



# ***Soil and water bioengineering as techniques for river restoration – database for quality of project designs***

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basics

river restoration

civil engineering structures

application technics

***soil – water bioengineering***

PLANTS

auxiliary  
materials



Rivers

river bank protection

river restoration, ground water

soil protection

slope and embankment protection

Slopes

Ecological

Technical Aesthetical

# river degradation Vienna, Wienfluss

## multiple stressor

bank stabilization, agricultural stress, weirs, fishing, waste discharge, eutrophication, drought, erosion, channelization, no sediment transport, ground water.....









design of river restoration work

Implemented soil bioengineering projects / Austria

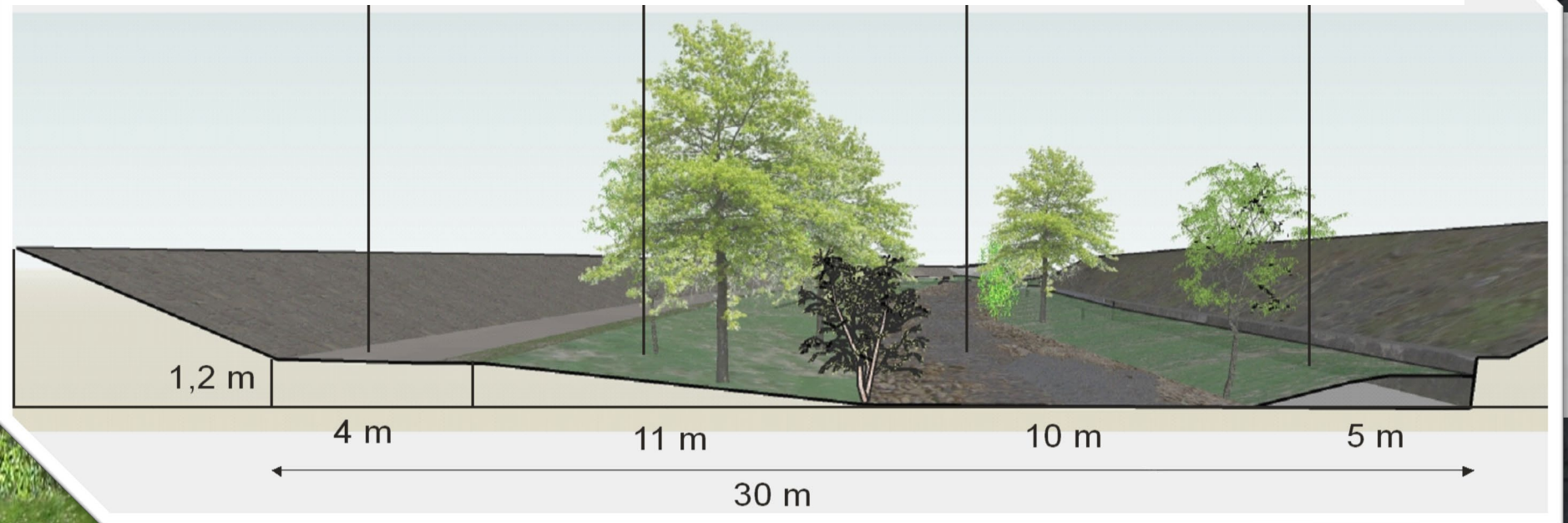


# Implemented soil bioengineering projects / Austria

## design of river restoration work

hiking and walking path

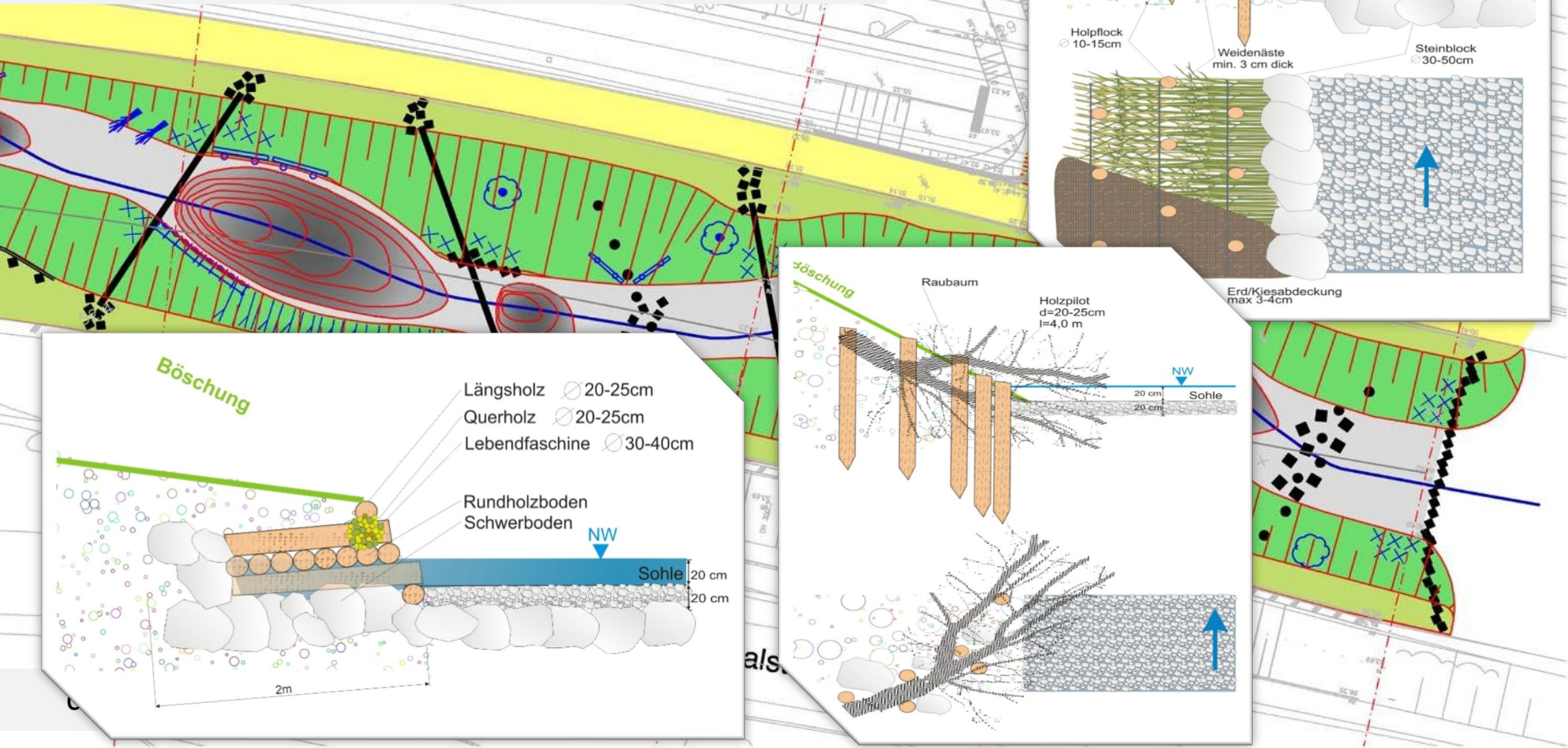
river development area





# river restoration Wienfluss

## design of river restoration work





construction work 2014



river restoration Wienfluss



# Implemented soil bioengineering projects / Austria

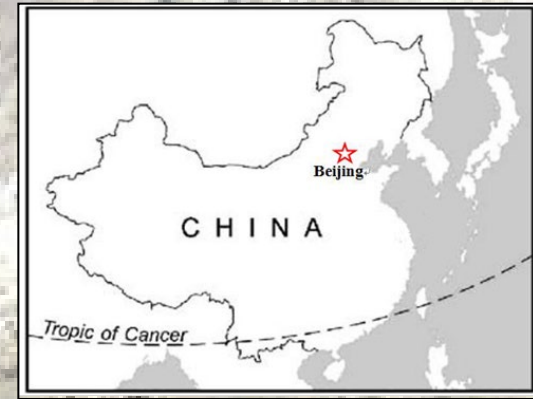


2 years after construction

**river restoration Wienfluss**

# Soil bioengineering

## China, YanQi River



before sb work



# Implemented soil bioengineering projects / China



SB work, China, YanQi River



*Salix alba var. Tristis*  
*Salix cheilophila*

# Soil bioengineering

## China, YanQi River



after 3 months



*Salix alba* var. *Tristis*  
*Salix cheilophila*



# Soil bioengineering China, YanQi River



after 5 years



*Salix alba var. Tristis*

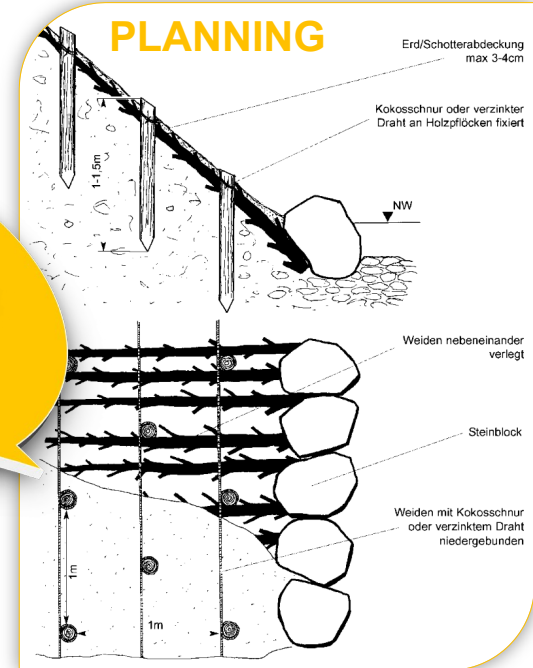
# CONCLUSIONS

## MONITORING



## SB Type 4: willow brush mattress

### PLANNING



## IMPLEMENTATION







**~ 1950**



**~ 2006**

# CONCLUSIONS

- soil bioengineering techniques are appropriate techniques for river restoration
- soil bioengineering techniques are appropriate techniques for connecting surface water and groundwater
- to install riparian vegetation, specifically providing a fast, low cost and easy installation
- biological properties of plants are the basis of soil bioengineering projects;
- soil bioengineering is an practical approach; for the future development as an engineering discipline monitoring is most important to quantify the interaction of plants and natural processes - which means an **interdisciplinary research approach**