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Accounting for FLOODS in IWRM

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Scope

Scope of this intervention is to discuss how flood risk alleviation measures can be introduced into sustaianble IWRM approaches.

The problem is not trivial for several reasons that will be discussed in the sequel.

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Traditionally,

Water Resources Planning and Management

and in particular **reservoirs** design and management were approached via

Deterministic or Stochastic Optimization

(Maas et al., 1962; James and Lee, 1971; Loucks et al., 1981)

using LP or DP, usually based upon monthly time steps

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A first problem: the Time Scale

Unfortunately, as opposed to droughts that may last several months or years, **floods** cannot be generally accounted for on a monthly basis, since their physical duration (apart from few large rivers, such as the Nile) is shorter than a month.

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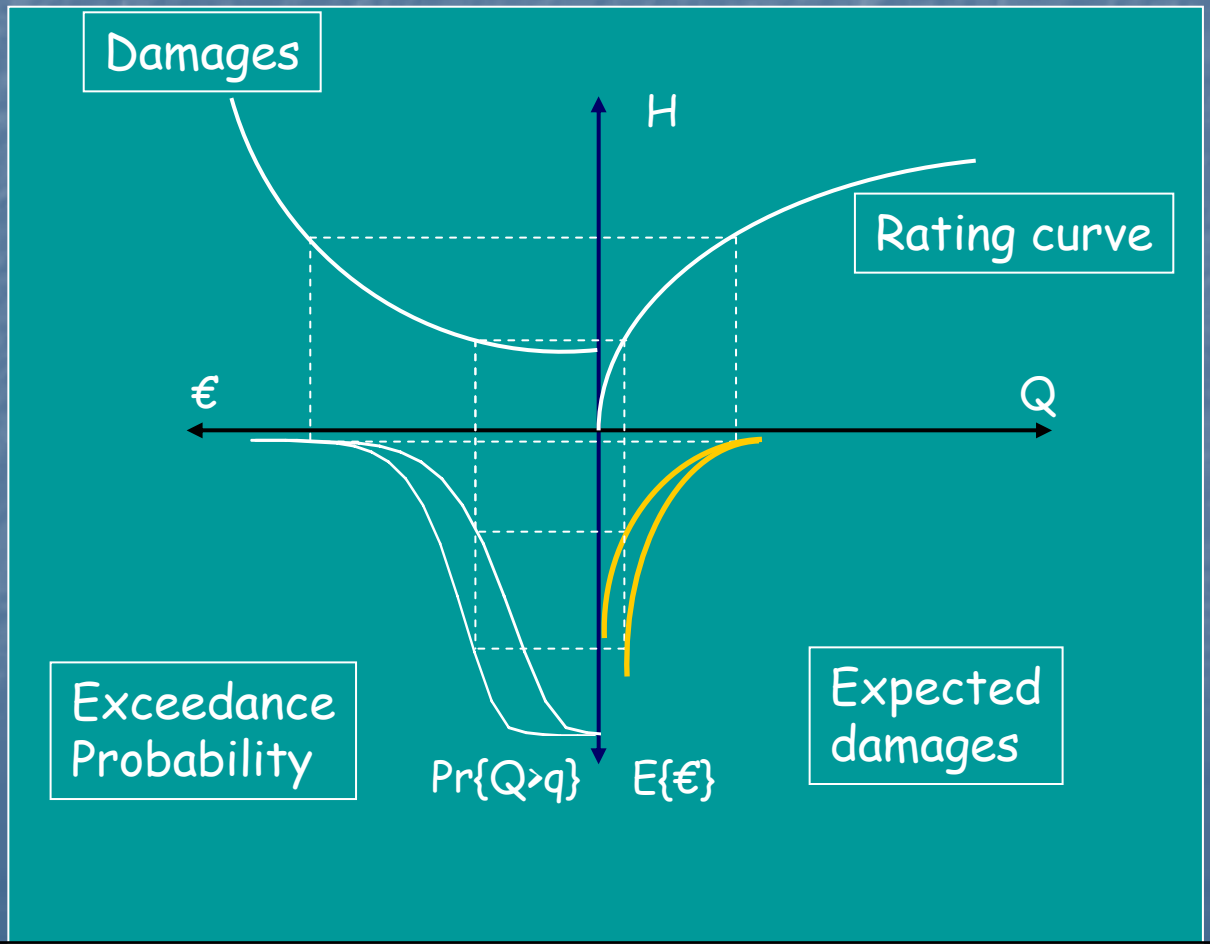
A second problem: the Risk

In order to account for, **flood alleviation benefits** one cannot avoid introducing the concepts of **uncertainty, extreme events and risk**.

For instance Loucks et al., 1981 introduce in a LP optimisation scheme the expected benefit due an increase in Flood Storage by means of the following computation.



More recently the introduction of the

Sustainability Concept

(World Commission on Environment and Development, 1987)

which aims at fulfilling the so called "3 Es" objectives:

- Environmental integrity
- Economic efficiency
- Equity for present and future generations

radically changed the traditional perspectives.

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SUSTAINABILITY IMPLIES THAT

- Water must be considered as a limiting factor for economic growth and development
- Environmental aspects (especially water quality which may reduce water availability and quality of life) must be taken into consideration
- Socio-economic aspects must be taken into account
- Legal and political (local, national and international) issues (strategies, restrictions) must be considered
- Uncertainty (including hydrological stochasticity, climate change and future demand) has to be accounted for

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EMERGING REQUIREMENTS

Sustainability requires studying problems in a comprehensive way at catchment scale.

Furthermore, with the introduction of the sustainability concept classical optimisation in water resources, has lost its leading role with respect to the integrated analysis of

environmental and socio-economical impacts

of pre-defined development scenarios.

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EXISTING DECISION SUPPORT SYSTEMS

such as for instance the **WSM DSS**, have been conceived to formulate the Planning or Management problem by describing the complex interrelations among all the physical, socio-economical and environmental components

But What about Floods

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THE COMPLEXITY INCREASES

Flood risk alleviation and flood control must now be approached with a "holistic view" and must be integrated into a "Sustainable IWRM" type of analysis.

This poses several additional and presently unresolved problems.

THE HOLISTIC APPROACH

The holistic approach to Flood Risk Management was advocated after the Mississippi flood, and implies looking at the problem in a broader sense, as illustrated in the sequel.

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HOLISTIC APPROACH TO RISK MANAGEMENT "PLANNING"

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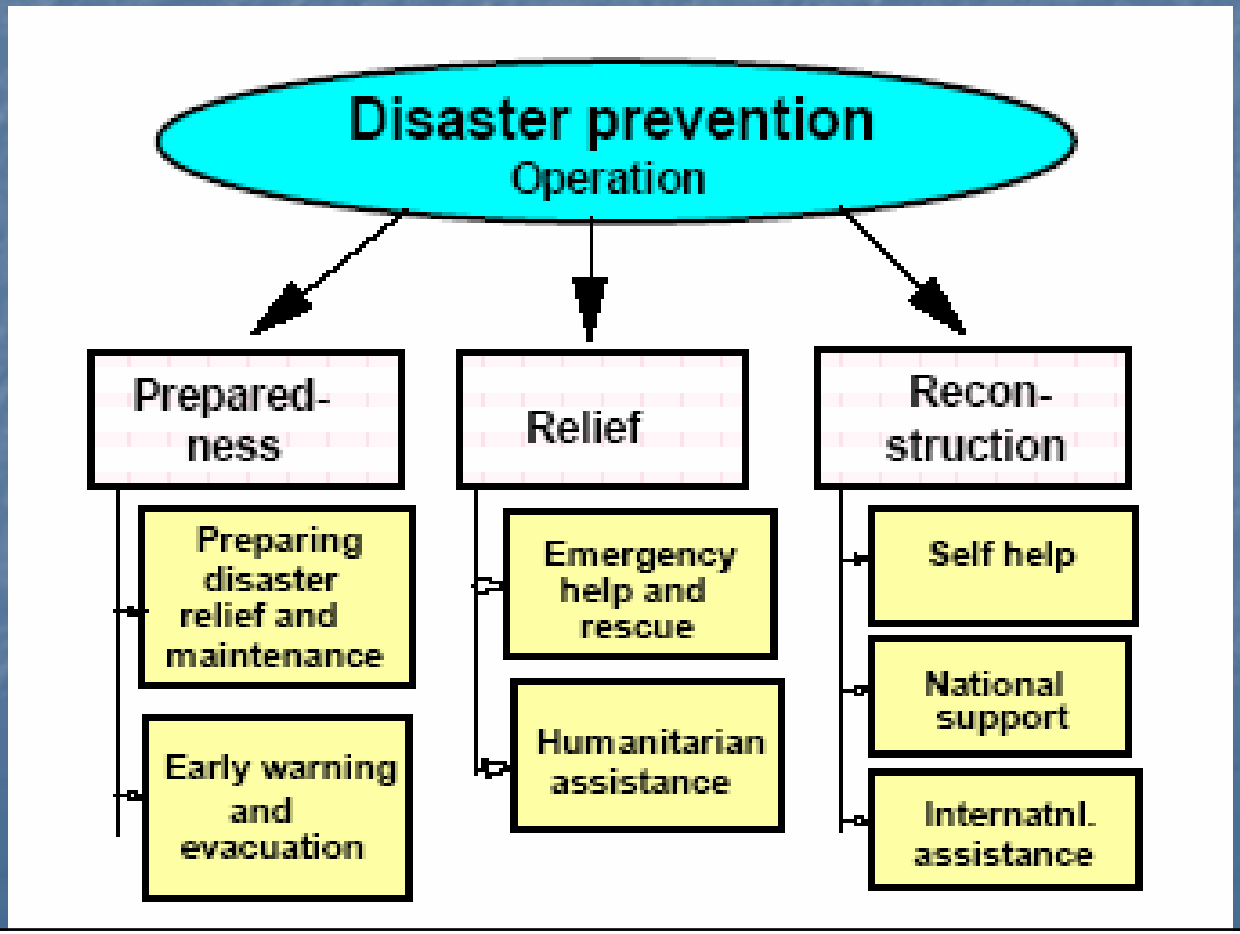
HOLISTIC APPROACH TO RISK MANAGEMENT "EMERGENCY MANAGEMENT"



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THE SUSTAINABLE IWRM APPROACH

The sustainable approach broadens the holistic flood risk management not just to include a wide variety of non-structural interventions, such as for instance restoration of wetlands, re-forestation, dry land-farming, but to radically change:

- How we think about floods
- How we make choices as what to do
- What options we seek to adopt
- How we implement these options

(Green, 2003)

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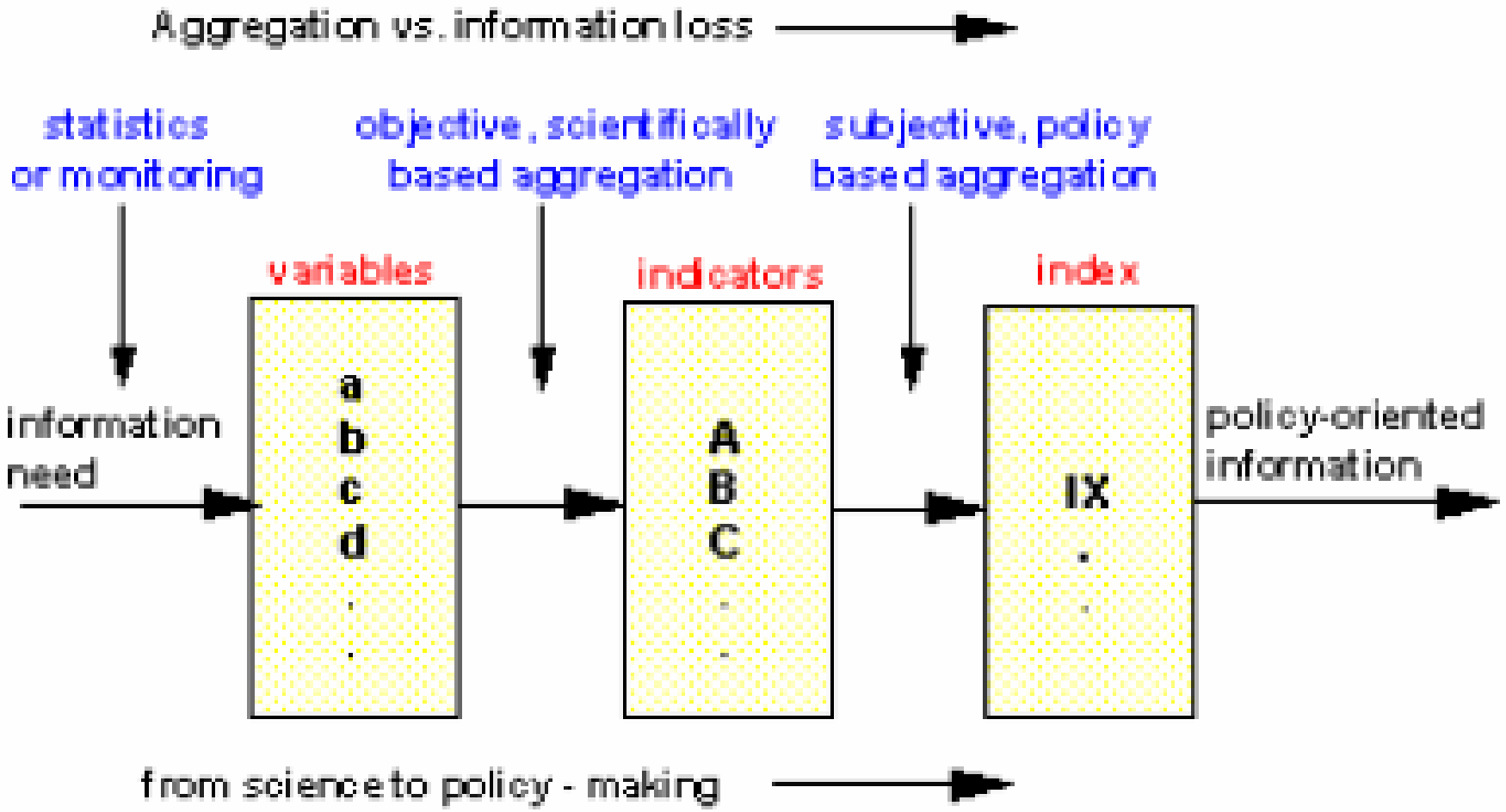
THE NEED FOR DEVELOPING INDICATORS



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DERIVING FLOOD INDICATORS AND INDEXES IS AN EXTREMELY COMPLEX PROBLEM

- Authorities generally perceive the flood problem in terms of structural, and mainly engineering interventions

- Flood time scales are incompatible with IWRM Scenario Based simulation models

- The flood risk analyses are extremely expensive operations scantly available in several European countries.

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Floods in the WFD

As a matter of fact, even the WFD only considers the flood problem as "temporary deterioration in the status of bodies of water" as well as "circumstances of natural cause or forcemajeure which are exceptional or could not reasonably have been foreseen " that allow for "exemptions" and that "shall not be in breach of the requirements of this Directive".

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An example: the case of the Tagliamento

The Tagliamento river in Italy is a very good example to illustrate the complexity of deriving a sustainable IWRM approach to flood risk alleviation.

The Tagliamento river is supposed to be the last European River still showing "natural conditions"

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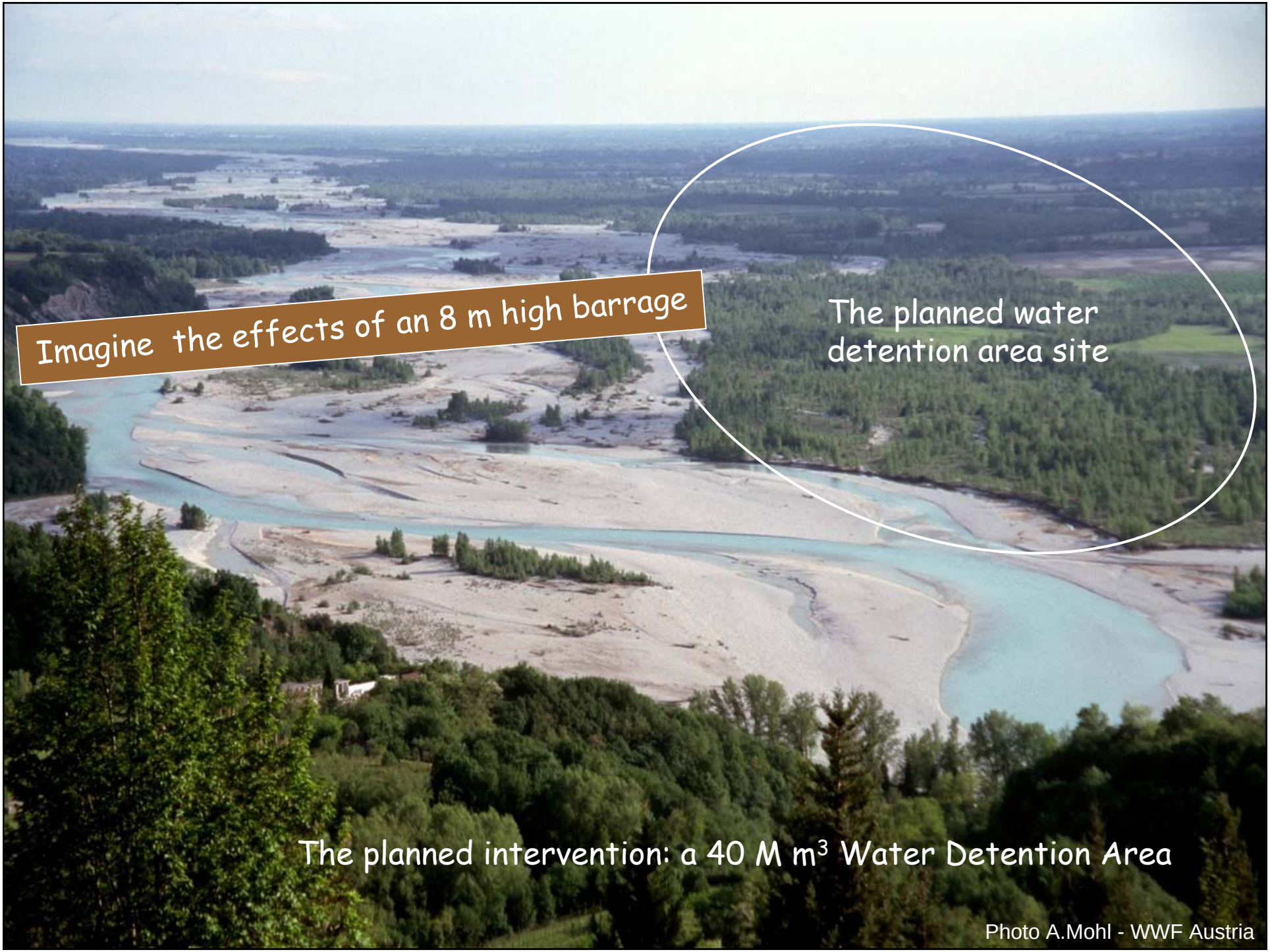
The Tagliamento River in Italy

Photo Arno Mohl - WWF Austria

A river with interconnected branches

- Exceptionally preserved natural conditions
- Wide variety of habitats (SIC)
- Inestimable ecological value due to the presence of a riverine band
- Extremely rare environment and panoramic views in Central Europe


Imagine the effects of an 8 m high barrage
The planned water detention area site
The planned intervention: a 40 M m³ Water Detention Area
Photo A.Mohl - WWF Austria

A proposal for an IWRM approach, was made by the WWF. Unfortunately negotiations with the Friuli Regional Authorities, mainly concerned with the flood protection of a downstram village, brought to nowhere.

The last hope lays in the bearers of the local interests, the mayors of the surrounding villages, given the planned touristic development of the area, which includes: uncontaminated sites, San Daniele del Friuli ham and excellent Friuli wines.

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CONCLUSIONS

I would not like to conclude in a pessimistic way, therefore also taking into account the scant literature on the subject, I will conclude by saying that:

We must be really pleased that there is much scope for research in the area of the incorporation of Flood Risk Management into Sustainable IWRM.