

Hydrologic connection and habitat improvement in the meanders of the lower course of the Arga River (Navarra)

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Author of the picture: Guillermo Cobos Campos/Fototeca CENEAM

Until the 70s, the lower course of the Arga River near the confluence with the Aragon River flowed with a meandering channel, occupying a wide flood plain characterized by intense fluvial dynamics. In this situation, it was considered necessary to carry out works to contain river floods, by rectifying and channel the section

stretching from the town of Falces to the mouth of the Aragón River.

In the mid-80s, channeling of the river was observed to be insufficient, with the river overflowing during certain flood events. In addition, shortening of the new stretch of river caused an increase in flow speed, resulting in serious imbalances and damages in this area of great ecological interest.

These phenomena have worsened in recent years due to the effects of climate change, among other factors.

Case Study Description

Challenges:

The project is carried out within the framework of the National Strategy for River Restoration, under the WATER program of the PIMA-Adapta Plan of the Ministry for Ecological Transition MITECO, whose objective is the development of climate change adaptation projects in the public hydraulic domain, by physically adapting water bodies such as rivers, watercourses or wetlands.

The development of the project "Hydrologic connection and habitat improvement in the meanders of the lower course of the Arga River (Navarra)" aims to recover the natural value ??of the lower course of the Arga River from the degradation it has suffered over the last decades, as a consequence of its channeling through construction cuts and earth flats that resulted in the abandonment of old meanders as well as the partial disappearance of the vegetation along its banks.

For this reason, the project aims to continue with the recovery of the meanders of the Arga River, recovering their natural functionality and dynamics, structuring the longitudinal and transverse continuity of the river system, reducing the risk of flooding, improving the available habitats and enabling transit and movement of the associated wildlife, such as the European mink (*Mustela lutreola*) and the otter (*Lutra lutra*), among other species, all of the above in a manner that is compatible with the human activities taking place in the area.

Project undertakings focus primarily on the Soto Sardilla meander in the municipality of Funes, at the confluence between the Arga and Aragón Rivers.

Objectives:

The project "Hydrological connection and improvement of habitats in the meanders of the lower course of the Arga River (Navarra)" is being carried out in several phases. The first phase concluded in 2017 and in it, actions were carried out in the old meander of Soto Sardilla of the Arga River, next to its confluence with the Aragón River, in the municipal district of Funes (Navarra), covering about 2 km in length. Its objectives were:

- Opening of the channel at the meander's downstream end
- Improvement of the quality of the waters in the meander, by removing the accumulated sludge in the abandoned riverbed originating from an old spill
- Recovery of the flood plain with the removal of the breakwater at the confluence of the Arga and Aragón Rivers
- Specific slope protection actions
- Restoration of ecological integrity of the areas subject to intervention and improvement of river habitats for the European mink through reforestation, in a way compatible with agricultural crops and poplar cultivation
- Creation of wetlands and islands from irregular excavations in the terrain

The second phase, which began in November 2017 and was included in the PIMA Adapta 2017 Plan, is currently underway. This phase is extended until 2020, its main objective being the continuation of the work already started in phase 1, while simultaneously contemplating new undertakings with the ultimate goal of recovering, as far as possible, the natural functionality and dynamics of the Arga River, in a manner that is compatible with the human activities taking place in the area. Its scope coincides with that of phase 1, that is, the confluence of the Arga and Aragón Rivers and the old meander of Soto Sardilla, belonging to the Arga River.

The main works included in this phase 2 are the following:

- Improvement of the quality of the waters in the meander, by removing the sludge accumulated therein, ending the work begun in phase 1
- Recovery of the flood plain, by removing the landfills constructed during the channeling works, continuing the work of phase 1
- Recovery of an old meander currently used for cultivation, by removing the infill materials and building a branch that will connect the old course of the Arga River with the Aragón River
- Restoration of ecological integrity of the intervention areas by planting riverside plant species typical of the area
- Construction of two wetlands adapted to the biological requirements of the European mink, which add to the three already implemented in the first phase
- Channel removal of the Arga River downstream from the urban city center of Funes, and setback of the defense levees, protecting the elements at risk such as the industrial estate
- Replenishment of affected services, such as irrigation canals/ditches, roads, and the weir and Las Mesicas park.
- Complementary undertakings to enhance and bring the population closer to the new spaces created by designing itineraries and publishing of informative materials on the actions executed.

The third phase is still in the drafting process.

Adaptation measures implemented in the case study:

[Structural/physical: Engineering alternatives and options for built environments](#) [3]

[Structural/physical: Ecosystemic options](#) [4]

Solutions:

The planned undertakings occur at the confluence of the Arga and Aragón Rivers and in the old meander of Soto Sardilla belonging to the Arga River, covering an approximate 2 km stretch located southeast of the town of Funes, immediately downstream from the city center, in the southeast of the province of Navarra. They comprise three phases; the first one has concluded, the second is currently in execution and the third is being drafted.

1. Actions executed in Phase 1:

- Opening of the channel at the end of the Soto Sardilla meander
- Recovery of the flood plain in the areas surrounding the channel opening and at the confluence of the Arga-Aragón Rivers
- Improvement of the quality of the waters in the meander, by removing part of the sludge from old discharges
- Restoration of ecological integrity of intervention areas and habitat improvement for the European mink
- Replacement of affected roads

2. Actions executed in Phase 2:

- Improvement of the quality of the waters in the meander
- Floodplain recovery
- Restoration of ecological integrity of intervention areas and habitat improvement for the European mink
- Complementary undertakings to replace affected services

3. Actions executed in Phase 3:

- Hydraulic connection of the Arga River at the upstream end of the Soto Sardilla meander.

Importance and relevance of the adaptation:

The measures applied in the project are aimed at providing the river ecosystem with greater long-term resilience to face disturbances that are intensifying and aggravating as a consequence of the current climate change scenario and, consequently, to maintain its capacity to render ecosystemic services.

According to the problematic described, the different measures implemented are essential to meet these

objectives.

The improvement of the channel's morphology (opening of the Soto Sardilla meander, removal/setback of protection and defense structures) and the flood plain (removal of poplar groves and lowering of the ground level) aimed at increasing the drainage capacity and lamination of floods contribute to the reduction of damages produced by the latter, now and in the future, in view of the fact that these episodes will occur with greater frequency and intensity.

The improvement of the riparian structure (restoration of ecological integrity and replanting of intervention areas), water quality (removal of mud, plantations) and morphology, contribute to the maintenance of suitable habitats for the wildlife of conservation interest, which complement each other in the project with the creation of specific habitats à wetlands for the European mink (*Mustela lutreola*).

Additional Details

Stakeholder engagement:

The execution of the project is an example of coordination among different Administrative Bodies, since, although financed by MITECO (funds from the PIMA Adapta plan (OECC) and with funds from the General Directorate of Water (DGA)), its execution relies essentially on the collaboration of the Government of Navarra and the City Council of Funes, without whom this project could not be developed.

Likewise, the project is backed by an important public participation process involving all social agents and stakeholders in the area through various awareness campaigns and guided visits. All the information and awareness campaigns are being carried out in collaboration with the Government of Navarra, through the public company Gestión Ambiental de Navarra and the Funes City Council.

Awareness-raising initiatives include:

- Planting workshops, held with elementary school students from Funes and Villafranca (Navarra) public schools to spread information about the project and involve the local population in the area in the river restoration and meander reconnection project being developed in the lower section of the Arga River.
- Guided tours of the works under the title "Looking at the river with new eyes"
- Informative exhibition at the Funes Cultural Center
- Publication by the Ebro Hydrographic Confederation and MITECO of a video documentary titled "Arga, the channel that became a river again" to publicize the project. It premiered at the Funes summer cinema and has subsequently been screened on different occasions at conferences and in outreach activities. It is currently available on the websites of the aforementioned public agencies.

All the works are subject to exhaustive environmental control and monitoring carried out by the environmental agency of the Comunidad Foral de Navarra (Navarre Region), the results of which are submitted to the environmental monitoring Commission created in compliance with the Resolution on the environmental evaluation of the project, which meets periodically and in which the Comunidad Foral de Navarra and the General Administration of the State are represented through the Ebro Hydrographic Confederation and the General Directorate of Water of MITECO.

Project interest:

As opposed to traditional management method, the actions described represent a novel approach to flood risk management, through the expansion of the river area and its restoration with measures that also contribute to improving existing riparian habitats and creating other new ones. These measures are serving as a pilot test and a demonstration case study for future replication in other areas of the basin.

In addition, within the framework of the project, the effects of climate change in the Arga River basin are being studied, especially in relation to premature snow melt and its relation to the episodes of extraordinary floods that have been occurring in this basin in the last decade.

In relation to the improvement and creation of habitats and in addition to the actions aimed at creating wet areas

and refuge for the European mink, it is worth highlighting the efforts to locate freshwater naiads typical of the Ebro River basin, both in the Arga and Aragón Rivers as in the Soto Sardilla meander itself, in order to study the existence of these populations and inventory them.

Success and limiting factors:

Floods in recent years, in the winter of 2017 and spring of 2018 fundamentally, have evidenced the improvement of the flooding situation in the municipality of Funes. The affected areas and the damages produced have been reduced significantly, thanks to the expansion of the river achieved through the executed works.

In achieving this objective, the elimination of rigid structural barriers at the confluence of the Arga and Aragón Rivers has played a key role, such as removing the breakwater protection as well as the reduction of the land adjacent to the channel once the existing production poplar lands were removed, allowing lamination of the water flow during floods.

At the same time, overall improvements of the river ecosystem leading to the recovery of the European mink habitat have been achieved in this confluence area, along with a decrease of the main threats and the reduction of flood risk.

Budget, funding and additional benefits:

The project as a whole has an approximate budget of more than € 9,000,000, to be allocated across its three phases, with funds originating from the PIMA Adapta Plan (OECC) and funds from the General Directorate of Water (DGA) of the Ministry for Ecological Transition (MITECO).

The Budget of the first, already executed phase, was € 2,172,583.11, broken down into the following items:

	Floodplain recovery	603,016.27 €
European mink habitat improvement	283,960.12 €	
Restoration of ecological integrity of intervention areas:		
- sludge extraction	731,484.32 €	
- env. regeneration through plantation	265,073.92 €	
Corrective and preventive measures of environmental impact (includes hydromorphological monitoring and flood risk)	181,215.88 €	
Slope protection	3,050.08 €	
Photographic and audiovisual monitoring	65,000.00 €	
Waste management	417.65 €	
Safety and health	39,364.87 €	

The second phase, currently underway, has a budget of € 6,139,662.03, distributed across the following items:

	Extraction of contaminated sludge by meander nitrates	938,945.01 €
Construction of outflow connection weir with the meander	45,686.79 €	

Increase of drainage section and fluvial territory, and replanting of reclaimed areas	1,565,060.40 €
Construction of new setback flats, stabilization through bioengineering and replanting	564,913.64 €
Complementary actions:	
- replacement of affected services, restoration of recreational areas and mink itinerary	912,491.73 €
- recovery of specific European mink habitats	907,858.55 €
- restoration of river habitats of interest for conservation through replanting	470,387.04€
SNCZI update (Flood Zone Mapping National System)	21,000.00 €
Hydromorphological monitoring	140,000.03 €
Environmental impact corrective measures	343,426.20 €
Waste management	15,812.03 €
Health and safety	57,080.61 €

Lastly, the third phase is currently being drafted, and contemplates the connection of the Soto Sardilla meander with the main channel of the Arga River, with the remaining budget remaining available for its execution.

Legal aspects:

This initiative has been declared as of general interest to the public, and falls under the Plan to Promote the Environment for Adaptation to Climate Change in Spain (PIMA-Adapta), the National Strategy for River Restoration and the Flood Risk Management Plan of the Ebro River Basin District, approved by the Government through Royal Decree 18/2016, of January 15.

Implementation time:

The execution period of the first phase was 16 months, from November 2016 to March 2018. The execution period of the second phase is 36 months, from November 2017 to November 2020.

The third phase, currently being drafted, does not yet have a predetermined timeframe.

Reference Information

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Websites:

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