Wetland restoration in Persina, Bulgaria

Year of issue

2025

Summary

Restoration of two wetlands along the Danube River within Persina Nature Park, through engineering works including sluices, channels, dykes and access roads, enabling controlled flooding, water flow to former wetlands, nutrient retention, and recovery of biodiversity and fish populations. Baseline data on water, birds, fish, mammals, reptiles and vegetation were collected for monitoring.

Implemented 2002–2008 by the Bulgarian Ministry of Environment and Water, with main funding from the Global Environment Facility (GEF) via the World Bank, the project also covered the Kalimok-Brashlen and Belene Islands Complex. Works improved hydrological connectivity and reduced pollution, supported by WWF Bulgaria and local communities.

Subsequent initiatives have continued restoration and management, including sluice maintenance, construction of a pelican nesting platform, and reintroduction of the white water lily. In 2025, the Persina4Nature project, under the DANUBEPARKS network, was launched to promote citizen science for wetland conservation and monitoring, further enhancing ecological and community engagement outcomes.

Photo Gallery







Location

43.88, 26

Project

NWRM

National ID

Bulgaria_01

Sector

Hydromorphology

Installation Date

2007

Implementation status

Completed

Contact

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Overview

Location of the project

Belene Island (2 280 ha) within the Persina Nature Park and Kalimok/Brushlen (1 755 ha) within the Kalimok

Country

Bulgaria

NUTS2 Code

Северен централен (Severen tsentralen)

Sponge measures implemented in the case study

Wetland restoration and management

Objectives

Project aim: “Create a model for reducing trans-boundary nutrient loads in the Danube and Black Sea basins and to preserve biodiversity in the protected sites through: restoration of wetlands, management plans for protected sites and support to the local people in adopting environmentally friendly economic activities.”

Involved partners

Authority type	Authority name	Authority role	Comments	Authority responsibility
National water authority	Government of Bulgaria, Ministry of Environment and Water	Implementation	and Financing	—

Authority type	Authority name	Authority role	Comments	Authority responsibility
Local water authority	Persina NP Directorate (NPD)	Monitoring	Long-term maintenance and monitoring of impacts	—
Regional / sub-national water authority	Dabube River Basin Directorate	Monitoring	Monitoring of WFD compliant quality elements, integration into RBMP	—
NGO	WWF Bulgaria	Monitoring	Partner in restoration/management follow-up (incl. work at Kaikusha; later practical actions such as infrastructure and habitat measures).	Supporting
NGO	BSPB (Bulgarian Society for the Protection of Birds)	Implementation	Co-implemented pelican platform with Persina NPD and WWF.	Supporting
Other	Belene Prison Administration	Other	Land user (agriculture/pasture) in western Persin; part of site jurisdiction.	Responsible

Documents

cs-bg-01-final_version.pdf (1.28 MB)

Site Information

Climate Zone

Cool temperate dry

Precipitation

540.00 mm

Temperature (°C)

11.70 °C

Evapotranspiration

0.27 mm

Runoff

6000.00 mm

Runoff coefficient

0.15

Elevation range

15

Slope range

0.015

Vegetation class

Dominant wetland/floodplain types: riparian willow–poplar forests and extensive reed and cattail communities, with marsh macrophytes (e.g., water-lily/trapa communities) documented for the island marshes.

WFD Ecological status

Moderate

WFD Chemical status

Failing to achieve good

Water quality status

past conversion of alluvial forests to poplar plantations, planned/ongoing navigation dredging, potential industrial dredging, wild boar disturbance; within-site agriculture by the prison administration.

Design and Implementation

Project scale

Meso

Project scale specifications

Construction work and soft measures implemented in two protected sites, including one Nature park

Project area

4035

Principles

Primary goal of the project is connected with the reduction of nutrient pollution by restoration of wetlands and their respective nutrient capture capacity.
Besides this goal, the project design follows the objectives related to the biodiversity conservation and the principle of conformity with the management objectives of the protected sites.

Factor constraints

Design of infrastructure facilities (dykes, sluices, channels, adjacent roads) was elaborated depending mainly on the topography of the island (for Persina) and the riparian bank and floodplain zone (for Kalimok-Brushlen). Other key factors were the shape and depth profiles of the former wetlands, design of the old dykes, hydraulic parameters of Danube River (flow, water level and seasonal fluctuations) as well as the desired water regime for the wetlands biodiversity.

Constraints

Possible appearance of disease because of mosquitoes

Favourable preconditions

Due to the hydrogeological conditions of the sites, parts of the wetlands continued to exist and have a high potential for restoration.

Financing

Total cost

9700000.00 €

Total cost information

Cost of restoration of Belene Island and K/B Marshes and other additional sites

Costs investment information

Cost of restoration of Belene Island and K/B Marshes

Costs capital

5480000.00 €

Costs capital information

Design & construction

Costs land acquisition

31000.00

Costs land acquisition unit

€ (total value)

Costs operation maintenance information

Operation of the facilities for regular flooding

Costs operational

600000.00 €

Costs operational information

Management and monitoring

Costs other

3600000.00 €

Costs other information

Protected areas management, capacity building, technical assistance

Economic costs additional

661000.00 €

Information on Economic costs additional

Restoration of additional sites

Administrative annual costs

3600000.00 €

Administrative annual cost information

Protected sites management planning, Capacity building, Monitoring

Financing authorities

Authority name	Type of funding	Comments	Financing share
GEF / World Bank	Other	5,35 million €	59 %
Government of Bulgaria	National funds	2 million €	22 %
European Union	EU-funds: Rural development funds	EU PHARE – 1,5 milion €	16.5 %
Municipalities	Local funds	0,07 million €	0.8 %
Austrian government	National funds	0,17 million €	1.9 %

Compensations

No

Policy and Governance

Policy description

Over the years, the wetlands and floodplain have been drained or dyked to create arable land and to reduce malarial mosquito habitats. Now the wetlands area is about 10 percent of its original size at the turn of the century, reducing the capacity of its ecological function of water purification.

Land ownership

State: 47%, Municipal: 10%, Private: 43%. Western Persin Island used for agriculture by the Prison administration (pastures; some hybrid poplar).

Policy targets

Pollutants Removal

Improved Biodiversity

Increase Water Storage

Target remarks

Natural assimilation (purification) of effluents through dilution, dispersion, and physic-chemical processes. Biodiversity and gene-pool conservation in riparian areas.

Policy pressure

Directive	Relevant pressure
WFD identified pressure	4.1.1 Physical alteration for flood protection
WFD identified pressure	4.1.2 Physical alteration for agriculture
WFD identified pressure	1.1 Point – Urban waste water
WFD identified pressure	2.2 Diffuse – Agricultural

Policy impact

Directive	Relevant impact
WFD identified pressure	Nutrient pollution
WFD identified pressure	Altered habitats due to morphological changes

Requirement directive

Requirement directive	Specification
WFD-achievement of good ecological status	Mitigation of nutrient pollution and morphological alterations
WFD-restoring a HMWB	Lower Danube is described as HMWB in DRBMP
WFD-achieving objectives for Protected areas	Natura 2000
The Birds and Habitat Directives	EU-Directive 79/409/EEC (Birds Directive 1979) EU-Directive 92/43/EEC (Habitats Directive)

Requirement directive remarks

RBMP of Danube River District
National Wetlands Conservation Plan of Bulgaria
National Biodiversity Strategy

Part of a wider plan

Yes

Wider plan

Wider plan type	Wider plan focus	Name	Comments
National	Environment & Biodiversity	GEF Black Sea/Danube Strategic Partenrship-Nutrient Reduction Investment fund	Bulgaria's strategy for nutrient reduction, biodiversity and agriculture and rural development.

Public consultation

Yes

Consultation activities

Activity type	Comments
Public and media outreach	The aproach ensure public awarenes
Training and consulting of local	Local consulting in Belene, 30th of June, 2002, 25 participants and in Slivo Pole, 31th of June, 20.
Project promotion	Public support as well as support of public institutions and donor community in the country.
Environmental education	—

Has contractual arrangements

Yes

Contractual arrangements

Arrangement type	Name
Contractual agreement	Global Environmental Facility Trust Fund Grant Agreement

Impacts and Monitoring

Monitoring System

Monitoring requirements

A comprehensive environmental monitoring program was developed with the financial support of the PHARE program.

Monitoring parameters

Nutrient load reduction: N and P monitoring on annual basis.
Biodiversity benefits: Monitoring of the total number of protected species and the quantitative status of target species.

Maintenance

Maintenance requirements

Maintenance of the dykes, sluices and other hydraulic facilities on annual basis. Operation of the sluices on daily basis in order to ensure appropriate water regime – ensure by Park administration

Impact Assessment Methodology

Performance impact assessment method

Catchment outlet

Performance impact estimation information

N and P monitoring on annual basis. Biodiversity database carried out in the period 2001-2008

Socio-economic Impacts

Direct benefits information

Protection of the Danube river basin from nutrient pollution inccreasing and improving the water quality.

Ancillary benefits information

Increased economic benefits due to fishery and biomass production and farming practices.
Chance for future tourism development in the region, new employment opportunities and economic benefits due to fishery and biomass production as well as for protection of the Danube river basin from nutrient pollution inccreasing and improving the water quality. The project has also introduced a new idea that wetlands are not a necessary evil, making the landscape attractive.

Biophysical impacts: Hydrology

Retained water

9.00

Retained water unit

mio m3/month

Information on retained water

In total both sites

Information on increased water storage

The space for flooding is wider, with the selected situation of the dykes, with an area of 4035ha

Runoff reduction

5.00

Runoff reduction unit

% Percent

Information on runoff reduction

Runoff control by controlled flooding regime of the restored wetlands.

Peak flow reduction

1.00

Peak flow reduction unit

% Percent

Information on Restoring hydraulic connection

Area re-wetted/restored: 4,035 ha of former marshes (vs. 2,340 ha planned) were restored across the two pilot sites; Persina forms a major share.

Information on reducing flood risks quantity

Flood regime & buffering: Test flooding on Belene (Persina) was completed in April 2008; restored wetlands are noted to buffer flood waters in the lower Danube. Hydraulic control: Sluices, channels and dykes constructed; Persina Nature Park Directorate operates the sluices for Persina Island and nearby Kaikusha marsh.

Biophysical impacts: Biodiversity

Improved biodiversity

Yes

Information on improved biodiversity

Rapid post-flood response (Belene/Persina, 2008): Within ~2 months of the first flooding, 10 new fish species were recorded in the restored area; ferruginous duck nesting pairs increased from 5 to 50, and mallard from 16 to 400. Bird numbers of 22 species were found to increase. Colonial waterbirds: Dalmatian pelican breeding recorded on Persina/Belene for the first time in ~60 years (2016).
Aquatic macrophytes: Water lilies (protected species) were reintroduced and have returned to Persina’s marshes following restoration actions.

Biophysical impacts: Water & Soil Quality

Water quality overall improvements

Positive impact-WQ improvement

Information on water quality overall

The measure has impacted the overall water quality by nutrient reduction and capture (N, P) and capture of organic pollutants. Preliminary analysis indicates that the total nutrients reduction could reach 2.200 tons/year nitrogen and 284 tons/year phosphorus.

Soil quality overall improvements

N/A info

Information on soil quality overall improvements

No info available

Biophysical impacts: Others

Ecosystem impact climate regulation

No information available

Information on ecosystem impact climate regulation

No info available

Increased evapotranspiration information

Evaporation in the wetland will be as max about 1 m3/sec.

Lessons Learned

Key lessons

The Persina wetland restoration shows that large-scale floodplain reconnection on the lower Danube is possible even in heavily altered landscapes. Restoring controlled hydrological connectivity through sluices and channels re-established seasonal flooding over thousands of hectares and triggered rapid ecological responses. The sudden return of fish diversity and waterbird colonies after the first flooding illustrates the resilience of floodplain ecosystems once hydrology is restored.

When many stakeholders are involved, longer groundwork is essential. Participatory approaches to restoration design proved critical for success, as the project depended on changing people’s perceptions of wetlands and securing full support from authorities and local communities. The work of the Protected Area Local Consultative Councils and targeted public-awareness campaigns effectively supported this involvement.

Controlled restoration has provided a platform for large-scale experimentation and for studying nutrient-trapping processes under real conditions. This approach allowed managers to adjust operations based on ecological feedback and hydrological performance.

A solid understanding of both the baseline conditions and the desired future ecosystem state should be embedded early in the design phase. While baseline water-quality and biodiversity data were collected, the project itself recognised that long-term monitoring—10 to 15 years—would be needed to fully assess nutrient retention and other hydrological benefits. The absence of easily accessible long-term datasets today limits the ability to quantify these outcomes.

The case also shows that restoration is not a one-off action. Follow-up measures such as hydraulic-structure maintenance, reintroduction of aquatic plants, and creation of nesting platforms have been essential to sustaining ecological gains and adapting to changing environmental conditions.

Barriers

Barrier type	Barrier role	Comments
Attitude of the public	Secondary barrier	Administrative difficulties, related to land ownership / statute resulted in project delay
Limited staff and consultant knowledge	Secondary barrier	Difficulties with technical design due to insufficient national expertise in wetlands restoration
Other	Secondary barrier	Not defined target ecosystem status (favorable conservation status) at the project start

Drivers

Driver type	Driver role	Comments
Legal obligations	Main driver	The Environmental Program for the Danube River Basin as a `preemptive measure to prevent river Danube and Black Sea water pollution from reaching catastrophic proportions`
Legal obligations	Main driver	Danube Pollution Reduction program (DRP)

Success factors

Success factor type	Comments
Attitude of relevant stakeholders	The intensive stakeholder involvement during design and implementation created strong ownership and sustainable Project outcomes
Financing possibilities	The overall co-financing proveded by government substantially exceeded amounts agreed at appraisal.
Existing staff and consultant knowledge	Bank and Gobernment cooperation was in timely attention to critical implementation issues.

Cost effectiveness

Reducing nutrient loads in the Danube River. Total cost-effectiveness ratios were estimated at US$1.3 to US$5.0 per kilogram of Nand US$28.9 to US$46.2 per kilogram of P removed annually.

Flexibility / Adaptability

Adaptation to changing ecological and hydrologic conditions of Danube River can be achieved by flexible operation of the hydraulic facilities (sluices) in order to maintain optimal water regime.

Transferability

Similar restoration works could be designed for other riparian (former) wetlands along medium and large rivers in their lower segments.
The first follow-up Project, “Kaikusha”, under EU LIFE+ program helps develop feasibility studies to restore the Kaikusha Marshes in the Danube River basin.

Basin characteristics influence

The low inclination and the plain landscape along lower Danube allow the achievement of relatively large flooded areas with low-head structures. The large mean discharge of lower Danube makes difficult to assess the measure relative impact due to scale.

Sources

Sources

Bulgaria: Wetland Restoration and Pollution Reduction Project - component of Danube/Black Sea Strategic Partnership: Nutrient Reduction Investment Fund

Wetlands Restoration - Pollution Reduction GEF Project

Information Sheet on Ramsar Wetlands (RIS) – Belene Islands Complex

Природен парк Персина, План за управление 2006–2016 г.

Implementation Completion and Results Report – Wetlands Restoration and Pollution Reduction Project (Bulgaria)

Dalmatian pelican hatches on Bulgarian site for the first time in 60 years

CEEweb News: Wetland Restoration in Persina, Bulgaria

Life-Pelicans News: New Nesting Colony in Burgas Area

Към мониторинг на подземните води в ПП „Персина“ и ЗМ „Калимок-Бръшлен