Gradaščica catchment in Ljubljana, Slovenia

Year of issue

2026

Summary

Sponge Scapes case study SI 08

The rainfall partitioning study plot is situated in the city of Ljubljana, Slovenia and is part of the Gradaščica river catchment (that covers 160km2). The Gradaščica River has typical torrential characteristics in the headwater part of the catchment, which increases the risk of floods in the downstream areas that are populated and urbanized, such as the city of Ljubljana.

This case study research is not only key to evaluating the sponge function of forests but also holds significant interest for local stakeholders and the general population in terms of reducing flood and drought risks, as well as mitigating related issues like soil erosion.

Photo Gallery



Location

46.0422222, 14.4925

Project

SpongeScapes

Sector

Forest

Installation Date

2014

Implementation status

Completed

Overview

Location of the project

The Gradaščica catchment in Ljubljana is located in a hilly pre-alpine region, with elevations ranging from 300 to 1000 meters above sea level. Approximately 70% of this area is forested, mainly with broad-leaved and mixed forests, which play a crucial role in the local ecosystem and water management. Within SpongeScapes, we are investigating how trees reduce rainwater run-off, which is crucial in flood-prone areas.

Sponge measures implemented in the case study

Maintenance of forest cover in headwater areas

Afforestation

Objectives

The objective of this case study is to quantify the decrease in stormwater runoff resulting from rainwater intercepted by trees.

Involved partners

Authority type	Authority name	Comments
Private property owners	Landowners	Landowners
Farmers	—	—
Other	Dobrova-Polhov Gradec	The municipality of Dobrova-Polhov Gradec in Slovenia
Other	Ljubljana	Capital and largest city of Slovenia

Authority type	Authority name	Comments
Other	Slovenia Forest Service	Zavod za gozdove in slovenian. The mission of Slovenia Forest Service is to preserve Slovenian forests and all of their functions with close-to-nature forestry. Effective and sustainable forest management and use are essential for conserving nature within forested areas, benefiting both present and future generations.
Research institute / University	Fisheries Research Institute of Slovenia	Zavod za ribištvo Slovenije in Slovenian

Site Information

Climate Zone

Cool temperate moist

Precipitation

1500.00 mm

Temperature (°C)

11.50 °C

Runoff

850.00 mm

Runoff coefficient

0.57

Elevation range

300-1000

Design and Implementation

Project scale specifications

The topography of the Gradaščica river catchment is characterised by steep slopes in the upper part of the catchment, which results in the runoff from precipitation being almost immediate during periods of heavy rainfall. This has led to a swift response from the river system, transportation of material, significant soil erosion and the potential for flooding in the lower reaches of the catchment.

Project area

600 m2 (research plot); 160 km2 (catchment)

Project area specifications

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The Gradaščica river catchment covers 160 km² and is almost 70% forested.

Policy and Governance

Land ownership

UL FGG (research plot); a lot of different private owners as well as public land (whole catchment)

Part of a wider plan

Oui

Public consultation

Non

Has contractual arrangements

Non

Impacts and Monitoring

Monitoring System

Monitoring parameters

Measurements of rainfall interception and throughfall have been taken at a study plot for two different tree species, pine and birch. In addition, the drop size distribution has been recorded. The soil characteristics of the plot area have been thoroughly investigated, with several soil profiles in place for ongoing monitoring of soil moisture temporal dynamics.

These high-frequency and long-term datasets are very useful in understanding the soil water retention capacity. However, it should be noted that making predictions for the entire catchment can be difficult due to high spatial variability and the anthropogenic character of the soil in the plot.

Long-term measurements of water level and river discharge in the catchment have been carried out at three gauging stations, two on Gradaščica and one on its tributary Šujica. In addition, there are three meteorological stations in the catchment area, namely, Dvor, Topol and Pasja ravan. These long-term hydrological and meteorological measurements will be essential in assessing the sponge function of forests in the catchment.

Impact Assessment Methodology

Performance impact estimation information

Land use change. Forests have an important impact on the water balance, reducing runoff and changing groundwater levels. Through modelling and field measurements we will evaluate the influences in land use change in the catchment on runoff and water retention.

Lessons Learned

Key lessons

The possibility of reducing both flood and drought risks, as well as related risks such as soil erosion, will be of particular interest to local stakeholders and the general population.