

## **Dam removal - catalyst for the restoration of inland waters**

**Horizon Europe Co-design 2021-2024**

**Input regarding the targeted impacts for Food, bioeconomy, natural resources, agriculture and environment (cluster 6)**

Freshwater ecosystems are doing proportionally worse than other ecosystems. Freshwater species numbers have declined dramatically since 1970. One of the main problems is the loss of longitudinal connectivity of rivers caused by dams, weirs and other structures, notably the huge number of small dams of which the sheer number is starting to be understood. Within Europe it is estimated that there is almost one barrier for each kilometer of river. Some species such as migratory fish are particularly sensitive to barriers. Besides, dams have a negative impact on habitat and water quality.

The Water Framework Directive (WFD) advocates for the restoration of inland waters. River Basin Management Plans are intended to serve as roadmaps for restoring freshwater ecosystems. While there has been progress in implementation, plans and actions taken to date fall short of what is needed to bring inland waters into good ecological status as required by WFD.

Dam removal-based river restoration (in short: dam removal) is a powerful approach that brings freshwater ecosystems into good health through restoring river continuity. Dam removal can reverse biodiversity decline (including abundance, diversity and population structure of species) and improve hydromorphological conditions or flow regime by returning rivers to their natural, free-flowing state. Hence, dam removal helps addressing the root causes preventing good ecological status and is a conservation priority for fish in Europe.

Dams are used for flood control, hydropower, drinking water, irrigation, transport and leisure. However, it is estimated that tens of thousands of mainly small dams are now obsolete. Removal of dams that no longer have a beneficial function can accelerate the ecological improvement of inland waters. Case studies have shown that dam removal solutions are cost effective and adaptive but the barriers to implementation need to be better understood and resolved. While some removals are straightforward and have significant benefits for habitats, others are more complex and require many studies, geomorphological and species assessments, testing of sediments and consenting. Applicability of dam removal is context specific, and for the approach to become fully mainstreamed further research and innovation is required.

This R&I programme is to support the EU's agenda towards increased application of ecological restoration measures in meeting key objectives including biodiversity conservation, flood risk reduction, climate mitigation and adaptation. R&I should focus on identifying and resolving the barriers to large-scale uptake of dam removal in different biophysical, socioeconomic and political environments. Building on existing assessments of the extent of river fragmentation and previous practices of dam removal, needs, opportunities and challenges have to be identified.

***This requires a comprehensive study and methodologies to support Member States in identifying and prioritising barriers that should be removed and which will significantly contribute towards achieving WFD objectives. Also scalable case studies that serve both as test grounds and demonstration sites are needed.***

A systematic approach to dam removal across river basins is needed. The programme should develop tools for referencing, mapping and prioritising obstacles, criteria for removal, feasibility studies, dismantling techniques, basin-wide impact assessments, cost-benefit and ownership analysis. Key issues need to be researched including: what institutional and legislative set-ups are optimally

conductive? What does the business case look like for dam removal and what are the funding opportunities? How can government and private sector players claim a role in the roll out of the approach? What methods can be developed for involving community and stakeholders to achieve social acceptance? Long-term monitoring programmes of social, economic and ecological impacts need to be designed as a basis for developing replication and upscaling methods.

The impact of large-scale roll out of dam removal is expected to be significant. Beyond maximising the ecological recovery of inland waters, dam removal solutions restore ecosystems services that contribute to enhanced safety and provide co-benefits including water quality improvement and opportunities for recreation. Dam removal can also help restore cultural and intrinsic values of riverine landscapes.

The insights derived from the research should result in substantial investment for upscaling and replication of selected cases and the dam removal philosophy at large. Dam removal solutions are highly site specific due to the fact that they are embedded in the local biophysical and social environment. Yet the overarching philosophy, i.e. catalysing freshwater ecosystem restoration for the benefit of nature and people, is readily replicable. This also holds for context specific removals, which can be modified and exported to similar areas elsewhere.

