The added value of Ecosystem-Based Management

AQUACROSS results show that ecosystem-based management (see Introducing Ecosystem-based Management (EBM)) is worth the effort. The identified management options are more effective in reaching environmental targets, in particular when supporting the EU Biodiversity Strategy (see Biodiversity Strategy and AQUACROSS). The more holistic perspective which is taken in ecosystem-based management allows trade-offs between ecosystem services to be considered, and takes several societal goals into account. Ecosystem-based management approaches promote the most efficient allocation of financial resources, while contributing to the sustainability of the whole social-ecological system. This comprehensive approach has the potential to unveil win-win situations.

WHICH INSIGHTS ON THE ADDED VALUE OF ECOSYSTEM-BASED MANAGEMENT THROUGH AQUACROSS?

Applying ecosystem-based management changes the perspective of the existing situation and the way it is analysed, and leads to innovative responses to complex environmental challenges

Applying ecosystem-based management starts with an in-depth analysis of the current situation. This analysis takes a wider range of issues into account than many other approaches do (in terms of the elements that define the environmental state, threats to biodiversity, benefits to society, etc.). This more comprehensive approach reveals different types of opportunities for reaching societal goals

- In the AQUACROSS case study of the Swiss Plateau (see Case Study: Swiss Plateau), for example, it is the combined consideration of morphological challenges and water quality that leads to a selection of measures that show increased ecological effectiveness.
- In Lough Erne (see Case Study: Lough Erne), the application of ecosystem-based management led to a radical change in the understanding of the system and of solutions considered for managing invasive alien species. Instead of their physical removal, which is costly and does not address the causes of the issue, the more holistic ecosystem-based management approach switched attention to conditions which promote their proliferation (in particular agricultural nutrient inputs to the lake), and opened a wider scope of measures that can be considered for their management (in particular the increase of lake water levels).

Applying ecosystem-based management leads to the proposition of alternative, multi-purpose management options with positive outcomes across multiple policy areas

In the context of ecosystem-based management, standardised, commonly-applicable solutions are not appropriate. Any situation is analysed case by case, and tailored approaches are developed. This requires decision-makers to be open minded: EBM can promote different types of measures and different policy instruments (see Identifying ecosystem-based management measures and policies: taking action), as well as the same measures or policy instruments which are currently applied, but with a different design.

- In the AQUACROSS case studies of the Danube (see Case Study: Danube) and the Intercontinental Biosphere Reserve of the Mediterranean (see Case Study: Spain/Morocco), for example, a spatial optimisation analysis within an ecosystem-based management context led to a different spatial allocation of river restoration sites, which achieved biodiversity targets at lower cost.
- The case study targeting the Intercontinental Biosphere Reserve of the Mediterranean (see Case Study: Spain/Morocco) exploited the benefits of multipurpose management solutions (Green and Blue Infrastructures) as well as co-creation with local stakeholders. To implement the resulting spatially prioritised restoration areas, local managers will now face the challenge of transboundary coordination and planning across freshwater, coastal, and marine realms.

Proposed ecosystem-based management options are in general multi-functional solutions, able to deliver benefits in many relevant areas. This is the case for example of natural water retention measures, which – depending on their design – can mitigate floods, increase carbon storage, promote biodiversity, buffer pollutants, etc. This is in contrast to solutions primarily designed to cope with single purpose problems (such as wastewater plants, fishing gears, etc.).

Ecosystem-based management is an incremental, piecemeal process, promoting continuous adaptation and improvement

Admittedly, ecosystem-based management comes across as a complex endeavour. Comprehensively analysing the current situation and identifying the most suitable approaches is a challenging task, and can result in choices that have high uncertainty. This is why ecosystem-based management is a cyclical approach, where the principles (see Introducing Ecosystem-based Management (EBM)) are integrated in the management practice in an incremental process. Each ecosystem-based management cycle further shapes the management of aquatic ecosystems based on the lessons learnt of the previous cycle, allowing for flexibility and continuous improvements to optimise ecological effectiveness and the achievement of other societal goals.

- The Ria de Aveiro (see Case Study: Ria de Aveiro, Portugal) presents complex challenges linked to managing the freshwater-marine continuum. These include the understanding and modelling of causal links and risks within the ecosystem, stakeholders' perceptions and spatial multicriteria analysis through valuation of ecosystem services. Modelling and stakeholder processes are useful steps for incrementally increasing stakeholder and decision-maker knowledge, supporting ongoing adaptive management.
- Within the Danube (see Case Study: Danube), ecosystem-based management has been approached through an integrative modelling exercise of multiple benefits linked to restoration measures. Restoration sites have been prioritised, taking into account the whole system, instead of country-specific target sites. However, complexity and heterogeneity of the environmental problems, lack of data, strong differences in socio- economic conditions, as well as inconsistencies in targets along the Danube significantly hampers ecosystem-based management planning that will require an incremental approach.

Ecosystem-based management allows optimising trade-offs between ecosystem services in a transparent way

Considering a wide range of ecosystem services (including provisioning services that are, for example, the basis for agricultural production) tends to lead to restoration of sites that are already closer to a near natural state. This approach implicitly considers trade-offs between ecosystem services that are compatible with nature conservation objectives (e.g. recreation, or partially flood protection) versus extractive / provisioning ecosystem services, which are rather incompatible, as they intervene with the ecosystem. Taking these trade-offs into account reduces costs imposed on those that currently benefit from provisioning services, which increases efficiency for the society as a whole.

- The AQUACROSS North Sea case study (see Case Study: North Sea) followed a risk-based approach that linked the impacts on biodiversity to the supply of ecosystem services, and evaluated the effectiveness of identified ecosystem-based management measures to achieve a healthy marine ecosystem. Solving trade-offs with other societal goals (sustainable food suply or clean energy) are still a challenge, but measures targeting fisheries or offshore wind farms- may result in comparable, if not bigger, reductions in total impact risk over biodiversity than those targeting biodiversity conservation (in particular marine protected areas).

Consideration of trade-offs between ecosystem services strengthens reflections on equity and fairness

Identifying ecosystem services and its beneficiaries, as part of the EBM process, is the basis for reflections on balancing costs and benefits between different societal groups and therefore for finding way to cooperate in restoring the environment and sharing the ensuing benefits.

- The Lough Erne case study (see Case Study: Lough Erne, Ireland) developed Fuzzy Cognitive Maps based on stakeholders' inputs to analyse management options concerning invasive alien species proliferation and water quality regarding actual ecosystem services and policy, goals that cannot be considered in isolation.
- The Swedish case study (see Case Study: Lake Ringsjön, Sweden) showed, for example, that even in the absence of quantitative or monetised estimations of ecosystem service provision, the identification of trade-offs allows fairness to be improved over space, over sectors and over time (e.g. among generations).

EBM's focus on tradeoffs supports policy coordination and simultaneous consideration of multiple policy objectives

Ecosystem-based management is particularly adapted to support the targets of the EU Biodiversity Strategy, and linked to this, any environmental policy (Birds and Habitats Directive, Water Framework Directive, Marine Strategy Framework Directive). At the same time, while considering all social demands linked to ecosystems, the ecosystem-based management approach takes account of sectoral policies, and the dependence of economic activities on the aquatic ecosystems (e.g. hydropower, agriculture, fishing). As the comprehensive analysis done in AQUACROSS shows, it is possible to identify win-win solutions, which should be the top priority for the next phase of the biodiversity strategy.

- In the AQUACROSS Azores case study, the assesment and understanding of the system using the AQUACROSS Linkage Framework (see Linkage Framework) allowed identifying synergies and conflicts between policies. Increasing stakeholder engagement, knowledge, and policy coordination enables adaptive management, reduces conflict, and can improve effectiveness and efficiency of ecosystem-based management.

Ecosystem-based management provides a framework for fully valuing stakeholder contributions

Although not a unique feature of ecosystem-based management, stakeholders (see Mobilising stakeholders) play a very important role in the process. Involving stakeholders in the elicitation of integrated societal objectives, or in the identification of joint solutions, is very important to make use of additional knowledge and of different existing perspectives. It increases the acceptability of proposed approaches, helps to define indicators that are (policy/real-life) relevant and more generally ensures that produced knowledge is useful for the decision-making process. In the case of incomplete scientific information, for example on the current status of aquatic ecosystems or on the causal relationships between management measures and induced changes, stakeholders can provide information and/or legitimacy to decisions taken in situations of high uncertainty.

- In the Swedish case study (see Case Study: Lake Ringsjön, Sweden), scenarios were co-designed with stakeholders, decision makers, civil servants and practitioners, exploring measures to enhance the resilience of the system with temporal (time lags between management actions and an improvement in the ecosystem)and spatial dynamics. Trade-offs have to be acknowledged to reach the full potential for managing catchment water quality.
- The assessment for the Swedish case study (see Case Study: Swiss Plateau), was done in close collaboration with stakeholders. It resulted in an optimisation procedure that provides a set of near-optimal combinations of measures to reach the highest ecological state for a given budget at the catchment scale.

In the context of uncertainty, ecosystem-based management promotes the creation of a transparent, best-informed basis for decision making

Ecosystems are complex, and it is not possible to foresee all potential consequences of management measures (both in the natural and the social system). In this context, ecosystem-based management faces difficulties that are also faced by other approaches to managing natural systems, including data limitations, uncertainty, and difficulties in estimating changes in ecosystem services. However, the holistic approach of ecosystem-based management provides the framework to prepare a basis for decision making that is as complete and transparent as possible. This is ensured for example through the comprehensive description of the current socio-ecological system, by asking for an evaluation that covers all most important criteria (e.g. effectiveness, efficiency and equity and fairness), and by involving relevant stakeholders in the discussions.

Even in situations where uncertainty remains high, information generated – even if imperfect – helps provide a critical look at different options for addressing biodiversity and water management issues. It then informs decision-making, and can be used in an adaptive management process that encompasses a learning-by-doing component and an incremental approach to move to the final solution.

← Go to Brief #27: EBM: Limitations / challenges	www.aquacross.eu/results	Go to Brief #29: EBM: Pre-conditions →

Further information

This is one of 38 short briefs summarising the key results of the AQUACROSS Project. For more detailed information on the topics covered in this brief, see the following:

- Gómez et al. (2016) The AQUACROSS Innovative Concept. Deliverable 3.1, European Union's Horizon 2020 Framework Programme for Research and Innovation grant agreement No. 642317. (Deliverable and Executive Summary)
- Gomez et al. (2016) Developing the AQUACROSS Assessment Framework. Deliverable 3.2, European Union's Horizon 2020 Framework Programme for Research and Innovation grant agreement No. 642317. (Deliverable and Executive Summary)
- Mattheiß et al. (2018) Evaluation of Ecosystem-Based Management Responses in Case Studies. Deliverable 8.2, European Union's Horizon 2020 Framework Programme for Research and Innovation grant agreement No. 642317. (Deliverable and Executive Summary)
- Piet et al. (2017) Making ecosystem-based management operational. Deliverable 8.1, European Union's Horizon 2020 Framework Programme for Research and Innovation grant agreement No. 642317. (Deliverable and Executive Summary)

AQUACROSS has received funding from the European Union's Horizon 2020 Programme for Research, Technological Development and Demonstration under Grant Agreement no. 642317.