Polder management near Altenheim, Germany

Year of issue

2025

Summary

Ecological flooding has been implemented in a polder area near Altenheim, Germany, as part of the Integrated Rhine Programme (IRP). Covering approximately 520 hectares, the Altenheim polders serve a dual function: ecological enhancement and flood retention, with a capacity of up to 17.6 million m³. Since 2001, controlled ecological flooding is triggered when the Rhine's flow exceeds 1550 m³/s, with infrastructure allowing flows up to 80 m³/s. This approach has significantly improved biodiversity, groundwater dynamics, and habitat conditions.

The project also created recreational opportunities and enhanced landscape connectivity. However, challenges arose related to forest adaptation (notably shifts in tree species), mosquito proliferation, and groundwater level management. In response, new measures were introduced—including permanent swing barriers (installed in 2021) to protect wildlife during floods, and coordinated post-flood clean-ups involving local authorities and forestry services.

Recent evaluations confirm ongoing positive ecological effects, including increased amphibian, fish, and mammal presence. Regular maintenance and monitoring are coordinated by the Regional Council (Regierungspräsidium Freiburg), ensuring the multifunctional goals of flood protection, ecological restoration, and local engagement are maintained.

Photo Gallery



Location

48.464318, 7.809403

Project

NWRM

National ID

Germany 02 light

Sector

Hydromorphology

Installation Date

1987

Implementation status

Completed

Contact

Sabine Tutte, ACTeon

Overview

Location of the project

The Altenheim polder area is located west of the village of Altenheim (part of the municipality of Neuried), in Baden-Württemberg, Germany.

Country

Germany

NUTS2 Code

Freiburg

Sponge measures implemented in the case study

Floodplain restoration and management

Restoration and reconnection of seasonal streams

Reconnection of oxbow lakes and similar features

Forest riparian buffers

Re-naturalisation of polder areas

Involved partners

Authority type	Authority name	Authority role	Comments
Other	Regional Council Freiburg	Determination of design details of the measure	The Regional Council Freiburg is a sub division of the Ministry of the Environment in Baden Wurtemberg. It was in charge of the planning and design of the measures, as well as of the publicity
Other	District Council	Other	Approval of the measures
Other	Community of Neuried	Other	Member of the Mosquito fighting task force
Forest owners	Forest owners	Other	Needed planning reliability and supported therefore the ecological flooding approach
NGO	Environmental NGOs	Initiation of the measure	Supporter of the ecological flooding approach

Site Information

Climate Zone

Cool temperate dry

Precipitation

800.00 mm

Temperature (°C)

9.50 °C

Runoff

1060.00 mm

Slope range

0-1%

Vegetation class

Alluvial floodplain forest.
This includes species typical of temperate riparian zones along the Upper Rhine, such as:
Hardwood species: oak (Quercus robur), ash (Fraxinus excelsior), elm (Ulmus spp.)
Softwood zones (in wetter areas): willow (Salix spp.), poplar (Populus spp.)
Understory and ground vegetation: includes reed beds, sedges (Carex spp.), and other floodplain herbaceous plants

Design and Implementation

Project area

520

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

520.00 ha

Basis of design

Use for retention approx. every 10 years.

Financing

Total cost

1300000000.00 €

Costs investment information

The adaptation of the forest was "cost neutral" since the community of Altenheim used the money received by the state as compensation to place funds and the interests are invested into forestry.

Costs capital

1300000000.00 €

Costs capital information

This money had to be invested for the 13 retention areas of the Integrated Rhine Programme.

Costs operation maintenance

450000.00 €

Costs operation maintenance information

Upkeeping costs per retention area. This depends on the length of the dykes, the number of pumping stations, the length of streets inside the polder etc.

Administrative annual costs

100000.00 €

Administrative annual cost information

The Regional Council hopes that this number will decrease sooner or later due to new knowledge.

Financing authorities

Authority name	Type of funding	Financing share
Federal Republic of Germany	National funds	41,5%
State of Baden-Württemberg	Sub-national funds	58,5%

Compensations

Oui

Compensations annual information

Every landowner inside the polder receives 20% of the land value as compensation. In return the Regional Council Freiburg enters to the title register. Forest owners are compensated once, since it is too complex to discuss after every flooding whether damages are new or old. After flooding events experts assume the damage happen on fields and the farmers are compensated individually

Policy and Governance

Policy description

Physical alteration of the channel, the river bed and the floodplain due to hydropower plants, flood protection and an easier navigability on the Rhine.

Land ownership

The land is mainly publicly owned by the State of Baden-Württemberg, with some areas owned by the municipality of Neuried and private landowners. The site is managed by the Regional Council of Freiburg.

Policy targets

Increase Water Storage

Peak-flow reduction

Improved Biodiversity

Part of a wider plan

Oui

Wider plan

Name	Comments
Integrated Rhine Programme	The main focus of this programme is flood protection by restoring the floodplain on the upper Rhine upstream of Karlsruhe.

Public consultation

Oui

Consultation activities

Activity stage	Activity type	Comments
Implementation phase	Information evenings	Since the ecological flooding is a quite new concept publicity has to be done in order that neighboring communities accept it. This has to be done continously. The polder Altenheim is a good exemple that shall calm down the worries of other communities were a polder shall be constructed
Other	site visits	—

Has contractual arrangements

Non

Contractual arrangements

Arrangement type	Responsibility	Name	Comments
Contractual agreement	Responsible	Treaty of Versailles	Treaty between France and Germany allowing France using the Rhine for Hydropower. Due to the construction of numerous dams the Rhine lost 90% of its floodplain and made the integrated rhine programme necessary
Organisational arrangement	Supporting	Comission for the Protection of The Rhine	The riparian countries of the Rhine formed this comission to improve the water quality and the overall ecological state of the river. Navigability is moreover an important issue

Impacts and Monitoring

Monitoring System

Monitoring parameters

Inside the polder several parameters were monitored to document the impact of ecological flooding on water and matter balance, state of groundwater, water courses and lakes, soil and biodiversity. Moreover, the water retention during flood events was documented.

Impact Assessment Methodology

Performance impact assessment method

Catchment outlet

Performance impact estimation information

The amount of terrestrial plants and the domination of single species in different vegetation layers was determined by rough assuming. Aquatic macrophytes were documented by the estimation method of Kohler and Janauer. Beetles were counted by pitfalls, the diversity of birds was determined by observing and counting nests.

Socio-economic Impacts

Direct benefits information

Lease of land around the swimming lake.

Ancillary benefits information

Recreational value since the polder area is used for hiking, jogging, cycling and canoeing.

Biophysical impacts: Hydrology

Hydrological effects

Strong influence on the fluctuation of the water table.

Information on increased water storage

The water is stored in watercourses inside the polder and in case of retention also in the forest.

Information on runoff reduction

No data available.

Information on peak flow reduction

During the last flood on the Upper Rhine in the 90's, the water retention inside the polder led to a reduction of the gauge of 24 cm and avoided thus the inondation of important industrial cities (Karlsruhe, Speyer, Mannheim).

Information on increased groundwater level

Ecological Flooding leads to rising groundwater levels outisde the polder that can affect property. Therfore a complex drainage system including channels, wells,lakes and pumping stations was created.

Information on Restoring hydraulic connection

In order to distribute evenly water inside the polder, a system of water courses was reconnected and restored, the so called Schluten

Biophysical impacts: Biodiversity

Improved biodiversity

Oui

Information on improved biodiversity

Due to ecological flooding alluvial plant and animal communities could be established. The floods diversify the water courses which thus became habitat of different invertebrate and fish species. Several groundbeetle and dragonfly species came back to the new established alluvial forest. However, the regular flood events are source of mosquito pests that require a treatment by the members of a taskforce.

Biophysical impacts: Water & Soil Quality

Water quality overall improvements

Negative impact-WQ deterioration

Information on water quality overall

Measurements have shown that the overall water quality of the Rhine deteriorates when the water passes the polder. However, no danger for the drinking water supply exists.

Soil quality overall improvements

Positive impact-SQ improvement

Information on soil quality overall improvements

Due to ecological flooding, the forest soil is constantly enriched by organic sediments serving as fertilizer for the plants.

Biophysical impacts: Others

Ecosystem impact climate regulation

No information available

Lessons Learned

Key lessons

It is possible to adapt and modify the ecosystem inside a polder to water retention events by ecological flooding. Due to the measures the polder became a valuable recreational area for the citizens of the neighboring community. However, expensive protection measures for Altenheim are needed to avoid damage by rising groundwater level in consequence of ecological flooding.

Barriers

Barrier type	Barrier role	Comments
Legal obligations / restrictions	Main barrier	Ecological flooding does not reach the entire polder area. The good functioning of hydropower plants has priority. As a consequence, the flooding process depends on the Rhine discharge.
Other	Secondary barrier	During ecological flooding, humans have to be kept out of the area and its surroundings. During the first test ecological flooding, animals could not escape from the polder area, as they were scared by the humans which were watching on the dykes. Many deers drowned in the flood that was hyped by German tabloids as scandal. The principle and usefulness of ecological flooding is often not understood by citizens. On other planned retention areas (polder Schwanau) of the Integrated Rhine Programme communities went to court against the state of Baden Wurtemberg. They fear for example that rising groundwater levels could damage their houses, or that dirty Rhine water could affect the drinking water aquifer.

Drivers

Driver type	Driver role	Comments
Legal obligations	Main driver	A sudden inondation of the polder would have caused a severe impact on the ecosystem. According to law, impacts have to be avoided, minimised or balanced. This led to the development of the ecological flooding concept.
Legal obligations	Secondary driver	Determines the amount of ecological flooding depending on the Rhine discharge.

Success factors

Success factor type	Success factor role	Comments

Attitude of decision makers	Main factor	The regional council had to meet many restrictions (international contracts, lack of space). Nevertheless, they created with the polder Altenheim an example for the whole Integrated Rhine Programme (IRP) showing that ecological flooding works and that a polder area has multiple benefits.
Financing possibilities	Main factor	The maintenance of a polder is very expensive. The international importance of the project enabled the mobilisation of sufficient funds.
Attitude of relevant stakeholders	Secondary factor	One argument against ecological flooding is the fear of people towards a mosquito pest. Several communities formed a tasked force (the KABS), which is controling the mosquito population. This programme is very complex but effective.

Sources

Sources

Auswirkungen der ökologischen Flutungen der Polder Altenheim

The Integrated Rhine Programme, flood control and restoration of former floodplains along the upper rhine

Integrated Rhine Programme Baden Wurtemberg

Einsatz der Polder nicht notwendig

Polder Altenheim ist vernetzt