



# POND Ecosystems for Resilient FUTURE Landscapes in a changing climate

## Reporting

### Project Information

#### PONDERFUL

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[Project website](#)

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Project closed

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Spain

## Periodic Reporting for period 2 - PONDERFUL (POND Ecosystems for Resilient FUTURE Landscapes in a changing climate)

Reporting period: 2022-06-01 to 2023-11-30

[Summary of the context and overall objectives of the project](#)

Ponds and pondscapes (networks of ponds) are crucial for biodiversity conservation. These habitats provide multiple benefits to society (called 'ecosystem services' or Nature's Contributions to People) and could play a crucial role in mitigating and adapting to climate change. However, ponds are largely neglected in water- and nature-related policies. We do not yet know enough about how we can manage and restore ponds to maximize their role as nature-based solutions (NBS) and increase the resilience of ecosystems and society to climate change.

The overarching aim of PONDERFUL is to develop better methods for maximizing the use of ponds and pondscapes in climate change adaptation and mitigation, biodiversity conservation and the delivery of other ecosystem services. We will achieve this by generating new knowledge of ponds' biodiversity and ecosystems, benefits to society and economy, as well as understanding of policies that impact possibilities for pond/pondscape NBS. We will also provide evidence-based guidance and tools for creating and restoring ponds as NBS.

The main objectives of PONDERFUL are:

- 1) Evaluate the interactions and feedbacks between biodiversity, ecosystem services and climate in pondscapes at locations across Europe and in Uruguay;
- 2) Develop future scenarios for pondscapes in Europe and Uruguay in the context of climate change, land use change, and changed policies (using stakeholder consultation);
- 3) Develop and test the implementation of effective multifunctional NBS in close collaboration with the stakeholders at a range of pond and pondscape sites in EU and Uruguay countries;
- 4) Develop a sustainable finance and investment guide for NBS, in collaboration with local stakeholders;
- 5) Develop a strategic approach to engagement with stakeholders, to ensure that they are able to effectively implement the benefits of ponds as NBS.

## Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far

The analysis of social aspects, ecosystem services and perception of cultural values of ponds was performed in the DEMO-sites and showed that pondscapes are widely valued by the inhabitants and stakeholders because of their benefits for quality of life and biodiversity. The stakeholder storyline analysis brought to light that most of them use pondscapes for conservation efforts and believes that climate change will have an impact on pond ecosystems or biodiversity. Furthermore, the pattern inferred from the IPBES's Nature Futures Framework triangles demonstrates that the stakeholders' attitudes toward ponds varied according to different cultures and countries.

The socio-economic and environmental benefits from pondscapes were also studied by deriving stakeholder preferences. Results show that in general stakeholders in the European and Turkish demo-sites prefer environmental benefits to economic benefits, while stakeholders in the Uruguayan demo-sites rank the economic benefits higher. A synthesis report on sustainable financing of the establishment of ponds and pondscapes was also produced in order to support pondscape developers to understand financing options and identify the finance instruments best suited to their pondscape NBS project.

The analyses of policies at national and local level revealed that the most important barriers for the

implementation of ponds and ponds as NBS are the lack of protection of these ecosystems, the lack of financing options and the lack of institutional cooperation. The analyses of EU policies showed that these policies strengthen NBS linked to existing and potential Natura 2000 sites, as well as to ecosystems protected through the EU's Birds and Habitats Directives and Water Framework Directive. However, if ecosystems fall outside of these already established policies – as is the case of most ponds – their implementation as NBS may be hampered.

Both the Pan-European biodiversity pond database and the database from the stratified survey of pond biodiversity and ecosystem functions in eight countries were produced. The work on the resampling of a subset of ponds from the stratified survey and the case studies has continued during this period. A highly standardised mesocosm experiment was conducted to investigate the effect of disturbance on ecological patterns and processes in ponds. In addition, dry-fluxes of greenhouse gases have been quantified in a selected set of ponds in multiple countries.

A web application has been developed to present the spatial distribution of the ponds, the pond data and hydroperiod information. Concerning the modelling of the impact of metacommunity networks, results show that the number of ponds, pond spatial distribution, and connections with other freshwater environments need to be considered for preserving pond diversity, resilience and associated ecosystem services. A novel protocol has been developed to upgrade the GLOBIO land use allocation model, which has enabled us to downscale the coarse resolution global land use scenarios to very fine 10 m spatial resolution. In the workshops in the different DEMO-sites, the land use scenario results were disseminated to the stakeholders and feedback was collected on their perceptions.

The analyses of data of 183 NBS implemented in 93 ponds and ponds from 24 countries revealed that 'Creation of habitat for biodiversity' is a primary objective in the implementation of most NBS in ponds, often also combined with other NCPs, showcasing NBS multifunctionality.

Implemented NBS primarily focused on climate change adaptation rather than mitigation. The costs associated with pond's NBS varied significantly depending on factors such as project scope, objectives, location, socio-economic-cultural system, and specific implementation requirements.

The Nature Contribution to People were assessed in the 8 DEMO-sites where NBS have been implemented and a user-friendly leaflet has been developed for each of 16 ponds. A first draft of the Handbook has been produced. A V0 mockup of the multi-criteria decision making tool has been designed, and a Prototype V0 has been implemented, in collaboration with stakeholders. A framework has been developed for the design of a CLIMA-pond prototype. The Handbook-guidance document, decision tool and Clima-pond have been co-developed with the stakeholders, taking the opportunity of the 3rd workshop and also of other exchanges.

## Progress beyond the state of the art and expected potential impact (including the socio-economic impact and the wider societal implications of the project so far) ▼

PONDERFUL will provide a quantitative framework on pondscape biodiversity, ecosystem services and climate interactions that will help to predict responses to climate change and land use scenarios. PONDERFUL will also quantify the contribution of ponds for climate change mitigation and adaptation. In addition, PONDERFUL will identify the best-practice for pond NBS implementation to

maximise climate change mitigation and adaptation, and enhance biodiversity and climate change resilience at both local and regional scales.

PONDERFUL is expected to have impact by (1) promoting the integration of ponds into policies to reach biodiversity, ecosystem services and climate change objectives, (2) making local, national and international governments and administrations, SMEs, NGOs and land managers aware of the benefits of improving ponds and pondscapes with respect to biodiversity conservation, climate change adaptation and mitigation, and other ecosystem services and (3) providing stakeholders with tools to widely use pondscapes as Nature-based solutions to increase resilience to global change.



Field work in a Mediterranean pond

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