

MEUSE RIVER

Title	THE RIVER RESTORATION PROJECT OF THE BORDER MEUSE
Organization	WWFs Ark Nature organisation, River Park Meuse Valley
River typology	Meandering large gravel river
Q mean	> 100 m ³ /s
Contact	Kris Van Looy: kris.vanlooy@hommesetterre.com

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LOCATION

The project comprises the restoration of a 45-kilometre section of the Meuse River between Maastricht and Roosteren, what is known as the Border Meuse Valley River Park in the Belgian and Dutch provinces of Limburg (Fig. 1).

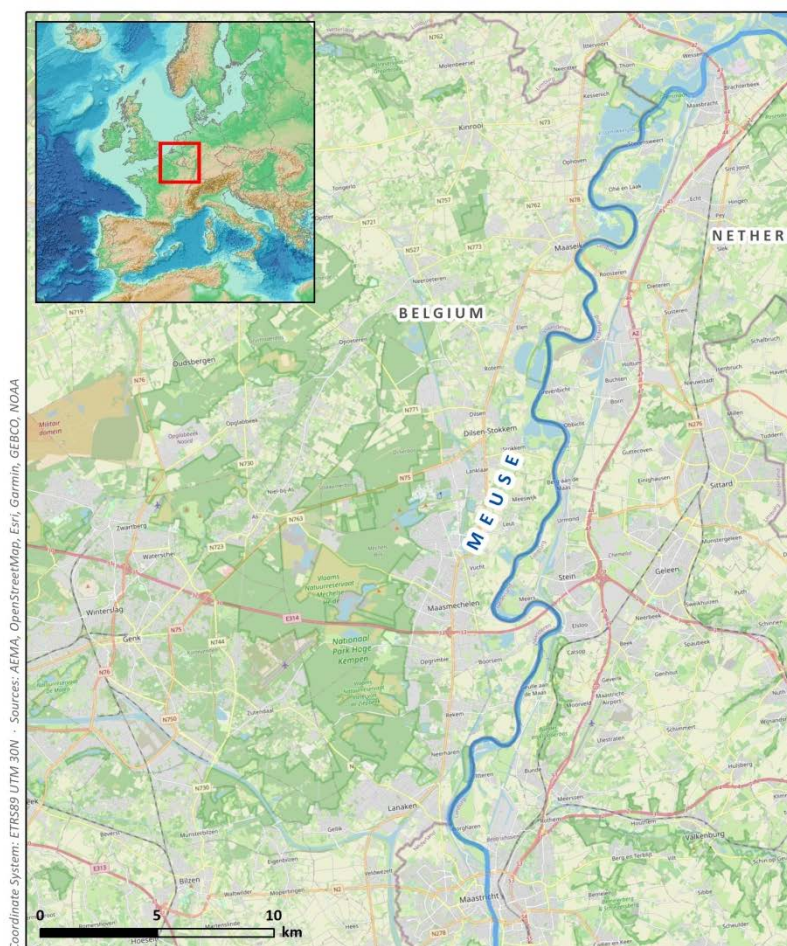


Figure 1. Location of the Meuse River restored reach

Therefore it is a transboundary project of more than 30 years.





Figure 2. Aspect and location of the restored reach and the navigation canals in the laterals of the river (Source: maasinbeeld.nl).

CONTEXT

The River Meuse was transformed for navigation, gravel extractions, straightening, lateral defences and urbanization of its floodplains have been the extended practices, except for this river reach along the Dutch-Belgian border due to its high slope (0.5 m/km) and without any transversal obstacle. The attempts of straightening and canalisation did not work and two lateral canals were constructed for navigation: the Albert canal from Liège straight to Antwerp, and the Juliana canal on the Dutch side. However, fluvial processes and river ecosystems were completely transformed.

PRESSURES & IMPACTS

- 1) Gravel extraction
- 2) Lateral defences
- 3) Embankments
- 4) Urbanization
- 5) Agricultural use
- 6) Narrowing
- 7) Incision



Figure 3. Gravel pit area on the Flemish side of Meuse River in 2009. Source: maasinbeeld.nl

Meuse River is a large meandering gravel river, unique in the Low Countries, with discharges ranging 10 m³/s up to 3,000 m³/s during floods.

OBJECTIVES

The project has 3 main objectives:

- **Reduce flood risk**
- **Healthier and more diverse nature**
- **Commercial benefit of both gravel extraction and nature-based economic development**

Target species/habitats

Atlantic salmon, alluvial forest

RESTORATION ACTION

The restoration project started with the “Green for Gravel” plan managed by WWFs Ark Nature. It is based in a coalition between gravel extraction and nature restoration plan, which funds the restoration and conservation of the river, giving a nature-based solution, “*since the gravel extraction follows the geomorphological contours and landforms*” (maasinbeeld.nl). It is considered one of the larger restored river reach with its 50 km restoration and it has become a singular study case or river restoration with important number of visitors each year which has given another income to the local economy. It has also an important social acceptance.

Two factors affected the loss of naturalness of the river: uncontrolled gravel mining with large gravel pits and straightening and lateral defenses for flood protection.

The restoration implementation has been executed from upstream to downstream.

1) RIVER WIDENING

The river has been widened broadening the stream channel, lowering the floodplain and storage of floodplain top soils in clay shields to protect the groundwater levels. The river itself broadened with banks of sand and gravel, side arms, varied shorelines, and areas of grassland and woodland. This has created a dynamic, braided river landscape that is allowed to flood and shift course naturally (European Rewilding Network) (Figure 4).

500 years of attempts to fix the meanders and make the river stretch navigable had reduced the river bed to a narrow fully-embanked channel, with a floodplain under intense agricultural use.

The project's implementation is executed from upstream to downstream. The river widening is carried out through a combination of broadening the stream channel, lowering the floodplain and storage of floodplain top soils in clay shields to protect the groundwater levels. Together with unexcavated parts, thirteen cross-border sub-areas make up the Border Meuse project.



Figure 4. Before and after the widening of the river channel (Source: maasinbeeld.nl).

2) GRAVEL ADDITION

400,000 m³ of gravel was added lowering the floodplain and river banks. *“The existing gravel pits were integrated into the river system by lowering the banks and guiding the floods through channels and levees”* (maasinbeeld.nl).



Figure 5. Gravel augmentation, lowering of banks and gravel pit recovering on the Flemish area in 2009 (Source: maasinbeeld.nl).

MONITORING

An extensive ecological monitoring programme was developed in cooperation among more than ten partners from the Netherlands and Flanders. The study focused on the restored natural areas in the southern part of the River Park, which have been created with riverbed widening and floodplain lowering (Figure 6).

In addition to recently completed areas, some 30-year-old nature restoration sites were also investigated. Not only the ecological results, but also a view on the economic benefits and the way inhabitants evaluate their transformed region is presented.

SURVEYED RESTORATION SITES

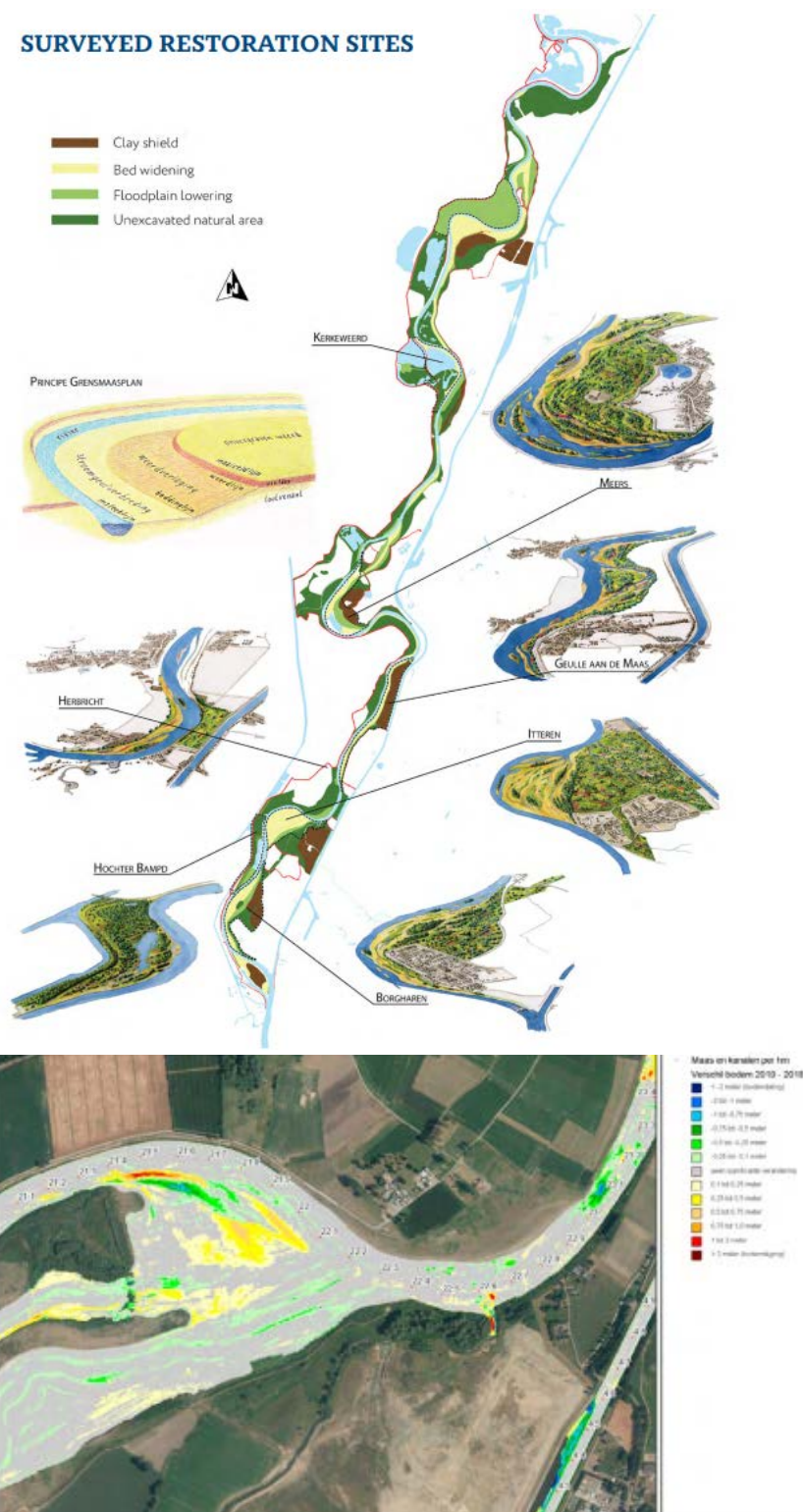


Figure 6. Location of the monitoring sites and hydromorphological monitoring (Source: maasinbeeld.nl).

ACHIEVEMENTS

The restoration of the river has given clear results of the geomorphological and ecological recovery of the river (Figure 6).



Figure 6. Same location 50 years ago and nowadays (Source: maasinbeeld.nl).

The project brochure, according to the monitoring results, summarizes the achievements of the Meuse River restoration project in the followings:

1) FLOW AND FLOOD DYNAMICS

“The recovery of river dynamics is occurring as predicted, with major changes in the zones of river bed widening. Erosion and sedimentation create natural bedforms of gravel bars and islands. The gravel is mainly deposited in and directly next to the bed at locations where the river changes from narrow to wide”. Increase of dynamics carries wood and new sediment.

Figure 7. Left: Stream velocity. Right: Characteristics pioneer and floodplain meadow species (Source: maasinbeeld.nl).

2) CONNECTIVITY

Increase connectivity of vegetation and animals. Fish communities have changed from dominated eurytopic fish to more typical gravel river community, increasing the rheophilic fish species. Sea trout and Atlantic salmon have been spotted. River lamprey and sea lamprey are migrating to the Meuse but are still rarely detected in the Border Meuse.

3) SHIFTING MOSAICS

Species and habitat inventory and mapping. Habitats present a good distribution. Xeric and sandy grasslands show the arrival and development of characteristic species, also for mud banks species.

Increase of insects, although dragonflies and macroinvertebrates are still critical due to pressures upstream (dams, hydropeaking).

4) REWILDING & NATURAL GRAZING

Natural grazing has provided a rewilding of the area, giving a varied landscape and mosaic that benefits many species.

5) NATURAL AREA

The extensive restored area benefited the passing migratory birds, but also species as the beaver, black kite, sand-piper or common tern. Furthermore, the connection with other surrounding natural areas will allow the increase of the richness of species and habitat relationships. Black poplar that needed a reintroduction has been successful and the native *Populus nigra* seems to have reduced the spread of the exotic poplar species. *“The reintroduction of the black poplar was executed with plantings at the margin of the bank lowering, so that new seeding could immediately take place”* (maasinbeeld.nl).

6) TIME OF DEVELOPMENT

The richness in characteristic species after the start of nature restoration doubled in the first 5 years, and tripled in 20 years. But it depends on the pressures of the specific site or the progress of the restoration actions.

Flood protection. The floods of July 2021 showed that the restored area provided the sufficient capacity to protect the urban areas, whereas upstream the restored reach the flood caused important affections and downstream the restored reach flood created severe threats.

SOCIAL IMPACT

“The restoration of the river has also restored the local community’s relationship with the river”. This has also increased the tourism potential of the region giving more income possibilities to the local people. The economic value of the societal benefits of the restoration have increased from 19,26 to 24,63 million €/year.

WEBSITES

<https://rewildingeurope.com/rew-project/meuse-valley-river-park/>

<https://rewildingeurope.com/news/river-meuse-restoration-shows-the-wide-ranging-benefits-of-working-with-nature/>

<https://networknature.eu/casestudy/23372>

https://www.rivierparkmaasvallei.eu/sites/default/files/2101005_maasinbeeld.pdf

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Van Looy, K., Meire, P., Wasson, J.-G. 2008. Including riparian vegetation in the definition of morphologic reference conditions for large rivers: a case study for Europe’s western plains. *Environmental Management*, 41: 625-639.