, group discussions on reducing anthropogenic pressures, improving ecosystem health, and integrating ecological needs into water management plans.
  - Objective: Develop a shared vision and propose actionable solutions for the conservation and sustainable management of the Sebou basin's ecosystems.
- 3:30 - 3:45 PM: Coffee Break
  - Activity: Refreshments and informal discussions.
- 3:45 - 4:30 PM: Session 3 – Tools for Knowledge Transfer and Dissemination
  - Speaker: Khalid El Ouardi (MT)
  - Content: Presentation of the Sebou Geoportal and other digital tools for knowledge transfer.

- Objective: Introduce participants to new tools and technologies that can support better decision-making and knowledge sharing.

- 4:30 - 5:00 PM: Workshop Closure
  - Facilitators: All Participants
  - Content: Recap of the day discussions, immediate feedback from participants, and next steps.
  - Objective: Summarise key takeaways, gather participant feedback, and outline the follow-up actions.

Workshop Summary

The Living Lab Sebou workshop successfully brought together a diverse group of stakeholders to address the pressing issues facing the Sebou basin. Key highlights from the workshop include:

- Understanding DPSIR Framework: Participants gained a deep understanding of the DPSIR framework, which facilitated a comprehensive analysis of the Sebou basin's environmental challenges and problems.
- Collaborative solutions: Through group discussions and expert panels, participants co-created solutions aimed at reducing pressures on the basin ecosystems, improving water quality, and enhancing biodiversity conservation.
- Knowledge transfer: The introduction of the SWF Geoportal and other digital tools provided participants with innovative ways to share knowledge and improve decision-making processes.
- Engagement and feedback: The workshop successfully engaged participants in meaningful discussions, collected valuable feedback, and established a foundation for ongoing collaboration and action.

Overall, the workshop served as a critical step in fostering multi-stakeholder engagement, analysing local issues and challenges faced by the basin, and developing actionable strategies for the long-term resilience of the Sebou basin.

9.2.2. Characteristics of the participants

The Living Lab Sebou workshop was attended by a diverse group of stakeholders, each bringing unique expertise and perspectives essential for the holistic management of the Sebou basin. The participants were carefully selected through a comprehensive stakeholder mapping exercise to ensure a balanced representation of various sectors and interests.

Participant composition

The participant pool consisted of 33 individuals (16 women and 17 men) representing a broad range of fields. This diversity was crucial for addressing the multifaceted challenges of water management and ecosystem conservation in the Sebou basin. The participants included:

- Local Government Officials: 18 Representatives from local and regional government bodies involved in water management, urban planning, and environmental regulation. Their participation was vital for aligning the workshop outcomes with regional policies and regulatory frameworks.
- NGO Representatives: 8 Members from environmental and conservation NGOs, such as Living Planet Morocco (LPM) and Tour du Valat (TdV), who brought in-depth knowledge of biodiversity conservation and community engagement.
- Environmental Scientists and Researchers: 3 Experts from universities and research institutions provided scientific insights into the ecological and hydrological dynamics of the Sebou basin, contributing to evidence-based discussions and solutions.
- Community Leaders: 2 Representatives from local communities who offered grassroots perspectives on water usage, agricultural practices, and the socio-economic challenges faced by residents of the Sebou basin.
- Private Sector/Industry Stakeholders: 2 Participants from key industries and private sector, including agriculture, manufacturing, and tourism, which are significant water users and impact the basin's water resources and ecosystems.

Expertise and domains of interest

The participants' expertise spanned multiple domains, which were crucial for a comprehensive understanding of the Sebou basin challenges and opportunities. According to the pre-workshop survey results, the areas of expertise and interest included:

- Water Management: Many participants had extensive experience in water resource management, focusing on sustainable usage, conservation, and policy development.
- Sustainable Development: Participants involved in sustainable development initiatives brought insights into balancing economic growth with environmental preservation.
- Agriculture and Agronomy: Experts in agriculture and agronomy discussed the impacts of farming practices on water resources and explored innovative, water-efficient agricultural techniques.
- Environmental Conservation: Participants with backgrounds in environmental science and conservation provided critical knowledge on ecosystem preservation, biodiversity, and habitat restoration.
- R&D and awareness: Educators and communicators focused on strategies for raising public awareness about water conservation and engaging communities in sustainable practices.

Key expectations and priorities

The pre-workshop survey revealed several key expectations and priorities among the participants:

- Knowledge acquisition: A significant number of participants expressed a desire to learn more about water management and wetland ecosystems in the Sebou basin. This interest underscored the importance of the workshop as an educational platform.
- Actionable solutions: Participants were eager to develop practical, implementable solutions to the basin environmental challenges, particularly in water quality improvement, biodiversity conservation, and sustainable agriculture.
- Collaboration and networking: The opportunity to collaborate with diverse stakeholders and build networks for future initiatives was a major draw for many participants. They valued the workshop as a forum for exchanging ideas and forming partnerships.
- Focus on priority themes: The top priority themes identified by participants were water management, climate change, and biodiversity conservation. These themes guided the workshop discussions and activities, ensuring that the outcomes aligned with participant interests and the most pressing issues facing the basin.

By bringing together a diverse and knowledgeable group of stakeholders, the Living Lab Sebou workshop created a dynamic environment for collaborative problem-solving and innovation. The varied expertise and perspectives of the participants enriched the discussions and contributed to the development of holistic, sustainable strategies for managing the Sebou basin's water resources and ecosystems.

9.2.3. Questions discussed in the workshop

During the Living Lab Sebou workshop, participants engaged in extensive discussions covering a range of critical questions aimed at addressing the multifaceted challenges faced by the Sebou basin. These questions were designed to stimulate thoughtful dialogue, encourage diverse perspectives, and foster collaborative problem-identification and -solving. The discussions were structured around the DPSIR framework to ensure a comprehensive analysis of the issues and the development of actionable solutions.

Key Questions Discussed:

1. What are the primary sources of water pollution in the Sebou basin?

Participants explored various pollution sources, including agricultural runoff, industrial discharges, and urban wastewater, and discussed methods to identify and mitigate these sources effectively.

2. How can we enhance the visibility and inclusion of wetlands in governance schemes?

The discussion focused on improving information systems for diagnosis, defining needs, delimiting zones, creating sectoral management plans, and raising institutional awareness about the importance of wetlands.

3. What strategies can be employed to promote sustainable agricultural practices in the Sebou basin?

Participants considered ways to encourage localised irrigation techniques, reduce the use of chemical products, and redefine agricultural priorities to ensure sustainability and environmental health.

4. How can we address the issue of wetland drying and ensure the protection of these vital ecosystems?

The group discussed limiting or prohibiting developments in wetland feeding zones, strengthening controls, promoting sustainable irrigation techniques, and restoring degraded wetlands.

5. What measures can be taken to prevent the silting of wetlands and manage river basins effectively?

Discussions included the promotion of resilient plantings, protection of riverbanks, reforestation, and the implementation of integrated river basin management practices.

6. How can we recreate and restore lost wetlands due to conversion?

Participants explored the feasibility of recreating wetlands by applying soil and water best practices (e.g., digging half-moons), identifying priority sites for wetland recreation, and employing innovative restoration techniques.

7. What role can community engagement and awareness play in achieving sustainable water management in the Sebou basin?

Emphasis was placed on the importance of community involvement, awareness campaigns, and educational initiatives to foster a culture of conservation and responsible water use.

8. How can we use advanced technologies and digital tools to support decision-making and knowledge transfer?

The introduction and application of the Sebou Basin Geoportal and other digital tools were discussed as means to improve data sharing, decision-making processes, and the dissemination of knowledge among stakeholders.

9. What are the main challenges and opportunities in implementing Integrated Water Resource Management (IWRM) in the Sebou basin?

Participants examined the barriers to IWRM implementation, such as institutional fragmentation and resource constraints, and identified opportunities for enhancing coordination, capacity building, and stakeholder collaboration.

10. How can we monitor and evaluate the effectiveness of the proposed solutions and actions?

The discussion included the development of monitoring frameworks, setting clear indicators for success, and establishing mechanisms for continuous evaluation and feedback to adapt and improve strategies over time.

The questions discussed during the Living Lab Sebou workshop were critical in guiding the collaborative efforts of participants towards identifying and addressing the key challenges facing the Sebou basin. By fostering an open and inclusive dialogue, the workshop facilitated the exchange of ideas, the formulation of innovative solutions, and the development of a shared vision for the sustainable management of the Sebou basin water resources and ecosystems.

9.2.4. Photos from the workshop

Figure 43 Welcome remarks and LL context setting.

Figure 44 Collection of participant expectations and interests.

Figure 45 Presentation of the current state of the Sebou basin and its pressures.

Figure 46 Group discussions on the pressures and problems faced by the basin.

Figure 47 Group Discussions on Potential Governance Scenarios for Sebou Wetlands.

Figure 48 Group Discussions on Potential Restoration Scenarios in the Sebou Basin.

9.3. Conclusion

The Living Lab Sebou workshop on May 2, 2024, marked a significant step forward in addressing the multifaceted environmental challenges facing the Sebou basin. The collaborative effort brought together a diverse range of stakeholders, fostering a holistic approach to water and ecosystem management. Key takeaways from the workshop underscored the importance of integrated water resource management, the vital role of stakeholder engagement, the need for effective pollution control, the promotion of

sustainable agricultural practices, and the conservation of biodiversity amidst the impacts of climate change. These insights form the foundation for actionable strategies aimed at ensuring the long-term sustainability and resilience of the Sebou basin's water resources and ecosystems.

9.3.1. Main take-aways from the workshop

This workshop was pivotal in identifying and addressing the pressing environmental problems of the Sebou basin. This event facilitated a collaborative platform where diverse stakeholders could discuss and analyse the complex issues and develop actionable strategies. The main take-aways from the workshop are crucial for guiding future initiatives and ensuring the sustainable management of the basin's water resources and ecosystems.

Key Insights

1. Significance of Integrated Water Resource Management:
    - The workshop highlighted the critical need for an IWRM approach that integrates water resources, land use, and ecosystem health. Participants emphasised that integrated management is essential for addressing the multifaceted challenges of the Sebou basin.
2. Vital role of stakeholder engagement:
    - The active participation of a wide range of stakeholders was recognized as essential for the success of environmental management initiatives. Inclusive engagement of local communities, government agencies, NGOs, and industry representatives is crucial for developing comprehensive and accepted solutions.
3. Pollution control challenges:
    - Pollution from agricultural runoff, industrial discharges, and urban wastewater was identified as a significant threat to water quality. Effective identification and mitigation of pollution sources, along with strengthened enforcement of water quality regulations, were deemed necessary.
4. Need for Sustainable Agricultural Practices:
    - Promoting sustainable agricultural practices that minimise water usage and reduce reliance on chemical inputs was emphasised. Techniques such as localised/drip irrigation, crop diversification, and organic farming were suggested to enhance sustainability in agriculture.
5. Ecological and biodiversity conservation:
    - The protection and restoration of wetlands and other critical habitats were prioritised for maintaining the ecological integrity of the Sebou basin. Creating ecological corridors, enhancing habitat connectivity, and implementing restoration projects were advocated to support biodiversity.

6. Impact of Climate Change:
    - Climate change impacts, including altered precipitation patterns and increased frequency of extreme weather events, were highlighted as significant concerns. The need for climate-resilient infrastructure and community-based adaptation programs was emphasised to mitigate these impacts.

Proposed Solutions

1. Enhanced pollution management:
    - Implementing stricter industrial discharge regulations and promoting sustainable agricultural practices to reduce runoff and contamination.
    - Organising regular cleaning campaigns and raising public awareness about pollution prevention.
2. Strengthened water governance:
    - Developing a comprehensive information system for better diagnosis and monitoring of water quality and quantity.
    - Creating sectoral management plans and defining clear governance frameworks to improve the visibility and inclusion of wetlands in policy decisions.
3. Sustainable agriculture initiatives:
    - Encouraging the adoption of water-saving irrigation techniques and reducing the use of chemical fertilisers and pesticides.
    - Supporting farmers through education and incentives to implement sustainable practices.
4. Wetland protection and restoration:
    - Limiting or prohibiting developments in wetland feeding zones and strengthening control measures to prevent habitat degradation.
    - Restoring degraded wetlands and recreating lost habitats through innovative restoration techniques.
5. Climate adaptation strategies:
    - Building climate-resilient infrastructure and promoting community-based adaptation programs to enhance the basin resilience to climate change.
    - Integrating climate projections into water management planning to ensure long-term sustainability.

Strategic Actions

1. Development of an action plan:

- An action plan was drafted based on the workshop discussions, outlining specific steps and responsibilities for implementing the proposed solutions. This plan will serve as a roadmap for future initiatives and collaborative efforts.

2. Implementation of digital tools:
    - The introduction of the Sebou Geoportal and OurMED digital tools was well-received. These tools will support decision-making, improve data sharing, and facilitate the transfer of knowledge among stakeholders.
3. Continuous Monitoring and Evaluation:
    - Establishing a framework for continuous monitoring and evaluation to track the progress of implemented actions and make necessary adjustments. This will ensure the effectiveness and adaptability of the strategies over time.
4. Capacity building and education:
    - Focusing on capacity building and educational programs to empower local communities and stakeholders with the knowledge and skills needed for sustainable water and ecosystem management.
5. Strengthening collaborative networks:
    - Building and maintaining strong collaborative networks among all stakeholders to foster ongoing dialogue, knowledge exchange, and joint problem-solving efforts.

These insights and solutions will guide future actions and support the long-term sustainability and resilience of the water resources and ecosystems at the scale of Sebou basin, aligning with the overarching objective of the report to identify and address key problems through a collaborative and informed approach.

9.3.2. Future directions and plans

Your text here Your text here Your text here Your text here Your text here Your text here Building on the outcomes of the Living Lab Sebou workshop, future directions and plans are centred around fostering sustainable management and enhancing the resilience of the basin water resources and ecosystems. These plans emphasise integrated efforts, stakeholder engagement, and adaptive management, ensuring that the strategies developed are effective, inclusive, and sustainable.

-Integrated Water Resource Management (IWRM): A cornerstone of future efforts is the full implementation of IWRM principles across the Sebou basin. This involves creating a comprehensive framework that integrates water, land, and ecosystem management practices. The aim is to ensure that policies and actions are coordinated and mutually reinforcing, addressing the interconnected challenges of water quality, quantity, and ecosystem health. By adopting a holistic approach, the basin can achieve a balanced and sustainable management of its resources.

-Expanding stakeholder engagement: The workshop highlighted the importance of inclusive stakeholder engagement. Future plans need to include broadening participation to encompass a wide range of stakeholders, including local communities, government agencies, NGOs, and industry representatives. Regular consultations and continuous involvement of these stakeholders are essential for maintaining momentum, ensuring relevance, and enhancing the effectiveness of management strategies. This approach fosters a sense of ownership and collective responsibility among all parties involved.

-Advancing pollution control measures: Effective pollution control is a critical priority. Future efforts have to focus on implementing and enforcing stricter pollution control measures. This includes enhanced monitoring of pollution sources, increasing penalties for non-compliance, and promoting best practices in waste management across agricultural, industrial, and urban sectors. These measures aim to significantly reduce contaminants entering the water bodies within the basin, thereby improving water quality and safeguarding public health.

-Promoting Sustainable Agricultural Practices: Sustainable agriculture is crucial for the long-term health of the Sebou basin. Initiatives can be launched to support farmers in adopting sustainable practices. These include training on water-saving irrigation techniques, promoting organic farming, and offering incentives for reducing the use of chemical fertilisers and pesticides. Sustainable agricultural practices help preserve water quality, ensure food security, and contribute to the overall sustainability of the basin ecosystems.

-Enhancing Wetland Conservation and Restoration: Wetlands are vital for maintaining the ecological integrity of the Sebou basin. Future efforts should focus on protecting and restoring these critical habitats. This involves identifying and prioritising key wetland areas for conservation, implementing habitat restoration projects, and creating ecological corridors to enhance connectivity. These actions are essential for safeguarding biodiversity and maintaining the ecological functions of wetlands, which are crucial for water purification, flood control, and habitat provision.

-Developing Climate adaptation Strategies: The impacts of climate change present significant challenges. Future plans include the development and implementation of climate adaptation strategies. This encompasses building climate-resilient infrastructure, promoting community-based adaptation programs, and integrating climate projections into water management planning. These strategies aim to enhance the resilience of the basin water resources and ecosystems to climate variability and change, ensuring their sustainability in the face of increasing climate impacts.

-Leveraging Digital Tools and Technologies: Digital tools such as the Sebou Geoportal and Digital Twins will play a crucial role in supporting data-driven decision-making. Future efforts can focus on expanding the use of these tools for better data collection, analysis, and dissemination. By providing timely and accurate information, these tools facilitate effective monitoring, reporting, and management of water resources. Technological integration is vital for enhancing transparency, accountability, and informed decision-making.

-Continuous M&E: A robust framework for continuous monitoring and evaluation is essential for tracking the progress of implemented actions. Future plans need to include regular assessments to identify areas for improvement, ensure accountability, and adapt strategies as needed. This iterative process is crucial for maintaining the effectiveness and sustainability of management efforts, allowing for dynamic responses to emerging challenges and opportunities.

-Capacity Building and Education: Investing in capacity building and education is fundamental for empowering stakeholders. Future plans must include workshops, training sessions, and awareness campaigns to enhance the knowledge and skills of local communities, policymakers, and practitioners. Education will focus on sustainable water management practices, conservation techniques, and the importance of maintaining healthy ecosystems. Empowered stakeholders are better equipped to contribute to the sustainable management of the Sebou basin.

-Strengthening Collaborative Networks: Strengthening and expanding collaborative networks among stakeholders is key to addressing the complex challenges of the Sebou basin. Future efforts can focus on forming partnerships with academic institutions, international organisations, and other Sebou basin management entities. These collaborations facilitate the sharing of best practices, innovations, and resources, fostering a collective approach to sustainable water management and ecological preservation.

These future directions and plans emphasise the need for integrated management, continuous stakeholder engagement, and adaptive strategies to ensure the long-term sustainability and resilience of the basin water resources and ecosystems. Through these efforts, the Sebou basin can serve as a model for sustainable water management and ecological preservation, aligning with the overarching goals of the OurMED project.

9.4. References

- LeVert (7 may 2024): Discusses the significance of the Living Lab Sebou in enhancing water management and governance in the Sebou basin and its impact on the local ecosystems. Retrieved from LeVert
- Ahdath.info. (2023, May 2): Highlights the first Living Lab Sebou as a pioneering initiative aimed at sustainable water management in the region. Retrieved from Ahdath.info
- Maroc24. (2023, May 2): Reports on the event held in Fez, emphasising its role in addressing environmental and water management challenges. Retrieved from Maroc24
- Planete verte. (2023, May 2): Covers the outcomes and the strategic discussions held during the Living Lab Sebou. Retrieved from Planete verte
- Kafa Press. (2023, May 2). Focuses on the collaborative efforts and key insights gained from the event. Retrieved from Kafa Press.