



ARSINOE

Coping with Water Scarcity in the Ohrid and Prespa Lakes

A Case Study in the region of Ohrid and
the Prespa Lakes, North Macedonia,
Albania and Greece



Background



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The **Ohrid and Prespa Lakes** are among the most ecologically significant aquatic ecosystems in Europe, renowned for their exceptional biodiversity and unique environmental value. Situated in a transboundary region, the lakes span across three countries and are home to a rich of endemic and rare species, some of which are endangered. The area encompasses six protected zones, including three internationally recognised wetlands under Ramsar Convention and the **UNESCO-designated Ohrid Biosphere Reserve**, which highlight the ecological importance of this region. These areas provide critical habitats for diverse flora and fauna, making the lakes a vital conservation priority on both a European and global scale.

Key challenges

Water scarcity poses significant challenges, **influencing water consumption patterns** and **creating tensions** between various sectors' interests and policies. This scarcity impacts agriculture, fishery, industry, and domestic water use, leading to **competing demands** and **complex management decisions**. Additionally, the limited availability of water puts pressure on the protection and sustainability of biodiversity, threatening delicate ecosystems and species that rely on stable water sources. Addressing water scarcity requires balancing human needs with environmental conservation to ensure long-term resilience for both people and nature.

Why was this Case Study selected for ARSINOE ?

- High level of exposure of the region to **climate risks**
- Identified problem of **depletion of surface** and **groundwater bodies**, that has been subject of observation in the past decade
- **Vulnerability, of multiple sectors dependent on water**, such as:
 - Valuable environmental ecosystems and endemic species
 - Economy sectors - tourism, fishery, agriculture industry, energy sector (hydropower)
- Need for an integrated and coordinated **cross sectoral, transboundary** and **multi stakeholders inclusive actions**, to improve climate resilience of the coupled environmental, economy and social sectors.



Main goals

The primary goal of the ARSINOE project in the Ohrid/Prespa Case Study was to systematically **monitor** and **enhance climate resilience across the entire water supply and usage chain** within this transboundary region. The project aimed to foster a comprehensive approach to **climate-adaptive water management** that takes into account the shared responsibilities of the three countries involved. By focusing on preserving the region's valuable ecosystems, ARSINOE aimed to **establish new sustainable behaviours** among the local communities, water users, and relevant stakeholders. This included promoting greater awareness of climate change impacts and encouraging active participation in climate-adaptive water resource management strategies.



Expected outcomes and benefits

The implementation of the ARSINOE project was expected to lead to significant improvements in the region's climate resilience. Key outcomes include development of an integrated climate-adapted water management model tailored to the unique needs of the Ohrid and Prespa Lakes, through **open data** and **open access** for the main stakeholders. The project resulted in **enhanced collaboration** between the three countries, fostering shared knowledge and cooperative water management practices. Additionally, the initiative is yielding long-term benefits by **safeguarding the region's rich biodiversity and ecosystems**. Through increased awareness and the establishment of new behavioural patterns, local communities and stakeholders are becoming more proactive in their roles and responsibilities, ensuring a more sustainable, climate-resilient water management system for future generations.



Methodology & Approach

Innovative solutions developed, tested and implemented

In the Ohrid and Prespa lakes Case Study, the **Integrated Water Management Model in multi sector coupled systems (IWaMM)** was implemented. The Model consists of analytical and planning framework, leveraged by system numeric modelling and simulation software tool, intended for improving climate resilience of environmental, economic and social sectors related to water use in complex systems. The model contributed to securing a balanced use of available water resources and bridged the gap between social and economic aspects, facing the climate changes impacts on a transboundary water ecosystem of Ohrid and Prespa lakes, shared by Greece, Albania and North-Macedonia.

Open Tender for Innovation solution selected and used

Two innovations were selected and implemented: **Water4All (MK)** and **Integrated Water Resilience System - IWRS (AL)**.

These are complementary by purpose and operation and of benefit for all stakeholders in the three countries. They provide real time information and open data on specific water bodies status, while the permanent availability thereof enables comprehensive monitoring and management by informed decision making. A dedicated training kit is being developed to understand the need of such innovations and usability in policy makers entities and main sectors of the countries.

Stakeholder engagement and participatory processes

The **System Innovation Approach** applied in Ohrid and Prespa lakes region had a specific dimension and outputs, as it was applied in three consecutive phases of national and international (**transboundary**) stakeholders' engagement.

Participatory design and co-creation of innovation pathways and outcomes shaped the process of selection and piloting of the nationally and regionally improved monitoring and management of waters.



Key results & Achievements

The deployment of ARSINOE's innovative approach in this case study, resulted in a **comprehensive framework and basis for resilient, climate adaptive regional water management**, for all stakeholders' benefit, coping with the problem of water scarcity and climate vulnerability in the region, being **one of the most appreciated environmental and social** (ancient cultural and historical heritage) **systems** in Europe. More specifically, modelling outputs included:

- Projections of selected climate change indicators (precipitations, temperature), for two climate scenarios, RCP 2.6 and 7.0, in the period 2021 – 2100,
- Lakes' status presented as lake water level on monthly basis, up to the projecting horizon,
- Projections of water consumption per explored economy sectors (tourism, agriculture, industry, households)
- Projections of water resources' availability and suggested adaptation options



Local communities and ecosystems

Raised awareness of importance, roles and responsibilities of communities' sectors and public administration, towards sustainable water management.



Lessons learned

Integrated approaches, leveraged by the engagement of water users and water system managers communities, provide reliable long term adaptivity of all sectors involved and ensure climate resilience through sustainable development.

Replicability & Scalability

→ **Replicability is feasible in other watershed areas, in particular of transboundary shared waters**

Key success factors and barriers to consider:

- Involvement and active engagement of all stakeholders at a transboundary level;
- Data availability and harmonisation;
- Sharing of information and knowledge;
- Improved capacity and attitude towards water as a scarce resource.

Conclusion

The outcomes of ARSINOE will be sustained and further developed through continuous upgrading of tools and methodologies, formal agreements between countries to **ensure data sharing, replication and upscaling of solutions**, as well as ongoing scientific improvement and extension of approaches.

Future collaboration will be pursued through **national and regional funding opportunities**, as well as through European Commission research and innovation programmes, ensuring continuity and expansion of the project's achievements.



Learn more about the ARSINOE Case studies: [HERE](#).

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The ARSINOE consortium



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