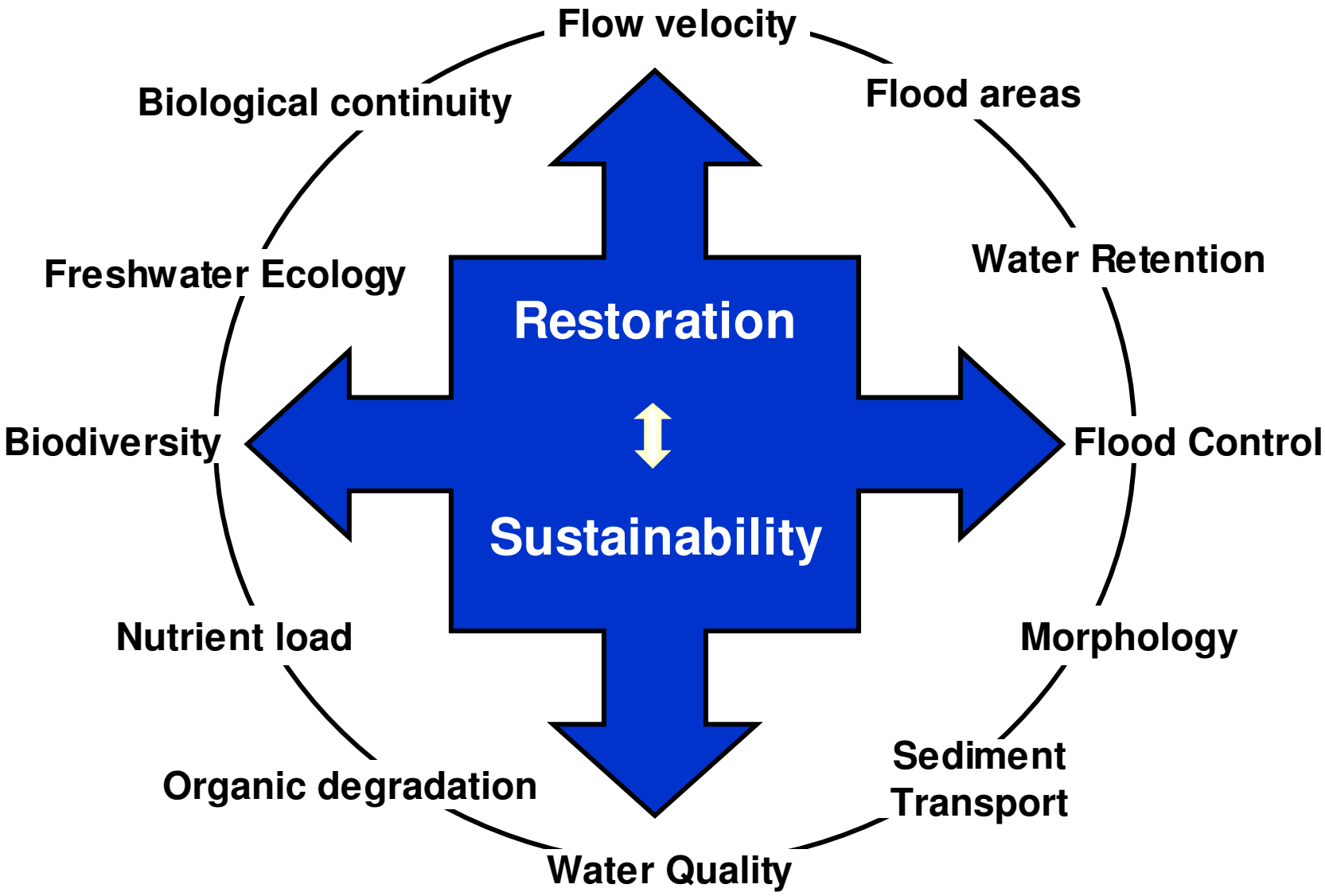
La restauracion de los rios

El caso del rio Isar en Alemania


Flow velocity
Flood areas
Water Retention
Flood Control
Morphology
Sediment
Transport
Water Quality
Organic degradation
Nutrient load
Biodiversity
Freshwater Ecology
Biological continuity
Restoration
Sustainability

Major Deficits of „civilized“ Rivers

- Straightened and Dammed
- Loss of ecological functions, habitats + groundwater interaction
- Reduced morphological processes
- Interruption of physical continuity
- Minor water quality
- Cut off floodplains with flood risks
- No Access to waterline
- Disturbed interaction between river bed and surrounding landscape

Main Purposes

- **Flood Control**
  - Water Retention Capacity
- **Restoration**
  - Ecological Upgrading of rivers
  - Morphological processes
  - Longitudinal and lateral continuity
  - Natural habitats, biodiversity, water quality
- **Recreation**
  - Access to waterline
  - Attractive landscape and views

Isar River sections

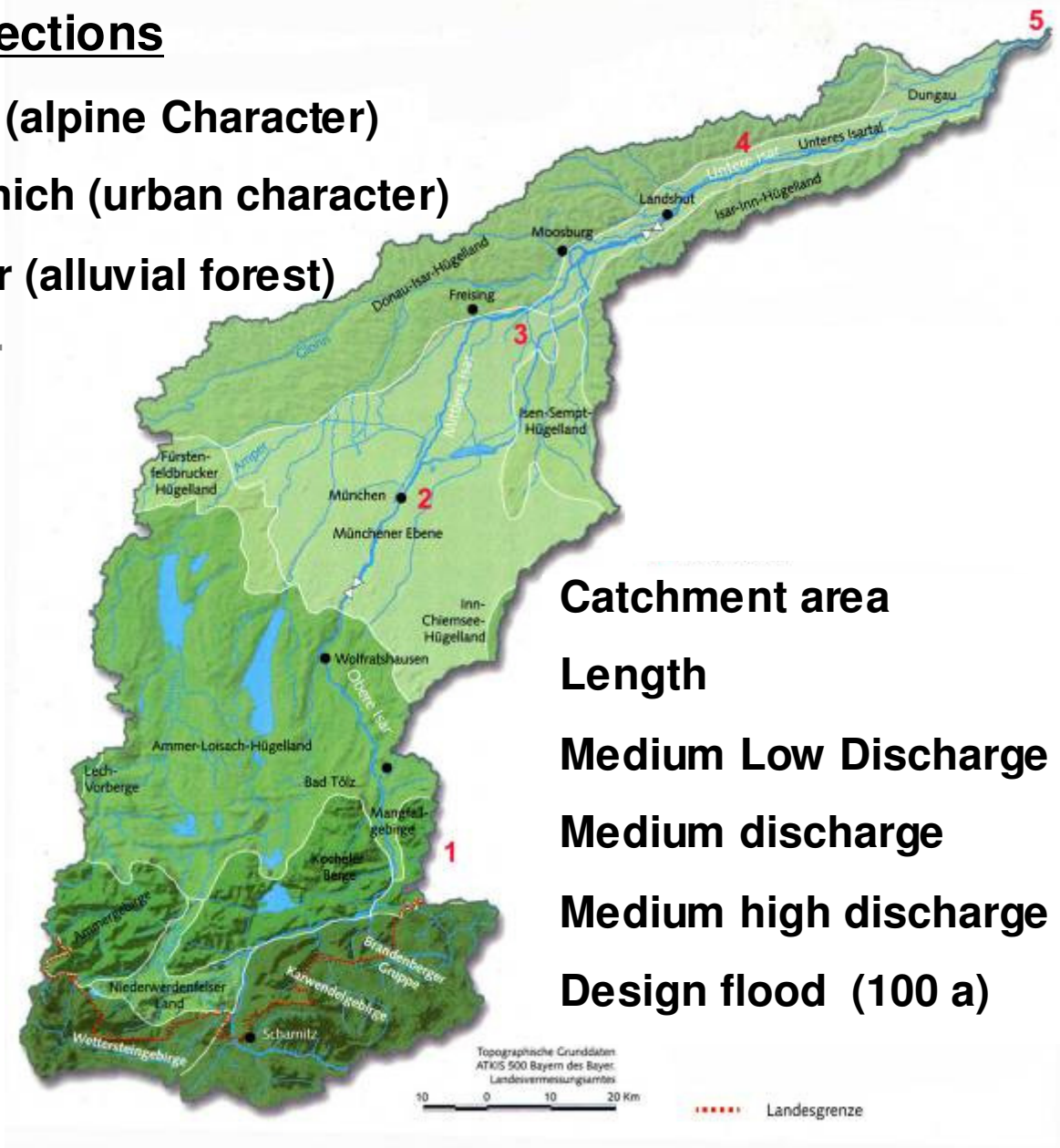
1 **Upper Isar (alpine Character)**

2 **Isar in Munich (urban character)**

3 **Middle Isar (alluvial forest)**

4 **Lower Isar**

5 **Danube**

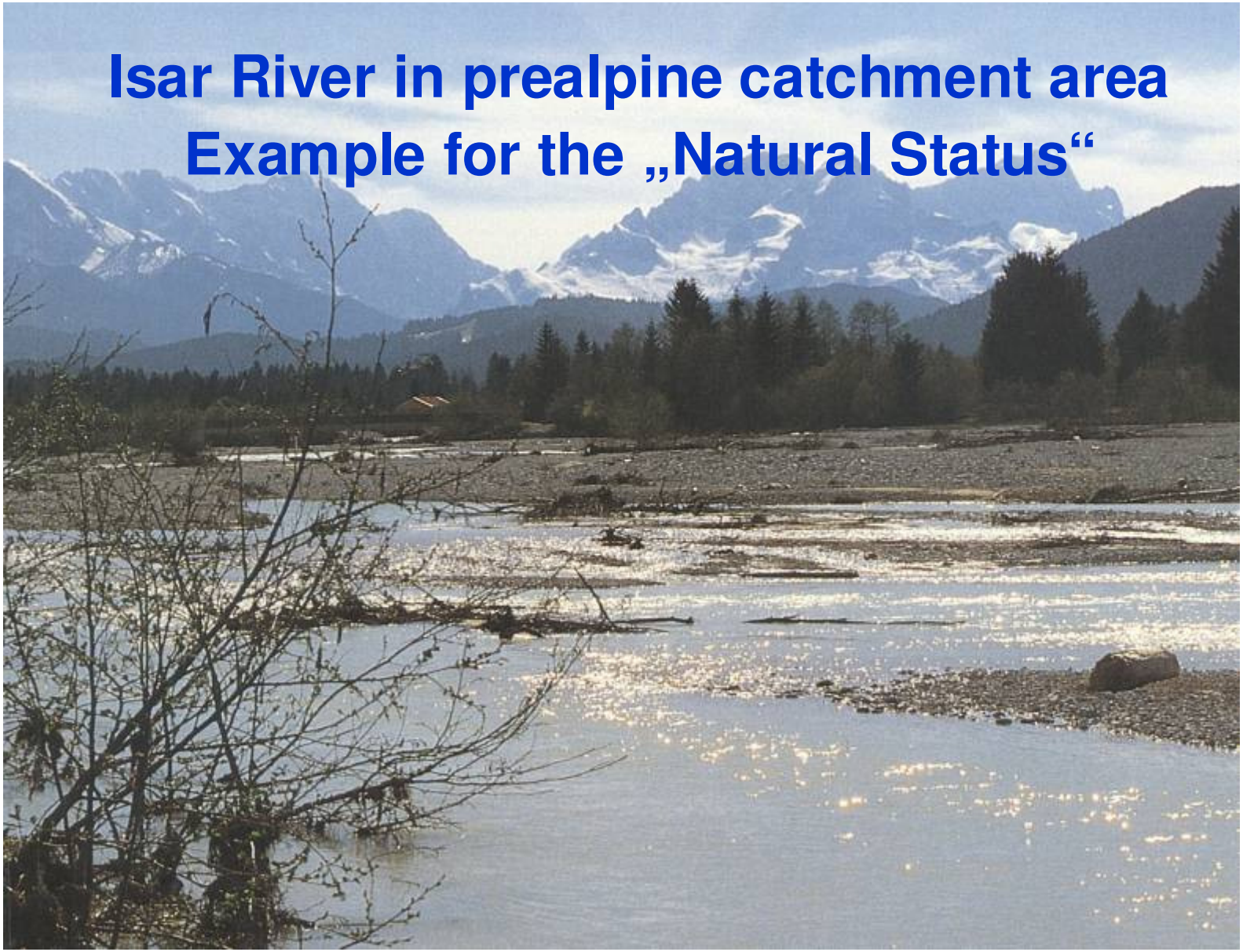


Catchment area	**9000 km²**
Length	**270 km**
Medium Low Discharge	**40 m³/s**
Medium discharge	**90 m³/s**
Medium high discharge	**420 m³/s**
Design flood (100 a)	**1.100 m³/s**

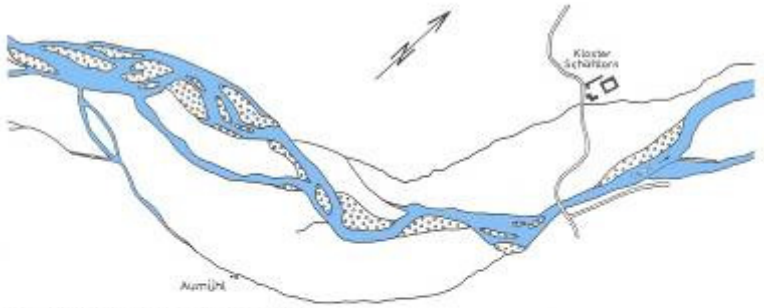
Concept and Planning

- Reference status of the river landscape
- Status quo
- Comparison of reference status/status quo → Deficits
- Restrictions (i.e. flood control, hydropower)
- Objectives of the restoration project
- Measurements and costs

Isar River in prealpine catchment area
Example for the „Natural Status“

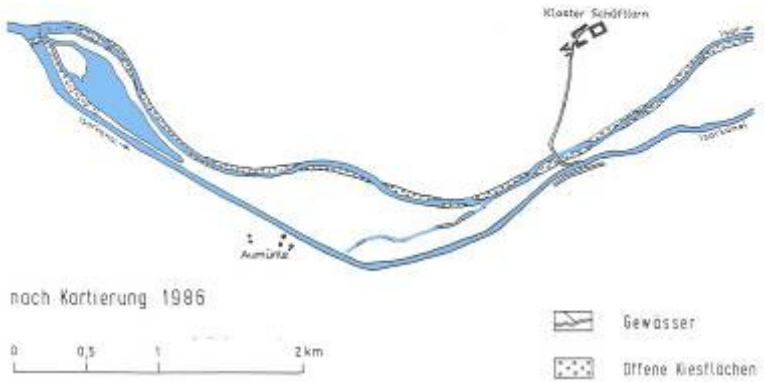


Morphological Changes as time goes by



Plan der Isar nach Consoni 1798

nach Luftbild von 1925



nach Kartierung 1986


1999


2002


2005
Isar Mühltal
south of Munich
Dipl. Ing. Stefan Joven, WWA München

Isar in Munich 1832

View before Restoration in 1999

Measurements

- Reinforcement of dikes
- Removal of concrete embankments
- Enlarging the cross section
- Bottom rock ramps
- Fish ladders for biological river continuity
- Interaction water to land


View during construction
Removal of concrete protection
New bank line


. . . view after Restoration
• Gravel banks, riffles and pools
• Natural river banks
• Dynamic river processes
• New habitats for flora and fauna
• Attractive recreation areas

River banks

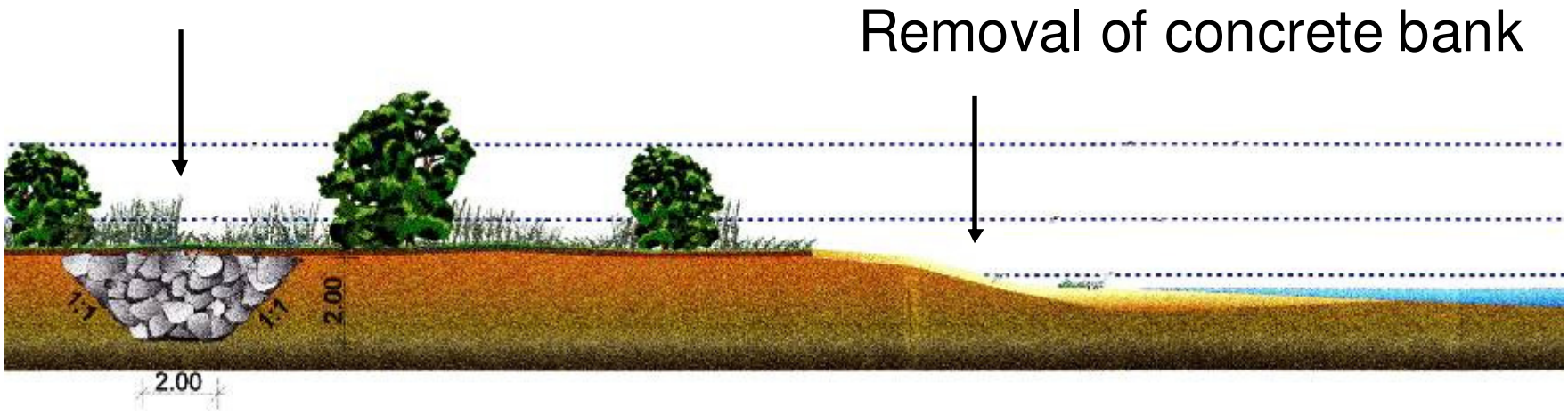
Before . . .

and after

Restored Bank

Space for morphological processes

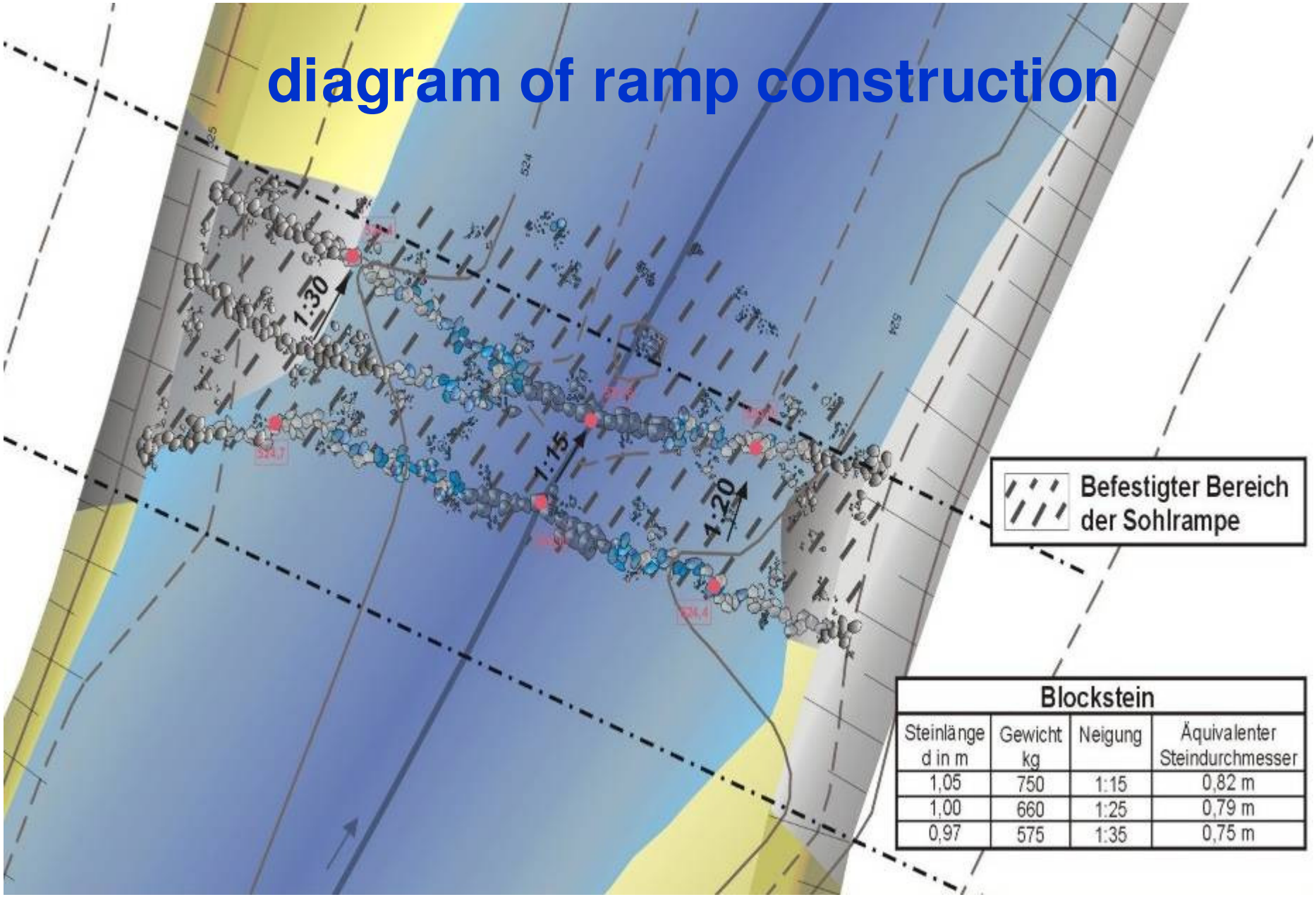
Backward „hidden“ protection



Dynamic River Bed Processes

River Bottom Ramp

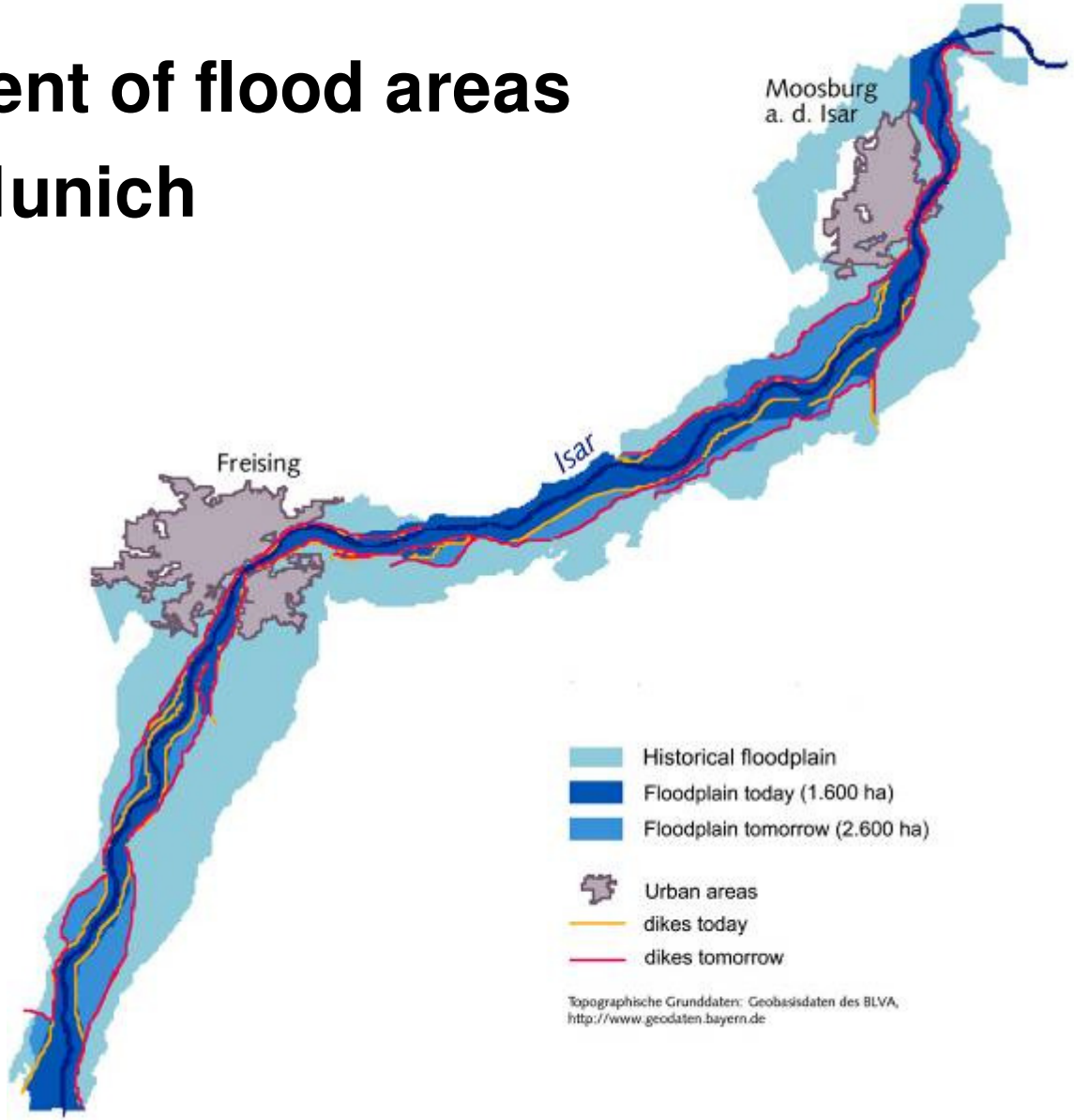
diagram of ramp construction

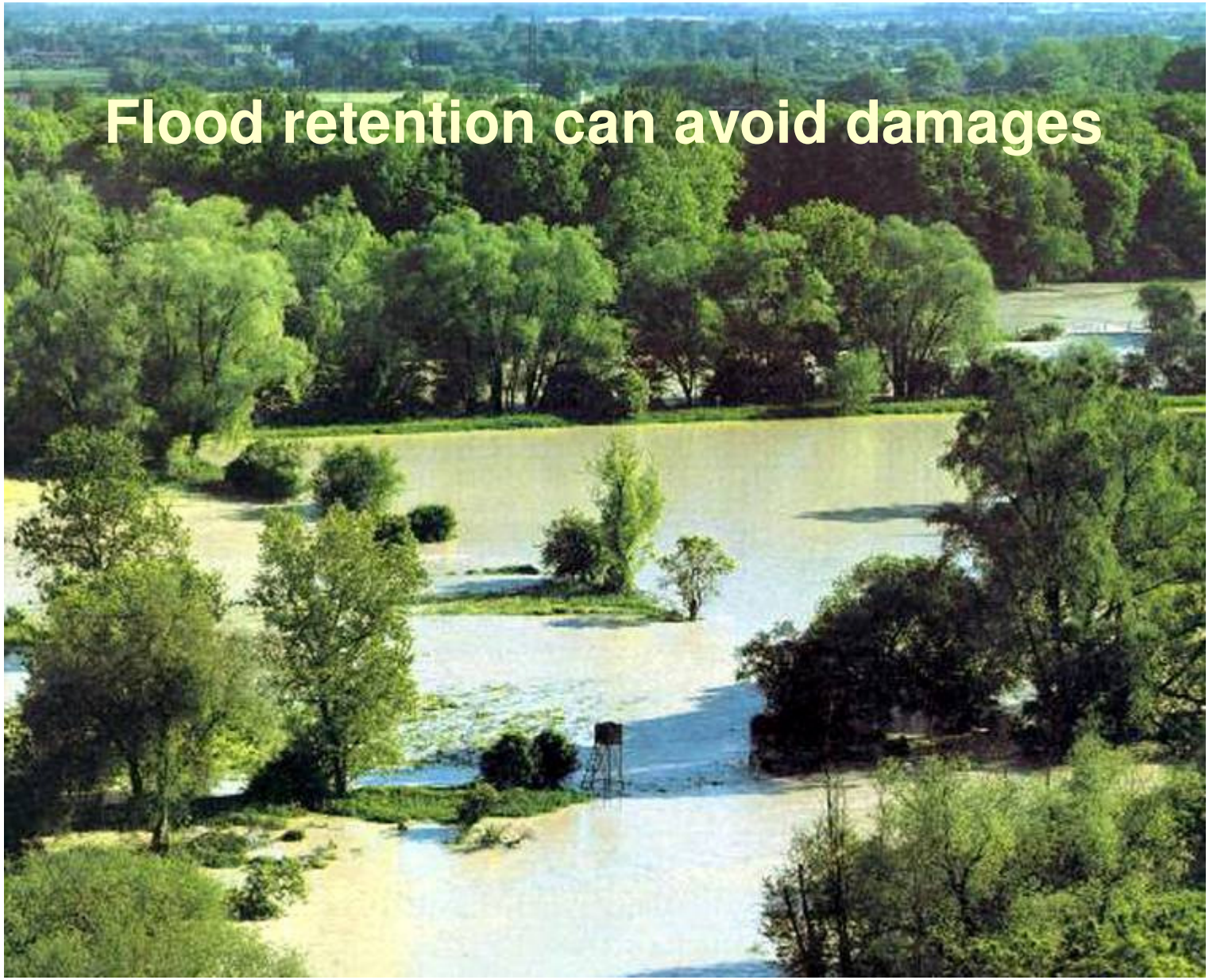


Blockstein			
Steinlänge d in m	Gewicht kg	Neigung	Äquivalenter Steindurchmesser
1,05	750	1:15	0,82 m
1,00	660	1:25	0,79 m
0,97	575	1:35	0,75 m


Urban Recreation
• Attractive landscape
• Access to waterline

Enlargement of flood areas north of Munich




Flood retention can avoid damages

Public Participation

Internet Platform

Info-Brochures

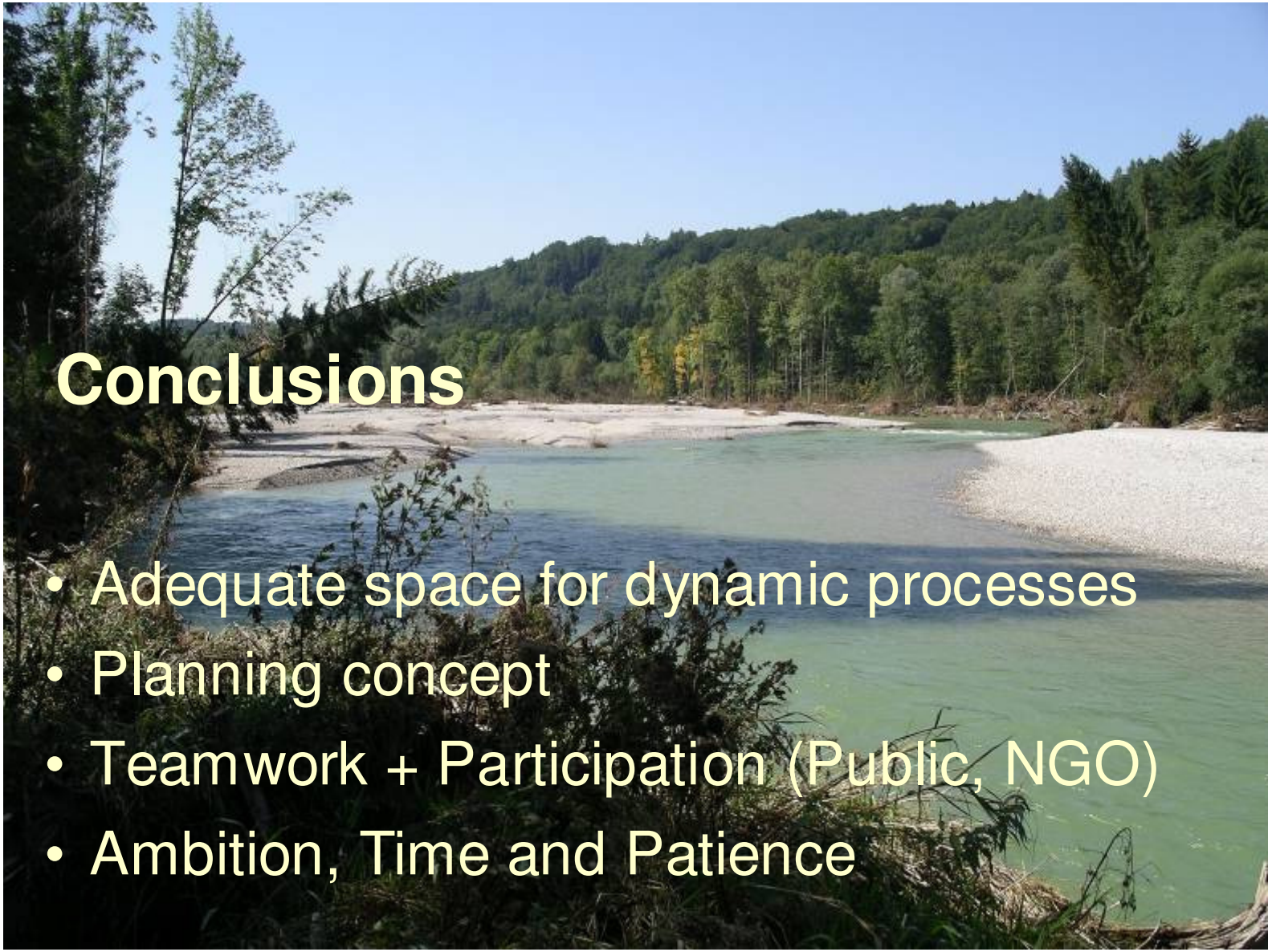
Excursions

Info-Points

TV + Press

Lectures

Round tables



Conclusions

- Adequate space for dynamic processes
- Planning concept
- Teamwork + Participation (Public, NGO)
- Ambition, Time and Patience