



UNIVERSITÄT ROSTOCK

Ecological River Development and the EU Water Framework Directive

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Revitalisation – Example



Heute: ein Kanal mit artenarmen, monotonen Grünflächen und starren Besufern



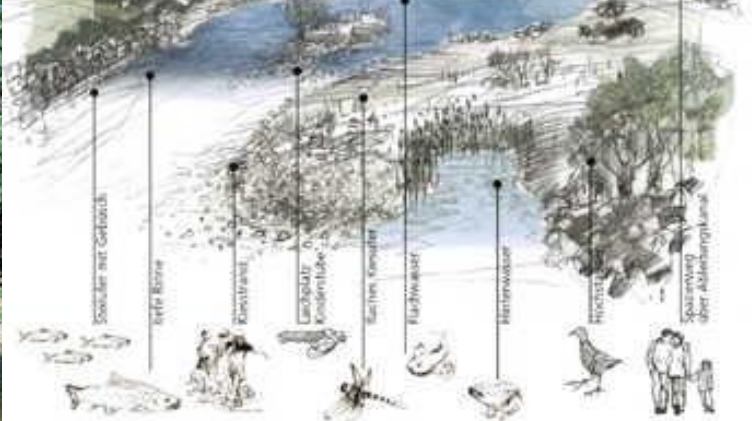
Doppeltabsprofil ohne Uferzone ohne Gliederung des Flusslaufes, ohne Natur auf dem Vorland



Morgen: der Lebensraum Birs



Reich gegliedertes Flussbett mit tiefen Becken, Flachwasserzonen und vielfältigen wechsellastigen Sandbänken; Ufer und Wasser sind vernetzt



River Birs

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River Training Concepts until the 1980s

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River Training – River Rhine



River Rhine (different sources)

River Training - Streams



Emscher River

River Training - Streams



River Training – Torrents



Torrent Control Structure, Weißenbachtal Photo: S. Cantré

Recent Problems

Problems

- Increasing frequency and strength of disasters caused by natural hazards such as floods, storms, mudstreams, and avalanches
- Major financial loss caused by disasters
- Bad structural quality of many waters
- People's wish for more aesthetics at the waters
- New European policies since 2000

Lead to

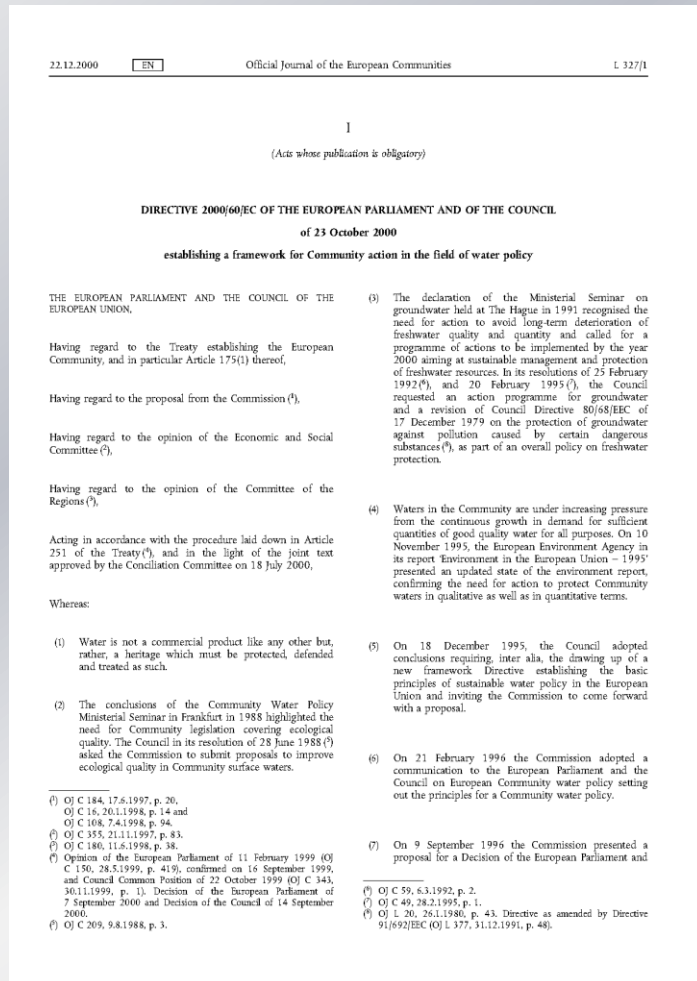
- A rethinking of earlier strategies
- Development of holistic approaches

EU Water Framework Directive

Aim: All European waters (surface waters, transitional waters, coastal waters, and ground water) need to have a good status until 2015!

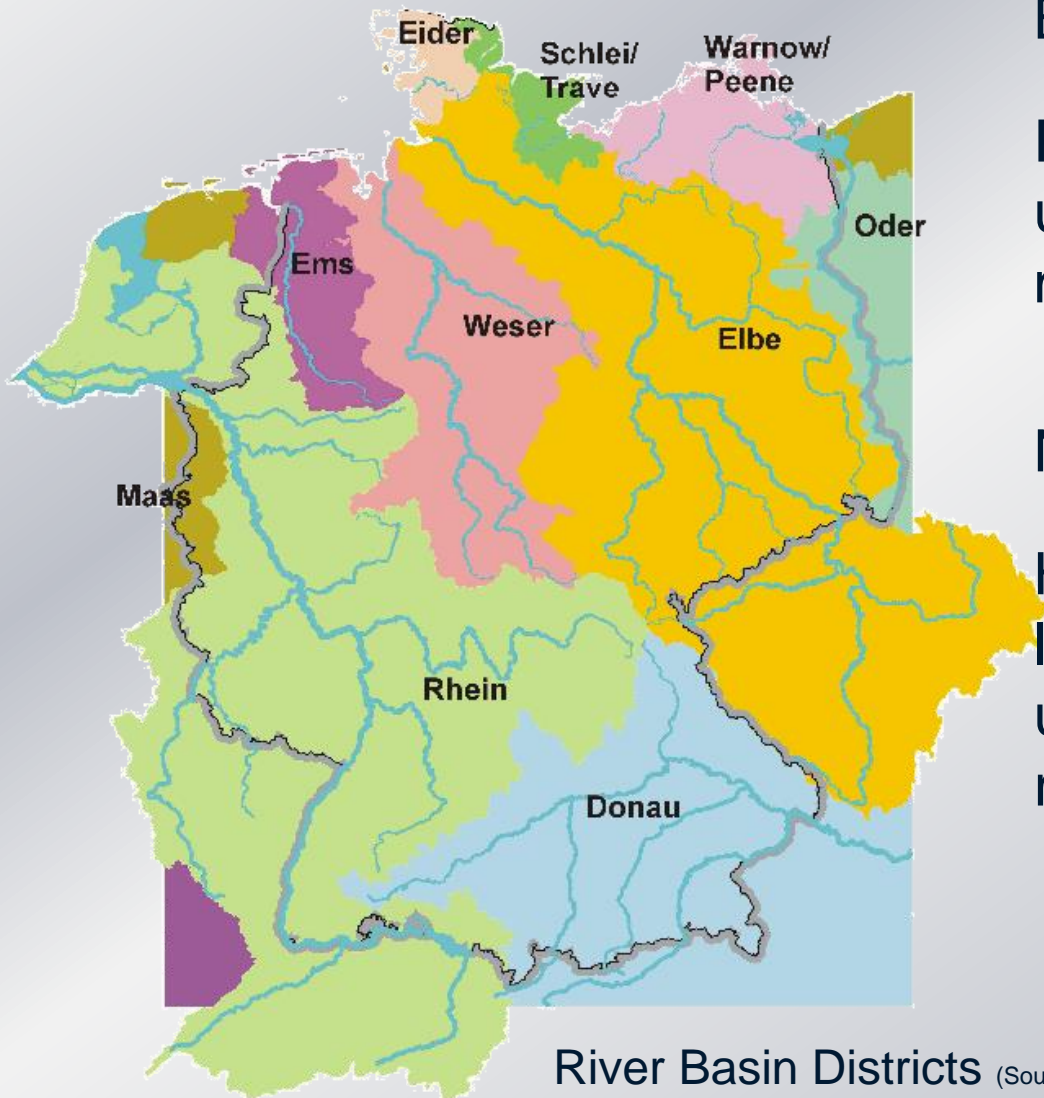
Features:

- Holistic approach – catchment management
- Quality of water body vs. water quality only
- River basins vs. administrative regions
- Cross-border projects
- Public participation concepts
- Defines quality elements and classification parameters
- Monitoring is obligatory



EU Water Framework Directive

River Basin Districts in Germany



Before:

Punctual planning in small units: local and regional water management agencies

Now:

Holistic approach where the local agencies work together under the aegis of responsible regional agencies

Goals of River Redevelopment

Improvement of the ecological state of the waters

Improvement of the water structure

Aesthetical and recreational improvement for tourism

More species (plants and animals)

Deconstruction of hard protection constructions

Protection from natural hazards (flood protection, etc.) in the whole catchment area

Also involve the surroundings to the waters:
water = stream + banks + meadows

Implementation of river continuum concepts

Conflicts

There may be conflicts with the users:

Navigation

Industrial use of waters and floodplains (cooling water, factory sites)

Water power plants

Agricultural use of floodplains

Fishery

others

Planning – Strategies and Instruments

Mapping of the structural state and the water quality, including the ground water

Implementation of river information systems e.g. ERN (European River Network)

Participation of the public during the creation of plans and management concepts (solves conflicts)

Buying of the borders between river banks and meadows for the cultivation of the river banks by the state



Steinwurf



Steinschüttung



Böschungsrasen



Pflaster, Steinsatz



Lebendverbau



wilder Verbau

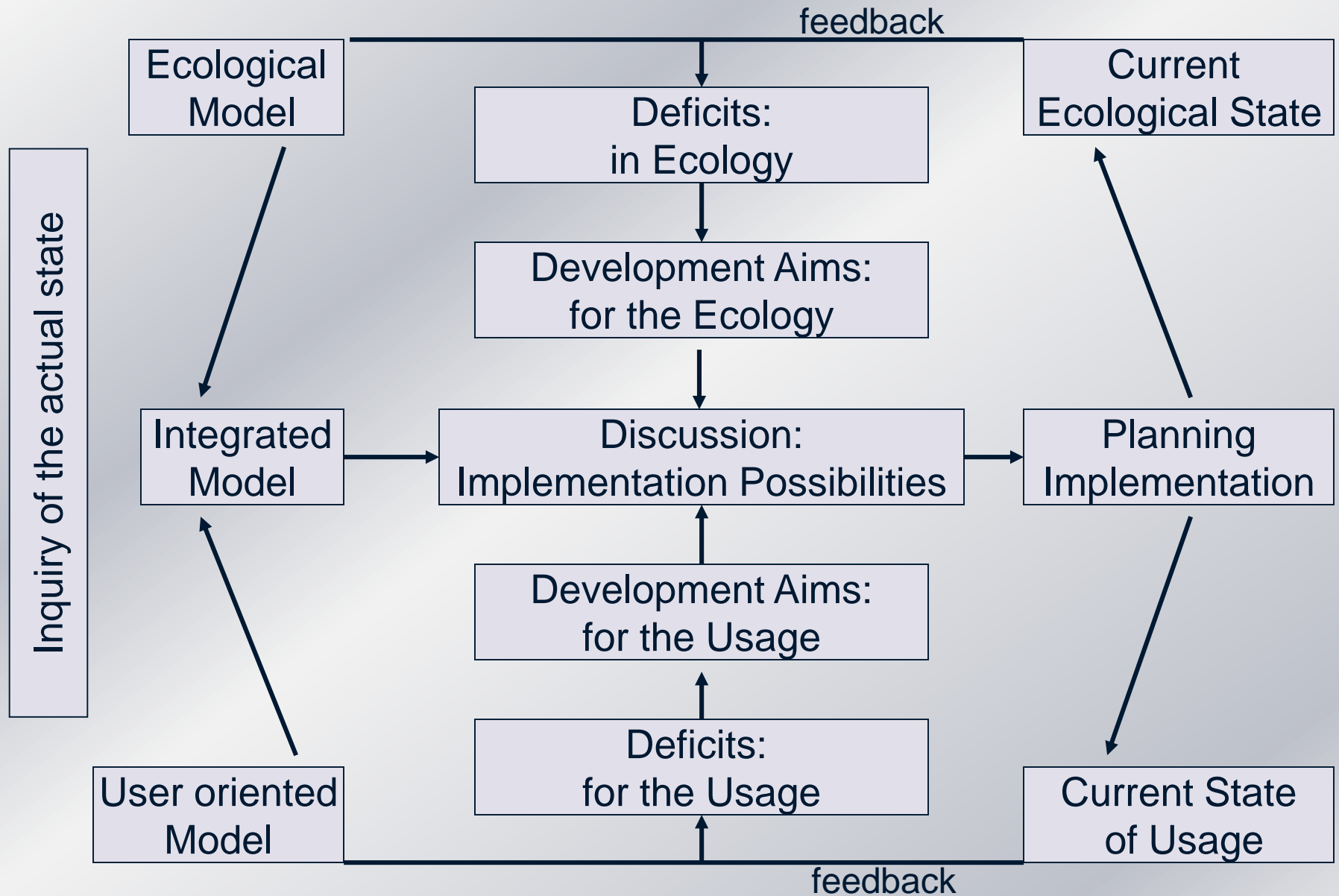


Holzverbau



Pflaster, Mauerwerk

Planning for Users & Environment



Planning – Modern Flood Protection

Only the total of measures may help to revitalise the rivers, lakes and coasts and to assure a good disaster protection also.

Measures are:

Flexible, transportable barrier constructions (aqua dams, geotextile tubes)

Flood retention basins

Sealing old dikes with geosynthetic clay liners (space problems)

Dike construction with steeper, but vegetated slopes (e.g. geotextile reinforced earth, dike cores with geosynthetic containers/tubes)

Revitalise natural retention areas like oxbows

Danger zone plans

Planning – Catchment Management

Upper section:

Increase interception → minimize direct run-off (reforestation)

Erosion control on higher slopes (slope protection through drainage, reforestation, and constructions) → minimize the bed-load entry

(bed-load balance concepts → bed-load management)

Assure fast flow (water down the max. water level)

Protection constructions with natural materials (timber, rock, soil-bioengineering, vegetated geotextile structures)

Middle section:

Lay out retention areas, revitalise oxbows (abandoned courses)

Lower section:

Protection constructions like dikes, faster flow: negative wave helps to drain the middle section

Ecological Development Concepts

- Meanders → construction or initial constructions for succession
- Widening
- Structural diversity
- Oxbows, old waters
- Deconstruction of hard bed and bank constructions
- Deconstructions of drops
- Hard structures only where other measures cannot succseed!!

- IMPORTANT: materials and shape only as the character of the water allows!!

Ecological Constructions

- Grass plantation on the banks/dikes (no navigation)
- Plantations, Biological constructions (trees, bushes)
- Soil-Bioengineering structures, fascines, etc.
- Combined structures
- Natural stone revetments
- Gabions
- Vegetated timber cribs
- Vegetated geotextile structures
- Hard structures (only where other measures cannot succseed)
- Plants have a very high stability and often constructions only need to be temporary!

Ecological Constructions



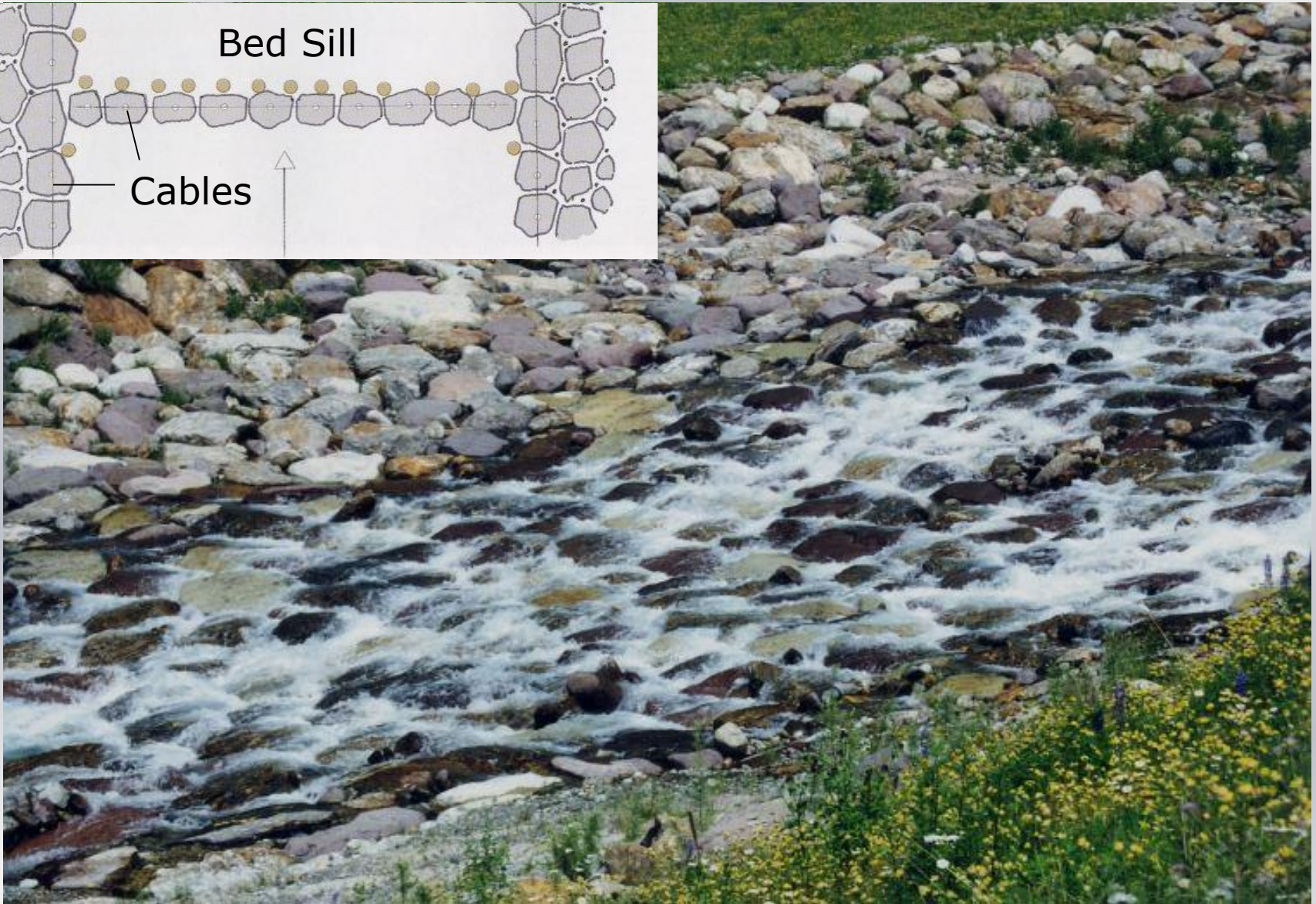
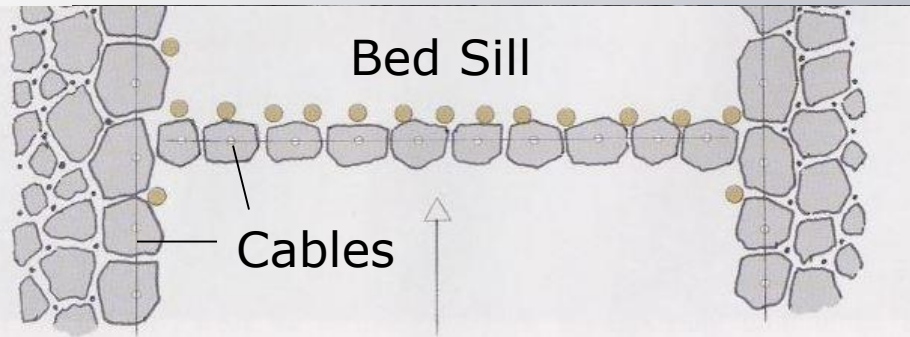
Slope fascine, Austria; Source:

Ecological Constructions



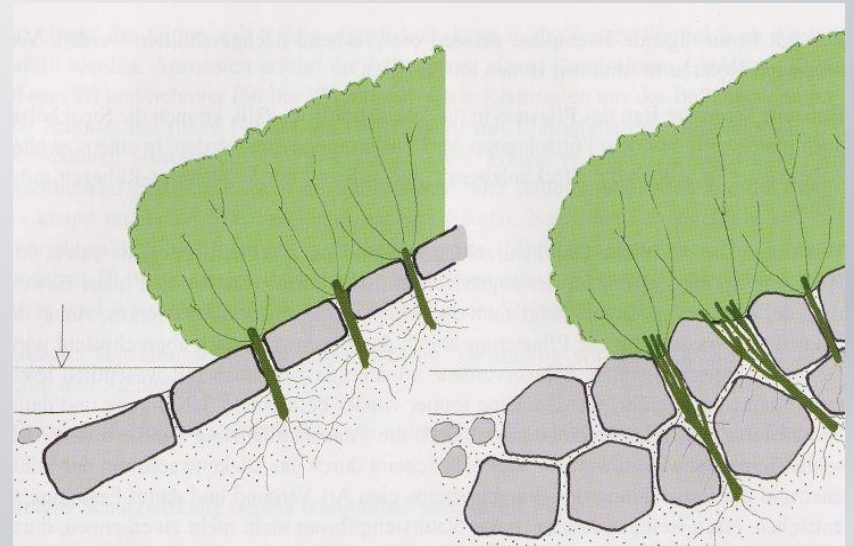
Ecological Torrent Control, Weißenbachtal Photo: S. Cantré

Ecological Constructions



Ecological Torrent Control, Weißenbachtal Photo: S. Cantré

Ecological Constructions



Different examples; Source: Schiechl, Stern

Ecological Constructions



River widening; Source: EAWAG

Ecological Constructions



Willow berms; Source: Schiechl, Stern

Ecological Constructions



River Isar, near Munich, before revitalisation; Source: BLK

Ecological Constructions



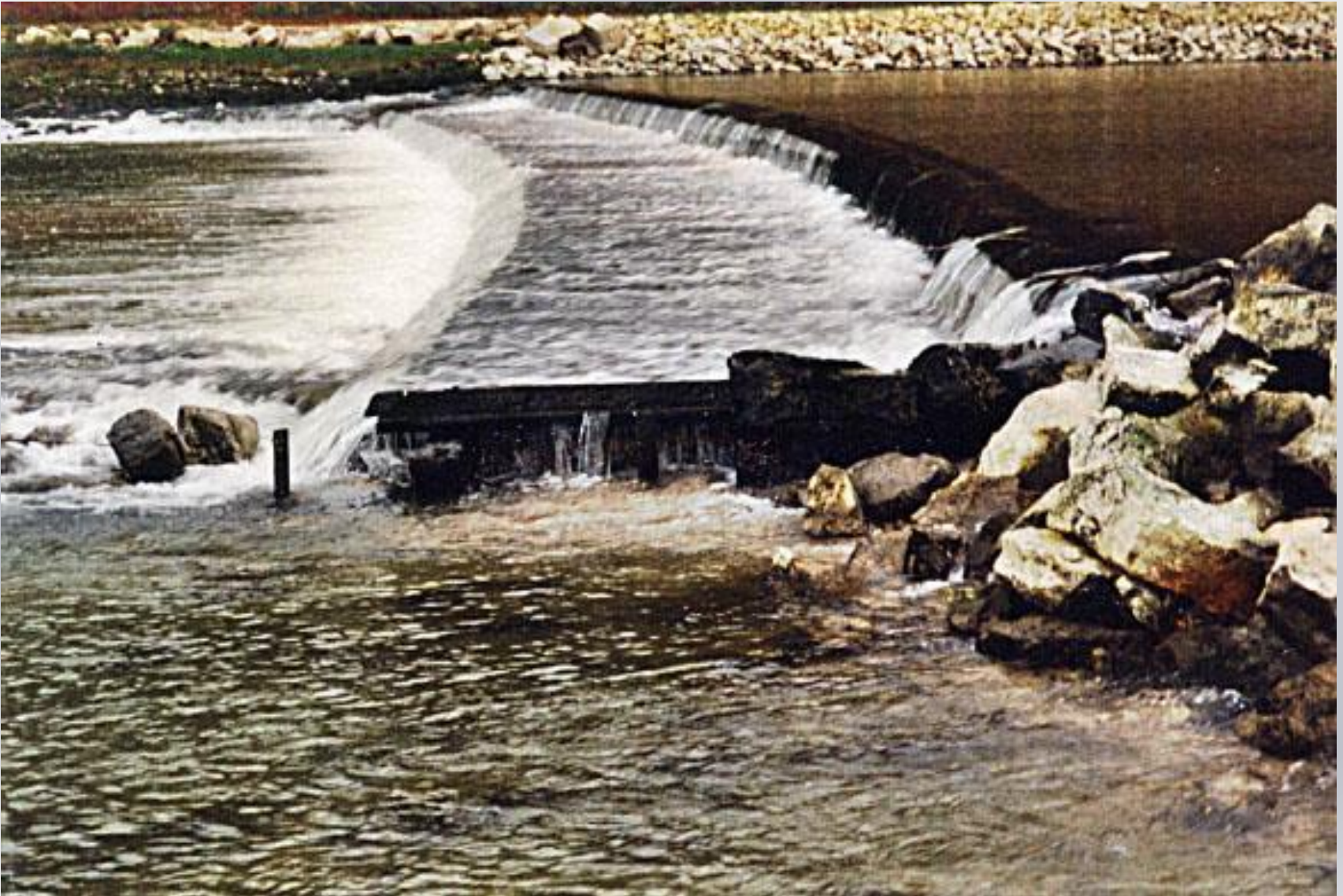
River Isar, near Munich, after revitalisation; Source: BLK

Ecological Constructions



River Isar, near Munich, after revitalisation; Source: BLK

Ecological Constructions



River Isar, near Munich, old drop; Source: BLK

Ecological Constructions



River Isar, near Munich, bed ramp after renaturation; Source: BLK

Ecological Constructions



River Drau project: Flood protection through renaturation (widening)



Ecological Constructions



Geosynthetic reinforced river embankment, Worb, Switzerland; Source: Schiechl, Stern

Ecological Constructions



Timber Cribs, Switzerland

Source: Schiechl, Stern

Ecological Constructions



Geosynthetic Mortar and Sand
Mattresses; Source: Huesker Synthetic



Ecological Constructions



Geotextile Tube as dike/dune core; Source: C-Horse Construction



Conclusions

- Holistic approaches for river development are very important
- The EU water framework directive is a first international way of rethinking old concepts and to initiate an integrated, holistic way of planning
- The single measures and constructions are not new but the combination is different in each project and needs a good knowledge of all processes in the catchment area
- Many projects of river renaturation in Europe have proved that even with hard rainfall the new systems meet their desired needs (flood protection, ecology, etc.).
- The ecological success of renaturation projects is very good.
- Concrete or steel constructions should only be used if it is proved that there is no other way of dealing with the problem.

