Multi-purpose water management development along the Körös-ér, Hungary

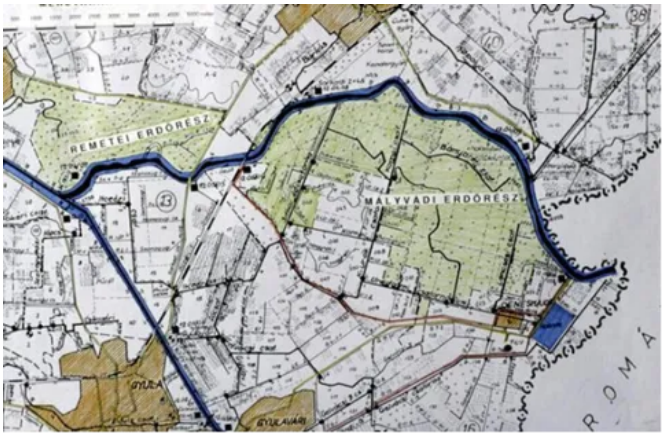
Year of issue

2025

Summary

The Körös-ér catchment lies in a drought-prone part of Hungary and is a heavily modified water body with nutrient inputs from urban and agricultural sources. Recurrent water-logging causes temporary flooding in spring and after cloudbursts. To address both extremes (floods and shortages) the water directorate upgraded control structures, reconnected ~2.5 km of former floodplain at the estuary, improved sluices to allow retention while clearing bottlenecks for flood conveyance, increased urban drainage capacity (via a closed conduit), and added an upstream retention pond. Since completion (2011), management has shifted toward active small-water retention: today water is stored at three points along the Körös-ér - at the mouth (0+000), at 5+850 (betétpallós gate), and at 16+675, where DINPI built a retention structure in 2022 with a lateral sluice and ditch to inundate low-lying grasslands, boosting retained volumes and waterfowl habitat (boards are removed at high water; overtopping is possible). In 2025, under the “Vizet a tájba / Water to the Landscape” programme, managed in-channel storage and controlled inundation were also implemented near 22+884 (≈14 ha, ≈46,000 m³). Fish from the Tisza have re-appeared in reaches previously isolated.

Photo Gallery



Location

47.047282, 19.984447

Project

NWRM

National ID

HU_03

Sector

Hydromorphology

Installation Date

2011-08

Implementation status

Completed

Contact

Gábor Ungvári, REKK

Overview

Location of the project

Former floodplain of the River Körös near the Town Gyula, County Békés

Country

Hungary

NUTS2 Code

Közép-Magyarország

Sponge measures implemented in the case study

Ponds and scrapes

Floodplain restoration and management

Objectives

Reconnect former floodplain at the estuary on a ~2.5 km section.
Upgrade sluices to enable retention and remove bottlenecks to improve flood conveyance (works applied along the ~40 km channel).
Provide urban drainage capacity: build a closed conduit (~1,200 m) through Nagykőrös and raise drainage coverage from 37.7% to 100%; create ~4 ha of green space at surface.
Create an upstream retention pond to control runoff and store water (design ~100,000 m^3).
Protect groundwater in town by using a closed culvert instead of an open channel.
Modify the Tisza confluence structure to allow fish passage and enable operation of a seasonal (later permanent) reservoir at the mouth.

Involved partners

Authority type	Authority name	Authority role	Comments	Authority responsibility
Regional / sub-national water authority	Állami Erdészeti Szolgálat Kecskeméti Igazgatóság, National Forestry Service – Kecskemét - Middle Tisza District Water Directorate	Determination of design details of the measure	Advise on planning	Supporting
Local water authority	Körösvidéki Vízügy Igazgatóság (Körös River Water Directorate)	Implementation	Co-planner	Responsible
Nature park	Duna-Ipoly National Park	Determination of design details of the measure	National Park	Responsible
Forest owners	ÁPV Rt (National Privatization and Asset management Ltd, state owned)	Other	Owner of the regional forestry management organization, Dalerd – financial sources for the development	Responsible
Forest owners	DALERD Rt (South-Alföld Forestry Ltd.	Implementation	Lead Planner, implementer of the development	Responsible

Site Information

Climate Zone

Warm temperate dry

Temperature (°C)

10.30 °C

Evapotranspiration

800.00 mm

Runoff coefficient

0.25

Imperviousness

0.25 %

Elevation range

85 m

Slope range

0-1%

Vegetation class

Species-rich wet meadows (grasslands) : chiefly Molinia meadows (6410, ~244 ha) and alluvial meadows (6440, ~202 ha) along the Kőrös-ér/Gógány-ér, with smaller patches of willow/ash riparian woods.

WFD Ecological status

Moderate

WFD Chemical status

Good

Design and Implementation

Project scale

Meso

Project scale specifications

The forest site is cc 2000 ha

Project area

48100

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

5.00 ha

Size

5.00

Size unit

ha

Design capacity

100000 m3

Principles

The basic restoration principle was to simulate the environmental conditions for the forest it had before the river regulation works as much as possible. Some design principle:
Use the existing infrastructure and former river beds, channels as much as possible in a landscape friendly manner.
Minimize future operation and maintenance costs.
Do not create conflicts with the other water uses of the area. The functioning of the system must be agreed with the other land users and owners of the area.

Factor 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.

Constraints

Negative way: 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.

Favourable preconditions

Positive way: The areas that are necessary for the development of the structures belong to public ownership. Upstream from the settlement there is interest for recreational use of the stored water

Financing

Total cost

970000.00 €

Costs investment

3667000.00 €

Costs investment information

Present value of the project 5% dc rate 30 year period, 2008 € exchange rate

Costs capital

3730000.00 €

Costs capital information

Project calculations include the estimated cost reduction in operational costs

Costs land acquisition

145000.00

Costs land acquisition unit

€ (total value)

Costs land acquisition information

Land value is part of the capital cost, cc 5ha was purchased

Costs operation maintenance information

There are cost savings due to forgone pumping cost 88.800€ (NPV, 5%, 30 year lifespan)

Costs operational

25400.00 €

Costs operational information

The NPV of total maintenance cost 57.100€, but there is a forgone cost of desludging 31.700€

Financing authorities

Authority name	Type of funding
DALERD Rt (South-Alföld Forestry Ltd.	Local funds
European Union	EU-funds: Cohesion and regional development funds

Compensations

No

Policy and Governance

Policy description

The Körös stream catchment lies in the most droughts stricken region of Hungary. There are repeating surface water resource shortages, the ground and subsurface water levels are declining at the uppers section. There are nutrient overload in the stream and in the ground water as well both from point and diffuse sources and both agricultural and urban. There are hydro-morphology problems as well.
Meanwhile recurring water logging periods cause temporary problems for the settlement and the agricultural areas.

Land ownership

All public ownership; about 5 ha were purchased.

Policy targets

Runoff control

Pollutants Removal

Groundwater Recharge

Target remarks

Regulation of hydrological cycle and water flow
Self-regulation of water by filtration / storage / accumulation by ecosystems

Policy pressure

Directive	Relevant pressure
WFD identified pressure	4.1.1 Physical alteration of channel/bed/riparia n area/shore of water body for flood protection

Policy impact

Directive	Relevant impact
WFD identified pressure	Damage to groundwater dependent terrestrial ecosystems for chemical / quantitative reasons

Requirement directive

Requirement directive	Specification
WFD-mitigation of significant pressure	Adverse effects of hydromorphological changes on groundwater and riparian ecosystems

Requirement directive remarks

The measures were made before Hungary joined the EU, so the specifications are backward induction of the recent classification.

Policy challenges requirements

The droughts challenge, but this development wasn’t induced along national policies. It was a local initiative to tackle the site specific problems that originates in a more general, regional scale effect.

Part of a wider plan

Yes

Wider plan

Name
Implementation of the WFD

Public consultation

No

Has contractual arrangements

No

Impacts and Monitoring

Monitoring System

Monitoring requirements

There is no permanent monitoring about the changes what introduction of the measure generates, there are event-by event surveys that are conducted mostly from botanical approach.

Monitoring parameters

chemical

Maintenance

Maintenance requirements

There is no extra maintenance required. There is no eutrophication process in the channel system due to the shadow that the forest provides. It means that there were no need to clear emerging vegetation or dredge the branches.

Impact Assessment Methodology

Performance impact assessment method

Catchment outlet

Performance impact estimation information

Comparison to the previous status:
Groundwater - water level in wells situated in the forest.
Biomass – not yet assessed, it will take place next year in the context of the decadal forestry plan supervision

Socio-economic Impacts

Direct benefits

The prevention of the loss of future timber production due to water shortage is the main benefit of the application.
Potential increase of timber mass growth rate compared to other forest sites will be investigated next year (20 years, two forest planning cycles from the implementation).
Cost reduction due to natural regeneration of some tree species (for example fraxinus ornus).
Farmer & private land participation: under Vizet a tájba, landowners around Nagykőrös, Abony, Törtel, Tószeg, Mikebuda offered parcels for temporary inundation; the scheme targets drought relief, soil-water supply and local micro-climate cooling.

Biophysical impacts: Hydrology

Information on retained water

The Körös-ér–Gerje–Perje system’s retention & controlled inundation now result in “several hundred thousand m³” infiltrating to soil, raising groundwater levels (programme-level statement that includes Körös-ér).

Information on increased water storage

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.

Runoff reduction

2000000.00

Runoff reduction unit

m3/year

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.

Information on peak flow reduction

Peak flow is reduced to the capacity of the detention pond, while other part of the catchment no runoff attenuation developments were made the emphasis was given to the storage areas

Information on increased groundwater level

There is no reliable monitoring, but a 2,5 meter increase of ground water level was detected in a forest dwell 300 meters from the channel after the re-introduction of the water supply of the area.

Information on soil moisture

Detention ponds and storage areas will increase infiltration, but only very local effect

Information on Restoring hydraulic connection

Hydraulic connections are developed cc half of the year 180 days

Biophysical impacts: Biodiversity

Improved biodiversity

Yes

Information on improved biodiversity

Improved habitat for species. Increased diversity of plant and bird species. There are surveys and list of the species, but it is not quantitative.
The 2022 DINPI structure at 16+675 expands shallow wet grassland habitat and supports waterfowl nesting/feeding.

Biophysical impacts: Water & Soil Quality

Information on water quality overall

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)

Information on soil quality overall improvements

neutral, no change

Lessons Learned

Key lessons

The development aims to manage both water extreme of a small water course water logging problem in residential and agricultural areas and low water or lack of water in the stream that results in bad water quality due to point and diffuse effluents. The technical elements are necessary, but not sufficient parts of NWRM measures. Using only the limited public lands along the water courses can provide only a limited set of the potential effects. Water quality improvements by natural assimilation needs more surface to interact with the polluted water.
EU funds can help overcome the technical shortages, but it can†™t make the interest resolution on a landscape scale avoidable between the different public and private interests. The works are ready to supply the potentially changing demand for more retention.
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 interseasonal 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 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 for education about the complex nature of the water-land useecosystem nexus.

Barriers

Barrier type	Barrier role	Comments
Other	Secondary barrier	the counter interest of private land owners along the watercourse to agree on water tolerant land use practices
Specific financing rules	Secondary barrier	Should the forestry pay for the water (resource)? It was resolved as ecological water supply
Legal obligations / restrictions	Secondary barrier	No water inlet at the front side of the flood waves because of flood safety reasons.
Attitude of relevant stakeholders	Secondary barrier	The forestry resign to demand compensation for damages that the water that remains out in its territory can cause

Drivers

Driver type	Driver role	Comments
Organisation committed to it	Main driver	The forestry management’s unequivocal understanding of the structural problem that threatens the sustainable operation: the lack of inundations. They grasped the first occasion to finance and negotiate such a development.

Success factors

Success factor type	Success factor role
Financing possibilities	Main factor
Legal obligations	Main factor

Cost effectiveness

The applied sluices for this purpose are very robust, low-tech solutions. There were no other solution that provides control of the inflow for lower price.

Flexibility / Adaptability

The application depends on the sufficiently lasting high water level in the river that now a downstream dam provides. It solves the most pressing predictability issue.
On the other hand the forest can play an equalizer role. The area could absorb more water, if technical flood risk concerns were solved. It means the area can adapt to different regimes to receive water. On the other side, because of the forest's ability to store water it can adapt by decreasing intake in case of growing competing water demands during water shortage periods in the summer.

Transferability

There were no such applications proposed elsewhere in the country.
The application could be used all around the country.
The necessary precondition is the complex problem identification and task definition at the responsible/acting institutions.
The missing key element of transferability is the conflict resolution in order to create the necessary conditions of land conversion.

Basin characteristics influence

The relief of the area – the former river channel and side arm residues - provided a natural basis for the new water supply network. A key point of providing water from the river for previously cut floodplains is the duration of suitable water level.

Sources

Sources

KÖRÖS-ÉRI BELVíZFÅCSATORNA MEDERFEJLESZTÉSE ÉS REKONSTRUKCIÓJA Riverbed development and reconstruction of the Körös-stream drainage channel. “ Feasibility study

Good practices handbook

Yearbook of the Middle Tisza District Water Directorate

A HUDI20022 Gógány- és Kőrös-ér mente kiemelt jelentőségű természetmegőrzési terület fenntartási terve

Befejeződött a Kőrös-ér projekt megvalósítása

Gógány- és Kőrös-ér mente | Natura 2000 (HUDI20022)

Vízvisszatartás lehetőségei a Kőrös-ér, Gerje, Perje vízrendszerében a gazdálkodók együttműködésével

Közel egymilliárdos uniós fejlesztés a Kőrös-éren