Pollution Treatment on the Glinščica, Slovenia

Year of issue

2025

Summary

Installed in 2006 by Limnos Ltd., the innovative ecoremediation (ERM) system on a polluted tributary of the Glinščica combines a sedimentation pond (to settle coarse particles and reduce flow velocity), a vegetated sand-filled drainage ditch with reeds, and a short meandered channel. Early monitoring (2008–2009) reported strong reductions in nutrients and suspended matter, with effectiveness sustained by routine maintenance (including sediment removal in 2008). The facility remains in place and in use, is maintained by the City of Ljubljana, and is incorporated into local educational activities; project managers confirm it has not been amended. Since installation, additional nature-based solutions for flood retention and stormwater management have been implemented elsewhere in the Glinščica catchment - most notably the Brdnikova dry retention reservoir and works at Podutik - which have helped mitigate recent heavy-rain events. In the technical literature the site is also referenced within a broader “Multifunctional Water Reservoir (MWR) Ljubljana,” where upgrades commissioned in 2014 enhanced ecological and educational functions without changing the ERM’s treatment role.

Photo Gallery





Location

46.0761, 14.45249

Project

NWRM

National ID

Slovenia_02

Sector

Hydromorphology

Installation Date

2006-01

Implementation status

Completed

Contact

REC

Overview

Location of the project

This is just off Podutiška cesta near the historic Kavšek Bridge over the Glinščica. Parcels listed in the thesis: KO Glince 668, 667/1, 660/1.

Country

Slovenia

NUTS2 Code

Zahodna Slovenija

Sponge measures implemented in the case study

Ponds and scrapes

Swales

Infiltration Trenches

Objectives

Clean the polluted inflow using a chain of a sedimentation pond → vegetated sand-filled drainage ditch (with reeds) → short meandered channel, while slowing flow, reducing erosion, and enhancing biodiversity; also to serve education/awareness (integration in a water learning trail). No explicit numeric targets were found ex-ante, but subsequent monitoring documents substantial nutrient reductions.

Involved partners

Authority type	Authority name	Authority role
—	Limnos ltd.	—
Local water authority	MOL-Municipality of the Ljubljana	Financing

Site Information

Climate Zone

Cool temperate moist

Precipitation

1343.00 mm

Temperature (°C)

9.70 °C

Elevation range

300 m

Slope range

0-1% Average channel gradient reported as 0.006

Vegetation class

On-site treatment vegetation is emergent wetland macrophytes dominated by common reed (Phragmites australis) in the vegetated drainage ditch; the municipal page notes planting with marsh plants.

WFD Ecological status

Good

WFD Chemical status

Failing to achieve good

Water quality status

Increased pollution/toxicity in Glinščica linked to leaking septic tanks/sewer overflows, stormwater runoff, and nearby agricultural non-point sources. The Podutik reservoir/Glinščica system is affected by these inputs.

Design and Implementation

Project scale

Micro

Project scale specifications

a site-specific intervention on a small tributary (sedimentation pond + vegetated ditch + short meandered reach; ERM length ~70 m), addressing local water quality/hydromorphology.

Size

225.00

Size unit

m2

Financing

Total cost

166723.00 €

Total cost information

€166,723 for the project “Ekoremediacijski objekt na Glinščici”
€23,000 in 2011 for maintenance/monitoring and flood-related repairs at the ERM.

Costs capital information

The cost was 100 Euro/m2 for investment

Costs operation maintenance information

Operation is about 30-50 Euro/m2/year

Financing authorities

Authority name	Financing share
City of Ljubljana	100 %

Compensations

Non

Policy and Governance

Policy description

Riparian development, pollution incident. a polluted tributary where urban stormwater (meteorna kanalizacija) meets a small brook carrying agricultural non-point pollution; the ERM was built to treat this inflow and restore local habitat.

Policy targets

Runoff control

Pollutants Removal

Improved Biodiversity

Oher Societal Benefits

Part of a wider plan

Non

Public consultation

Oui

Consultation activities

Activity type
Improved public acces

Has contractual arrangements

Non

Impacts and Monitoring

Monitoring System

Monitoring requirements

Limnos monitored 2006–2009 for nutrients, physico-chemistry, toxicity and biota, demonstrating substantial nutrient reductions when maintenance was performed.

Monitoring parameters

Multi-season programme covered BOD_5, organic N, NH_4^+, NO_2^-, NO_3^-, total N, total P, plus pH, salinity, oxygen balance, temperature, specific (non-)synthetic pollutants, water/sediment toxicity, reed productivity, and plant diversity. Hydromorphology noted quantity & dynamics of flow and substrate conditions. Reported removal in the third season: NO_2^- 84%, NO_3^- 68%, total N 40%, etc.

Upstream station

The water level was measured at Inflow and at additional 6 sampling points in the VDD.

Downstream station

Outflow of the VDD and the outflow of the RBM

Maintenance

Maintenance requirements

Regular municipal maintenance like mowing, debris/sludge removal and conveyance upkeep (with a key pond desilt in 2008) keeps the ERM effective.

Impact Assessment Methodology

Performance impact assessment method

Catchment outlet

Performance impact estimation information

pH, EC, DO and T were measured with portable meters WTW Multiline P4 according to Standard Methods. Hydraulic residence time (HRT) was measured with the tracer test with CaCl on 25.7.2007 and 26.7.2007. And statistical analyses.

Socio-economic Impacts

Direct benefits

Education & access: The City plans the ERM as part of a water learning trail; information boards and improved public access are listed measures.

Biophysical impacts: Hydrology

Retained water

118.70

Information on retained water

Creation of a sedimentation pond, a vegetated drainage ditch and a short meandered channel (≈70 m). The City states the ERM slows flow, mitigates erosion and retains water; this can help during dry periods (no volumes given). 118.7m3

Biophysical impacts: Biodiversity

Information on improved biodiversity

System planted with common reed (Phragmites); the City reports 49 plant species recorded on the ERM and notes increasing biodiversity. (RiverWiki’s macrophyte results are marked “inconclusive”.)

Biophysical impacts: Water & Soil Quality

Water quality overall improvements

Positive impact-WQ improvement

Information on water quality overall

The results showed efficient removal of BOD5 (9%), organic N (24%), ammonia (7%), nitrites (84%), nitrates (68%), total N (40%) and total P (3%) in the entire ERM system in the third season. Vegetated ditch was efficient in removal of ammonia (38%), nitrites (91%) and nitrates (63%) and meandered stream was efficient in removal of total P (10%). With the exception of suspended and dissolved solids, pollutants concentrations at the end of the ERM system stayed within the permitted levels for outflow. The results showed the entire ERM system to be more efficient in removal of nitrites and ammonia in season 2008/2009 compared to previous year. Removal of sediments from the pond proved to be essential for efficiency of vegetated ditch, since the ditch reached higher efficiency for almost all parameters after maintenance work in the summer 2008

Water quality improvements - Phosphorus (P)

3.00

Water quality improvements - Phosphorus (P) - Unit

% reduction pf pollutant

Water quality improvements - Nitrogen (N)

40.00

Water quality improvements - Nitrogen (N) - Unit

% reduction pf pollutant

Information on water quality improvements (TSS)

SS increased

Soil quality overall improvements

Negative impact-SQ deterioration

Biophysical impacts: Others

Ecosystem impact climate regulation

Not relevant for the specific application

Information on other biophysical impacts

Microclimate/drought buffering: Municipality notes water retention can play an important role in dry periods (adaptation benefit). No site-specific data on evapotranspiration, greenhouse gases or carbon.

Lessons Learned

Key lessons

Regular maintenance is decisive. Performance jumped after desilting the sedimentation pond in July 2008, showing that the ERM's efficiency depends on routine sludge/debris removal and vegetation upkeep.
The combined design works. A staged chain—sedimentation pond → vegetated drainage ditch (VDD) → meandered reach—delivered marked nutrient reductions (e.g., NO_2^- −84%, NO_3^- −68%, TN −40%) and is a sound option for polluted run-off with variable flows. This aligns with the case's stated lesson that a regularly maintained ERM can efficiently decrease pollutants and that the VDD+meander combo is promising.
Hydromorphology requires attention. While water-quality improved, RiverWiki notes a deterioration signal for "quantity & dynamics of flow" and "substrate conditions," reminding practitioners to track morphology alongside chemistry and adapt the layout/operations if needed.
Long-term anchoring helps. Municipal ownership, budgeting and use as an educational stop kept the installation active and cared for years after commissioning, an underrated enabler of continuity.
Highly fluctuating inflows shape processes. Monitoring found even distribution of the denitrification narG gene across the VDD under flashy hydraulics, useful insight for similar small urban/agri catchments.

Barriers

Barrier type	Barrier role	Comments
Expected maintenance needs	Main barrier	Flashy flow regime and solids: suspended solids remained problematic; the pond clogged and required desilting.
Other	Secondary barrier	Persistent upstream pressures (leaky sewers, septic overflows, diffuse agri runoff) that the ERM alone cannot eliminate.
Attitude of decision makers	Secondary barrier	Dependence on continuous municipal O&M (mowing, debris/sludge removal, conveyance upkeep) to sustain performance.

Drivers

Driver type	Driver role	Comments
Organisation committed to it	Main driver	Dedicated municipal role (Mestna občina Ljubljana) with ongoing care and public-facing use (learning trail).

Success factors

Success factor type	Success factor role	Comments
Existing technical standards	Main factor	Timely maintenance, especially the 2008 desilt that restored treatment efficiency.

Success factor type	Success factor role	Comments
Attitude of relevant stakeholders	Secondary factor	Structured monitoring (2008–2009) enabling adaptive management and evidencing results.

Transferability

Highly transferable to small, mixed-pollution tributaries and stormwater outfalls. Success hinges on routine O&M (esp. desilting the pond), capacity to manage flashy inflows, and space for a pond-VDD-meander chain. Watch solids loads, upstream sewer/agri pressures, and potential hydromorphology trade-offs; keep monitoring nutrients/physico-chemistry to adapt.

Sources

Sources

Case study: Ecoremediation System (ERM) for treatment of polluted tributary of Glinscica, Slovenia

Run-off treatment of highly fluctuating waters with subsurface vegetated drainage ditch and river bed with meanders

Vegetated ditches for treatment of surface water with highly fluctuating water regime

Phytoremediation and Stream Revitalization for Amelioration of Ecological Status of Stream Glinščica, Slovenia

Ekoremediacijski objekt na Glinščici (City project page)

Pregled vseh projektov