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The Emscher Restoration: A Contribution to Climate Adaptation

A New River Basin for a Blue-Green Future

The Emschergenossenschaft (Emscher Cooperative) implemented the Emscher Generation Project, one of the largest river restoration projects in Europe. The project improved water quality, hydromorphology and biodiversity and largely contributed to combating flooding and droughts.

Key Learnings

- **Water management is a driver of ecological and social transformation**: It is necessary to think and act sustainably and in the long term to achieve the best possible climate change adaptation outcome.
- **Public water management in a cooperative:** Broad participation of municipalities, citizens, politicians and NGOs, without profit orientation enhances project success and adaptation achievements.
- **Nature-based Solutions** (renaturation of water bodies and floodplains, near-natural retention areas): Significantly contribute to carbon sequestration and the adaptation to climate change consequences. Additional blue-green infrastructure creates added value for living, living and working.

About the region

The entire Emscher Catchment, a sub-basin of the River Rhine in the federal state of North-Rhine Westphalia, Germany, covers 865 km² and hosts 2.2 million inhabitants in one of the most densely populated areas of Germany (3,300 inhabitants/km²). The Emscher River has experienced a century of intensive mining, steel industry expansion, and population growth, during which the entire river network was transformed into an open wastewater drain, straightened and with concrete beds and dikes. Such an open infrastructure system was the only solution, given the risk of ground subsidence due to underground coal mining. Now that mining has ended, the open wastewater system is being restored and transformed into near natural streams.

Climate Hazards

Droughts, Flooding

Water Scarcity

Sector

Water management

Key system

Water Management,

Ecosystems and Nature Based Solutions

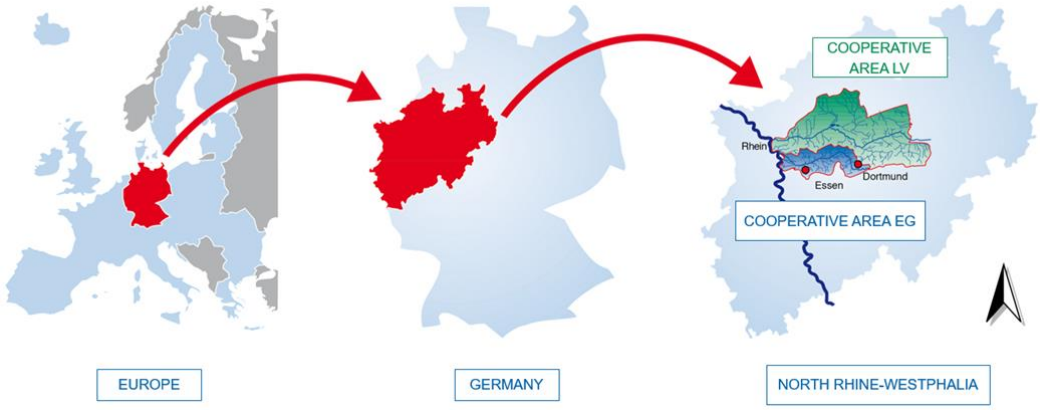

Figure 1: Spatial categorisation of the Emscher river basin (cooperative area EG, in blue), together with the Lippe catchment area (cooperative area LV, in green), managed by EGLV in the administrative community. Image Credit: EGLV.

Climate Threats

Extreme weather events driven by climate change present significant water management challenges for the Emschergenossenschaft. Changes in runoff conditions such as intensified heavy rainfall events causing floods, increase the need for water retention areas, while prolonged droughts lead to drying streams and tributaries. To address these challenges, the association is focused on integrating technical and ecological solutions for sustainable water management, including transforming flood retention basins into ecologically valuable spaces. The flood risk action plan foresees enhanced protection levels for the Emscher main arm and includes appropriate management manuals and roadmaps for extreme weather events such as floods and droughts.

The Emscher restoration plays a central role in implementing the European Green Deal. The renaturation measures also strengthen the region's overall resilience to the effects of climate change. Blue-green infrastructures, such as near-natural flood retention areas, contribute to carbon sequestration and promote biodiversity. At Zukunftsinitiative Klima.Werk, a climate adaptation initiative, cities are working with Emschergenossenschaft and Lippeverband to promote the sustainable use of rainwater as a vital resource.

Figure 2: In areas where there is sufficient space, the canalised river can be transformed into a free-flowing Emscher. The Emscher in Oberhausen (left) and the Emscher in Castrop-Rauxel (right) demonstrate the potential of this approach. Image Credit: EGLV.

Working together as a cooperative for a blue-green tomorrow

The Emschergenossenschaft was founded on 14 December 1899 as the first German water management association in the form of a cooperative. The municipalities along the Emscher co-founded the Emschergenossenschaft and have been members ever since. A large proportion of the industrial companies in the catchment area are also members of the cooperative, which treats wastewater for them.

For 125 years, the Emschergenossenschaft has been responsible for all matters related to the Emscher and its tributaries. This includes water maintenance, flood protection, wastewater disposal, rain- and groundwater management, the restoration of the Emscher and general planning, consulting and implementing all measures required for the Emscher conversion. In addition, it has developed adaptation projects such as rainwater decoupling and infiltration, green roofs and façades and renewable energy.

Sixteen cities from the Emscher region are working with the Emschergenossenschaft to become blue-green sponge cities. Those cities have (near-)natural green and blue features absorbing water in a flooding event and storing water during droughts and water scarcity. Such features range from trees and green spaces to parks, lakes and even roofs.

Figure 3: Visualisation from a grey, canalised sewer system to a blue-green infrastructure with revitalised streams in the Landscape Park in Duisburg. Image Credit: EGLV.

Nature-based solutions in the field for better climate adaptation

The measures developed by the Emschergenossenschaft aim to achieve more natural and climate-resilient water courses and involve acquiring more river areas through floodplain restoration and constructing near-natural wetlands and retention basins. The actions also include the construction of urban lakes to improve the urban micro-climate and enlarge recreation and leisure areas. De-sealing urban surfaces improved the urban water cycle, enhanced rainwater infiltration and reduced urban heat. Other measures to adapt to climate change are:

- Rainwater supply to the water bodies
- Extensive green roofs
- Façade greening
- Rainwater harvesting

Using organic materials to mow meadows, such as compost, soil fertiliser, or biochar, contributes to soil health and supports the circular economy approach to reducing the overall environmental impact.

Figure 4: Revitalised stream (Borbecker Mühlenbach) as an example for the successful restoration of the smaller tributaries in the Emscher catchment area. Image Credit: EGLV.

Tangible results

- **170 km of renatured rivers** (out of a planned 326 km)
- Increase in **the number of species of invertebrates visible to the human eye from 170 to 300** (river basin level)
- **322 ha of new, near-natural flood retention areas** built (of a planned 330 ha)
- **Increase in bird species in the new near-natural flood retention areas from 38 to 147** (middle Emscher)
- **11% decoupling of paved areas** from the combined sewer system achieved (target state 25% by 2040)

Figure 5: Example for a biodiverse grassland: Emscher ike in Essen. Image Credit: EGLV.

- **140 km of new cycle paths** built along the renatured waters

Figure 6: Climate adaptation projects as part of the Emscher conversion. Image Credit: EGLV.

Financing and communication

The total investment for climate change adaptation and restoration measures at the Emscher River was 5.5 billion euros (Emscher Restoration includes four Wastewater Treatment Plants). Wastewater fees

financed 80% of the measures, and funding from the EU, national, and federal levels and other private funding sources funded 20% of the restoration project.

Another success factor of the project is the broad-based participation process. In addition to the statutory participation (planning approval procedure), this process includes many voluntary participation formats of EGLV to involve stakeholders. For example, the cooperative organised consultation hours, construction site visits, planning workshops, and competitions. The mediation process to increase the large-scale project's popularity also included art and cultural events (e.g. Triennial "Emscher Kunst"), sports events, and environmental education programs (Blue Classrooms).

Figure 7: The Emscher Conversion as a driver for social-ecological Transformation in the Ruhrgebiet. Image Credit: EGLV.

> *"The Emscher restoration with all the new watercourses and floodplains, and its many projects for a water-conscious urban development in the face of climate change, is perhaps the best thing that could have happened to the region."*
>
> *Dr. Frank Dudda, Mayor of the City of Herne, Chairman of the Supervisory Board of the Emschergenossenschaft*

Summary

The Emscher Restoration contributes to climate change adaptation after severe human impact over the past decades, supports biodiversity conservation, and benefits human well-being. The project's success is also due to broad public engagement and collaboration with multiple stakeholders. Financing from multiple funding sources covered the cost of the restoration, which totalled 5.5 billion euros.

Further information

- https://www.eglv.de/emscher/

Contact

https://www.eglv.de/en/

https://www.klima-werk.de/en/index.html

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