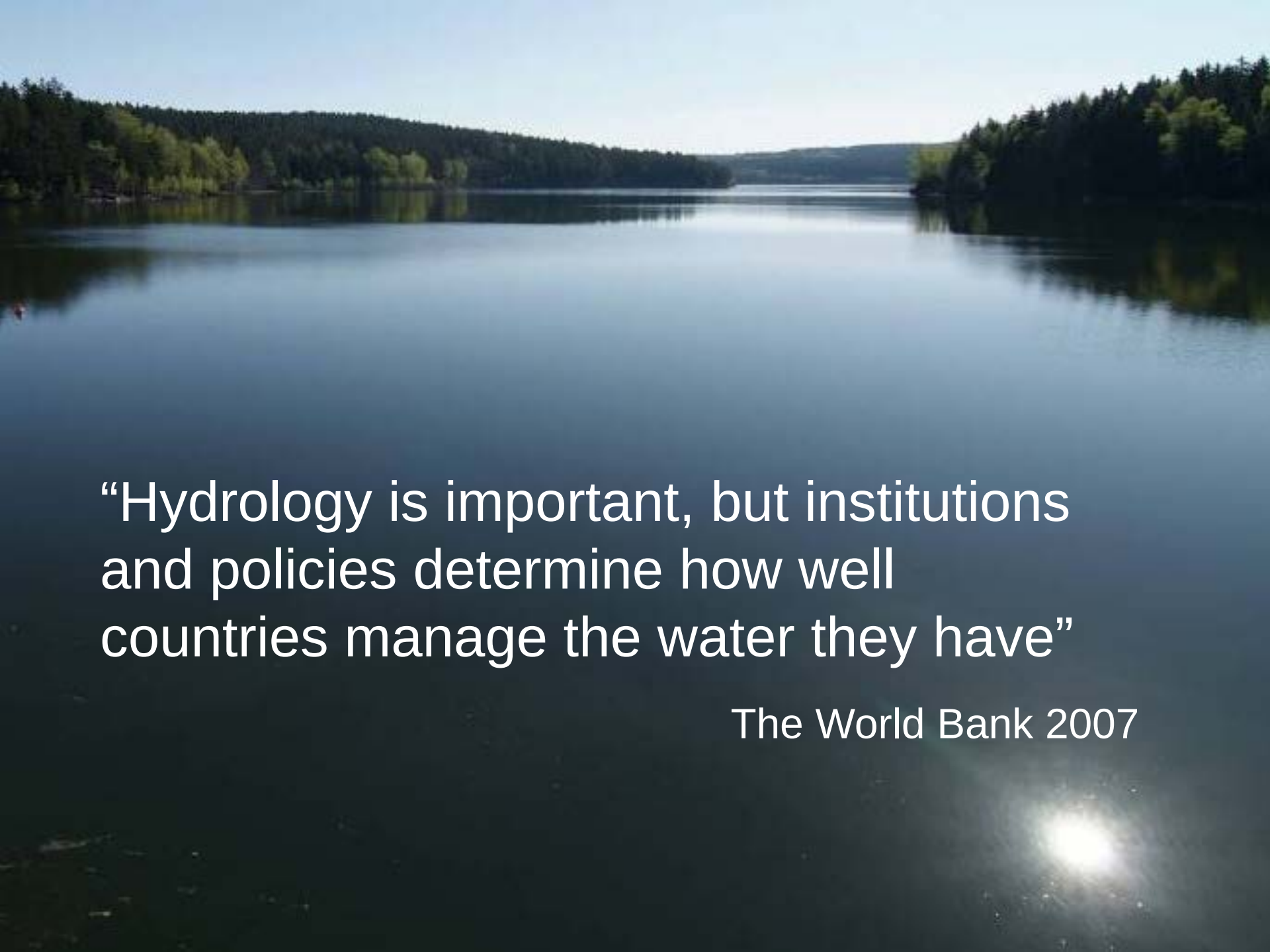
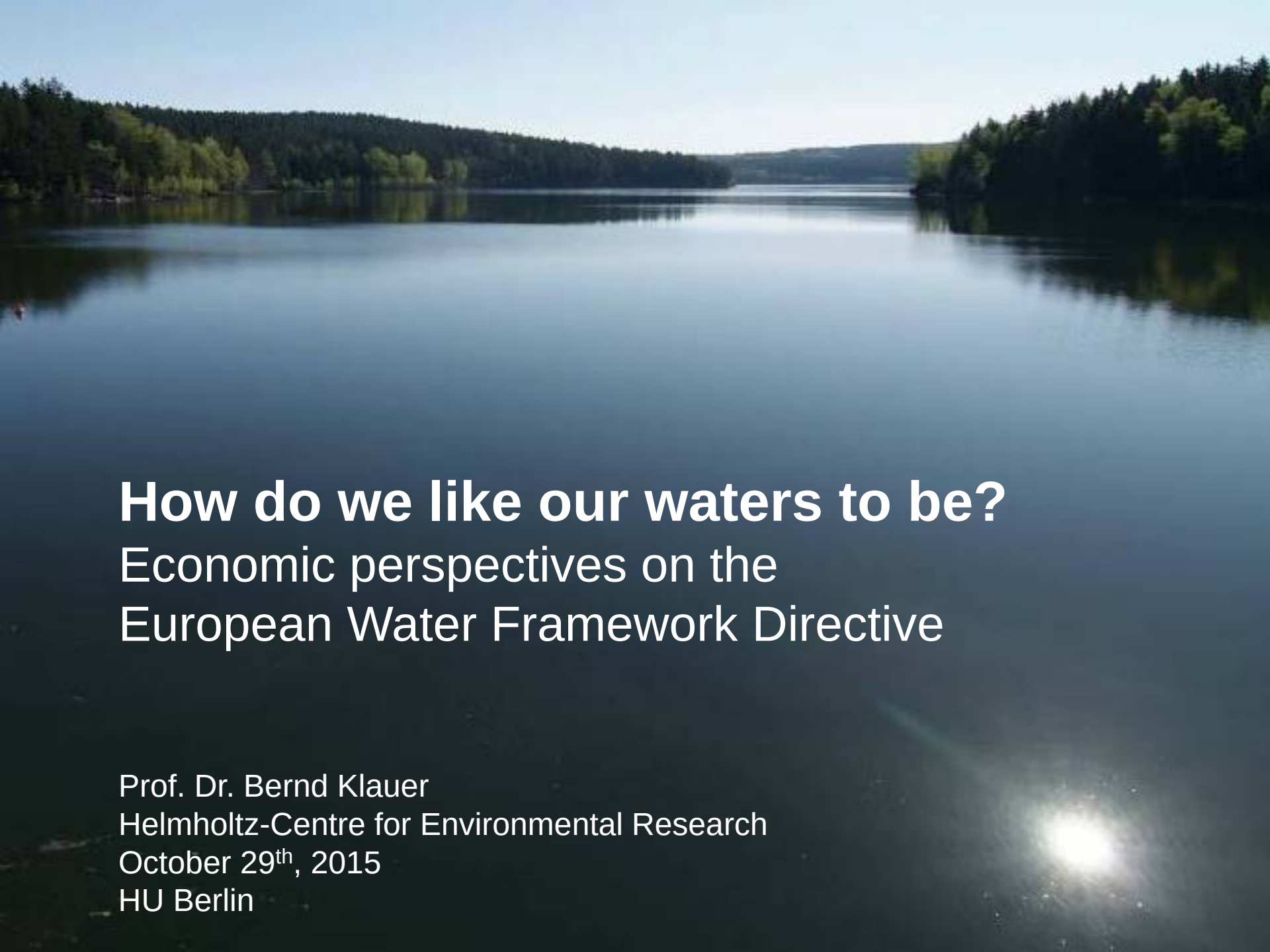
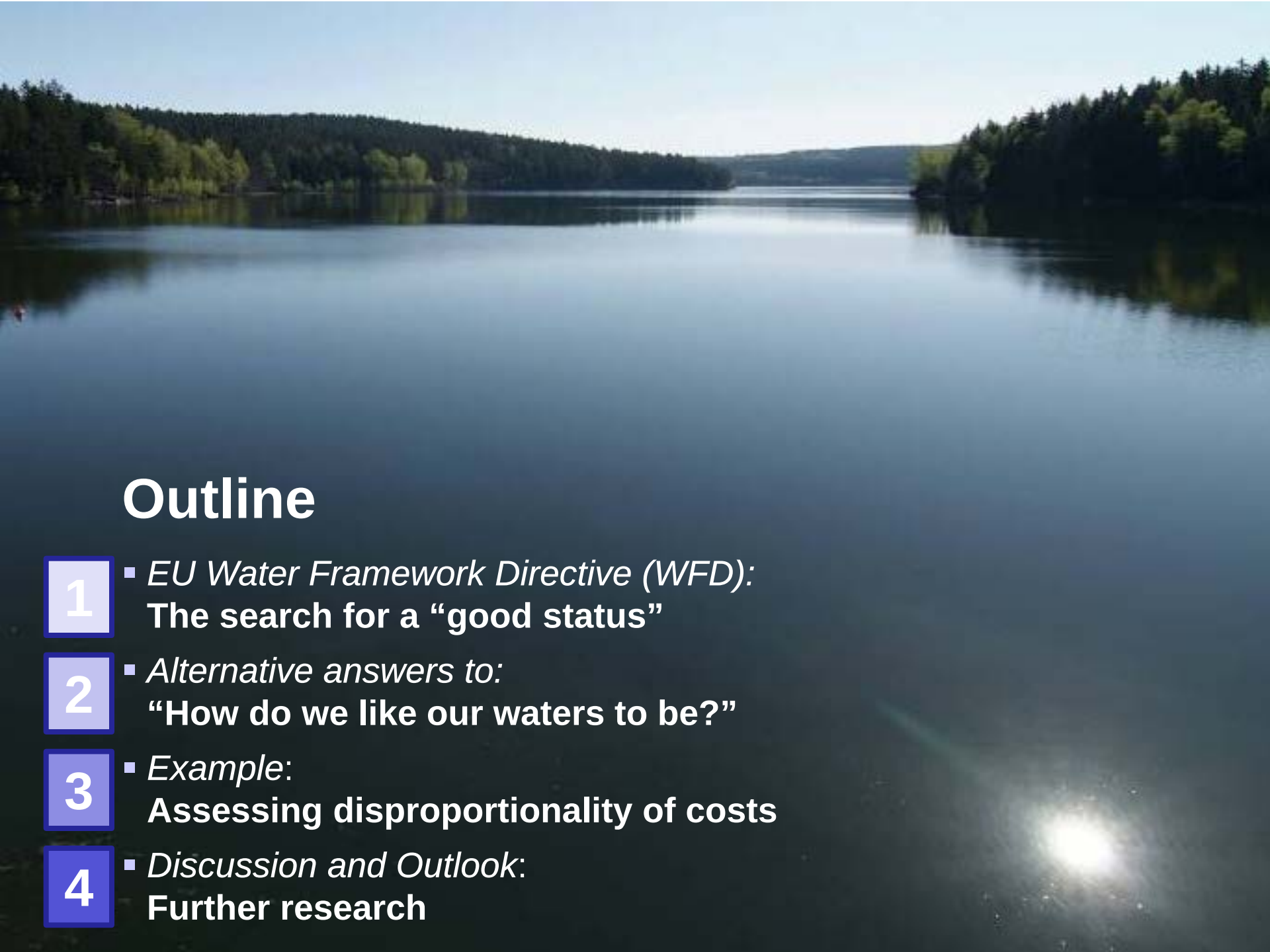

“Hydrology is important, but institutions and policies determine how well countries manage the water they have”
The World Bank 2007



How do we like our waters to be?

Economic perspectives on the European Water Framework Directive

Prof. Dr. Bernd Klauer
Helmholtz-Centre for Environmental Research
October 29th, 2015
HU Berlin



Outline

1. *EU Water Framework Directive (WFD):*
   The search for a “good status”
2. *Alternative answers to:*
   “How do we like our waters to be?”
3. *Example*:
   Assessing disproportionality of costs
4. *Discussion and Outlook*:
   Further research

EU Water Framework Directive (WFD)

- Ambitious
  - Quality objectives (“good water status”)
  - Procedural goals
- Best-practice example for an Integrated Water Resources Management (IWRM)
- But many issues arise

- Interesting research object

The concept of “ecological water status”

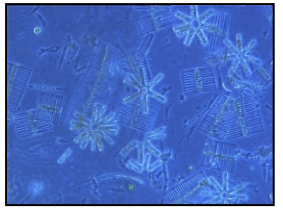
The Directive takes an ecological perspective.

- **High water status** = “*No, or only very minor, anthropogenic alterations” from the taxonomical situation of an undisturbed water”* (Annex V, WFD)
- **Good water status**
  = slight derivation from high water status

Class	Assessment of ecological Status	Deterioration from type-specific reference value
1	High	Minimal
2	Good	Low
3	Moderate	Moderate
4	Poor	Strong
5	Bad	Very strong

Macro-phytes

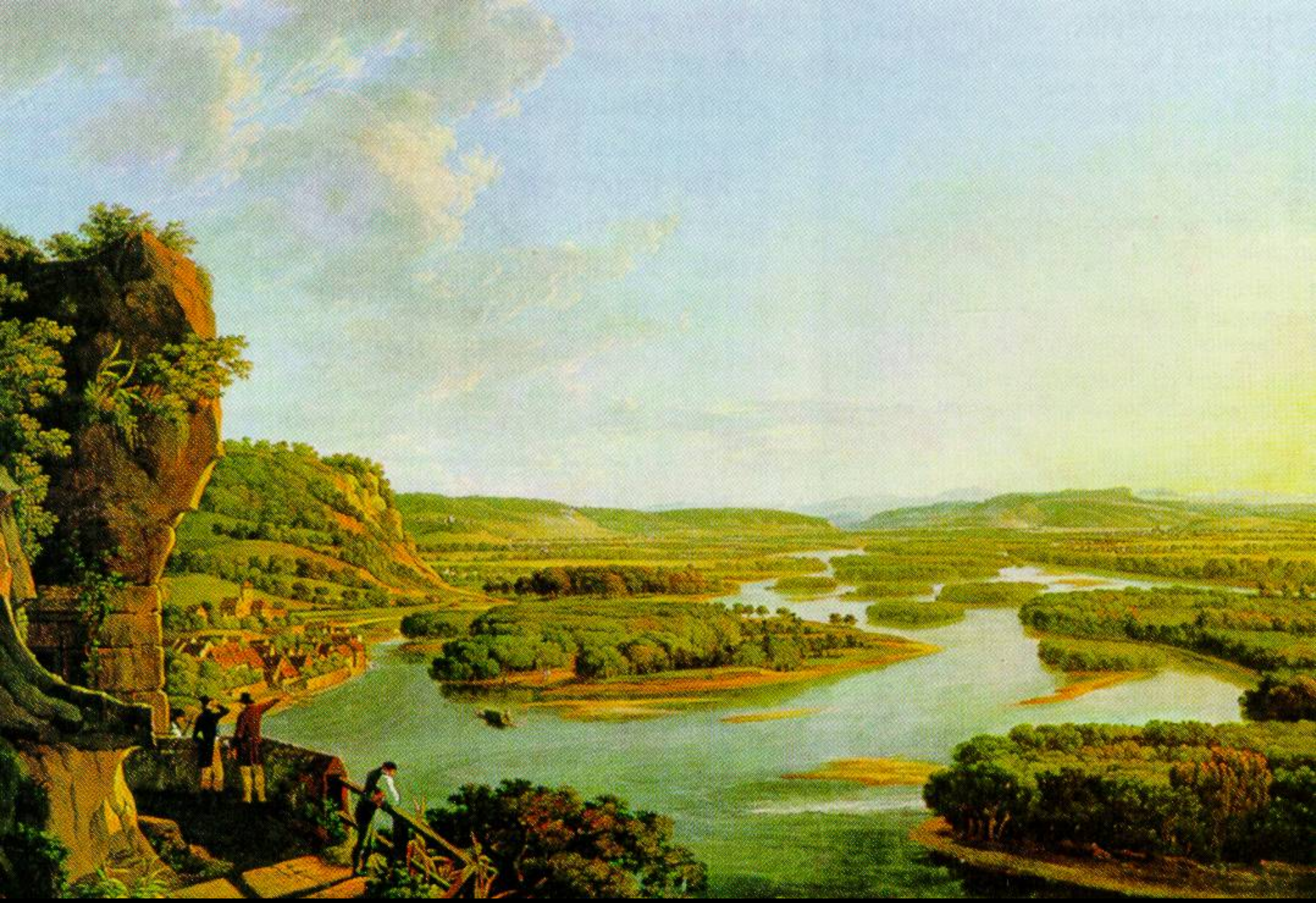
Phyto-plankton



Macro-zoobenthos

Phyto-benthos

Fish



Peter Birmann (1758 -1844): Der Oberrhein nördlich von Basel um 1800
(Kunstmuseum Basel)

W.L. Kozlowsky (1932):
Landwirtschaftlicher (kulturtechnischer) Wasserbau
(Österreichisches Lebensministerium)

Result today

EC WFD's aims: "good status" of waters

1

Surface water bodies in 2015

82 % not in "good status"

Very good
=
Reference

Good

Moderate

Poor

Bad

Historical transformation (intended)

Wanted restoration

How do we like our waters to be?

Two alternative approaches:

“Nature itself tells us what is good”

Different concepts, e.g.:

- Taxonomical status “close-to-nature”
- Resilience
- Ecosystem functioning

- Ignores the use of aquatic ecosystems by mankind
- “Naturalistic fallacy”

“Optimizing ecosystem services”

1. Identification of the various ecosystem services
2. Calculation of cost-benefit relation

- Monetization of ecosystem services necessary but often problematic

Exemptions from “good status”

Surface water bodies in 2015

82 % not in “good status”

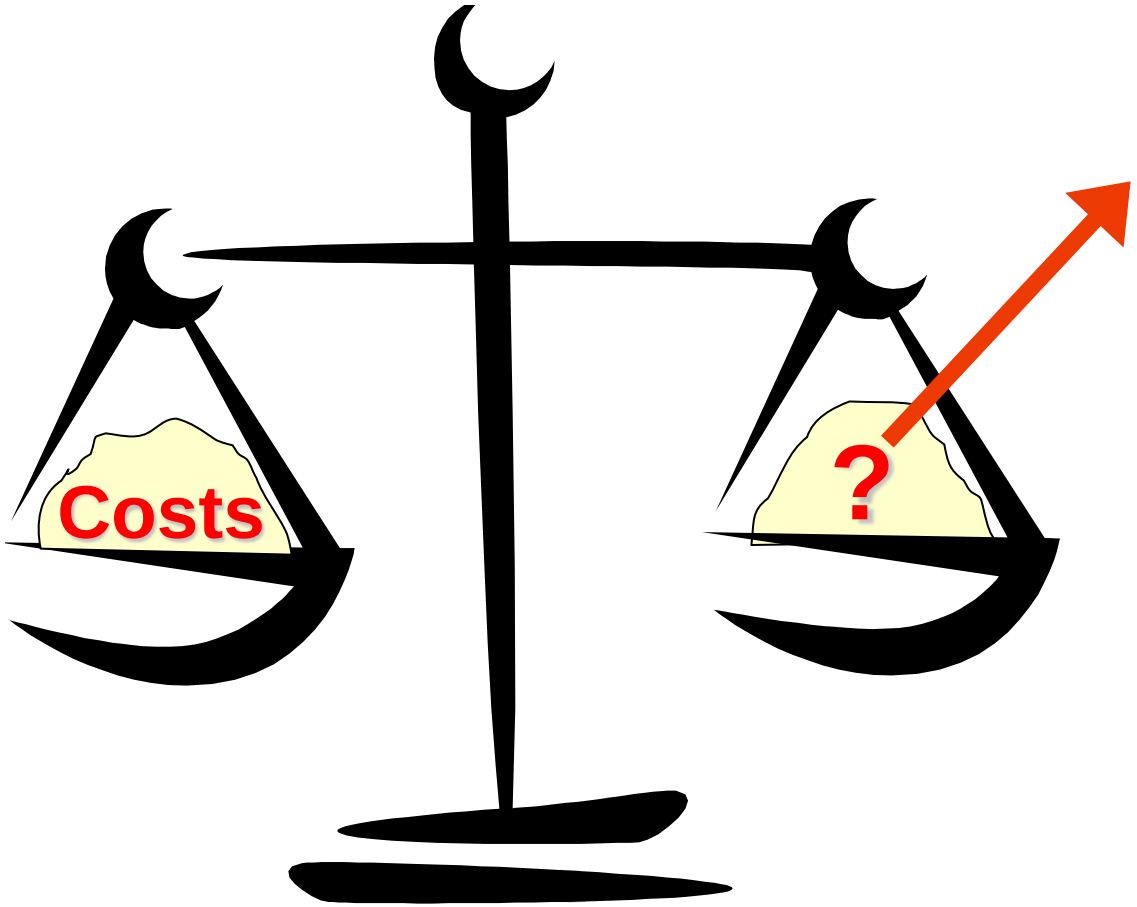
Art. 4.5 WFD:

“Member States may aim to achieve **less stringent environmental objectives** [... if] the achievement of [a good water status] would be **infeasible** or **disproportionately expensive**.”

How to understand “disproportionate”?

Checking disproportionality requires *balancing* costs with a standard of comparison.

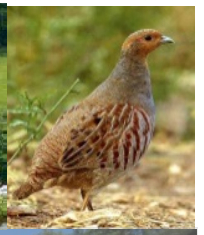
Standards of comparison



Benefits of the management measures

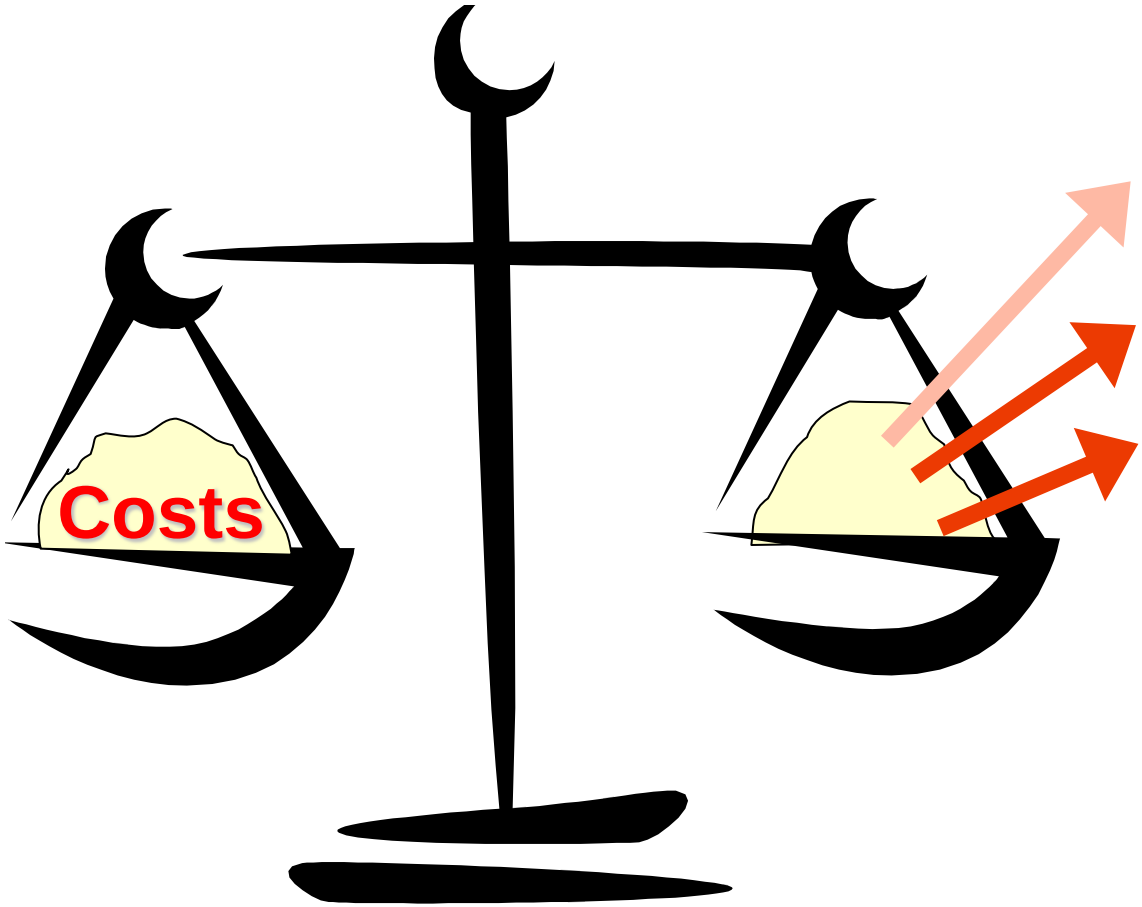
Benefits of management measures

Benefits of improving water status



Additional benefits (water and non-water related)

Standard of comparison?



Benefits of the management measures

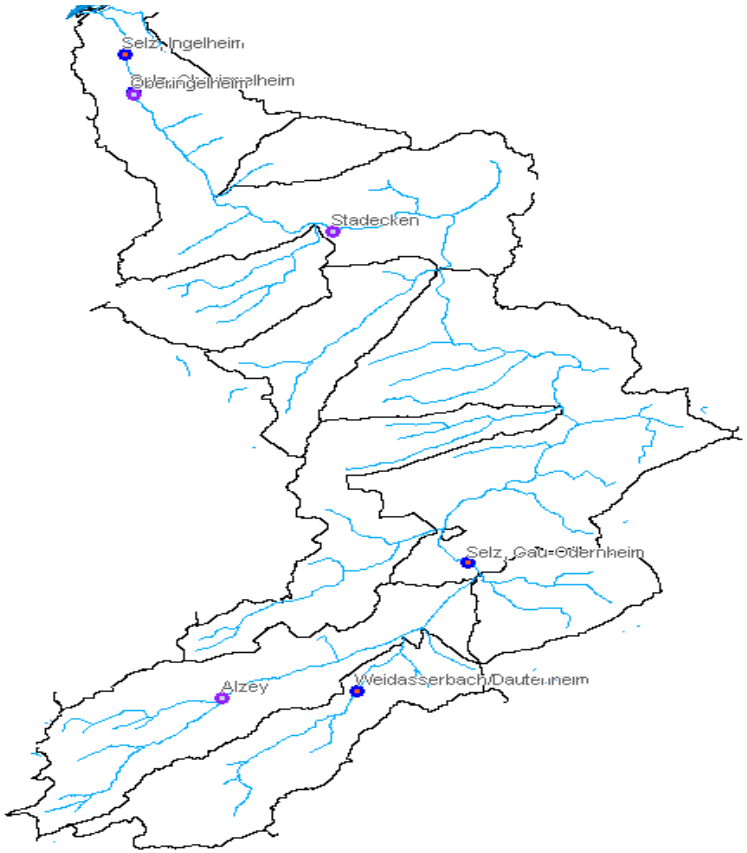
Ability to pay of those who bear the costs

Past expenditures

LAWA Project (2014-2015)

Aim:	Development of a method for assessing the disproportionality of costs. - Low data requirements - Transparent
Idea:	Find a water-body specific threshold for disproportionality by - looking at past public expenditures for water protection - adjusting for the new challenges of WFD - relating to specific water body (area, current status)

Case study: River in Rhineland-Palatinate

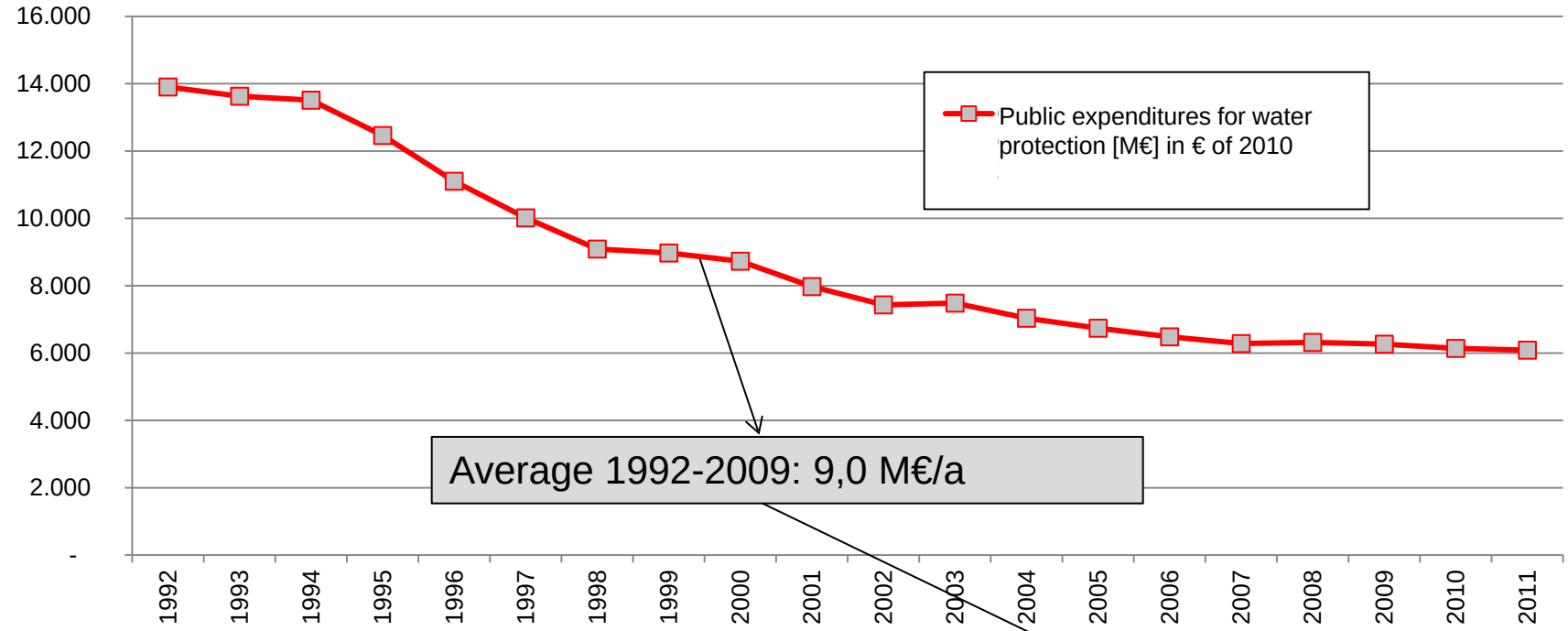


Description

- Tributary to River Rhine
- Catchment area 375 km²
- Main problem: eutrophication due to phosphate pollution

Step 0: Calculate nationwide average public expenditures for water protection

State expenditures for water protection in Germany
Source: Federal Statistic Office (statistics on public households)



Area of Germany: 360,000 km²

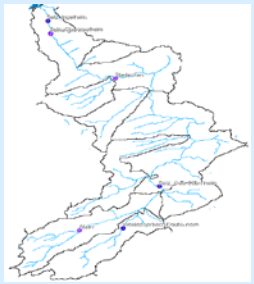
Average public expenditures per area and year: 25 K€/(km² · a)

Step 1: Estimation of costs for reaching good status

	Supplementary measures	Investment costs [M€]	Operation costs [M€/a]
Past	Measures for sewage treatment (2009-2012)	2.7	-
Planned	Further measures for sewage treatment plants (optimizing chemical precipitation, flocculation filtration for plants > 5,000 citizens)	11.4	0.156
	Improvement of combined wastewater sewer (retention soil filter for about 70 % of the cites)	38.9	0.410
	River bank buffer strips of 5-15 m on each side (cost for land acquisition)	5.8	-
	Initial planting of buffer strips	6.9	-
	„Additional“ morphological measures	6.8	-
	Total	**72.5**	**0.566** (= 6.8 M€ in 2015-2027)
	Total costs of (supplementary) measures 2009-2027: 79.3 M€		

Step 2: Calculation of water-body related cost thresholds for disproportionate costs

Nationwide average public expenditures for water protection:
25 K€/(km² · a)

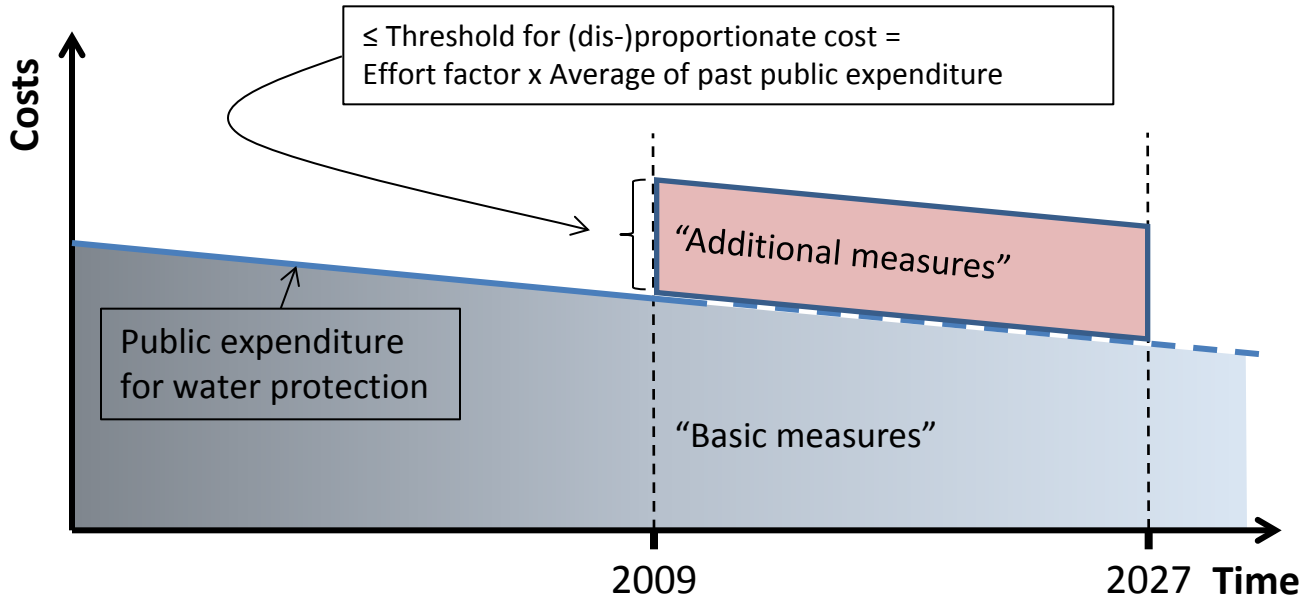


Area of water body:
375 km²

Relate Ø-costs to area:
25 K€/(km² · a) x 375 km² = 9,5 M€/a

Relate Ø-costs to 2009-2027:
9,5 M€/a x 18 a = **172 M€**

Step 2: Calculation of water-body related cost thresholds for disproportionate costs



Cost threshold = Past average expenditures x *"Effort" factor*

For example:

Effort factor = 0: Continuation of past efforts for reaching good status. Only basic measures are taken.

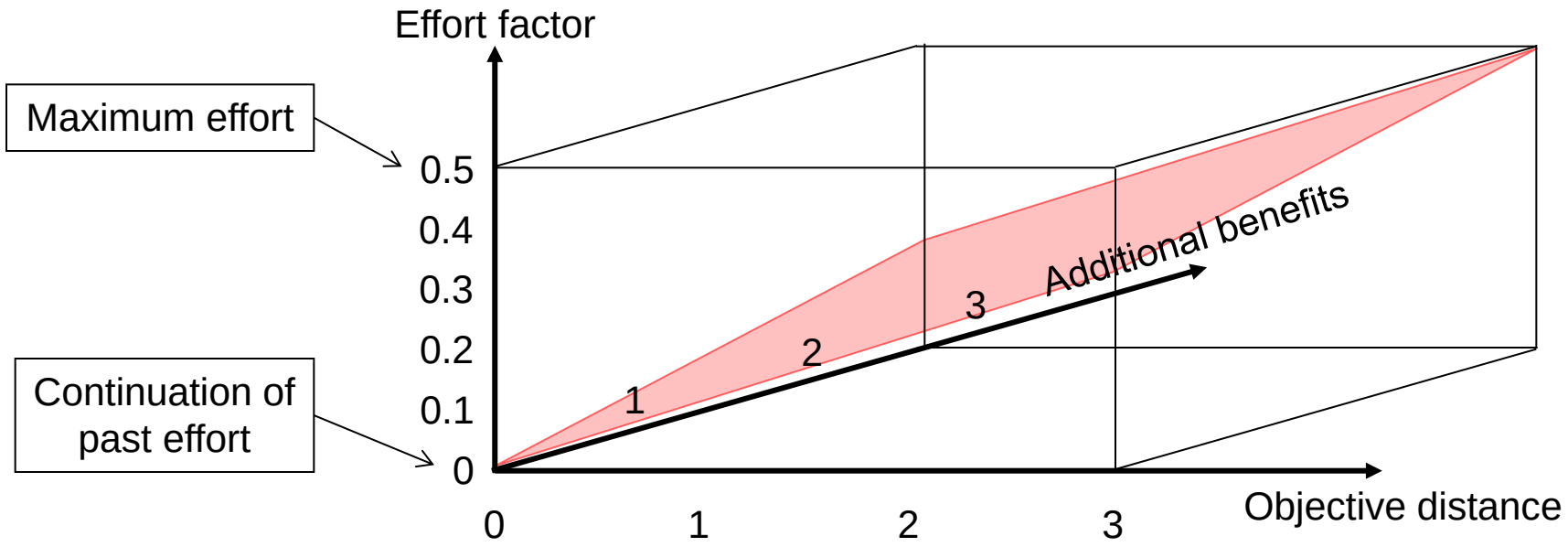
Effort factor = 0.5: Effort for additional measures is half of effort for basic measures.

How should this "Effort" factor be set?

Step 2: Calculation of water-body related cost thresholds for disproportionate costs

Reasonable effort should depend on benefits. There are two types of benefits:

1. Benefits of improving water status
   → **"objective distance"**
2. Additional benefits besides those from improving water status
   → **"additional benefits"**



Proposed formula:

Effort Factor = 2/18 Objective Distance + 1/18 Additional Benefits

Step 2: Calculation of water-body related cost thresholds for disproportionate costs

Reasonable effort should depend on benefits. There are two types of benefits:

1. Benefits of improving water status
   → **"objective distance"**
2. Additional benefits besides those from improving water status
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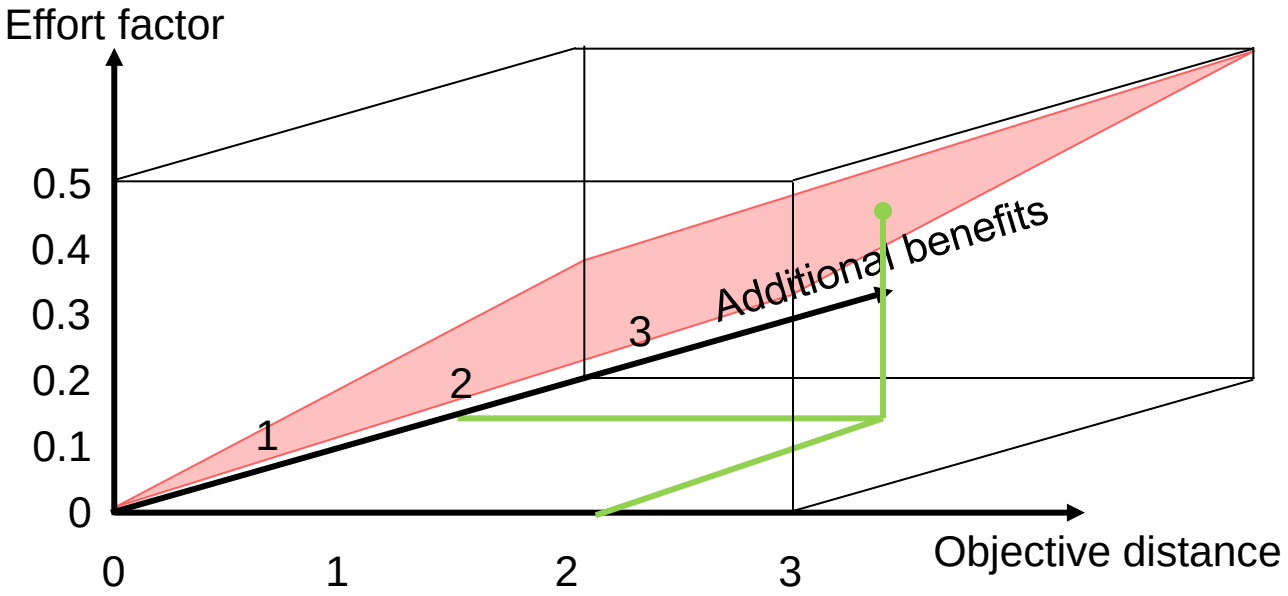
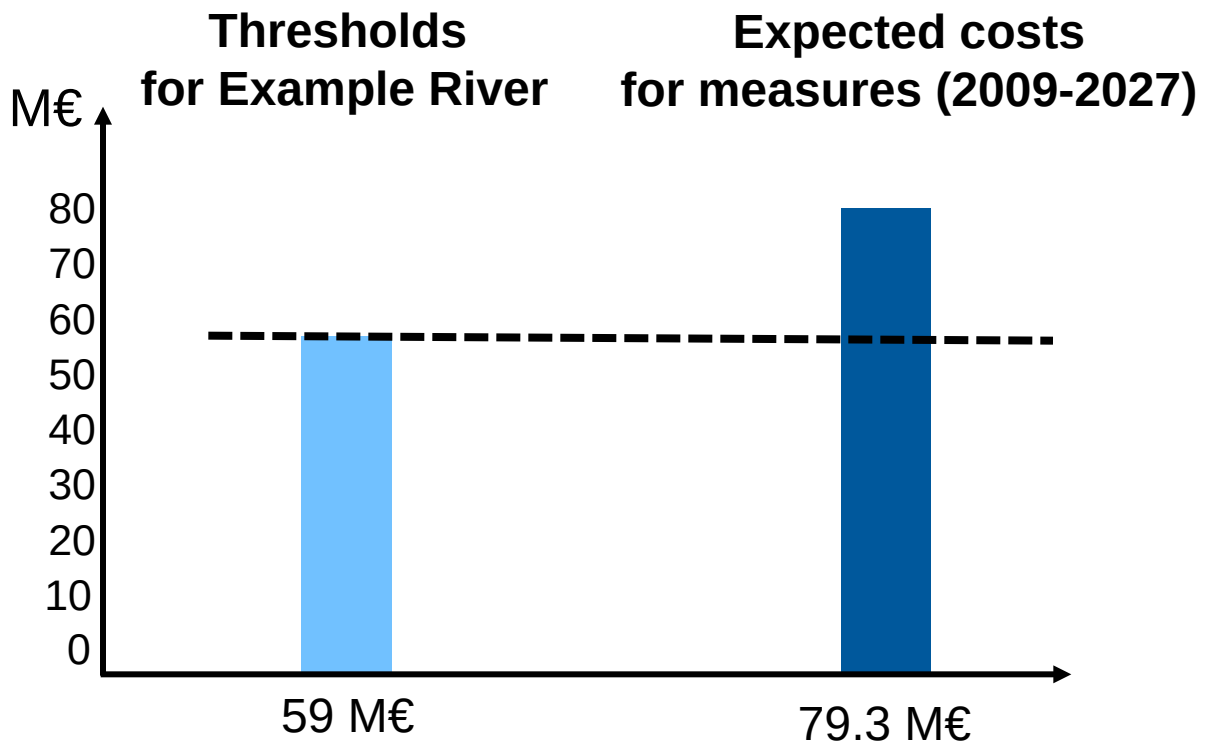


Example River: Objective distance: 2.12, additional benefits: 2.0

→ Effort Factor: 2/18 x 2.12 + 1/18 x 2.0 = 0.346

→ Cost threshold: 172 M€ x 0.346 ≈ **59 M€**

Step 3: Comparison of costs and threshold 3



Good status in Example River is disproportionately expensive!

Discussion and outlook

4

- Exemptions are an indispensable part of the WFD.
- General problem:
  Find a balance between nature protection and exploitation!
- Our method for assessing disproportionality supports this search for a good balance …
  … but does not release politics form its responsibility.
- Further research:
  Define less ambitious environmental objectives that still ensure the functioning of (aquatic) ecosystems.

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