Habitat Reconstruction in the forests of the Körös Valley, Hungary

Year of issue

2025

Summary

The fragments of floodplain forests (Fraxino - pannonicae -Ulmetum) along the River Körös were cut from the river by dykes during the river regulation works in the 19th century. The deteriorated groundwater conditions were worsened in a drought period during the 1980-1990’s that triggered action of the forestry service. Restoration of the river connection and the floodplain watercourse network provide surface water supply from the backwater of flood waves to the 2000 ha forest. The result of the habitat reconstruction work is a 38.8 km long water-flow and a water surface of 15.7 hectares, cc 400 hectares of the forest has a direct positive ecological impact.

The water supply of the floodplain channel network has another source as well. A smaller volume comes from a fishery. In case of this second source the nutrient content of the fishery is assimilated in the forest as an additional service. Previously this load were let back into the river directly.

Due to the particularly dry recent years, there has been an increase in the tendency to retain water in the watershed. Landowners have voluntarily offered areas designated for periodic flooding in order to mitigate the damage caused by drought during summer periods. Due to the water shortages, the use of water retention options has become more valuable. For this reason, in 2025 temporary storage is carried out at two locations along the canal.

Photo Gallery



Location

46.698664, 21.389736

Project

NWRM

National ID

Hungary_01

Sector

Hydromorphology

Installation Date

1999-2011

Contact

Gábor Ungvári, REKK

Overview

Country

Hungary

NUTS2 Code

Dél-Alföld

Sponge measures implemented in the case study

Floodplain restoration and management

Afforestation

Objectives

Regulation of hydrological cycle and water flow.

Regulation of the chemical status of freshwater.

Enhance infiltration into the soil at the detention ponds to recharge subsurface resources.

Involved partners

Authority type	Authority name	Authority role	Comments	Authority responsibility
Regional / sub-national water authority	Közép-Tisza-vidéki Vízügyi Igazgatóság	Initiation of the measure	The provider of the public water management services of the area by law. Details that belong to the design of the dyke crossing of the water supply channels. It also has role in the operation of the locks.	Responsible
Local water authority	Local governments of the area	Other	Help public acceptance, scenic fit	Supporting
Nature park	Duna-Ipoly National Park	Determination of design details of the measure	Advice on ecology questions	Supporting
NGO	Water Management Association South Pest County	Implementation	Representative of farmers interest towards the water services	Supporting

Site Information

Climate Zone

Warm temperate dry

Precipitation

550.00 mm

Temperature (°C)

12.00 °C

Evapotranspiration

800.00 mm

Runoff

34.60 mm

Runoff coefficient

0.20

Elevation range

98

Slope range

0-1%

Vegetation class

Broad-leaved forest

WFD Ecological status

Moderate

WFD Chemical status

Failing to achieve good

Water quality status

Significant nutrient load from a point source polluter : sewage treatment plan of a food processing plant. There is no risk of priority substances. pH is 8.04-8.34. Salinity is medium.

Design and Implementation

Project scale

Large

Project scale specifications

Size of the Körös stream catchment is 481 km2. The length of the water course is 40 km.

Project area

5 ha at the estuary

Project area specifications

The application intends to control surface flows of the 480 km2 catchment. At a recent stage of the development, with 5 hectares restored, there are temporarily flooding areas at the estuary.

Area subject to Land use change or Management/Practice change (ha)

40.00 ha

Size

38.80

Size unit

km

Design capacity

The volume of the detention pond above the town is 50-60 thousand m3. The retention capacity at the estuary is 50 thousand m3. The retention and assimilation capacity of the connected meadows are aproximately 93 ha, and 650 thousand m3.

Principles

Planning principles from the feasibility study are:
Keep in mind the social rationality of protection against water logging in areas where drainage cost more than the yield of farming the land use change should promote.
Surplus water that pose threat to life and property must be drained. Residential and agricultural water management must be harmonized and surface water runoff must be reduced by retention and storage.
Conditions that are necessary to reach the good ecological status of water must be provided, especially for the quality of the retained water.

Factor constraints

Detention pond and online storage capacities were introduced upstream of the settlement in order to slow control runoff and to provide surplus water at low water periods to prevent water quality problems (of high pollutant concentration) downstream. This was the solution that required only public land along the water course.

Constraints

The high cost of a previous attempt to pump water for the area proved prohibitively expensive and made it clear that only gravitational supply can provide sustainable solution.

Favourable preconditions

This is a state owned forest, that consists of one forest body. Also it is inside a temporary flood storage reservoir in a band of the River Fekete-Körös. The isolation of the area and lack of the risk of flooding further areas made it an easy case from the water directorate's point of view
The landscape relief that has the former river branches in the territory

Financing

Total cost

3667000.00 €

Total cost information

The calculations assumed 5% discount rate for the 30 year period of the project. The HUF-EURO exchange was calculated on 2008 € average exchange rate.

Costs investment

810000.00 €

Costs investment information

Planner's estimation of the development cost in 2014 prices of the same work volume, 200-300 million HUF (650.000 - 970.000€)

Costs capital

3730000.00 €

Costs capital information

It is higher than the total because project calculations include the estimated cost reduction in operational costs.

Costs land acquisition

145000.00

Costs operation maintenance information

No significant operation or maintenance cost were identified

Costs operational information

There are cost savings due to forgone pumping cost 88.800€

Costs maintenance

25400.00 €

Costs maintenance information

The Net Present Value of total maintenance cost € 57,100, but there is a forgone cost of desludging € 31,700.

Financing authorities

Authority name	Type of funding	Comments
National Privatization and Asset Management Ltd.	National funds	Reorganization subsidy from the owner the (state owned) National Privatization and Asset Management Ltd. (Regional Forestry Organizations were formed into state owned joint stock companies. Transfer from the (that time existed) national Forest Regeneration Fund
European Union	EU-funds: Rural development funds	EU Regional Development Fund KMOP-3.3.1/C-2008-0003

Compensations

Non

Policy and Governance

Policy description

River regulation works of the 19th and 20th century resulted in degraded living conditions for the river valley forests (declining groundwater levels, lack of inundations). A 12 year long dry period in the 1980-1990 pushed the remaining forests into critical status. The insufficient available water quantity had to increase.

Land ownership

The areas that are necessary for the development of the structures belong to public ownership. Along the middle section of the stream there are privately owned agricultural lands.

Policy targets

Groundwater Recharge

Increase Water Storage

Policy pressure

Directive	Relevant pressure

WFD identified pressure	4.1.2 Physical alteration of channel/bed/riparian area/shore of water body for agriculture
WFD identified pressure	1.3 Point - IED plants
Floods Directive identified pressure	Other FD pressure: water logging on agricultural land and urban sites

Policy impact

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

Requirement directive

Requirement directive	Specification
WFD-achievement of good chemical status	High nutrient and salinity level, dissolved oxygen status medium, not fulfills the requirements of good potential.
WFD-achievement of good ecological status	Hydro-morphological status. No zoning, lack of morphological variability along the water course.

Requirement directive remarks

In the WFD categorization the stream is designated as heavily modified water body, the goal is good ecological potential

Policy challenges requirements

This area is part of the highly concerned region of The National Droughts Strategy Text

Part of a wider plan

Non

Public consultation

Oui

Consultation activities

Activity stage	Activity type	Comments

Design phase	There were consultation with the private land owners of the area	There were no details provided

Has contractual arrangements

Non

Impacts and Monitoring

Monitoring System

Monitoring parameters

There is a qualification of the water body by the WFD components every year: Oxygen status, organic materials; nutrient load; acidity; salination, also priority substances. The biomonitoring includes: fitoplankton, Macrofita, macrozoobenton, fish fauna. Chemical parameters and fitoplankton are collected on monthly bases, the other annual bases. There are three sample point above the settlement, below the discharge point and at the estuary

Maintenance

Maintenance requirements

Half sided maintenance works along the stream to keep clean the peak flow cross section and provide the necessary zoning.

Impact Assessment Methodology

Performance impact assessment method

Unknown

Biophysical impact assessment method

The last WFD status assessment was carried out in 2015. The monitoring results are compared with the annual rating of monitoring results, which is published in the yearbook of the regional water management directorate.

Socio-economic Impacts

Benefits and co-benefits

There are lower defence costs at water logging periods because no pumping costs will be raised at the estuary lock where temporary storage area was created.
Amenity benefits in the settlement where a new 4 hectare park was created above the track of the culvert.

Direct benefits information

Biomass production.
Wildlife management, the area provides higher animal carrying capacity.
Assimilation of nutrient load of incoming water.

Ancillary benefits information

Amenities: This area is the Forest School of the nearby Gyula town, education and recreation facilities for school programs with regional importance. Total education activity 3-4 thousand education day per year (counted like workload in the person month). 3-6 visitor nights.

Biophysical impacts: Hydrology

Retained water

2000000.00

Retained water unit

m3/year

Information on increased water storage

Previously it was zero

Runoff reduction

50000.00

Information on runoff reduction

Runoff is attenuated by the detention pond upstream the settlement. The flow inside the settlement is controlled by the capacity increase of the crossing culvert. 50-60,000 m3

Information on peak flow reduction

Peak flow is reduced by the capacity of the detention pond. While on other parts of the catchment no runoff attenuation developments were made. The emphasis was given to the creation of storage areas.

Information on increased infiltration

Measures impact on groundwater is positive, there are enhanced possibility of infiltration at the retention pond. The reason of applying a closed culvert (among other aspects) across the settlement was the protection of groundwater, because an open watercourse would drain the groundwater at low water periods.

Information on Restoring hydraulic connection

At the stream estuary 5 ha can be inundated. Along the 31km middle section there are places where protected areas are reconnected to get water at high water periods.

Information on reducing flood risks quantity

Flood risk is managed with the upstream detention pond, the upgrade of the culvert across the settlement, the provision of the necessary drainage capacity of the stream and the creation of buffer zones at the estuary

Biophysical impacts: Biodiversity

Improved biodiversity

Oui

Information on improved biodiversity

The upgrade of the lock at the estuary enable the fish migration between the Körös stream and the Tisza.

Biophysical impacts: Water & Soil Quality

Water quality overall improvements

Positive impact-WQ improvement

Information on water quality overall

The forest assimilate the nutrient overloaded water from the near-by fishery. The detention pond above the settlement will serve as a reserve for dilution when water quality problems arise due to low water quantities in the stream. (The effluent of the town’s treatment plant discharges into the stream)

Biophysical impacts: Others

Ecosystem impact climate regulation

No information available

Lessons Learned

Key lessons

Surface water supply is an effective way of recharging groundwater storage capacity of forest soil in order to reduce droughts risk by enhancing the natural inter-seasonal allocation of water.

The key difference of this application compared to an area with generally the same problems is the possibility to sort out the transaction costs that emerge from in an area with multi-party ownership.

If the suitable complex knowledge happens to be at the right place, no further incentive is needed to take advantage of an upcoming possibility. †“ It highlights the fundamental need of education about the complex nature of the water-land use-ecosystem nexus.

Barriers

Barrier type	Barrier role	Comments
Existing institutional framework	Main barrier	Implementation required the reconciliation of forestry and water management interests. The main issues were: - Should the forestry pay for the water (resource)? It was resolved as ecological water supply - No water inlet at the front side of the flood waves because of flood safety reasons. - The forestry resign to demand compensation for damages what the water that remains out in its territory can cause.
Lacking coordination between authorities	Main barrier	The watershed belongs to three counties NUTS HU102 , 322, 331, and two different regions HU1, HU3 that belong to two different regional development fund subsidy level. It caused big difficulties and delay to secure EU funding and acknowledge the overstretch characteristic of the project.
Attitude of relevant stakeholders	Secondary barrier	Along the middle section of the stream there are privately owned agricultural lands without interest to change arable farming that constrains the retention capacities.

Drivers

Driver type	Driver role	Comments
Organisation committed to it	Main driver	Enabling factor was the initiative role of the water directorate and its co-operation with the national park to. The main enabling factor was the availability of funds that make possible to tackle problems that the settlement faced.

Success factors

Success factor type	Success factor role	Comments
Attitude of relevant stakeholders	Main factor	The main success factor was the forestry management's unequivocal understanding of the structural problem what threatens the sustainable operation: the lack of inundations. They grasped the first occasion to finance and negotiate such a development. The financial consolidation/restructuring process of the state forestry organizations provided financial sources that were used to improve fundamental production conditions.

Cost effectiveness

The development was a mix of different type of measures. There is no possibility to compare by such dimensions.

Flexibility / Adaptability

The implemented measures are flexible. From technical point of view it can service higher water retention needs and governing water to adjacent areas if the necessary land use agreements are set.

Sources

Sources

A FEKETE-KÖRÖS ERDEINEK Ví ZPÓTLÁSA ÉS 15 ÉVES ÖKOLÓGIAI EREDMÉNYEI