Introduction

Session 4
Water uses and environmental flows

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Open issues in determining environmental flows
What is the role of environmental flows connected with other restoration measures in modified rivers?
Good examples in Europe
How can the use of environmental flows be promoted?
How to determine suitable flows to biota and sediments seasonally?
Water related ecosystem services

Water uses
- Hydropower
- Industry
- Communities
- Dilution and natural purification
- Agriculture
- Recreation
- Tourism

Environmental flows
- Fishery
- Ecology
- Landscape
Linkages between restoration and discharges

**Impact**
- Loss of connectivity
  - fish, good/weak swimmers
  - Invertebrates, mammals
- Loss of reproduction habitats
  - damming rapids to stagnant condition
  - dredged and filled channels
- Discharge patterns
  - regulation
  - dry old channels
  - fish pass and bypass flow summer/winter

**Mitigation or compensation**
- Removing barriers
- Fish passes
- Nature-like bypass channels
- Constructing new compensative side channels
  - spawning channels
  - rearing channels
  - restoration of dredged rapids

**Environmental flows**
- Minimum flows in hydropower permits
- Requirements for migration and juvenile habitats
- Sediment balance
Isar, Mühltal and Munich, Germany

- Restoration of floodplain, allowing natural development
- Minimum flow was increased from 5 to 15 m3/s but big floods affect more to the morphological processes
- Bypass with fluctuating discharges, natural modifications
Ruppoldingen, Aare, Switzerland

- Bypass channel 1, 2 km, 2-5 m³/s, connected with a fish pass
- Has the most demanding ecolable Naturemade Star
Rupperswil, Aare, Switzerland

- Discharges in the bypass channel follow the discharges in Aare river between 2 and 4 m3/s
Rheinfelden, Rhine, Germany/Switzerland

- Constructed spawning channel 10 m³/s, flushing with 25 m³/s
- Discharge for landscape, river rapid 10 m³/s
- Opening March 2012
- First salmon May 2012
- Largest facility in Europe
How to promote decisions about environmental flows?

- Monitoring and assessing existing environmental impacts
- Making conflict solving scenarios
- Making programs of measures
- Presenting convincing cases about usefulness
Possible approaches for permits and contracts for defining environmental flows

- Minimum flow requirements in permitting – difficulties in renewal of permits?
- Voluntary agreements and contracts - PR for companies
- Eco-labelling: for consumers who are willing to pay more for environmental measures and flow
- Trading: loss of energy is payed by a municipality, fish authority or others who gain advantage of environmental flow - not feasible as a general solution

Have an inspiring session!