Assessment of deterioration according to Article 4(7) WFD – Experiences from practical cases in Germany

Workshop

New experience in implementation of Article 4.7 of the Water Framework Directive (WFD) in the Danube Region

Hotel Holiday Inn, Bratislava

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Content

- Introduction
- Analysis of potential effects
- Data basis
- A question of quantity, quality and time
- Conclusion

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Recent national activities (selection)

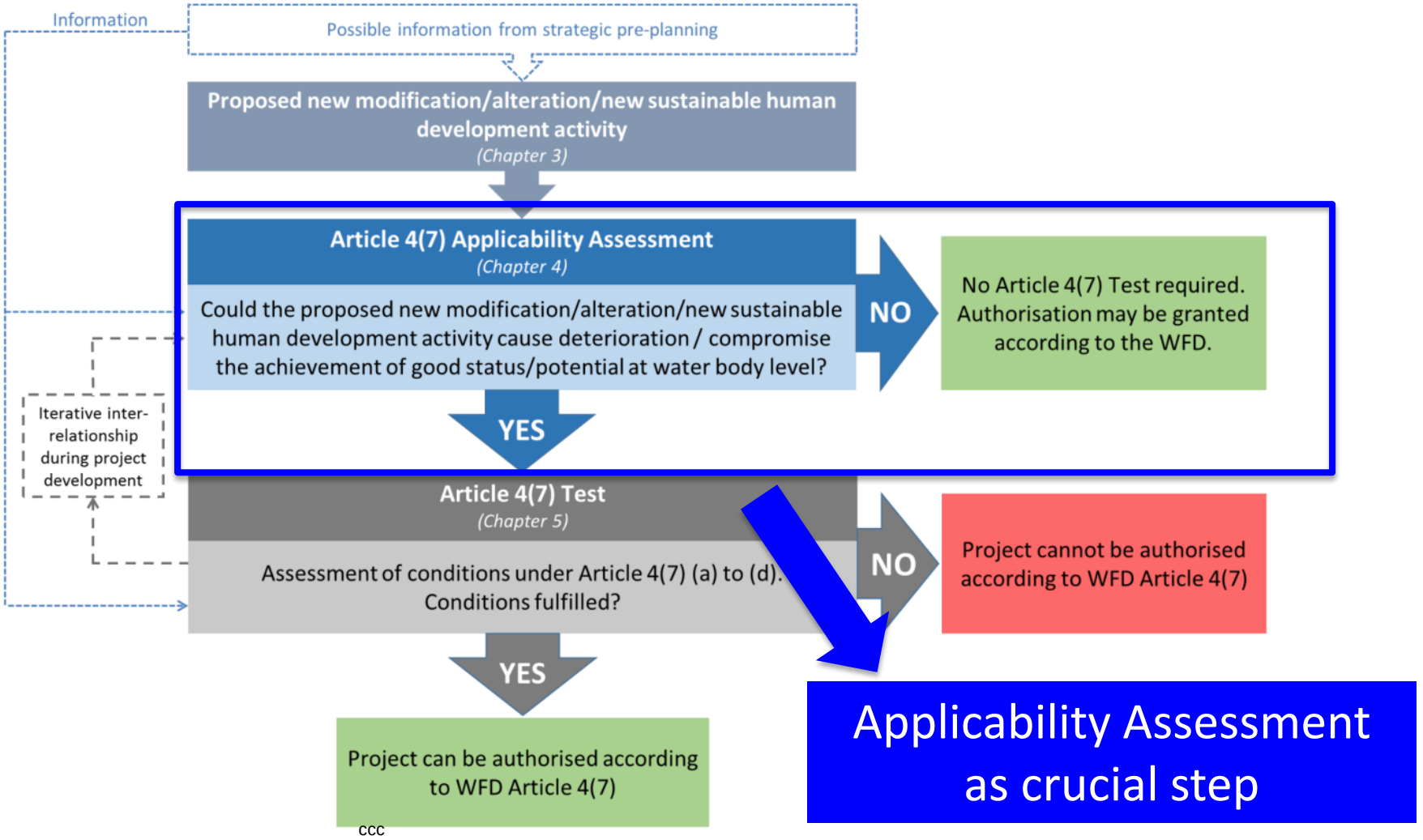
- Federal Environmental Agency (UBA) (2014):
  -> Guidance on Exemptions from environmental objectives (WFD)*
- Court of Justice of the European Union (2015):
  -> “Weser Ruling” (Case C-461/13)
- German Federal states (since 2015):
  -> Guidance and Implementation notes*
- LAWA (*German Working Group on water issues of the Federal States and the Federal Government*) (2017):
  -> Guidance on Deterioration from legal perspective
- **LAWA ongoing project (2018-2019):**
  -> Interpretation of the „Weser ruling“ regarding ecological assessment of waters according to WFD
  ⇒ National standard for implementation / licensing
  ⇒ Planning instrument -> Expert contribution WFD

Project partners

Planungsbüro Koenzen Wasser und Landschaft

CIS Guidance No. 36

Figure 1: Principle relationship between "Article 4(7) Applicability Assessment" and "Article 4(7) Test"



ccc

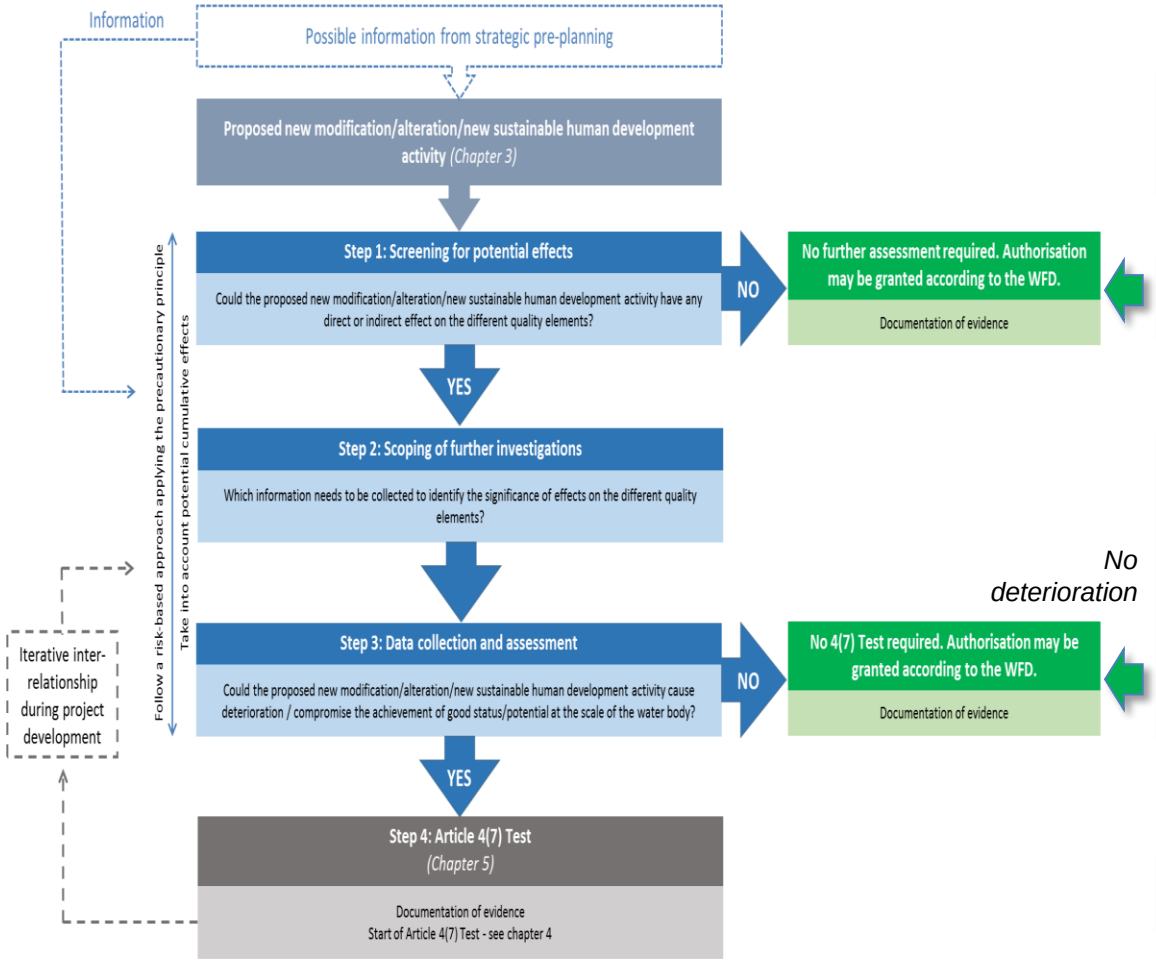
European Communities 2017. Common implementation strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 36 Exemptions to the Environmental Objectives according to Article 4(7). New modifications to the physical characteristics of surface water bodies, alterations to the level of groundwater, or new sustainable human development activities.

Applicability Assessment in practise

CIS Guidance No. 36

Practical approach
(2 main steps)

Figure 4: Outline for a step-wise approach for an Article 4(7) Applicability Assessment



Project description (overview)
incl. functional effect analysis

No potentially relevant effects

Screening

Potentially relevant effects

Detailed assessment

- Detailed effect analysis
- Detailed quantification (e.g. Modelling)
- Detailed analysis of biological, chemical and supporting quality elements

No deterioration

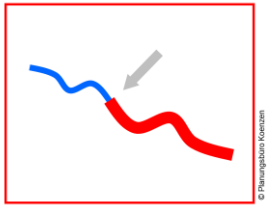
Deterioration possible

Article 4(7) Test

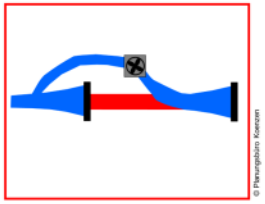
Relevant projects and modifications

New modifications / alterations (examples)

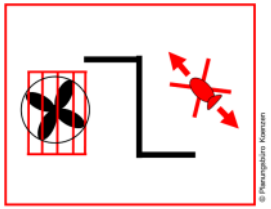
- Water discharge (e.g. seawage water treatment, Mining, Power plant)

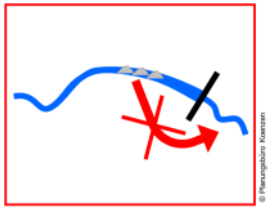


- Water abstraction (e.g. hydropower, irrigation, water supply)



- Barriers (e.g. hydropower, flood protection, roads)

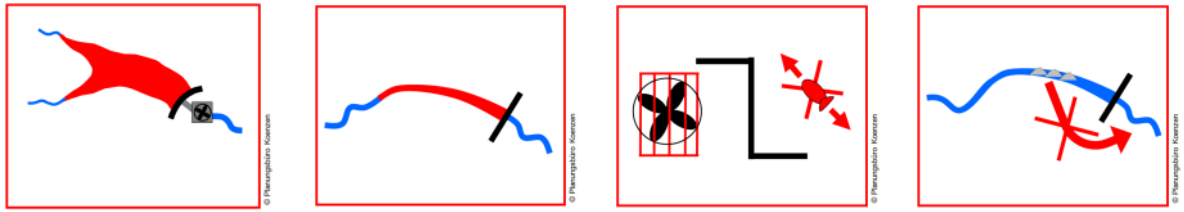




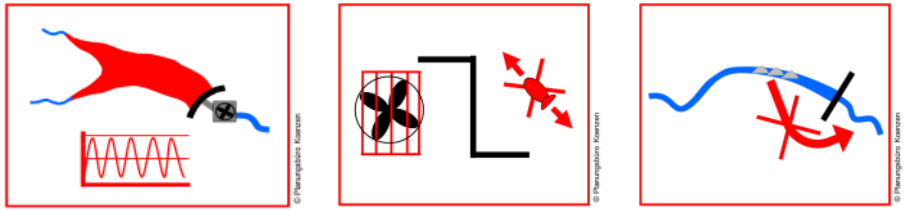
Relevant projects and modifications

New modifications / alterations (examples)

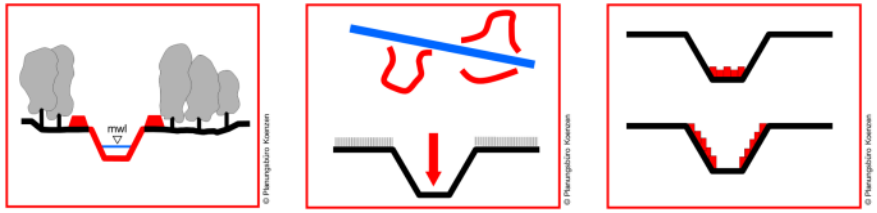
- Barriers with water storage (e.g. hydropower, water supply, flood protection)



- Barriers with water storage and rapidly changing flows (e.g. hydropower with hydropeaking)



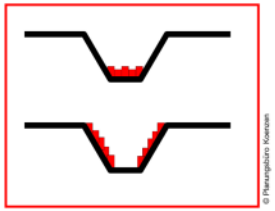
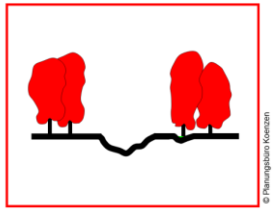
- Channel construction (e.g. flood protection, land drainage)



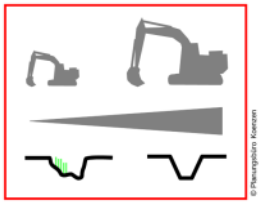
Relevant projects and modifications

New modifications / alterations (examples)

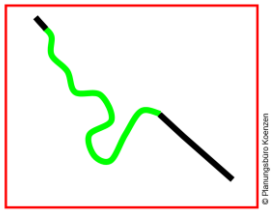
- Habitat alteration (e.g. roads, pipelines)

- River maintenance (e.g. navigation, urbanisation, land drainage)



- River restoration (e.g. construction)



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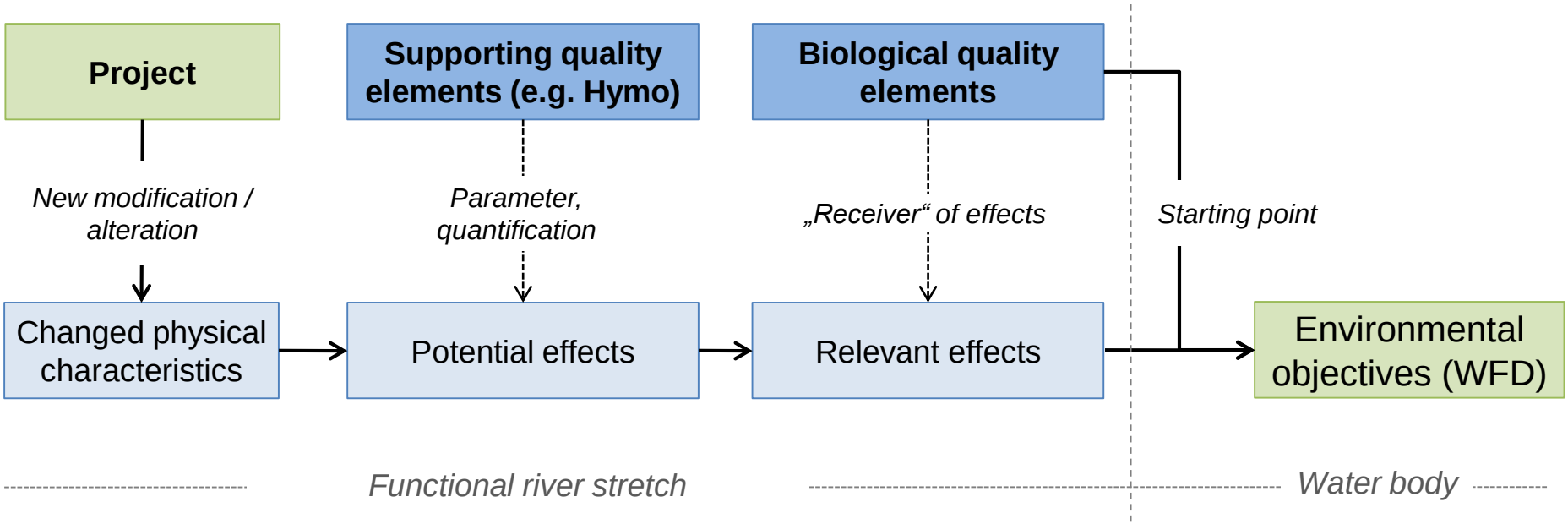
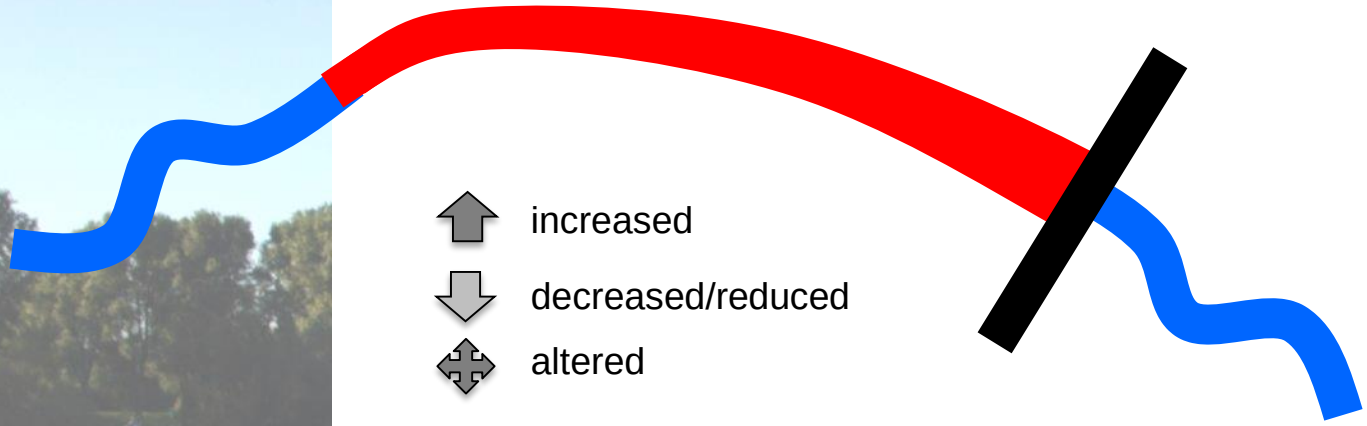
Analyses of potential effects

Example Biological quality elements



- Functional system analyses
- All potential effects in the first step (also very small ones)
- Assessment
  - 1. functional river stretches (dependend on modification / alteration)
  - 2. water body

Impoundment (ponded river)



Hydromorphological alterations	
flow velocity/diversity	⇩
water level dynamics	⇩
floodplain dynamics	⇩
fine sediment	⇧
sediment dynamics/diversity	⇩
depth variance	⇩
riparian habitat	⇕
vertical continuity (groundwater)	⇕

Physico-chemical quality elements	
temperature	⇧
oxygen (O_2)	⇩
nutrient deposition	⇧

Biological quality elements	
rheophilic species*	⇩
eurytopic species	⇧
stagnant species	⇧

* Decrease in abundance or loss of species

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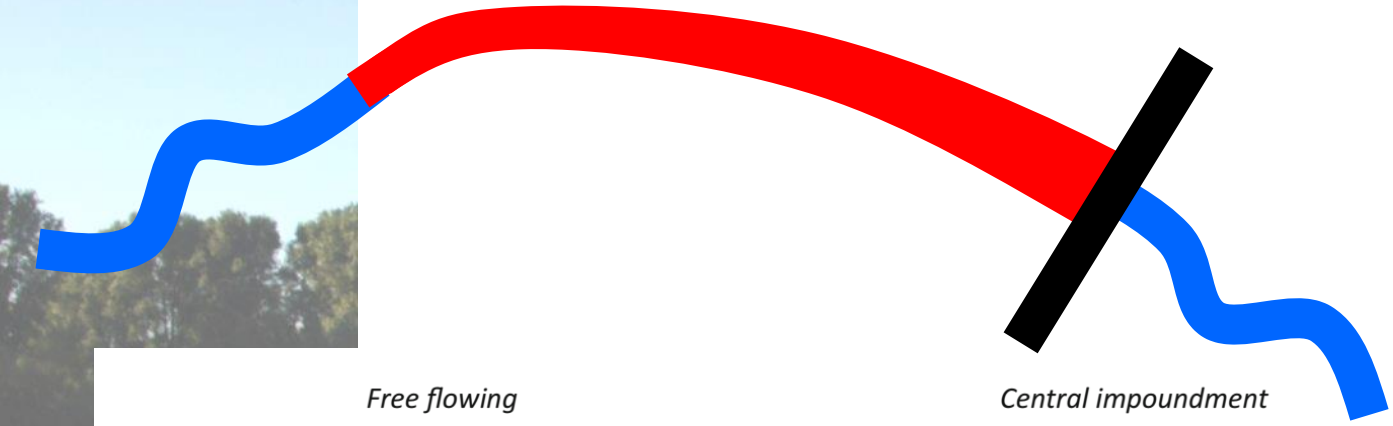
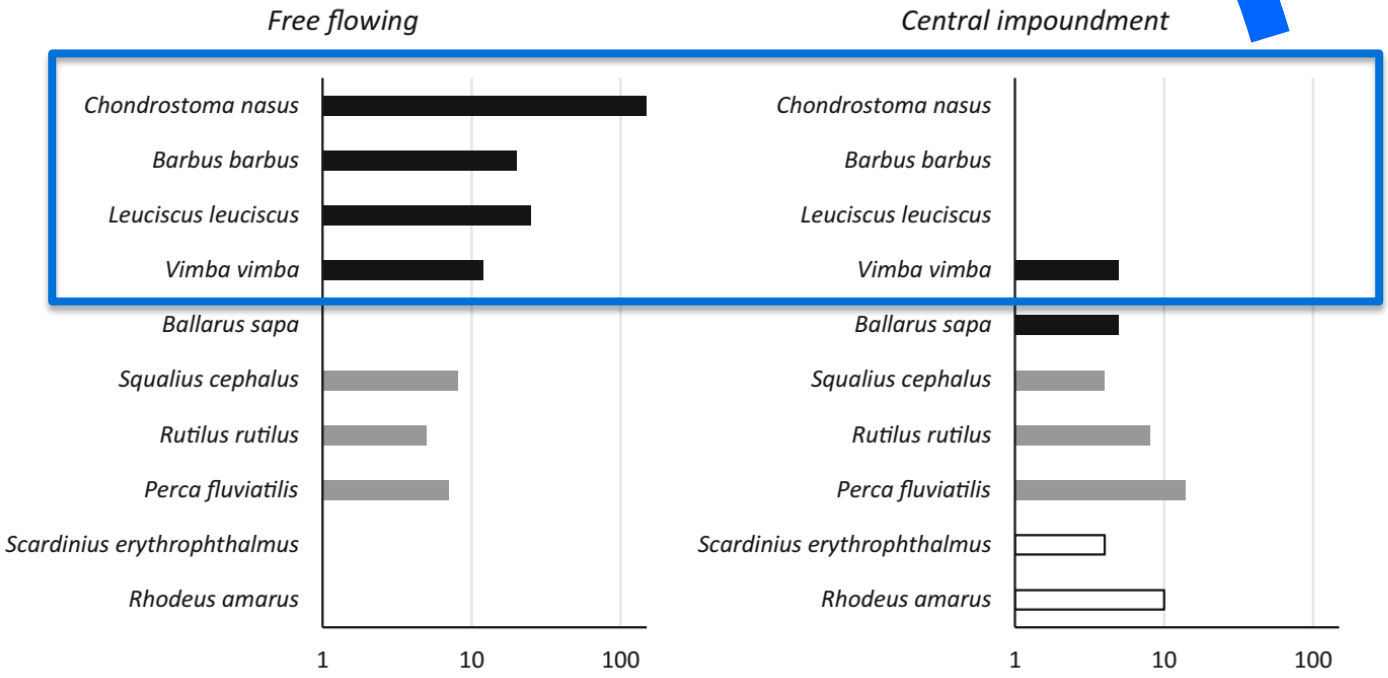
Impoundment (ponded river)



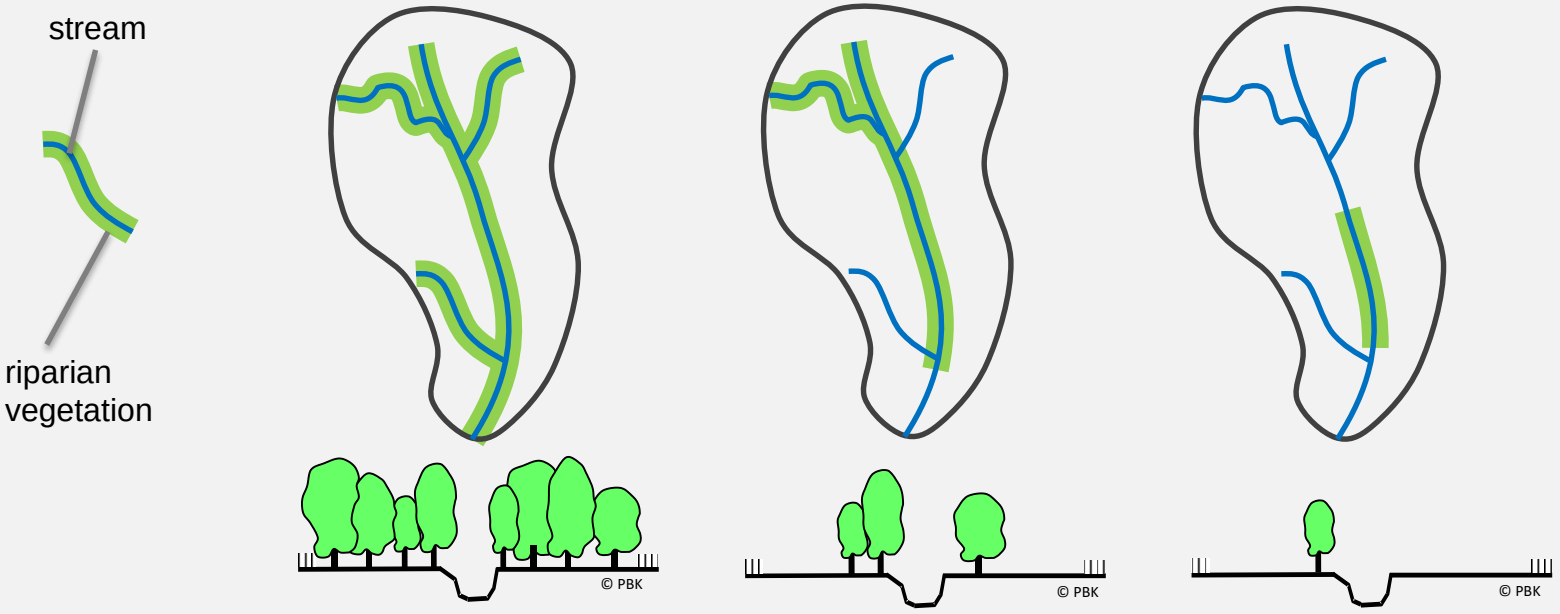


rheophilic fish species

Fig. 24.2 Mean numerical composition of juvenile fish in three shore seine catches; free-flowing area is located in "Wachau"; central impoundment in the impoundment of "Altenwörth"; black, rheophilic; gray, eurytopic; white, limnophilic species (own data)

Schmutz & Sendzimir 2018. Riverine Ecosystem Management – Science for Governing Towards a Sustainable Future. Springer International Publishing.

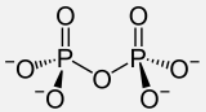
Alteration of riparian vegetation



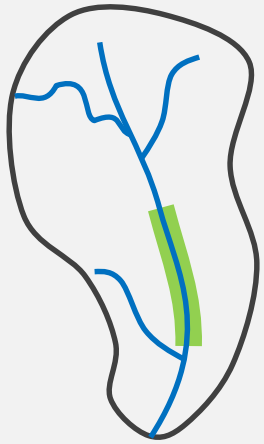
Increase of water temperature

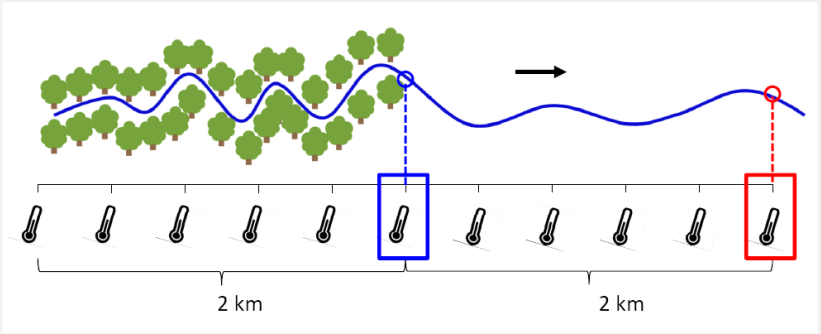
Increase of fine sediment input (erosion)

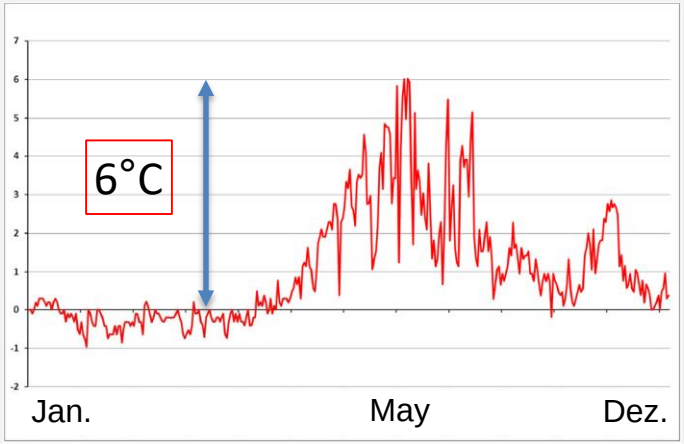
Increase of nutrient input (surface run off)



Alteration of riparian vegetation





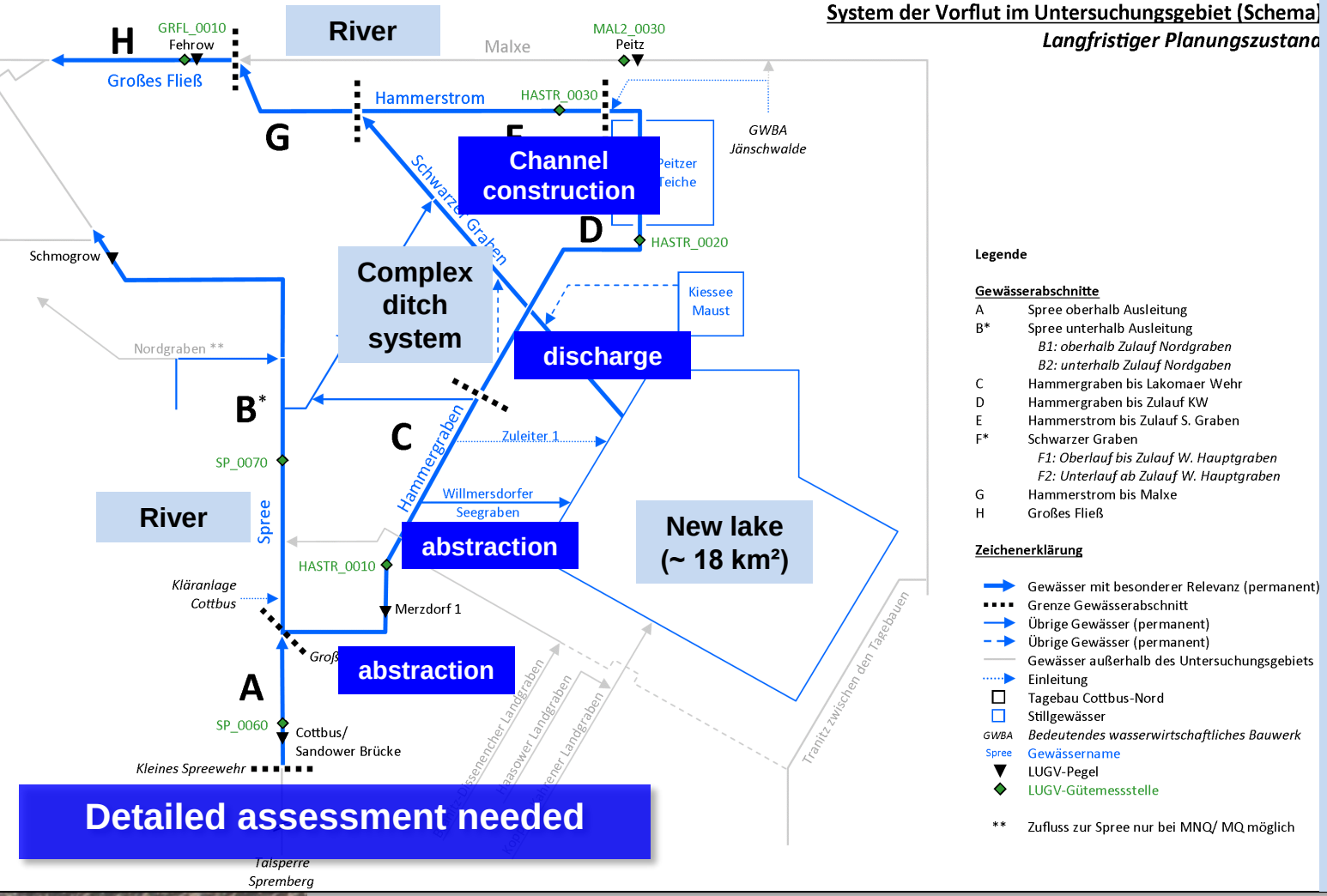


Hering (2016)

Hering D. 2016. Ufergehölze und Wassertemperatur. Fachtagung: Lebendige Gewässer – Sohle, Ufer, Aue. Natur- und Umweltschutzakademie NRW. Coesfeld. https://www.nua.nrw.de/fileadmin/user_upload/Hering_freigegeben.pdf

Analyses of potential effects

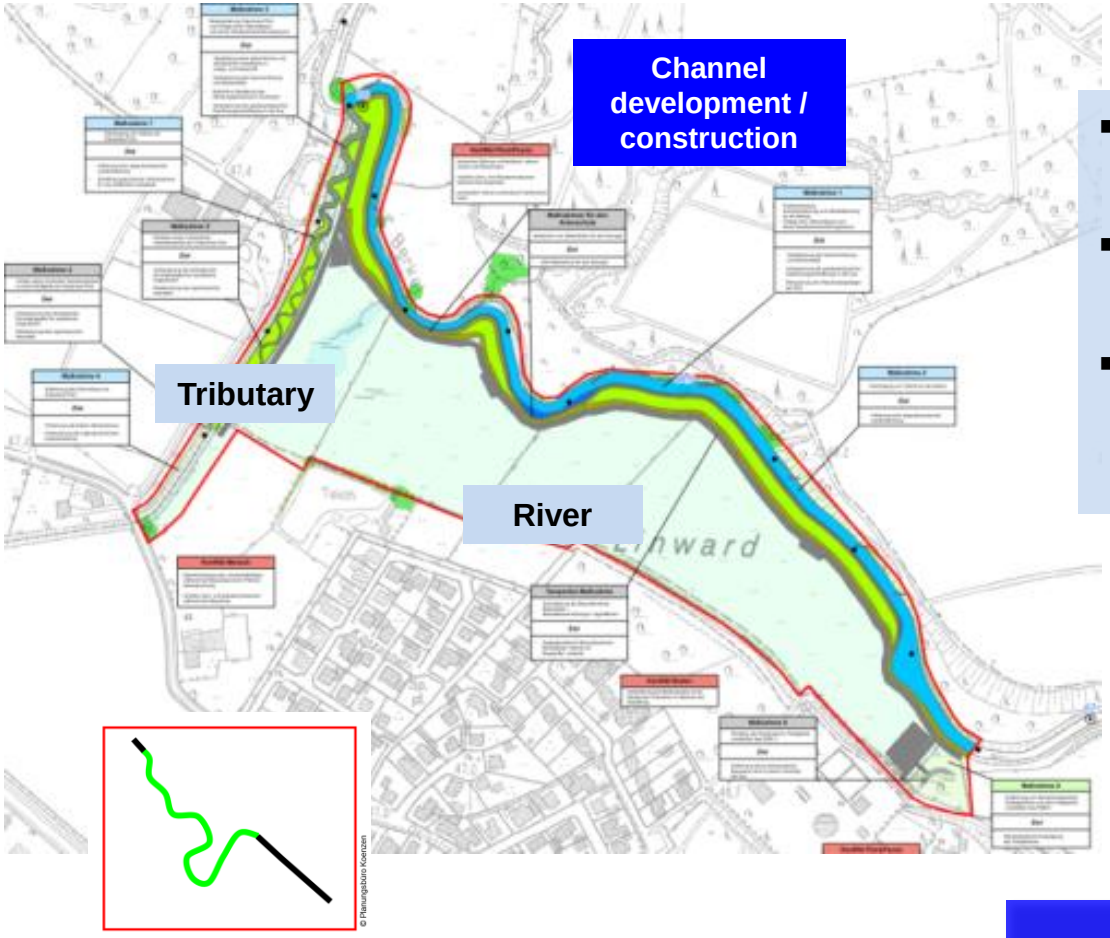
Practical case – New lake with outlet (Lake Cottbus)



- **Combination of different modifications / alterations**
- **Different time scenarios**
  - Starting point (status quo)
  - Lake flooding (mid-term)
  - Lake flooded (long-term)
- **Different (sub-) catchments**
- **Functional river stretches (A-H, with subdivisions)**
- **Surface waters (NWB, HMWB, AWB) and groundwater**
- **Different flow scenarios (low flow, mean flow, high flow)**

Analyses of potential effects

Practical case – River restoration (River Berkel)



- **One clear modification / alteration**
- **Positive development expected**
- **Temporary negative effects possible (construction)**

Screening sufficient

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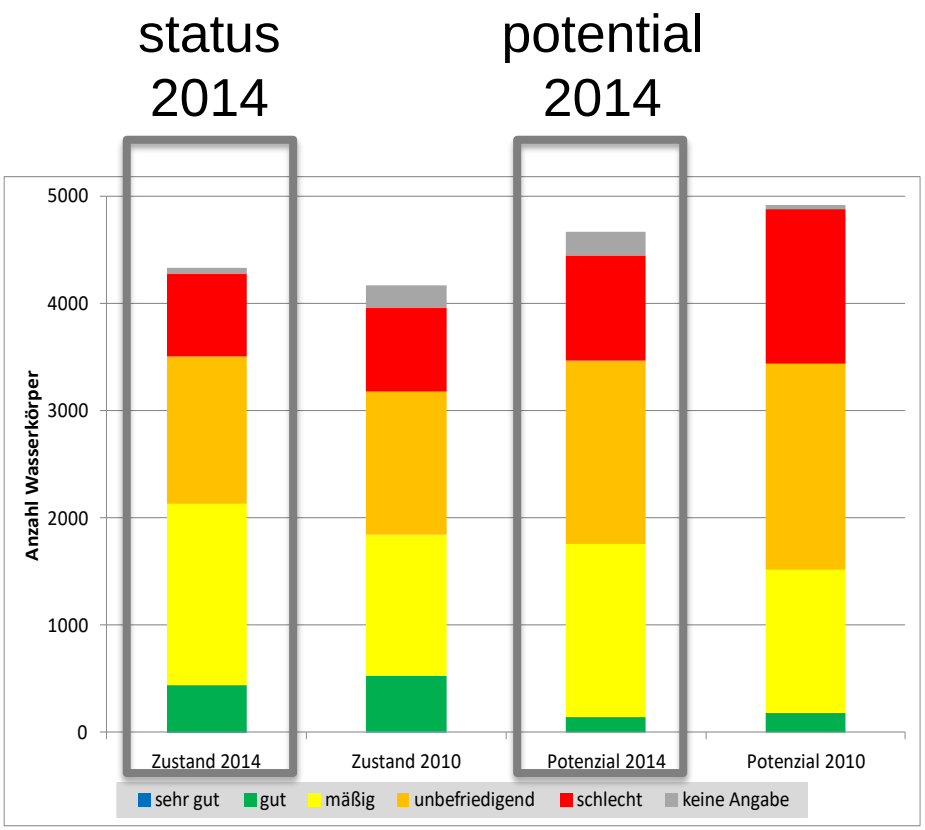
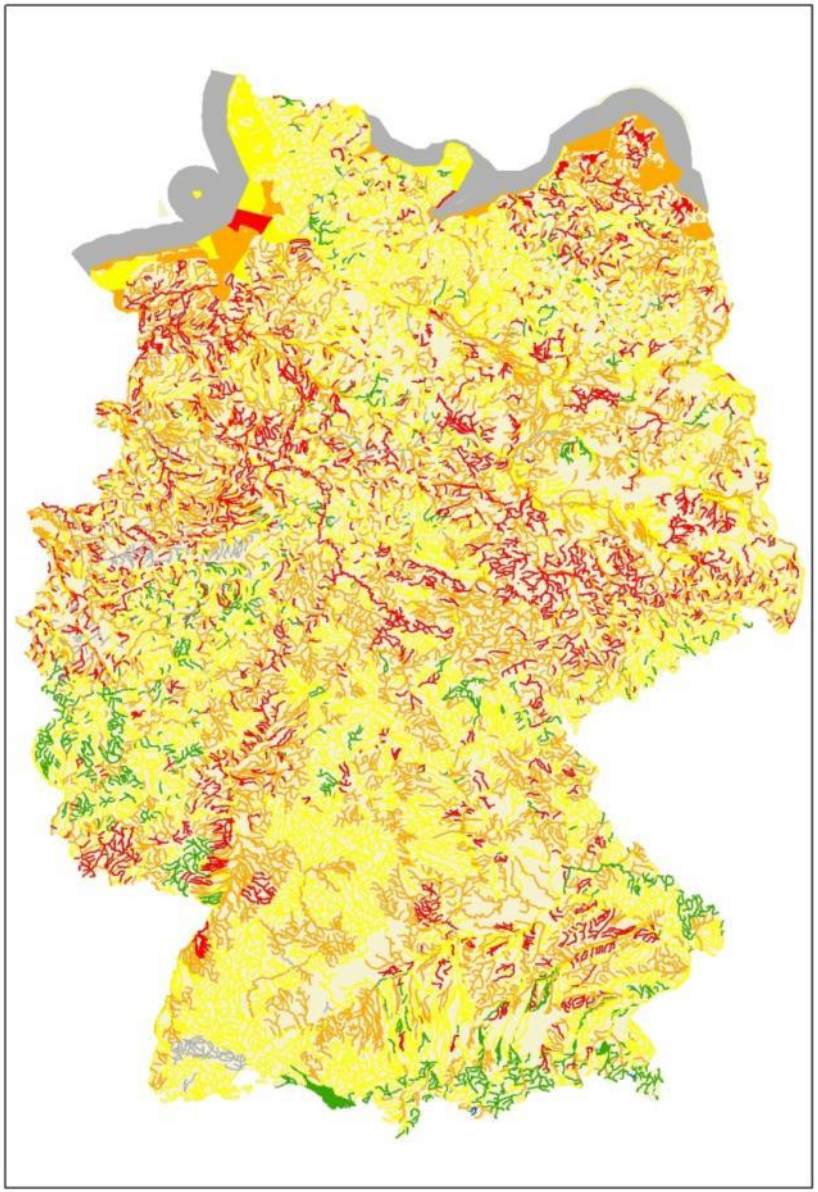
Biological assessment – Status classes (Quality elements)



UBA from data „Wasserblick“ (2014)

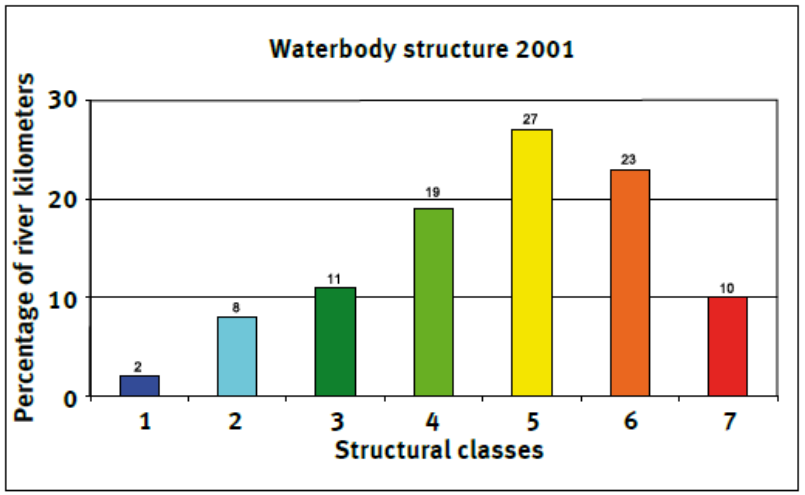


UBA from data „Wasserblick“ (2014)

Quality classes of biological quality elements (BQE) are fundamental (each component separate)

Supporting quality elements (e.g. Hydromorphology rivers)

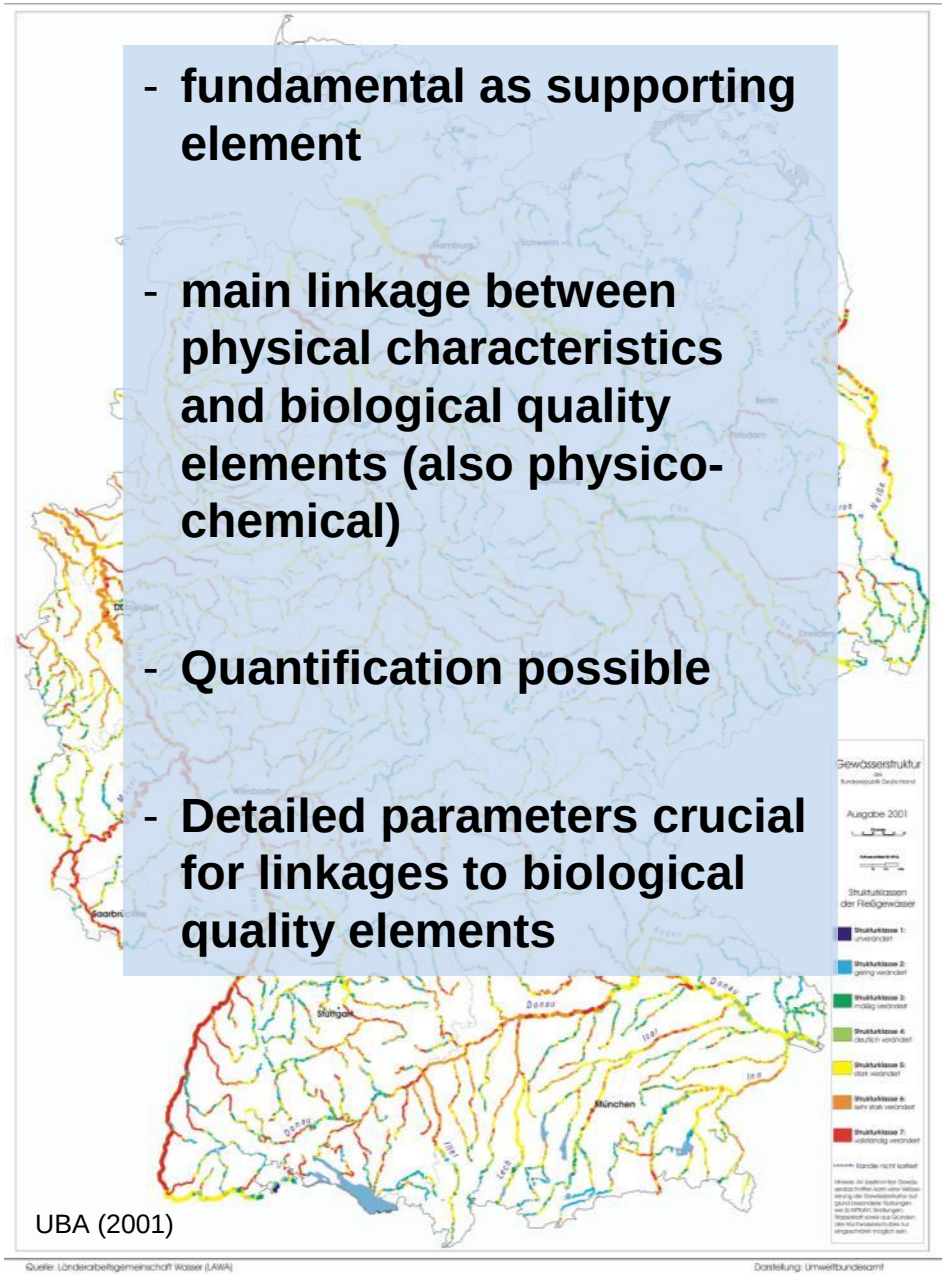
- ~60% obviously (class 5) to completely changed (class 7)
- ~21% unchanged (class 1) to moderately changed (class 3)



Source: LAWA

UBA (2014): Water Resource Management in Germany - Part 1: Fundamentals. UBA, Berlin. www.uba.de

- **fundamental as supporting element**
- **main linkage between physical characteristics and biological quality elements (also physico-chemical)**
- **Quantification possible**
- **Detailed parameters crucial for linkages to biological quality elements**



UBA (2001)

Based on available data, if possible…

- Many assessments can be undertaken based on **existing data from WFD monitoring**:
  - Hydromorphological data
  - Chemical data
  - Physico-chemical data
  - Biological data

- Data from **other sources** can be used (e.g. Environmental Impact Assessment, Natura 2000 Assessment, technical and biological reports)

- In some cases **additional data** have to be sampled or modeled (e.g. detailed biological assessment, hydrological models, water quality models)

"Things should be made as simple as possible, but not more simple"
Albert Einstein

Based on available data, if possible…

- At least 5 classes for hymo assessment recommended to fullfil the requirements of Art 4(7) Applicability Assessment and Art 4(7) Test

- Detailed, current biological data and hymo-sensitive biological assessment methods as basis for comprehensive analysis and decisions

- How to deal with uncertainty?
  - Improved data basis
  - Use of reasonable assumptions
  - In case of doubt Article 4(7) Test recommended (precautionary principle)

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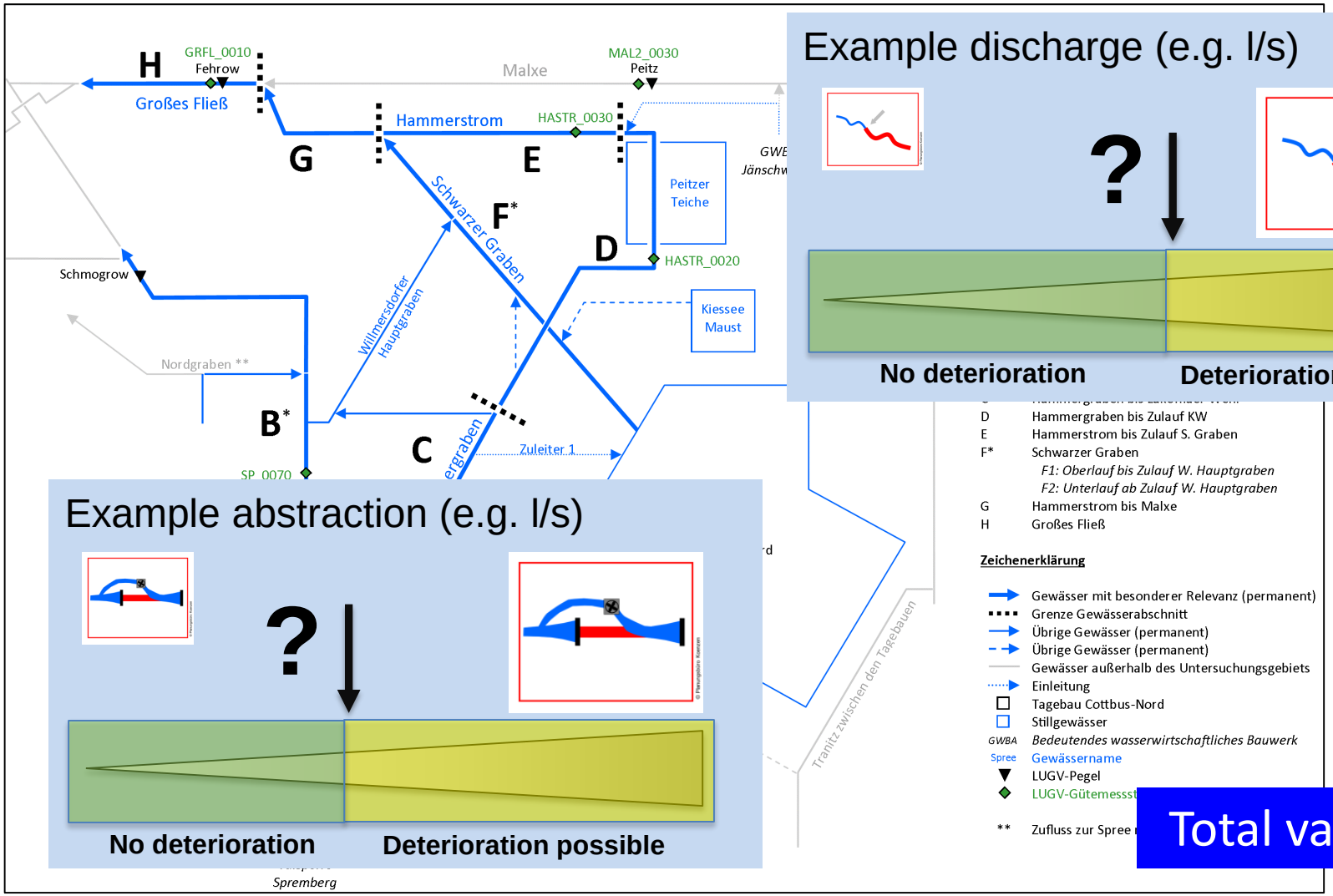
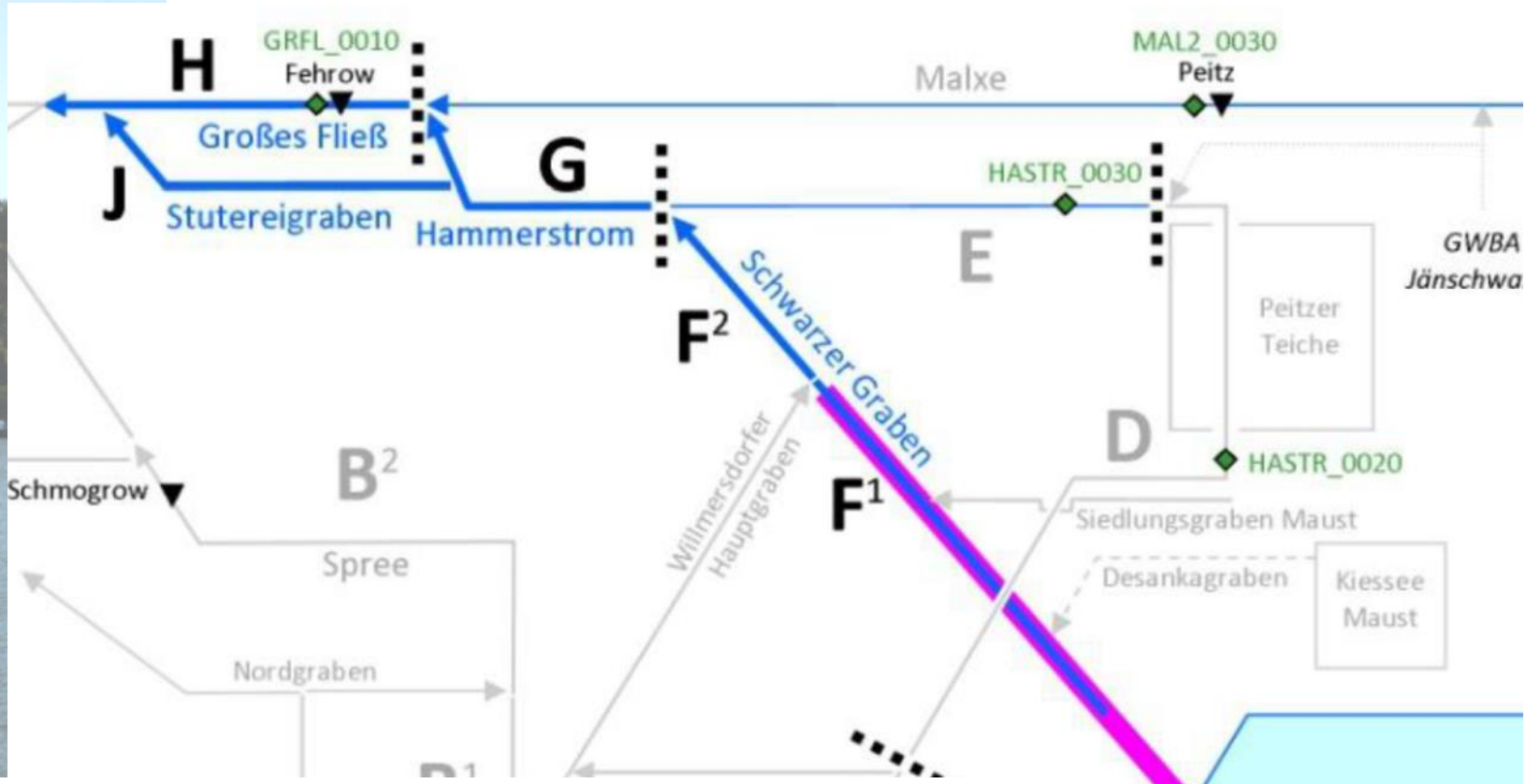
A question of quantity

Practical case – New lake with outlet (Lake Cottbus)



A question of quantity

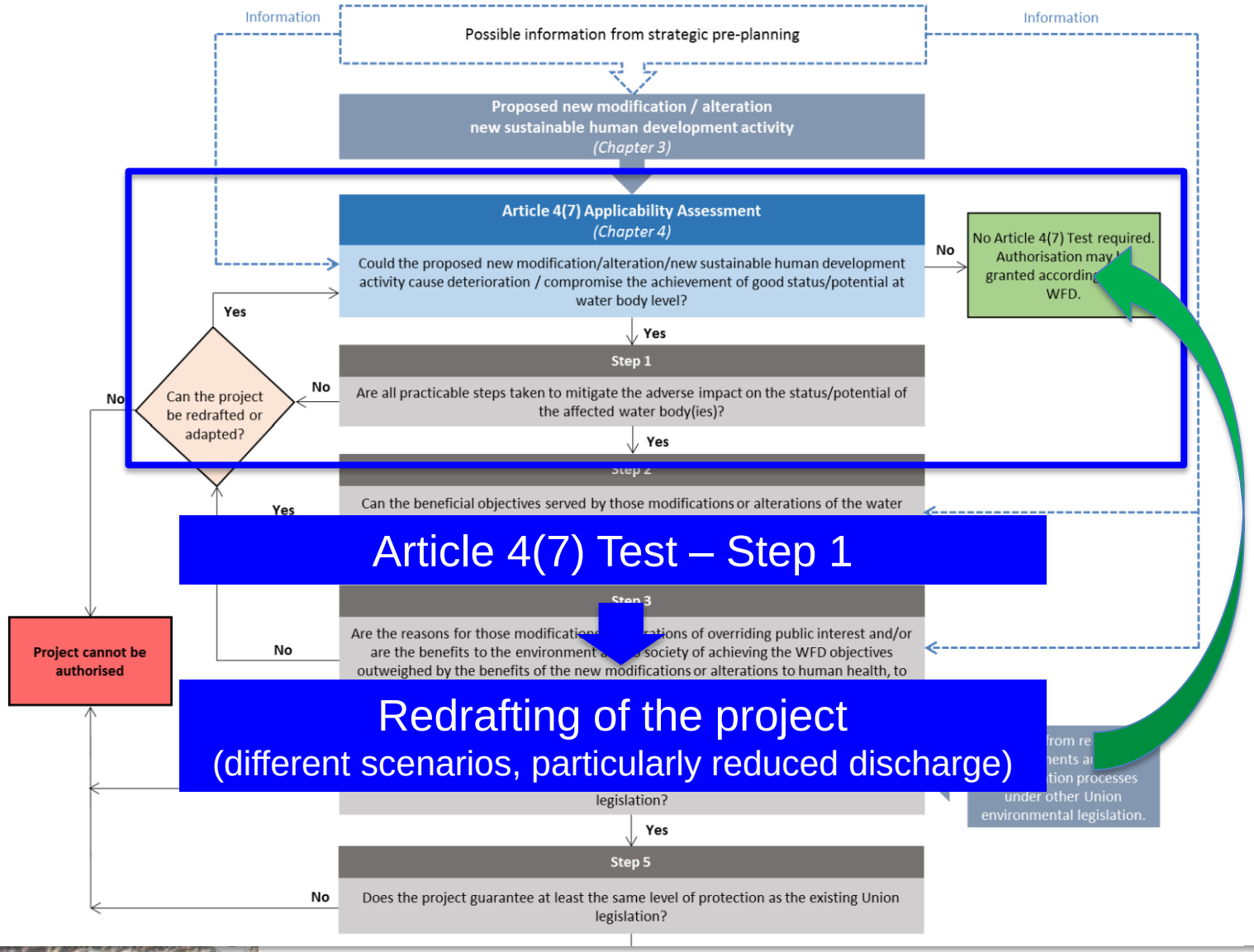


OFWK (Name, Kennung)	Funktionaler Gewässerabschnitt			
	Abschnitt	Stat. km[1]	Länge	OFWK-Anteil
Schwarzer Graben (DEBB58262268_1603)	F1	3,3 - 6,7[2]	3,4 km	51 %
	F2	0,0 - 3,3	3,3 km	49 %
„Hammerstrom“ (DEBB5826226_1247)[2]	G	0,0 - 5,7	5,7 km	48 %
Malxe (DEBB582622_745)	H	19,0 - 24,8	5,8 km	13 %
Stutereigraben (DEBB5826228_1249)	J	0,0 - 7,4	7,4 km	100 %

Portion of water body

A question of quantity

Figure 6: Example for a step-wise approach for an Article 4(7) Test and the iterative relationship with the Article 4(7) Applicability Assessment

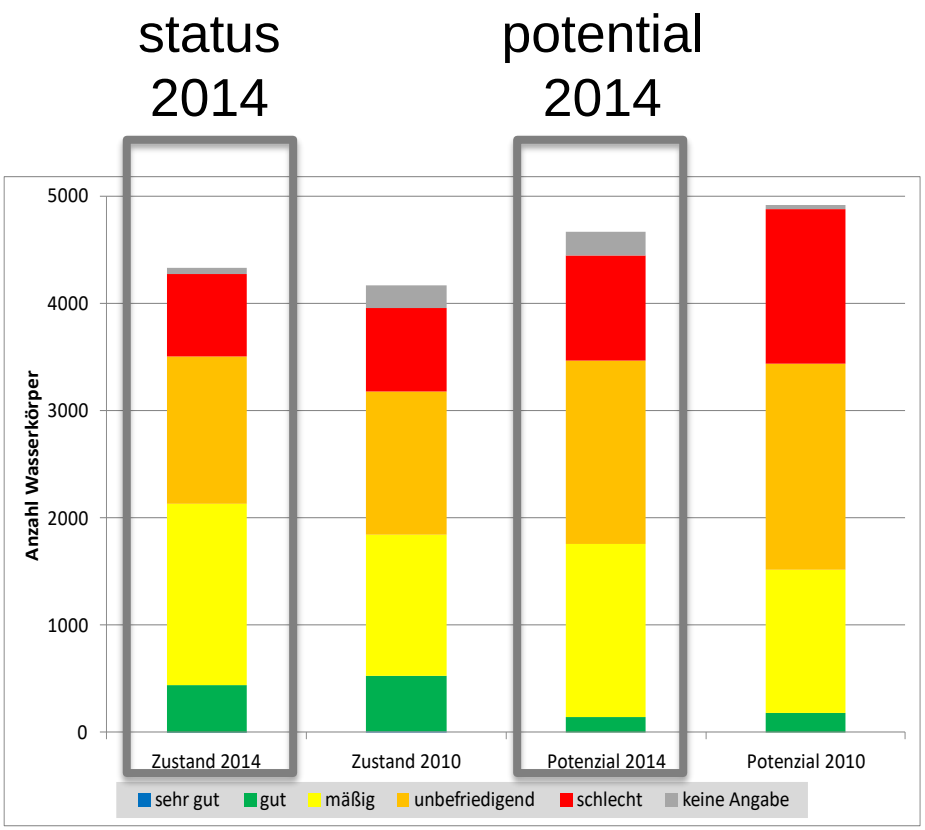


Article 4(7) Test – Step 1

Redrafting of the project
(different scenarios, particularly reduced discharge)

No deterioration

A question of Quality – Status classes (Quality elements)



UBA from data „Wasserblick“ (2014)

Quality classes of biological quality elements (BQE) are fundamental (each component separate)

- **Separate assessment for all relevant biological quality elements (BQE)**

- **Starting point essential:**

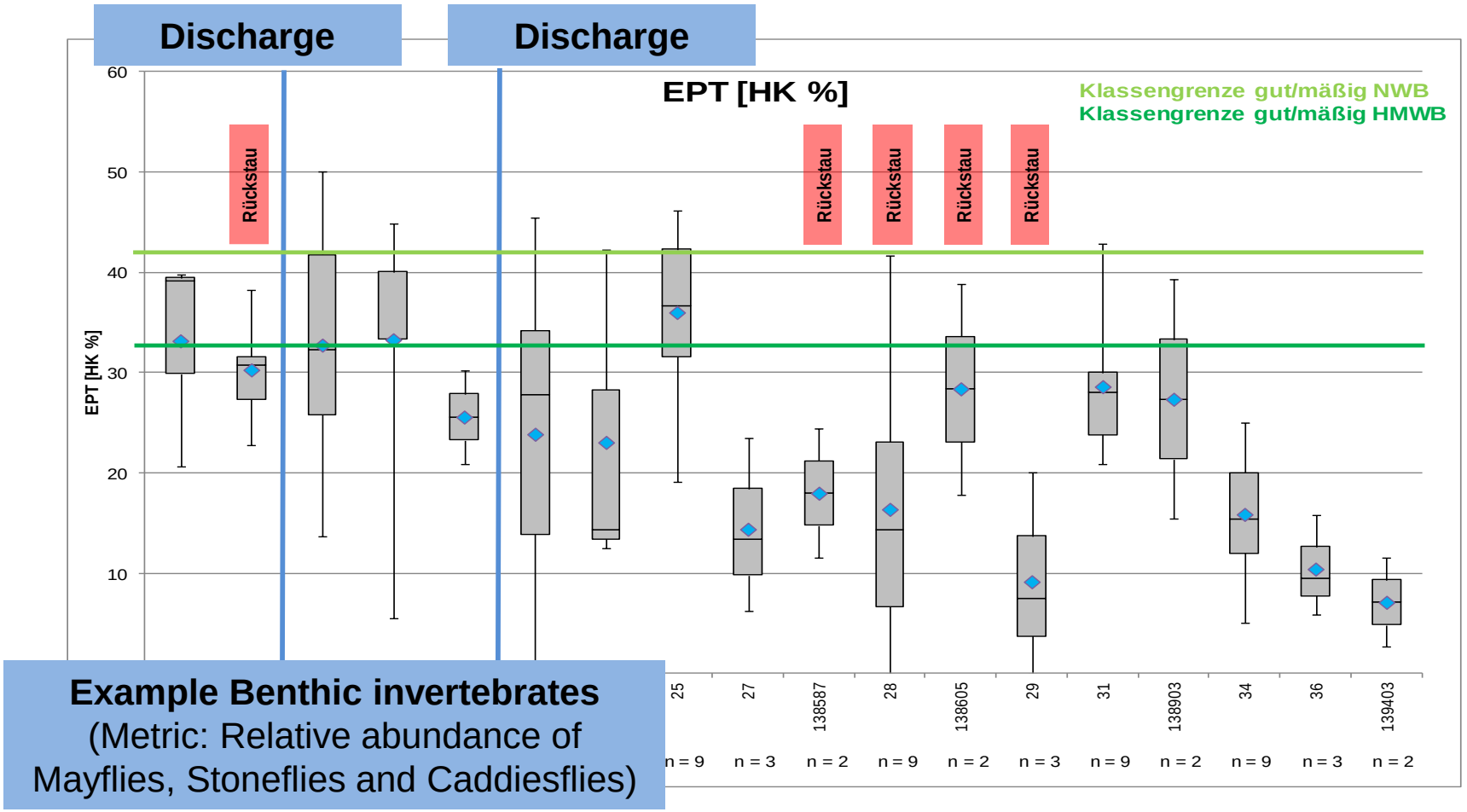
  high to poor:
  -> deterioration if change to lower class

  bad (lowest class):
  -> all (measurable) negative effects are a deterioration

– **practical challenges:**
  -> distinguish measurable from non-measurable effects
  -> cummulative effects

UBA from data „Wasserblick“ (2014)

A question of quality – Metrics and class boundaries



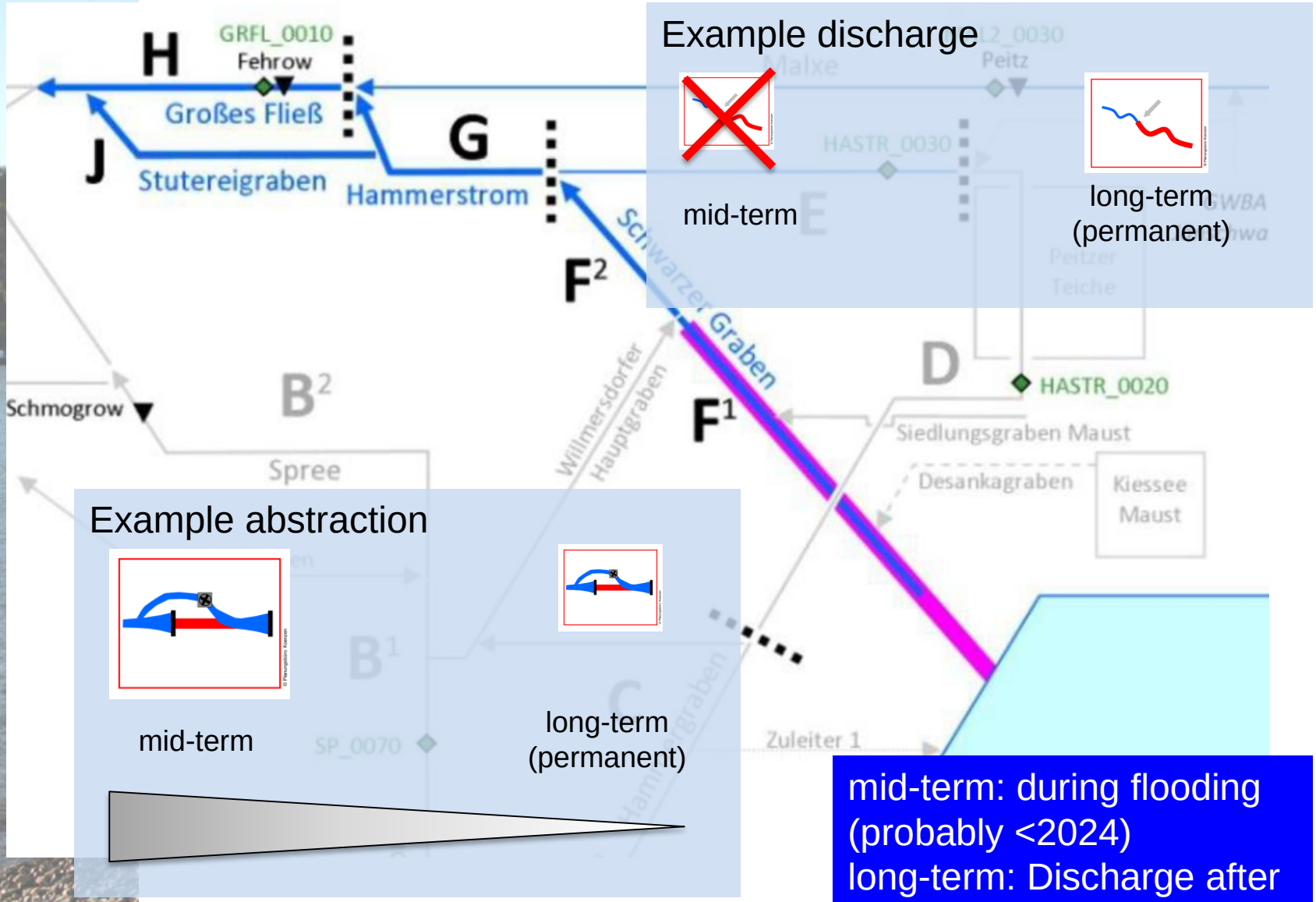
Example Benthic invertebrates
(Metric: Relative abundance of Mayflies, Stoneflies and Caddiesflies)

Metrics and class boundaries of biological quality elements (BQE) are fundamental

-> Is the starting point near the lower class boundary (e.g. lowest quarter of class)?

-> Could a modification result in a lower class or just in a reduced metric value?

A question of time



mid-term: during flooding (probably <2024)
long-term: Discharge after flooding (probably >2024)

Conclusion (I)

- The philosophy is not philosophical:
  “As simple as possible, as detailed as necessary”
  -> target-oriented approach!

- Instrument as fundamental step for sustainable use of water ecosystems -> Applicability Assessment as main step with practical relevance

- All type specific and potentially affected (biological) quality elements are relevant for the Applicability Assessment

- Detailed data (particularly hydromorphological and biological) and hymo-sensitive biological assessment methods crucial

- Many cases can be undertaken with an overview asssessment (Screening, if sufficient data available),
  Some cases need a detailed assessment

Conclusion (II)

- Multiple pressures dominate river systems
  -> Differentiation of pressures is difficult, but identification of potential negative effects is possible!

- Quantification of potential negative effects is the main challenge (especially with cummulative effects) -> Scenarios can help for an approximation

- Uncertainties are the order of the day
  -> Use of reasonable assumptions is necessary for practical application

- Worst-case approach is fundamental for appropriate assessments (precautionary principle)

- In case of doubt -> Article 4(7) Test recommended

- Standardized methodology crucial for comparable results and (economical) planning security


Thank you very much for
your attention!