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Deba barrier removal ES

Unchoke rivers, improve nature and society

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Imprint

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Contributors: Miriam Colls (University of Basque Country), Arturo Elosegi (University of Basque Country) and Iñaki Bañares (Gipuzkoa Provincial Council)

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1. For the reader

Unchoke rivers, improve nature and society

In the Basque Country and beyond, rivers and streams are choked by countless weirs and dams (Belletti et al 2020). Some of these fluvial obstacles have a specific use, such as water supply, irrigation, or hydroelectric power generation. However, most of them are obsolete obstacles, reminders of the industries that once operated there and now abandoned in the middle of our streams and rivers. In addition to the aesthetic impact of these obstacles, both currently used and obsolete obstacles, block fish movements, destroy river habitats, block sediment transport and nutrient dynamics, increase greenhouse gas emissions and flood risk, between others. Additionally, climate change scenarios predict a decline in the ecological status of fluvial ecosystems as a result of climate change impacts, leading to the greatest degradation of our streams and rivers. Fluvial ecosystems have been and continue to be essential for the development of human societies, but if we want them to continue to be so, it is essential to renaturalise and protect them. After the implementation of wastewater treatment plants and sanitation systems, the removal of obsolete barriers is the next renaturation strategy that needs to be taken to protect both nature and societies.

The aim of this Regional Scalability Plan (RSP) is to provide a framework to guide the improvement of the longitudinal connectivity of fluvial ecosystems to face climate change in accordance with the European Green Deals and Sustainable Development Objectives. In this document, the improvement of the longitudinal connectivity is mainly focused on the demolition of weirs (total or partial demolition), but the examples and ideas developed in this document are also applicable to other barriers that, at some point, cause a longitudinal disruption in the fluvial ecosystem (Garcia De Leaniz & O'Hanley 2022). Due to the large number of stakeholders involved in this type of renaturation actions and their diverse, sometimes conflicting, interests, a secondary goal of this RSP is to provide some examples of how to manage these potential conflicts that may arise during its implementation. It is primarily aimed at river managers of the Basque Country, including the Basque Water Agency and the Provincial Councils, but may also be of interest to other stakeholders such as river managers beyond the Basque Country, municipalities, the insurance, or hydropower sectors.

This document has been prepared by the Group of Stream Ecology at the University of the Basque Country, based on the experience of working with the Hydraulic Works Department of the Gipuzkoa Provincial Council on the MERLIN project. However, this RSP is also the result of the multiple inputs from other departments of the administration, as well as from stakeholders such as the insurance, hydropower sector or nature conservation NGOs. Overall, this RSP has been written with the intention of providing the reader with an overview of the benefits and trade-offs of obstacle removal, as well as some examples and recommendations to building a roadmap for obstacle removal as part of the adaptation to reduce the risks of climate change and hand down the oncoming generations a more sustainable environment.

2. Focus of the RSP

2.1. Regional characteristics

The Basque Country is a small territory (ca. 7,300 km^2) located in the north of the Iberian Peninsula, and divided into three historical territories: Alava, Bizkaia and Gipuzkoa (Figure 1). It borders Navarre and the French department of the Atlantic Pyrenees to the east, La Rioja to the south, and Burgos and Cantabria to the west. The land is mainly covered by tree plantations, native forests, pastures and scattered dairy farms. The population of the region is currently around 2,20 million people, highly concentrated in small- and medium-sized towns in the bottom of the valleys. The population density is high (308 inhabitants km^2), and the main economic sectors are the industry and the tertiary sector.

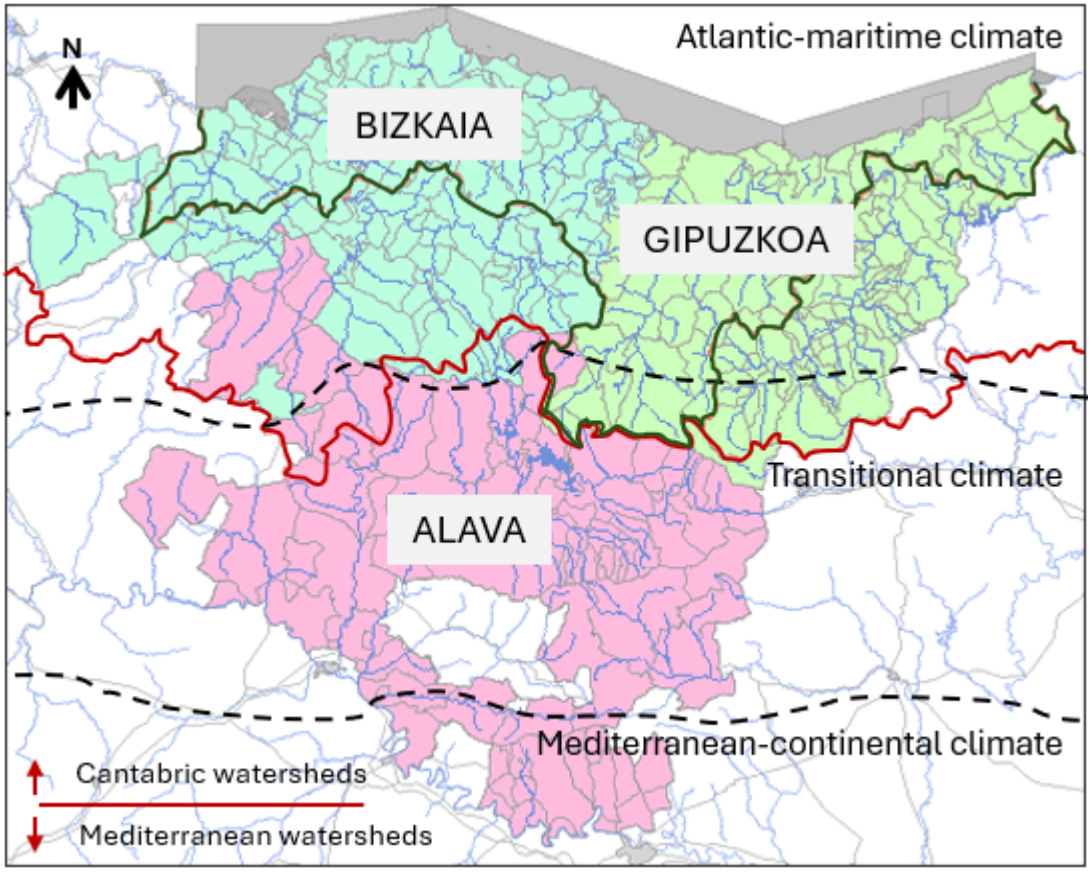

Figure 1. Basque Country map. Shaded areas indicate historical territories (blue: Bizkaia, green: Gipuzkoa, pink: Alava). Ashed lines indicate the climatic regions, red line the limit of Cantabric and Mediterranean watersheds, and green line the internal watersheds of the Basque Country.

The Basque Country is mainly made up of two mountain systems, the Basque Mountains and the Cantabrian Mountain chain, which give the region a rugged and mountainous landscape, reaching up to 1,600m above sea level. The small area of the region and the proximity of the mountains to the coast result in short, steep, and narrow valleys. Despite its small area, the above-mentioned topographical characteristics result give rise to three climatic regions: Atlantic-maritime, Mediterranean-continental, and Transitional (Fig. 1). The Atlantic-maritime climate dominates in Bizkaia and Gipuzkoa. This climate is humid and rainy all the year (mean annual rainfall: 1200-2000 mm). The influence of the sea causes a slight thermal oscillation: the average temperature in summer is 19-20 C, in winter 8C, and the annual average is 13C. The mediterranean-continental climate corresponds to the southern part of the territory. This area has well-defined seasons and a significant difference between daytime and nighttime temperatures, especially in summer. Summer is mainly dry and warm, whereas the winter is dry and cold. Spring is the wettest season. Between these two climatic regions is the Transitional climate, an intermediate climate between the two.

The hydrographic network of the Basque Country is made up of two types of basins. On the one hand, there are the streams that flow into the Cantabric Sea, Cantabric Basin District, and on the other hand, there is the Ebro Basin District. From a management point of view, the 147 streams of the Basque Country may be divided into four groups: a) the Orienta-Cantabric Basin District, which includes eight basins that have their source and always flow through the Basque Country to the Cantabric Sea, thus forming the internal watersheds of the Basque Country (i.e., Basbadun, Butron, Oka, Lea, Artibai, Deba, Urola, and Oiartzun); b) the

Occidental-Cantabric Basin District, which includes five basins that flow through the Basque Country at some point, but also through other territories, and eventually flow into the Cantabric Sea (i.e., Karrantza, Agüera, Idiazabal, Oria, and Urumea); c) the Ebro Basin District, which includes seven basins that have their source in the Basque Country and flow into the Ebro River (i.e., Ebro, Prón, Omecillo, Zadorra, Arakil, Inglares and Ega basins) and has its own management agency, the Ebro Hydrographic Confederation (CHE); d) transboundary waters. The latter is the case of the Bidasoa basin, a transboundary river that forms the border between Gipuzkoa and France. Due to the topographical and climatic characteristics of the area, the Cantabric basins are smaller but carry more water than those that end in the Ebro River. The first two basin-districts are part of the Basque Country River Basin District and the Cantabrian Hydrographic Confederation (CHC), to which the proposals presented are addressed.

The streams of the Basque Country were extremely polluted as a result of industrial and urban effluents, but the situation has improved considerably in recent decades thanks to major investments in sanitation, wastewater treatment plants and the restructuring of the industrial sector. Now that fish have returned to all the streams, other environmental problems are becoming evident, notably the degradation of the physical habitat of the streams as a result of channelling and the presence of hundreds of obstacles. The latter, obstacles, consist mainly of old weirs (small structures that raise the water level but do not regulate the flow), most of which are useless and obsolete, but which fragment the river continuum. Weirs, whether are active or not, alter or completely block the movement of fish and the transport of sediment and nutrients, destroy the river habitats, emit greenhouse gases, and increase the risk of flooding by raising the water level under base flow conditions. Climate change, with increasing temperatures and decreasing precipitation but more intense rainfalls in the region (i.e., more torrential), will exacerbate the impact of weirs on both the ecosystem and on the human society, promoting greenhouse gas emissions, the proliferation of invasive species, pathogenic micro-organisms, and enhancing flood risks. In this context, the removal of obsolete weirs stands out as a strategy to renaturalise fluvial ecosystems and face climate change scenarios.

The Basque Water Agency has made an inventory of all the impacts on the territory and has concluded that river obstacles are the most common impact in the Basque Country's river basins, reaching 7000 obstacles, although in the Ebro District Basin, water drowning caused by agricultural activity is also important[1]. On the basis of this information, the Basque Water Authority is preparing a master plan to prioritise the removal of these obstacles in the coming years. Based on our previous experience, the present RSP claims to present some examples of strategies and actions to ensure that the process of removing obstacles is more sustainable, comprehensive and inclusive, in line with the Green Deals established by the European Union. Overall, the main environmental issues and risks of the region to be addressed by the present RSP are related to flood risk resilience, pollution and toxin free environment, biodiversity and ecosystem net gain, climate regulation, green growth and health and well-being. All in a context of inclusiveness.

2.2. Justification for the region

There are two reasons why the Basque Country has been chosen as the main region to implement the RSP of the case study Deba barrier removal ES. The first is based on the criteria of opportunity, and that is, during the first steps in the development of this RSP, we learned that the Basque Water Agency was preparing a master plan to prioritise the removal of barriers impacting the longitudinal connectivity of fluvial ecosystems of the Basque Country. We therefore concluded that our upscaling to the territorial level could be an opportunity to increase the impact of the RSP, perhaps by providing ideas to be implemented by the Basque Water Authorities. Secondly, although Gipuzkoa is the province where the Merlin restoration project is taking place, the Gipuzkoa Provincial Council (i.e. the executive body that carries out some governmental and administrative functions in Gipuzkoa) has already developed and is implementing a Master Plan to improve the longitudinal connectivity of fluvial ecosystems in Gipuzkoa. Both together, the development process of a master plan to improve the longitudinal connectivity of fluvial ecosystems at the scale of the Basque Country, as well as the difficulty of modifying a plan already underway, lead us to choose the scale of the Basque Country as the best one to perform the upscaling of our restoration projects.

2.3. Linkages and synergies with other initiatives

The removal of obstacles is an increasingly important renaturation measure in the Basque Country. In the 1980s and 1990s, following the disastrous floods of August 1983, some weirs were removed to reduce the risk of flooding. Later, in the early 2000s, weir removal was carried out mainly as a measure to restore Atlantic salmon populations and improve river habitats in Natura 2000 sites. These early works were carried out with fundings from the European Union, in collaboration between the Gipuzkoa Provincial Council, the Basque Water Agency and the Government of Navarre, and became part of the Gipuzkoa Provincial Council's Obstacles Removal

[1] https://www.uragentzia.euskadi.eus/libro/tomo-4-y-5-humedales/webura00-contents/es/

Programme. This document focuses on the identification and prioritisation, from a technical point of view, of the obstacles to be removed. While the Obstacles Demolition Programme of the Gipuzkoa Provincial Council, or other projects such as DESEMBALSE, focus mainly on the effects of obstacles removal on fluvial ecosystems, the present RSP, in the framework of the MERLIN project, also includes the social dimension.

The interest in removing obstacles as a means of restoring river ecosystems is growing among scientists and water authorities, and fewer and fewer experts doubt the negative effects of obstacles on river ecosystems. However, as this type of restoration becomes more widespread, so too does the social opposition and misinformation surrounding the effects of removing obstacles. How to deal with this situation is becoming increasingly challenging. Based on the experience gained in the MERLIN project, we present here a set of indicators to objectively assess the impact of river obstruction removal on river ecosystems, but also on society. The use of these indicators would provide objective data that would help to gather evidence on the pros and cons of barrier removal. We therefore wish to make it clear that this document is not intended to put an end to conflict situations, but to present different tools for learning how to carry out this type of restoration in the most objective and fair way possible.

3. Stakeholders of the RSP

Based on the lessons learned from the implementation of the CS2 restoration actions, two main groups of stakeholders have been identified: local and strategic stakeholders. The first refers to organisations or citizens from the municipalities where each specific restoration action is implemented. Their level of involvement is generally low and limited to information, disseminated through websites, local newspapers, etc., or consultation. The second group includes local authorities or associations of local authorities, as well as authorities or groups at catchment or even regional level. This second group is actively involved, ranging from collaboration to empowerment. Within this second group, the Department of Culture of the Basque Government, the provincial water agencies, and the Biodiversity Departments of the Provincial Councils and the Basque Government stand out.

The classification of the stakeholders in these two groups, as well as the level of involvement of each stakeholder group, can change over time and depends mainly on the interest of the groups to the restoration actions. For example, representatives of local groups with a particular interest in the development of the restoration actions may be invited to the meetings of the strategic stakeholders. In our experience, this will depend on the social interest in the obstacle to be removed. Demolition of centrally located urban obstacles, which are part of people's daily lives, will tend to generate more opposition, and it is in these cases that local stakeholders need to be actively involved in the process.

To facilitate stakeholder mapping, stakeholders were divided into two categories:

i) Strategic stakeholders: Key players in the implementation of restoration actions (e.g., municipalities or water agencies).

ii) Local stakeholders: Local organizations at the municipal scale that may be interested in the restoration actions but do not play a key role in their implementation and have a specific working area within a particular municipality.

The following details the strategic stakeholders who must be included from the beginning of the project. Local stakeholders will depend on each locality and may change over time, as associations or social groups may show interest in the restoration actions at different times or places. This list should be developed in conjunction with the strategic stakeholders, especially those with extensive knowledge of the environment, such as town councils. Additionally, awareness campaigns and talks may bring forth other interested groups that were not initially included.

Table 1: Overview of RSP stakeholders

Name of stakeholder	Acronym	Sector	Involvement status	Scale	Ownership	Description	WebLink
Gipuzkoa Provincial Council	DFG	Cross Sector	Already involved	Regional	Public	The Gipuzkoa Provincial Council, governing Guipúzcoa in the Basque Country, manages environmental and waterworks projects, including dam removal and monitoring	www.gipuzkoa.eus/es/diputacion/medio-ambiente-y-obras-hidraulicas
Basque Country Water Agency	URA	Cross Sector	Already involved	Sub-national	Public	URA aims to implement water policy in the Basque Country, collaborating with the DFG on developing flood maps and managing dam removal administratively and technically.	www.ura-gentzia.euskadi.eus/u81-0002/es/
Society for the Economic Development of Deba Basin	DEBEGESA	Other	Already involved	Catchment	Private	DEBEGESA, comprising eight municipalities, aims to promote sustainable growth in the Debabarrena region by addressing regional needs to benefit citizens, companies, and municipalities, and will actively engage the local population due to its extensive basin-scale network.	www.debegesa.eus
Deba Bassin Rural Development Association	DEBEMEN	Agriculture	Already involved	Catchment	Community group	DEBEMEN, comprising representatives from six municipalities, trade unions, cooperatives, and baserritarras associations, aims to enhance rural quality of life.	www.debemen.eus/es
Eibar's Living Forests		Environment, climate and disaster	Already involved	Catchment	NGO	A naturalist association active in the Deba river basin will contribute to understanding local environmental group perspectives and promoting restoration actions in the project.	-
Environmental Technician		Cross Sector	Already involved	Municipal	Public	All of them are working in local town councils where restoration actions will occur, facilitating access to local meeting spaces, promoting restoration dissemination, and collaborating with the Gipuzkoa Provincial Council and Basque Water Agency on administrative tasks for MERLIN.	
Alderman		Cross Sector	Already involved	Municipal	Public		
Civil Works Technician		Cross Sector	Already involved	Municipal	Public		

Name of stakeholder	Acronym	Sector	Involvement status	Scale	Ownership	Description	WebLink
Agricultural Technician		Cross Sector	Already involved	Municipal	Public	All of them are working in local town councils where restoration actions will occur, facilitating access to local meeting spaces, promoting restoration dissemination, and collaborating with the Gipuzkoa Provincial Council and Basque Water Agency on administrative tasks for MERLIN.	
Mayor		Cross Sector	Already involved	Municipal	Public		
Sustainable Development Tech.		Cross Sector	Already involved	Municipal	Public		
Hydroelectric power plant association		Hydropower	Already involved	Catchment	Private	Involving the owner of a local hydroelectric power plant will provide insights into his concerns regarding the planned restoration actions.	
Commonwealth of the Upper Deba	MAD	Cross Sector	Already involved	Catchment	Public	The Commonwealth of the Upper Deba, comprising Oñati, Arrasate, and Bergara, manages regional services including waste and environmental management, and will be crucial for involving key community groups due to its extensive basin-scale network.	https://www.debagoiena.eus/es/mancomunidad

4. Green deal goals

Improving the longitudinal connectivity of river ecosystems is mainly associated with seven green deal goals (see Figure 2). The presence of an obstacle in the middle of a streambed generally increases the water level under baseflow conditions. Under high flow conditions, this situation increases the risk of flooding in the catchment area. In cases where the obstacle is part of the urban landscape, this highest flood risk due to the obstacle presence also represents a major risk to the citizens, endangering their health and well-being. Removing river barriers will therefore improve flood risk resilience, but also human health and well-being. As urban obsolete barriers are generally located in small or medium-sized urban areas, their removal is a mechanism to improve territorial cohesion (i.e. inclusiveness) by reducing the vulnerability and exposure of citizens of these areas to climate change and environmental degradation. They also block the movement of fish such as salmon, trout, and eels along the river, reducing their biodiversity and threatening their survival. They also trap sediments rich in organic matter, which decompose in impounded areas, causing foul odours, and releasing significant amounts of greenhouse gases into the atmosphere. Downstream, this retention of organic matter affects the dynamics of nutrients and the capacity of the ecosystem to retain them, i.e., affect the self-purification capacity of stream ecosystems. Finally, the impounded areas also promote the proliferation of mosquitoes, which also affect human health and well-being.

Criterion	Indicator(s)
Biodiversity net gain	Conservation status and trends of species and habitat of community interest (Habitats Directive) and/or WFD ecological status
Climate regulation	IPCC emission reporting guidelines on net CO_2 equivalent reductions or storage
Flood resilience	Flood hazard reduction for people (number) in vulnerable communities or volume (m^3) of additional storage capacity created
Drought resilience	Drought risk reduction for vulnerable communities in (number) of people affected
Health & Well-being	Increased access to nature-centred recreation and eco-tourism for people (number)
Zero pollution Goals	Reduce nitrate and chemical run-off from agricultural land (% of change)
Farm to Fork - Sustainable Food Systems	Sustainable agriculture and aquaculture (ha increase)
Sustainable energy	Energy savings of using NbS and any increase in renewable energy generation capacity in restored area (kWh)
Sustainable transport	Measures taken to improve active and public transport (increases in numbers) or renewable energy use (kWh)
Inclusivity (Leaving no one behind)	Change in access to blue-green space - a) overall, b) for disadvantaged communities, i.e. low employment/high deprivation (% change)
Circular economy	Business models adapted according to principles of a circular economy (number); Reduced consumption of water and other relevant resources (%)
Financing the transition	New economic activity (number) company registrations in relevant standard industry classification codes in the region
Green Growth	Employment (% changes) in relevant standard industry classification codes in the region

Figure 2: Overview of Green deal Goals

4.1. SMART Green Deal goals relevant for the region: primary goals

Climate related goals. Weirs, and other types of barriers that regulate water flow, create water impoundments areas upstream of them. In these impounded areas, river hydrology is significantly altered; water velocity and turbulence are reduced, organic matter (OM) deposition increases, and oxygen saturation is reduced. As a

result, the decomposition of accumulated OM occurs under conditions that tend to be anoxic, which favours methane (CH4) production in these zones. Removal of obstacles leads to the elimination of these impounded areas and therefore promotes the reduction of these emissions.

Biodiversity related goals. Obstacles in stream act as a barrier to the movement of organisms and sediment, which negatively affect community and nutrient dynamics. Firstly, the removal of these obstacles will facilitate the longitudinal movement of species along the river courses. Additionally, the elimination of impounded areas as a result of weir removal will return to its natural habitat heterogeneity and consequently its functioning. This will favour the improvement of the ecological status of the fluvial ecosystem and consequently the net improvement of biodiversity.

Inclusivity goals/ Goals for local community/public participation. The lack of investment and services in rural areas or small and medium-size towns, compared with investment in large cities leads to major social inequalities and is a major challenge for territorial cohesion. Among other things, this model crates inequalities in the exposure and vulnerability of societies to climate change and environmental degradation. Indeed, the European Commission expects the costs of climate change to be higher in these areas than in large cities. Removing obsolete barriers that endanger citizens in these areas (see section 4) will achieve inclusiveness and territorial cohesion.

Flood risk related goals. The hydromorphological modifications resulting from the presence of weirs in stream ecosystems cause an increase of the water level upstream of the obstacle. This water level increase, together with the fact that weirs slow down but do not regulate the water flow (i.e., the water overflows over them), increases the risk of flooding in the areas near the weir. Their elimination, therefore, will result in a direct and immediate reduction of flood risk.

4.2. SMART Green Deal goals relevant for the region: secondary goals

Green growth goals. The maintenance and enhancement of natural ecosystems promotes more natural and sustainable tourism while making local communities aware of the importance of natural heritage. The demolition of dams and other types of obstacles is a direct action in favour of river ecosystems.

Health and wellbeing goals. Impounded waters, such as those resulting from the presence of obstacles in stream ecosystems, favour the presence of mosquitoes as well as bad odours, which are directly detrimental to human well-being. Indirectly, the replacement of these areas by naturalized river courses encourages people to go for walks in these areas and, therefore, improves their quality of life.

Knowledge goals. As mentioned above (see section Linkages and synergies with other initiatives), one of the major challenges of the 21st century is disinformation, which is derived from fake news. One of the consequences of this disinformation is an increase in social opposition to certain measures, such as the demolition of barriers. It is therefore very important that we create models that serve as examples to learn from, but also as evidence of the benefits that certain actions have on ecosystems and people's lives. The implementation of the restoration measures described here, and their monitoring using both ecological and social indicators, will help to build this model and provide objective evidence of the benefits of removing barriers.

Zero-pollution goals. In-stream obstacles represent a barrier to the movement of sediment, which negatively affect nutrient dynamics. The elimination of impounded areas will return to the river its natural habitat heterogeneity and consequently its functioning, which will improve the self-purification capacity of stream ecosystems.

5. From general goals to actions

Translating these sustainable development goals into concrete actions to help achieve them is not easy. Below are several actions that can help. However, we would like to stress that the concrete actions presented here are just a few examples, limited to our experiences and case study.

Climate Goal

- Develop an Obstacles Permeabilization Plan.
- Execute the obstacles permeabilization.
- Habitat heterogeneity improvement to improve self-purification of the stream ecosystem.
- Analyse greenhouse gas emissions resulting from the presence of obstacles in river ecosystems to provide other prioritisation criteria for obstacle removal.

Biodiversity Goal

- Continuous monitoring of the stream water quality to provide data to help prioritisation decisions and, at long term, data to demonstrate obstacle removal benefits.
- Periodic physico-chemical monitoring to provide data to help prioritisation decisions and, at long term, data to demonstrate obstacle removal benefits.
- Macroinvertebrates monitoring
- Fish monitoring to provide data to help prioritisation decisions and, at long term, data to demonstrate obstacle removal benefits.
- Macroinvertebrates monitoring to provide data to help prioritisation decisions and, at long term, data to demonstrate obstacle removal benefits.
- Macroinvertebrates monitoring
- Use of eel (Anguila anguila) as a flagship species to promote dam removal movement.

Inclusivity goal

- Establish regular meetings with mayors to discuss progress or potential problems that may arise.
- To illustrate the benefits of obstacle removal through examples from previous case studies, initially, but as the project progresses, show the results in terms of the indicators set out in the other subsections of this section 5, organize workshops periodically.
- Create a communication channel through which citizens can contact the experts in charge of the project and ask them any questions or doubts they may have.
- Regardless of whether or not permeabilization actions are planned, create awareness campaigns through social media.
- Constant updating of the official website of the water agencies un chart of the renaturalisation actions, so that citizens can easily access information related to the elimination of obstacles.

Flood risk

- Develop an Obstacles Permeabilization Plan.
- Execute the obstacles permeabilization.
- Regardless of whether or not permeabilization actions are planned, create awareness campaigns of flood risks associated with the presence of obstacles in fluvial ecosystems through social media.
- To quantify the damages associated with floods corresponding to return periods of 10, 50, 100, 500 years as a data to include in the awareness campaigns but also as a prioritization criterion.

Green Growth

- Develop an Obstacles Permeabilization Plan.
- Execute the obstacles permeabilization.
- Waste Water Treatment Plant improvement to reduce the loads of OM to the stream ecosystem

- Identification of discharges of wastewater directly to the sewage bed that increase the load of MO and pollutants

Zero pollution

- Develop an Obstacles Permeabilization Plan.
- Execute the obstacles permeabilization.
- Habitat heterogeneity improvement to improve self-purification of the stream ecosystem.

Health & well-being

- Develop an Obstacles Permeabilization Plan.
- Execute the obstacles permeabilization.
- Create awareness campaigns of flood risks associated with the presence of obstacles in fluvial ecosystems through social media.

5.1. Responsible stakeholders and their roles

In this type of renaturalisation action, there are different actors who share responsibilities and play significant roles. Nevertheless, the coordinator of the restoration actions must be the water authority, in this case the Basque Water Authority.

In a first stage, the water authority is responsible for drawing up an obstacle removal plan with a clear prioritisation strategy. To this end, it may be interesting to examine the different prioritisation strategies that can be applied2. In addition, the Basque Water Authority can contact experts such as scientists and provincial councils, organise some sampling campaigns, and gather additional information to base decisions.

In a second state, the water authorities, in this case the Basque Water Agency but also the provincial councils, are responsible for obtaining the budget (see section 7) and executing the restoration actions. They must also liaise with scientists to facilitate the collection of relevant data to generate new knowledge and examples. To preserve the historical significance, it is important to consult with an archaeologist and perform the demolition work under their supervision. If necessary, create informative panels on-site or organize talks to explain the cultural value of the obstacles. However, it is also crucial to highlight the following points:

1. The proposed actions aim to balance social and environmental protection by removing the barrier while acknowledging its historical value.
2. Protection is meaningless without active maintenance. Therefore, it is imperative to remove barriers that are not being maintained.

Finally, it is important to share the acquired knowledge with the public and experts. All the aforementioned stakeholders are responsible for this dissemination.

6. Timeline

Actions	Period (2 years interval)				Period (5 years interval)			
	2025 - 2006	2027 - 2028	2029 - 2030	2031 - 2032	2033 - 2034	2035 - 2039	2040 - 2044	2045 - 2050
Obstacle Removal Plan creation								
Obstacle Removal Plan Implementation								
Collecting prior data								
Awareness campaigns								
Workshops and meetings								
Collecting data to analyse the impact of the actions								

7. Budget

The budget for removing the obstacles may come from public taxes as well as from European funding through projects or other financing opportunities.

8. Uncertainties and assumptions/ boundary conditions

The main weaknesses of the restoration efforts are linked to the presence of other anthropogenic impacts in the area, which may limit the expected improvements. These multiple stressors include a diverse array of pollutants from wastewater treatment plant (WWTP) effluents, point-source pollution from leaking or unconnected sewers, illegal yet ongoing releases of industrial pollutants, high loads of suspended solids from erosion in intensive tree plantations, and morphological alterations beyond obstacles fragmenting logitudinal connectivity.

Through workshops and social inclusion initiatives, there is an opportunity to enhance social awareness and ecological knowledge among the local population. This increased awareness can drive demand for and promote improvements in all other aspects of the Green Deal. Furthermore, improving the biodiversity and ecological status of the rivers in the Basque Country can elevate their conservation status and degree of protection.

Obstacle removal is just one aspect of the restoration process, as the territory faces multiple stressors. These include erosion from forestry, the presence of exotic species, lack of lateral connectivity, and high pollution levels from current and historical industrial activities. These stressors pose significant threats to achieving restoration objectives. However, removing obstacles can highlight these other stressors and encourage the involvement of local and strategic stakeholders in their management. This RSP, derived from the Deba River restoration experience, is valuable for demonstrating how to approach restoration in such complex situations and presents an opportunity to generate new knowledge.

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