RIVER, LAKESIDE, FLOODPLAIN AND WETLAND MANAGEMENT

CHANNEL WIDENING

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ADDRESSED HAZARDS

PROTECTED CRITICAL INFRASTRUCTURE

River Drau at Obersgottesfeld (Austria) before (2003) and after (2024) restoration works and channel widening.
Image Credit: [Google Earth Capture], [2003, 2024], Free to use

What is it?

Channel widening, as a river rehabilitation measure that is influencing river morphology, is a lateral expansion of the river (stream) channel. It is an approach to re-naturalise past river alterations and riparian ecosystems while increasing the channel's discharge capacity. This river restoration technique helps reduce erosion and stabilise river bed and banks, promoting dynamic morphological processes that create riparian habitats (Deltares, 2017; Rachelly et al., 2018; Ruiz-Villanueva et al, 2023).

Challenges this NbS addresses

- **Floods –** prevention/reduction/recovery (Ruiz-Villanueva et al, 2023);
- **Erosion –** prevention/reduction;
- **Drought –** prevention/reduction;

Primary functions and key services

Flood mitigation: channel widening increases its discharge conductivity, allowing higher peak flows at lower flood levels, protecting surrounding area and surrounding infrastructure from flooding, such as **roads, bridges, housing or railways**. (Ruiz-Villanueva et al, 2023; Vermaat et al., 2019)

Erosion control: by lowering shear stresses of water flow.

Sediment control: reduced flow velocities encourage sediment deposition and alter sediment dynamics, alternating river clogging (colmation) processes.
(Rachelly et al., 2018; Ruiz-Villanueva et al, 2023).

Hydrological hazards:

- Moderate mitigation of pluvial flood (heavy rainfall), fluvial flood, surface runoff, fluvial sediment transport, stream bank and bed erosion, sheet erosion and rill erosion, gully erosion, and debris flood (volumetric sediment concentration 20-40%)

Landslide hazards:

- Moderate mitigation of debris flow (volumetric sediment concentration >40%)

Site suitability, scale and coverage

Regions and sites suitable for channel widening (and generally for river restoration) are highly site-specific depending on desired goals and local conditions (hydrological, geomorphological, topographical, etc.). For their selection, a decision support system for prioritisation should be applied, such as multiple criteria decision analysis or cost-benefit analysis (Brousse et al. 2021; Deltares, 2017; Ruiz-Villanueva et al, 2023; Vermaat et al., 2019).

- Alluvial valleys
- Floodplains (Deltares, 2017)
- Mountainous areas (Ruiz-Villanueva et al, 2023)
- Urbanised areas

Ecosystem services

- **Biodiversity support and habitat provision:** creation of riparian and riverine habitats.
- **Aesthetic and cultural value**
- **Water quality improvement:** enhances natural filtration by increasing interaction with riparian vegetation and wetlands (Deltares, 2017; Vermaat et al., 2019).
- **Groundwater recharge:** promotes infiltration, replenishing underground water reserves (Ruiz-Villanueva et al, 2023).
- **Carbon sequestration:** expands riparian vegetation, increasing carbon storage and reducing greenhouse gas emissions.
- **Microclimate regulation:** moderates local temperatures through increased vegetation and water surface area (Deltares, 2017).

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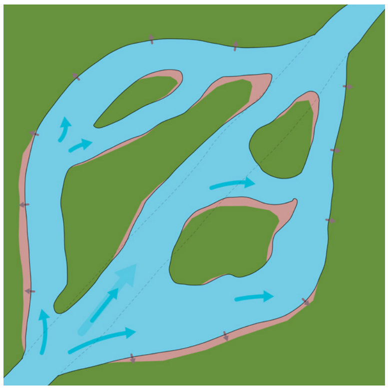
Cost-benefit profile

Channel widening is a river rehabilitation technique that incurs **various costs** related to land **acquisition, excavation, and removal of existing infrastructure** such as levees. Additional expenses stem from **engineering assessments, environmental impact studies, and erosion control measures** (Rachelly et al., 2018). Despite the **high initial investment**, channel widening provides **long-term cost savings** by reducing the need for **flood control infrastructure** and **lowering maintenance expenses** associated with dike reinforcement (Deltares, 2017). This approach also enhances riparian habitats, supports biodiversity, and improves water quality, creating economic benefits through ecosystem services and recreational opportunities (Vermaat et al., 2019). A cost-benefit analysis often reveals that the societal advantages of channel widening outweigh the initial expenditures, making it a cost-effective strategy for sustainable river management (Deltares, 2017; Ruiz-Villanueva et al, 2023; Vermaat et al., 2019).

Environmental impacts
(EU taxonomy)

- ☐ Climate change mitigation
- ☑ Climate change adaptation
- ☑ Sustainable use and protection of water and marine resources
- ☐ Transition to a circular economy
- ☑ Pollution prevention and control
- ☑ Protection and restoration of biodiversity and ecosystems.



Conceptual illustration for river widening of a samll-scale river reach, which allows channel movement.
Image Credit: [Alchemia-nova Research and Innovation], [2025]

Main components

- **Static (excavated) channel widening:** mechanical excavation to the final channel width with bank protection using embankments, riprap, etc.
- **Dynamic channel widening:** removal of bank protection structures over a reach of the channelised riverbed, encouraging natural lateral mobility through bank erosion and downstream sediment deposition (Rachelly et al., 2018).
- **One bank or both river banks** depending on the specific goals and constraints of the restoration project.
- **Vegetation cover:** natural vegetation colonisation or vegetation planting on newly established banks.
- **River mezoforms creation:** creation of gravel bars, alternating gravel banks, and gravel islands.

Example of installation

- **Combine of the flood plain-forests of the Upper Drau-river valley** (Carinthia, Austria). LIFE99 NAT/A/006055
- **Measures:** widening and restructuring of river bed and banks, reconnecting former side arms with the main channel, creating new water bodies in the floodplains, re-establishment of the longitudinal continuum (river- tributaries) on 60-km middle part of the Drau River between Oberdrauburg and Spittal (a large-scale river revitalisation/restoration project) – for that altogether 52.95 ha land were purchased.
- **Implemented by:** Amt der Kärntner Landesregierung, Abt. 18 - Wasserwirtschaft
- **Description and results:** at Kleblach-Lind, e.g., the Drau riverbed has been widened to 45 m over more than 1.3 km length, where 0.5 ha pioneer habitats have been created. Elsewhere, 22 amphibian pools were created, and bank stabilisation works removed.

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