DC1.1 SUMMARY INITIAL ECOLOGICAL STATUS REPORT

LIFE Ebro Resilience P1 Project

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In collaboration with the European Union's LIFE financial instrument

Project partners:

lifeebroresiliencep1@tragsa.es
www.lifeebroresilience.com

Summary

The middle section of the River Ebro (TME) floods frequently, causing environmental and economic damage to agriculture, livestock, built-up areas and infrastructure, causing effects that produce widespread unease in society, which in turn calls for long-term solutions.

Although these episodes are caused by natural phenomena, the reduction in the River Ebro's fluvial dynamism, due mainly to the construction of large reservoirs and the execution of defensive works, coupled with the effects of climate change, have contributed to increasing the likelihood of these phenomena occurring, as well as to exacerbating their consequences.

In socio-economic terms, the greatest damage occurs when defences overflow and do lack proper drainage infrastructure, which usually leads to their collapse and flash flooding of large areas.

In environmental terms, the effect on the river's lateral connectivity has led to changes to the plant formations in the TME's protected areas. Pioneer plant formations have been displaced and the ecosystems there are degraded by the presence of invasive species.

The current situation is thus affected by multiple factors and it will not be possible to rectify these problems with single solutions. It is necessary to tackle flood risk management in terms of resilience to minimise economic losses, preserve environmental values, maintain the population in the territory and to adapt to the effects of climate change.

This approach is based on the Flood Risk Management Plans (PGRIs), as set out in the framework for flood risk management laid down in Directive 2007/60/EC, which seeks to lessen the risks and reduce the negative consequences of floods.

Within the scope of the PGRI, the relevant national and regional authorities, the Ministry for Ecological Transition and the Demographic Challenge, the Ebro Hydrographic Confederation and the Regions of Aragon, La Rioja and Navarre, agreed to carry out a plan of measures focused on improving resilience in the middle section of the River Ebro and the lower sections of its tributaries, between the towns of Logroño (La Rioja) and La Zaida (Zaragoza), a territory that encompasses 325 kilometres of the River Ebro and runs through 62 municipalities in La Rioja, Navarre and Aragon, giving rise to the Ebro Resilience Strategy.

This Strategy consists of driving actions to reduce the impact of floods in the areas of greatest conflict in the middle section of the River Ebro while contributing, in turn, to improving the condition of the bodies of water and river habitats and also to improving the people's ability to respond to these episodes. Therefore, the future vision and purpose of the Ebro Resilience Strategy is to achieve a middle section of the River Ebro in which economic activities and population centres coexist with a well-conserved river, without significant damage caused by the inevitable floods.

The Ebro Resilience Strategy is thus a large-scale, supra-regional project with significant financing requirements that can be replicated both nationally and at EU level. To meet these needs, a decision

was made to apply for funding through the LIFE Programme, since it is the only EU financial instrument exclusively focused on the environment and climate action.

For this purpose, a proposal was drawn up for actions in two areas of the middle section of the River Ebro, which was formally approved in 2021 and led to the LIFE EBRO RESILIENCE P1 Project, with an expected duration of six years. The first four years will be spent implementing the main actions and the last two years will be spent assessing the results and drawing conclusions. The total budget is 13,310,350 euros, 55% of which shall be contributed by the LIFE Programme. The title of the proposal is EBRO RESILIENCE STRATEGY: FLOOD RISK MANAGEMENT BY MEANS OF GREEN INFRASTRUCTURE AND ADAPTATION MEASURES and its acronym LIFE EBRO RESILIENCE P1.

The primary objective of this LIFE project is to enhance resilience and to contribute to preventing flood risk in these areas, and it also pursues various specific objectives, including improving flood resilience in the intervention territory by 60%, improving the ecological condition of the River Ebro in the intervention areas, involving the local people, improving native biodiversity, and establishing a replication strategy to be used at the regional, national and EU level.

The Project includes various types of actions, which are labelled with the letters of the alphabet: type A actions include preliminary works necessary to execute the main actions; type B actions are the Project's main actions since they implement the LIFE Programme's policies; type C actions encompass the follow-up, monitoring and assessment of the Project's objectives; type D actions communicate the work done, the participation of stakeholders and the general public and capacity-building, by implementing their corresponding Plans; and type E actions comprise the tasks related to the Project's internal management and coordination.

Within the type of actions mentioned in the preceding paragraph, this report is one of the type C actions, since it includes the so-called "Action C1 - Monitoring of the environmental impact", which aims to ensure effective control of the Project's outcomes, shall serve, among other functions, to demonstrate the feasibility and efficiency of the solution, and it is based on following up on the environmental impact assessment of the actions set out in the main type B actions described below.

In this Project, two main type B actions are proposed, which have the following characteristics:

- Action B1- Section between the towns of Alfaro (La Rioja) and Castejón (Navarra):
    - Location: This area corresponds to an extensive meandering channelled section with the potential to be restored, which is located between the municipalities of Alfaro (La Rioja) and Castejón (Navarre), and includes actions in the Soto de Alfaro meander, the La Roza meander and the El Señorío meander.
    - Unaltered state: Originally, the slight gradient in this stretch of the River Ebro formed a braided riverbed with many interconnected minor channels and broad

meanders, which led to the formation of bars and islands in the middle of the riverbed and dense vegetation on the banks.

- Problem: In this area, the river channelling works, occupying river areas and having an irregular course, cause, among other things, periods of flooding to involve the water bursting the banks of the channel and breaking the dykes, flooding the agricultural land adjacent to the river. In such cases, the water is retained by the dams themselves, which is known as the "dam effect", causing the opposite effect to what is desired, for an extended period of time, thus increasing the damage caused.
  The canalisation has also led to the incision of the river bed, the longitudinal disconnection of the riparian corridor, the loss of an important extension of the flood plain and, consequently, of a significant surface area of river spaces and their associated fauna.

- Current status: The action area exhibits significant morphological and environmental degradation, and this degradation in turn leads to significant and periodic economic losses in the social systems adjacent to the watercourse. Moreover, the current problems show no signs of spontaneous reversal; on the contrary, the future prediction of a possible evolution of these areas appears to be based on the causes of these problems remaining in place and, therefore, on their consequences accumulating and progressing, especially if one considers the forecasted effects of climate change. Given the unsustainability of this situation, action is deemed necessary to put in place long-term solutions.

- Proposed interventions: A demonstration action shall be performed by implementing natural water retention measures (NWRMs) in a long intervention section to demonstrate that river restoration leads to a reduction in the risk of flood.

- Objective: To demonstrate that the implementation of successive NWRMs will achieve a measurable improvement in terms of flood damage reduction at section level, with better results than if actions were executed in isolation.
  In particular, it that there will be an improvement in the effects of flooding over about 500 ha of the affected agricultural area.
  These actions will also make it possible to enlarge the space for river mobility and, therefore, to increase river habitats and restore riverbank vegetation.

- Sub-actions:
  - B1.1 Removal of dykes (NWRM - N11) on the right bank of the River Ebro in the La Roza (1,344 m) and El Señorío (1,142 m) meanders.
  - B1.2 Construction of new relocated defence (NWRM - N3) at the La Roza meander (900 m).
  - B1.3 Construction of relief channels (NWRM - N3) in the La Roza meander, which is 800 m long and 100 m wide, and in the El Señorío meander, which is about 1,000 m long and 100 m wide.

- B1.4 Restoration of meanders (NWRM - N4) with riverside habitats on about 22 ha of land in the La Roza meander and 23 ha in the El Señorío meander.
- B1.5 Reclaiming lost arms (NWRM - N7) in the meander of the Soto de Alfaro (about 1,000 m).

➢ Action B2- Fuentes de Ebro - Osera de Ebro Section (Aragon):

- Location: This area corresponds to the middle section of the River Ebro in the province of Zaragoza (Aragon) between the Las Viudas eyot, in the municipality of Osera de Ebro, as far as the Aguilar meander, in the municipality of Fuentes de Ebro, a section about 13 km long covering an area of 1,621 ha.

- Unaltered state: The hydraulic behaviour of the River Ebro in this section is influenced by the presence of river terraces at different heights, with the left bank being higher, which means that in episodes of flooding the river overflows onto the land on the right bank, forming part of the river's flood plain.

- Problem: The channelling and narrowing of the riverbed causes the overflows towards the agricultural land on the right bank of the River Ebro in this section to have increased negative effects.
  In flood events, the water overflows the upstream channel and there is a pronounced "dam effect", preventing the overflowing water from returning to the main channel. At these times, the water flowing through the cultivated area reaches sometimes reaches speeds that erode the agricultural land and break the irrigation system, which are located at a higher altitude than the fields.
  The effects of this process are visible in the Aguilar meander. The accelerated water must decelerate to flow around the perimeter of the meander. The increased speed of the water flowing into the meander, and thus its energy, has induced an erosive process on the bank that directly opposes the current, such that the width of the neck of the meander has been reduced by half. In turn, the perimeter of the lobe has increased so as to absorb this excess energy.
  Moreover, the vegetation in the section has evolved, with an "intensive" maturation of the existing vegetation.
  As a result, the functioning of the system contains phenomena uncontrolled in space and time which cause significant damage.

- Current status: This section of the River Ebro belongs to a series of areas in the middle section of the River Ebro where the harmful effects of channelling have been more persistent and damaging. In these areas, there is little potential for restoring the riverbed and the application of natural water retention measures (NWRMs) would entail a significant social and economic impact; measures to mitigate and prepare for the effects of the floods would be more appropriate.

- Proposed interventions: This is a pilot action that seeks to adapt an intensive agricultural area in the province of Zaragoza to the effects of flooding by creating lateral flow buffer zones (ZAFLs).

The implementation of ZAFLs will compartmentalise the plots into watertight enclosures that will allow the estates to be flooded to a lower depth in the moments prior to the general overflow of the defences, thus creating water cushions that will minimise damage to land and infrastructure due to floods.

- Objective: To reduce flood damage on about 350 ha of agricultural land, thus increasing resilience to the event.
  The planned restoration will also enable an expansion of river habitats and the recovery of riverbank vegetation.

- Sub-actions:
  - B2.1 Removal of defences (NWRM - N11) over about 2,500 m in the narrow sections.
  - B2.2 Construction of new relocated defences (NWRM - N3) in the sections where the existing hillocks are removed.
  - B2.3. Lateral flow buffer zones, comprising measures to:
    - B2.3.1. Adaptation of the perimeter of the buffer zone.
    - B2.3.2. Adaptation of the irrigation system.
  - B2.4 Restoration of the meanders (NWRM - N4) by eliminating existing crops and establishing river habitats of interest, on about 5 ha of land in the first area, the straight section, and 15 ha in the Aguilar meander.

The aforementioned "Action C1 - Monitoring of environmental impact" included in the LIFE EBRO RESILIENCE P1 Project sets out a series of indicators, milestones and follow-up reports to assess the results obtained in both intervention areas during the impact monitoring period in place, which covers the period from 2021 to 2027.

This report is the initial report due to be delivered in December 2021, based on the assessment of the ecological status of the intervention areas, whose purpose is to set out the baseline, or initial situation prior to beginning the works, and it includes an assessment of the initial indicators for Actions B1 and B2.

The methodology selected to monitor the environmental impact of the actions set out in this Project is based on characterising and measuring the improvement to the indicators in place, using by way of starting data the inventories, models and cartography available in the Ebro Hydrographic Confederation and the detailed cartography arising from the field surveys performed for the initial environmental study of both intervention areas (CERNUA (2022)).

A summary table is thus set out below that includes the assessed indicators, the baseline situation and the measurement set out in the monitoring reports in place.

LIFE EBRO RESILIENCE PROJECT P1				DC1.1 INITIAL ECOLOGICAL STATUS REPORT (12/2021)					IMPACT MONITORING SYSTEM IN PLACE			
INDICATORS		ACTION / SUB-ACTION	OBJECTIVE	INITIAL MEASUREMENT	ASSESSMENT METHOD	INITIAL ASSESSMENT INDICATOR	ENVIRONMENTAL BENEFIT	MOTIVE	MILESTONE	MILESTONE ASSESSMENT DATE	INTERMEDIATE MEASUREMENTS	MONITORING REPORTS WITH ASSESSMENT OF THE INDICATOR
Improving flood resilience	Improving intensive agriculture conditions*.[1]	B1	500 ha	770 ha	Assessment based on 2015 and 2018 avenues data	Nil	0	Actions have not begun	MC1.1 Measurement of the area at improved risk of flooding	Jun-27	Assessment according to the most recent flood data for the period 2025-2027. Assessment of milestone MC1.1 with most recent flood data for the period 2021-2027 for the final ecological status report.	DC1.3 Ecological monitoring report 2 (06/2025) DC1.4 Ecological monitoring report 3 (12/2025) DC1.5 Ecological monitoring report 4 (06/2026) DC1.6 Ecological monitoring report 5 (12/2026) DC1.7 Ecological Monitoring Report 6 (06/2027) DC1.8 Final Ecological Status Report (12/2027)
		B2	350 ha	630 ha		Nil	0	Actions have not begun				
	Reclaiming river space	B1	plus 45 ha	225 ha	Plots of land associated with the river before the actions	Nil	0	Actions have not begun	MC1.2 Measurement of the area reclaimed for the river	Dec-24	Assessment of milestone MC1.2 after the works are complete and it does not vary in the remaining monitoring reports.	DC1.2 Ecological monitoring report 1 (12/2024)
		B2	plus 15 ha	418 ha		Nil	0	Actions have not begun				
Improvement of the river's hydromorphological condition	Removal of defensive dykes	B1.1	1,400 + 1,800 m	Current dikes: 7,865 m Prediction dike removal: 1,344 m and 1,142 m	Measurement of the initial state of the defensive dykes and the length planned for removal	Nil	0	Actions have not begun	MC1.3 Measurement of the length of defence dykes removed	Dec-24	Assessment of milestone MC1.3 after the works are complete and it does not vary in the remaining monitoring reports.	DC1.2 Ecological monitoring report 1 (12/2024)
		B2.1	2,500 m	Current dikes: 23,424 m Prediction dike removal: 765 m and 1,726 m		Nil	0	Actions have not begun				
	New relocated defences	B1.2	900 m	Current dikes: 7,865 m Prediction relocation dike: 900 m	Constructed length of new defences	Nil	0	Actions have not begun	MC1.4 Measurement of the length of relocated defensive dykes	Dec-24	Assessment of milestone MC1.4 after the works are complete and it does not vary in the remaining monitoring reports.	DC1.2 Ecological monitoring report 1 (12/2024)
		B2.2	2,500 m	Current dikes: 23,424 m Prediction relocation dike: 2,500 m		Nil	0	Actions have not begun				
	Constructed relief channels	B1.3	2 units	Current relief channels: 0 units Provision for the construction of relief channels: 2 units	Measurement of the no. of constructed relief channels	Nil	0	Actions have not begun	MC1.5 Measurement of constructed relief channels	Dec-24	Assessment of milestone MC1.5 after the works are complete and it does not vary in the remaining monitoring reports.	DC1.2 Ecological monitoring report 1 (12/2024)
	Recovery of meanders	B1.4	2 units	2 units	Predicted recovered meanders	Nil	0	Actions have not begun	MC1.6 Measurement of recovered meanders	Dec-24	Assessment of milestone MC1.6 after the works are complete and it does not vary in the remaining monitoring reports.	DC1.2 Ecological monitoring report 1 (12/2024)
	Recovery of lost arms of the river*.	B1.5	1,000 m	1,000 m	Measurement of the expected recovered length of recovered lost liver branches.	Nil	0	Actions have not begun	MC1.7 Measurement of the length of reclaimed river branches	Nov-24	Assessment of milestone MC1.7 for the first monitoring report. Measurement of the length in all the monitoring reports, with a final assessment for the last monitoring report.	DC1.2 Ecological monitoring report 1 (12/2024) DC1.3 Ecological monitoring report 2 (06/2025) DC1.4 Ecological monitoring report 3 (12/2025) DC1.5 Ecological monitoring report 4 (06/2026) DC1.6 Ecological monitoring report 5 (12/2026) DC1.7 Ecological Monitoring Report 6 (06/2027) DC1.8 Final Ecological Status Report (12/2027)

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Hydromorphological effects		**B1**	20%	1.- Hydrological system: Flow and hydrodynamics: 6.27 2.- Hydrological regime: Connection of groundwater bodies: 6.70 3.- Continuity of the rivers: 10.00 4.- Morphological conditions: Variation of depth and width: 4.78 5.- Morphological conditions: Structure and substrate of the bed: 5.00 6.- Morphological conditions: Structure of the riparian zone: 6.95	Application of the hydromorphological protocol in the current situation	1.- Hydrological system: Flow and hydrodynamics: 6.27 2.- Hydrological regime: Connection of groundwater bodies: 6.70 3.- Continuity of the rivers: 10.00 4.- Morphological conditions: Variation of depth and width: 4.78 5.- Morphological conditions: Structure and substrate of the bed: 5.00 6.- Morphological conditions: Structure of the riparian zone: 6.95	0	Actions have not begun	-	-	Application of the hydromorphological protocol in the final location and assessment of the improvement	DC1.8 Final Ecological Status Report (12/2027)
		B2	20%	1.- Hydrological system: Flow and hydrodynamics: 5.81 2.- Hydrological regime: Connection of groundwater bodies: 6.70 3.- Continuity of the rivers: 10.00 4.- Morphological conditions: Variation of depth and width: 6.05 5.- Morphological conditions: Structure and substrate of the bed: 5.00 6.- Morphological conditions: Structure of the riparian zone: 5.68		1.- Hydrological system: Flow and hydrodynamics: 5.81 2.- Hydrological regime: Connection of groundwater bodies: 6.70 3.- Continuity of the rivers: 10.00 4.- Morphological conditions: Variation of depth and width: 6.05 5.- Morphological conditions: Structure and substrate of the bed: 5.00 6.- Morphological conditions: Structure of the riparian zone: 5.68	0	Actions have not begun				
Increase in reforested area		**B1.4**	15 ha	79 ha	Characterisation of the current riparian forest area	Nil	0	Actions have not begun	MC1.8 Measurement of the current reforested area	Jun-27	Assessment of milestone MC1.8 for the final monitoring report (DC1.7). Characterisation of riverside forest area and assessment of improvement in the remaining monitoring reports and the final report.	DC1.2 Ecological monitoring report 1 (12/2024) DC1.3 Ecological monitoring report 2 (06/2025) DC1.4 Ecological monitoring report 3 (12/2025) DC1.5 Ecological monitoring report 4 (06/2026) DC1.6 Ecological monitoring report 5 (12/2026) DC1.7 Ecological Monitoring Report 6 (06/2027) DC1.8 Final Ecological Status Report (12/2027)
		B2.4	5 ha	149.97 ha		Nil	0	Actions have not begun				
Improving nature, species and biodiversity	Area of arable land reclaimed for river dynamics	**B1.4**	45 ha	46.83 ha	Measurement of the current cropland area	Nil	0	Actions have not begun	MC1.9 Measurement of the area of	Dec-24	Assessment of milestone MC1.9 after the works are complete and it does	DC1.2 Ecological monitoring report 1 (12/2024)

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		B2.4	20 ha	1,115 ha		Nil	0	Actions have not begun	arable land reclaimed for river dynamics		not vary in the remaining monitoring reports.	
	Elimination of invasive species	**B1.4**	1 ha	0.79 ha	Characterisation of the area colonised by invasive species	Nil	0	Actions have not begun	MC1.10 Measurement of the area from which invasive species have been eradicated	Dec-24	Assessment of milestone MC1.10 for the first monitoring report (DC1.2). Characterisation of the area colonised by invasive species in the remaining monitoring reports.	DC1.2 Ecological monitoring report 1 (12/2024) DC1.3 Ecological monitoring report 2 (06/2025) DC1.4 Ecological monitoring report 3 (12/2025) DC1.5 Ecological monitoring report 4 (06/2026) DC1.6 Ecological monitoring report 5 (12/2026) DC1.7 Ecological Monitoring Report 6 (06/2027) DC1.8 Final Ecological Status Report (12/2027)
		B2.4	1 ha	16.48 ha		Nil	0	Actions have not begun				
	Habitat improvement	**B1.4**	45 ha	114.23 ha	Characterisation of habitats of interest in the current situation	Nil	0	Actions have not begun	MC1.12 Measurement of the recovered habitat area	Jun-27	Characterisation of habitats of interest and assessment of the improvement in all the monitoring reports. Assessment of milestone MC1.12 in the final monitoring report (DC1.7).	DC1.2 Ecological monitoring report 1 (12/2024) DC1.3 Ecological monitoring report 2 (06/2025) DC1.4 Ecological monitoring report 3 (12/2025) DC1.5 Ecological monitoring report 4 (06/2026) DC1.6 Ecological monitoring report 5 (12/2026) DC1.7 Ecological Monitoring Report 6 (06/2027) DC1.8 Final Ecological Status Report (12/2027)
		B2.4	20 ha	234.87 ha		Nil	0	Actions have not begun				

*Monitoring forecast according to the current situation, which may vary depending upon the execution of the actions.
[1] Should there be no flooding, hydraulic simulations shall be performed