

A photograph of the UNESCO-IHE Institute for Water Education building in Delft, Netherlands. The building is a modern, multi-story structure with a light-colored facade and large windows. A flagpole with a blue flag is visible in the foreground. The sky is clear and blue. The text "UNESCO-IHE INSTITUTE FOR WATER EDUCATION" is visible on the building's facade.

# Key factors for implementation of water quality guidelines

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- Need for Water Quality Guidelines
- Ecosystem Health Approach
- Analysis of 15 Water Quality Guidelines
- Classes, Indicators
- Range of criteria
- Key factors for implementation
- What hampers Implementation?
- Enforcement, Transboundary waters

# Need for Water Quality Guidelines

## 17 Sustainable Development Goals

**SDG 6**  
Ensure availability and sustainable management of water and sanitation for all

**SDG 11**  
Make cities and human settlements inclusive, safe, resilient and sustainable

**SDG 15**  
Protect, restore and promote sustainable use of terrestrial ecosystems, halt biodiversity loss, etc.

**Targets 6.1, 6.2, 6.4, 6.5 and 6.a & 6.b**

Improve water-use efficiency, access to sanitation, protect water-related systems, etc.

**Target 6.3**

Improve water quality, halting the proportion of untreated wastewater and substantially increasing recycling & safe reuse globally

**Target 6.6**

By 2020, protect and restore water-related ecosystems, incl. mountains, forests, wetlands, rivers, aquifers and lakes

**Target 11.5**

By 2030, significantly reduce the number of people affected by, amongst others, impacts of water-related disasters, etc.

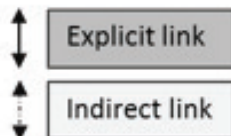
**Target 15.1**

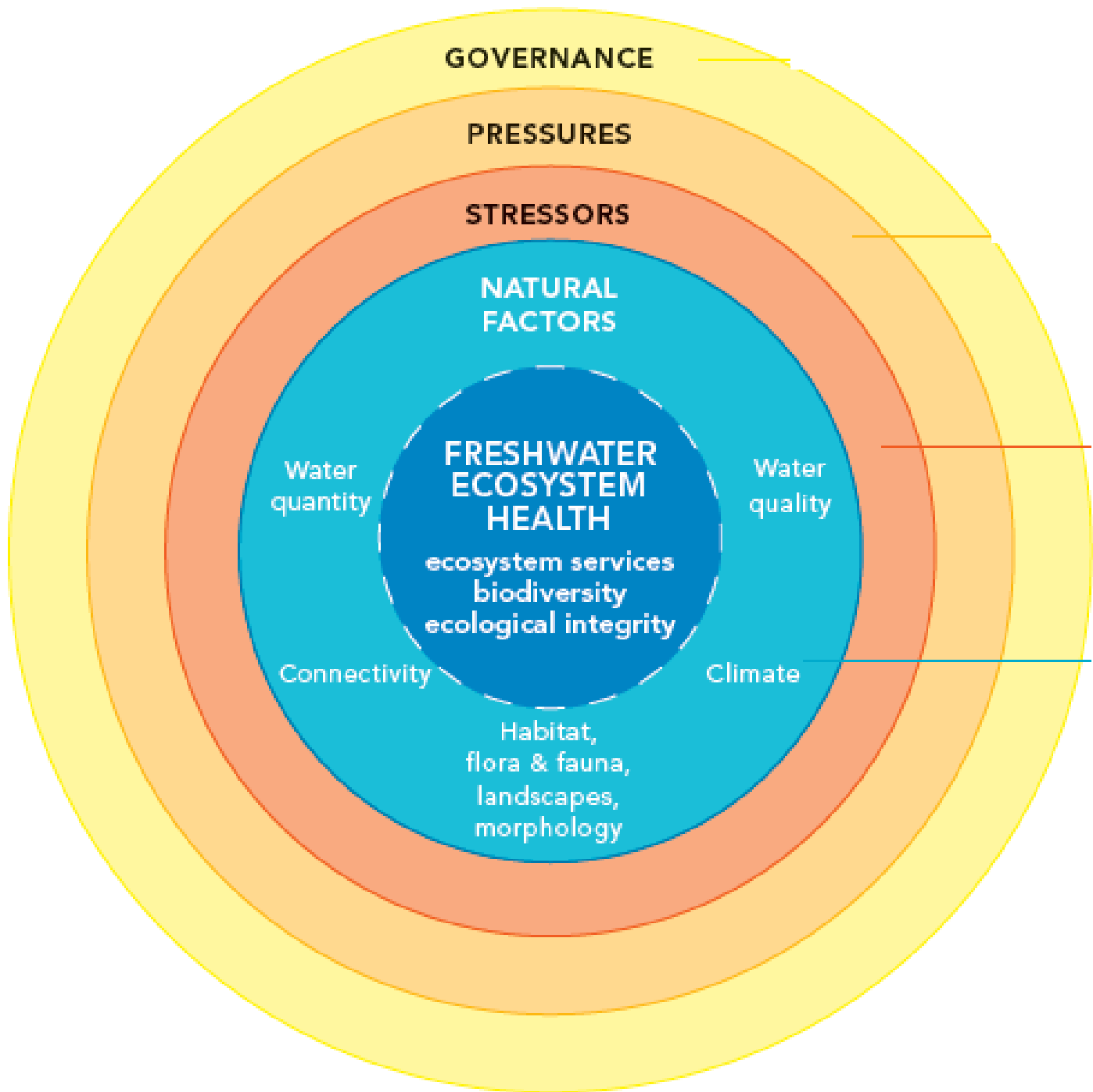
By 2020, ensure the conservation, restoration and sustainable use of, amongst others, inland freshwater ecosystems and their services

**Target 15.5**

Take urgent and significant action to reduce degradation of natural habitats, halt biodiversity loss, protect threatened species

IWQGES





# Overview of 15 Water Quality Guidelines studied

*Australia/New Zealand*

Japan

Brazil

Kenya

Canada

Nigeria

China

Russia

Colombia

South Africa

*European Union*

*USA*

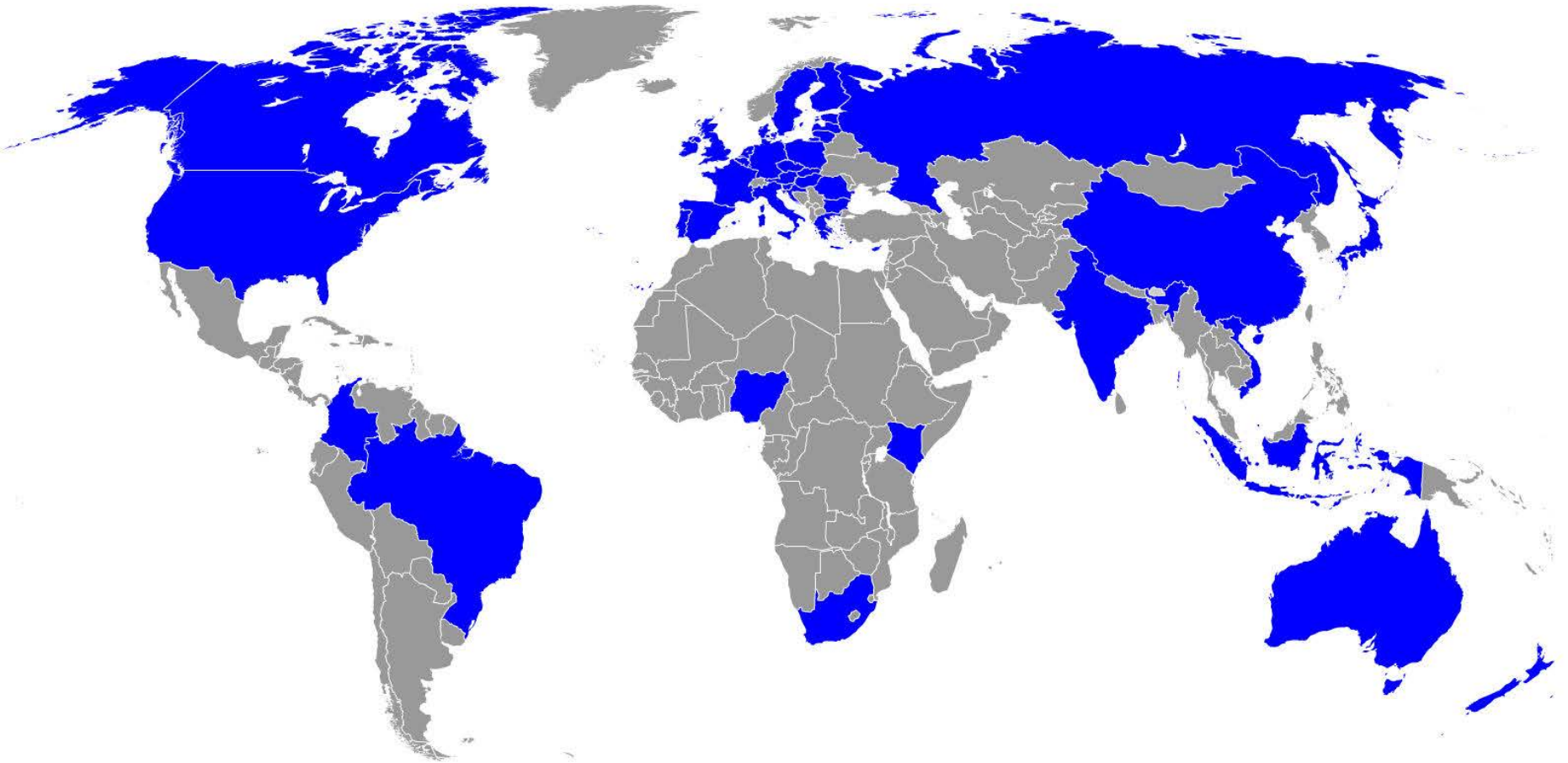
India

Viet Nam

Indonesia



# Overview of Water Quality Guidelines studied



# Analysis existing guidelines I

- 15 guidelines from all over the world are selected for first analysis
- Nearly all guidelines aim at the protection of human uses and aquatic life
- 6 guidelines provides specific physical and chemical values for the protection of aquatic life
- 3 guidelines provides tools for integrated ecological assessment of ecosystem, including biological, physical, chemical and hydromorphological indicators (Aus/EU/USA)

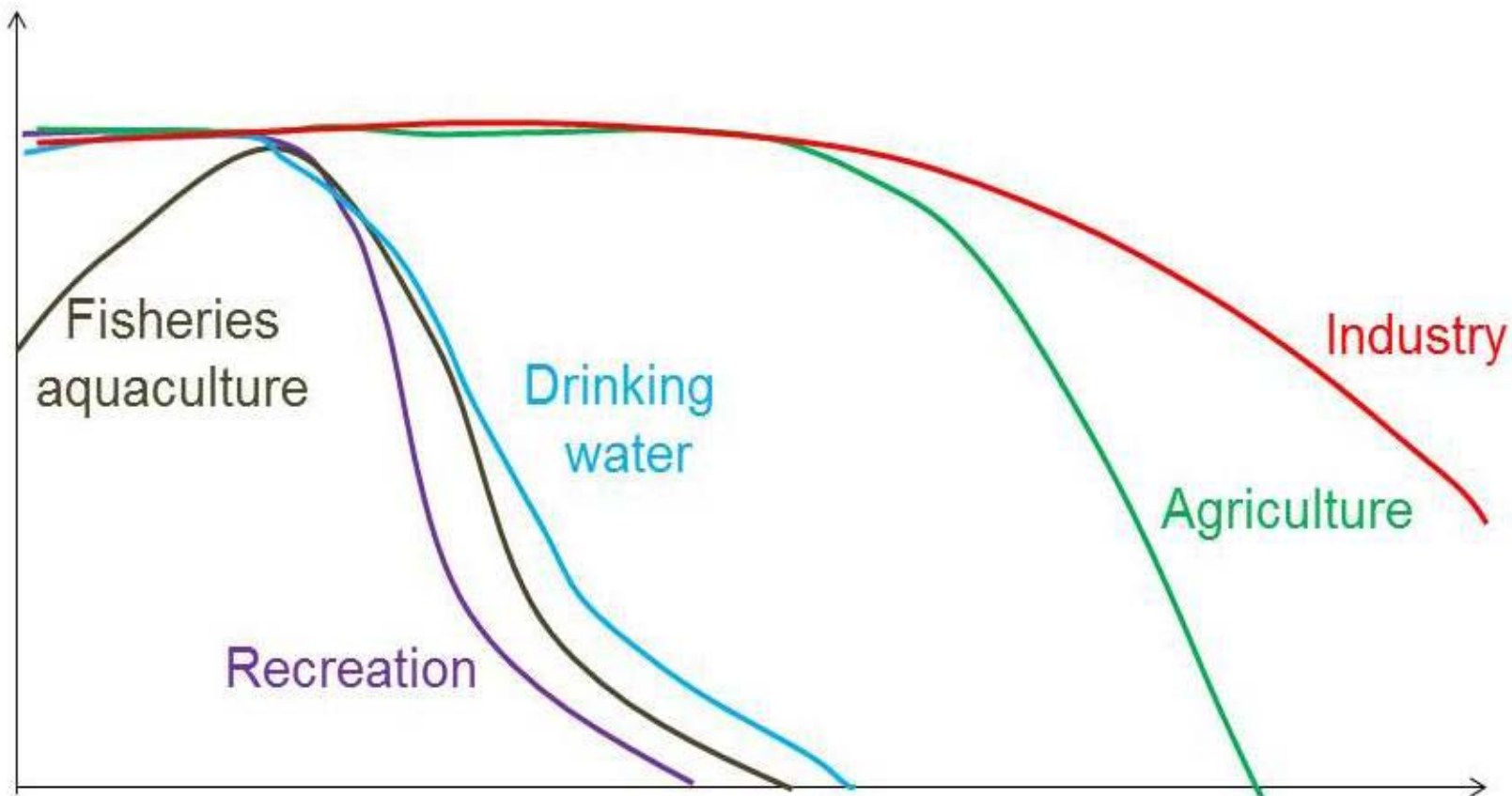


# Analysis existing guidelines II

- Guidelines for ecosystems are/should be part of a **larger framework** for water quality management
- Differences in **terminology**: criteria, standards, objectives, thresholds, benchmarks
- In most of the guidelines, **quality classes** are defined in order
  - to formulate objectives
  - to present the quality status
  - to create awareness
  - to compare quality of different systems



# Potential uses related to ecosystem quality



High ecosystem integrity

Minimal to moderately disturbed

Highly disturbed

Does not sustain freshwater life

# Selection of Indicators and Monitoring

Physico-chemical	Metabolic
	Trophic
	Toxicants
Biological	Fish
	Invertebrates
	Algae
	Macrophytes
	Microbial Pollutants
Hydromorphological	Aquatic Habitats
	Riparian Habitats

# Analysis existing guidelines III

- O<sub>2</sub>, Nutrients      Guidelines available  
Site specific application needed
- Toxics      Not site specific  
Different guidelines available
- Biological      Site specific  
Need for reference values, within  
or with similar basins
- Hydromorphological      Site specific

# Water Quality Criteria for High Integrity Ecosystems

**Countries: Australia/NZ, Canada, China, EU (UK), Japan, South Africa, USA, UNECE**

	Range ( $\mu\text{g/l}$ )
Total P	5 - 100
NH <sub>3</sub>	7 - 40
Al (pH>6.5)	1.6 - 100
Cd	0.06 - 0.4
Hg	0.003 - 0.77
Zn	2.0 - 120

# Conclusions of analysis

- Narrative and numerical criteria for **biological and hydromorphological indicators** and natural occurring chemical substances (e.g. P, N) are nearly always related to **reference conditions**
- For the derivation of criteria for **toxic chemicals** (heavy metals, pesticides, etc.) comprehensive guidelines are available. However, established criteria vary largely.
- **Need for international criteria on toxicity!**  
*Compare WHO-standards Drinking Water*

# Key factors for Water Quality Guidelines

- Agreement on Objectives
- Agreement on numeric and narrative criteria
- Agreement on Monitoring
- Agreement on strategy of Implementation
  - Governance
  - Knowledge
  - Participation
  - Cost-Benefit considerations

# Levels of Agreement

- National Government
  - Legislation
  - Enforcement
- Basin Organizations
  - Data exchange
  - Standard procedures
  - Joint monitoring
  - Joint reporting
  - Permanent technical secretariat
  - Public Participation

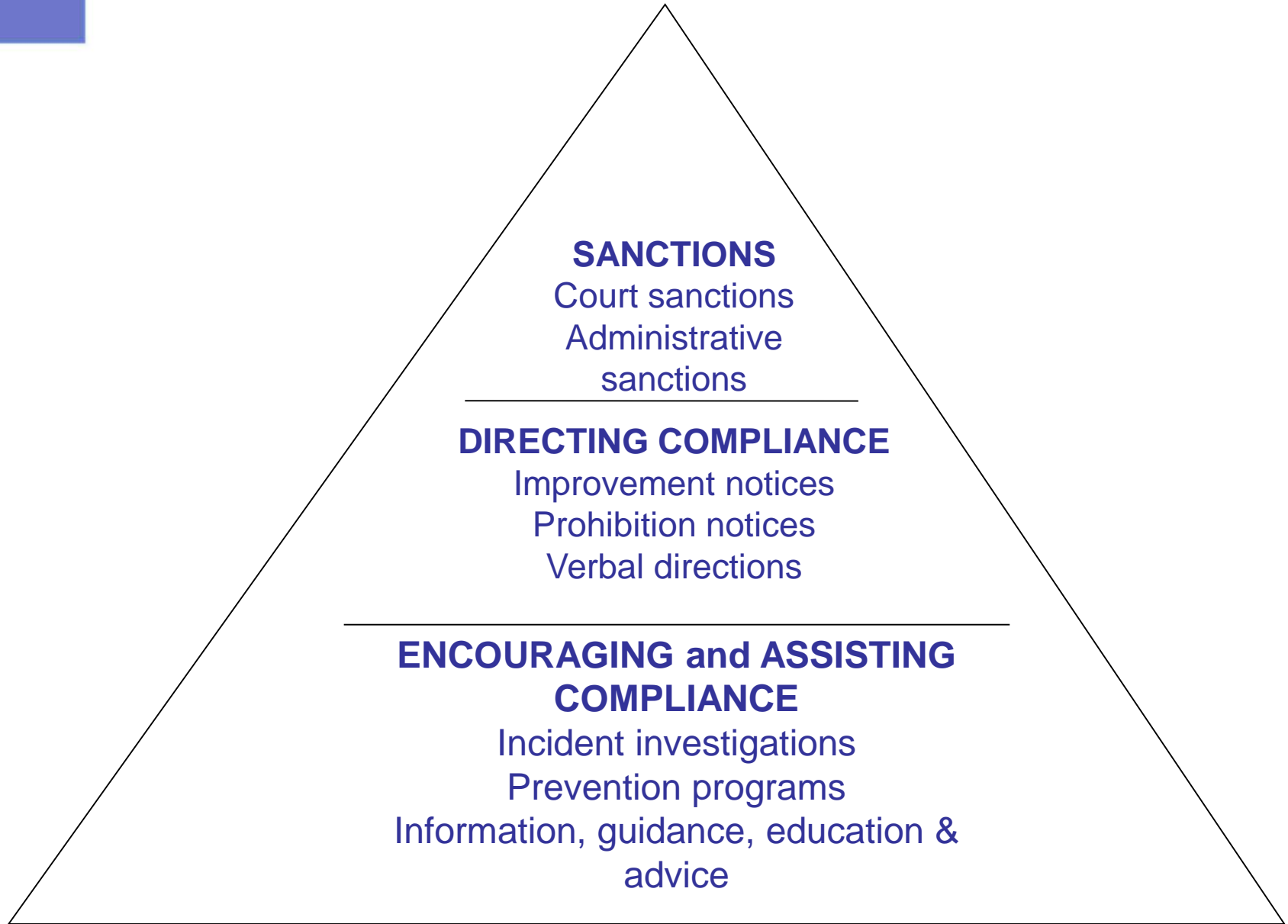


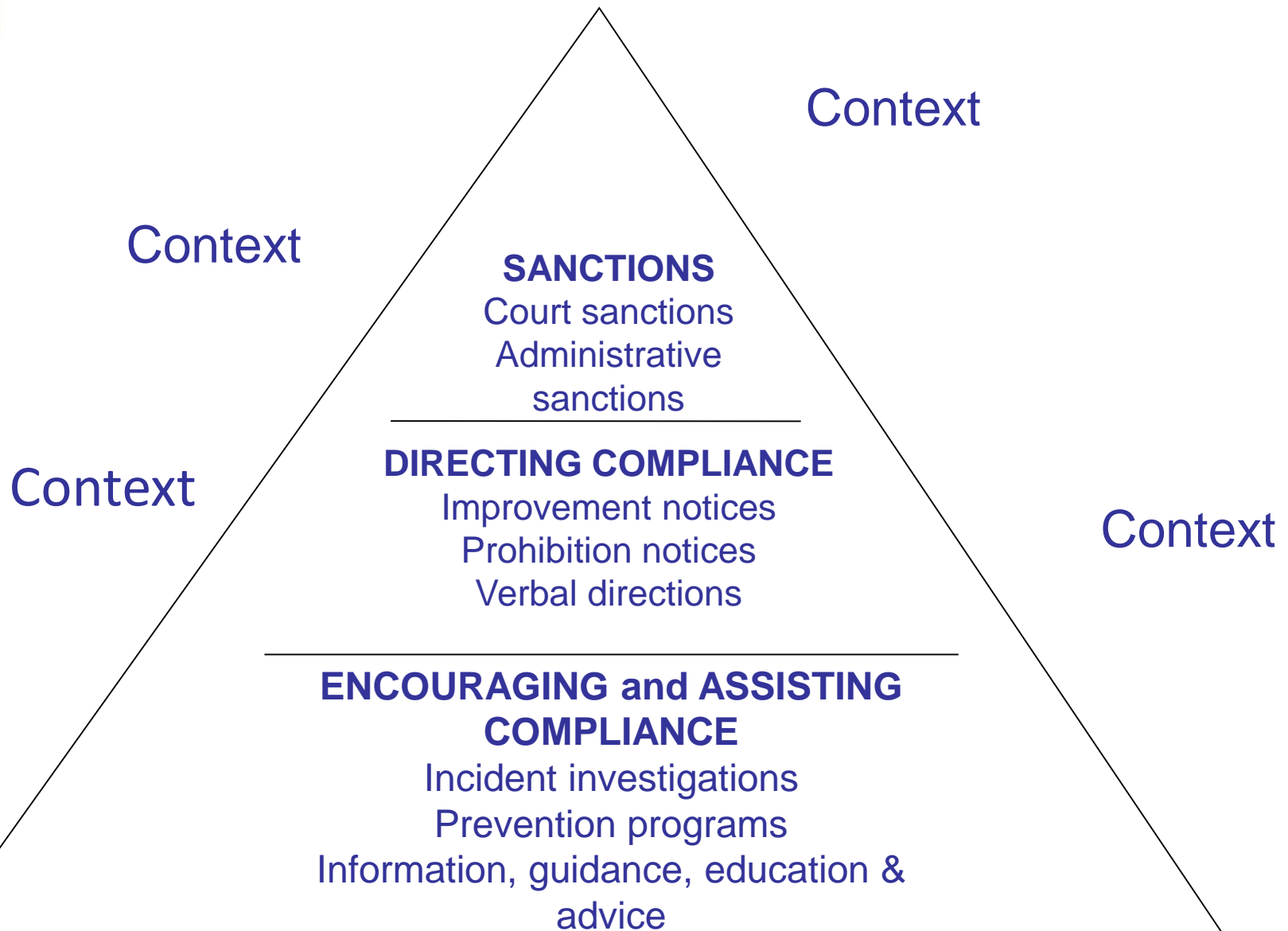
# What hampers good implementation?

- Too high Ambition / Standards
- Lack of Coordination / Cooperation
- Diffuse sources
- No Responsible Authorities
- No Monitoring / too expensive Monitoring
- Politicians expect results too soon
- Corruption
- No / poor Enforcement
- Poor collaboration in transboundary basin

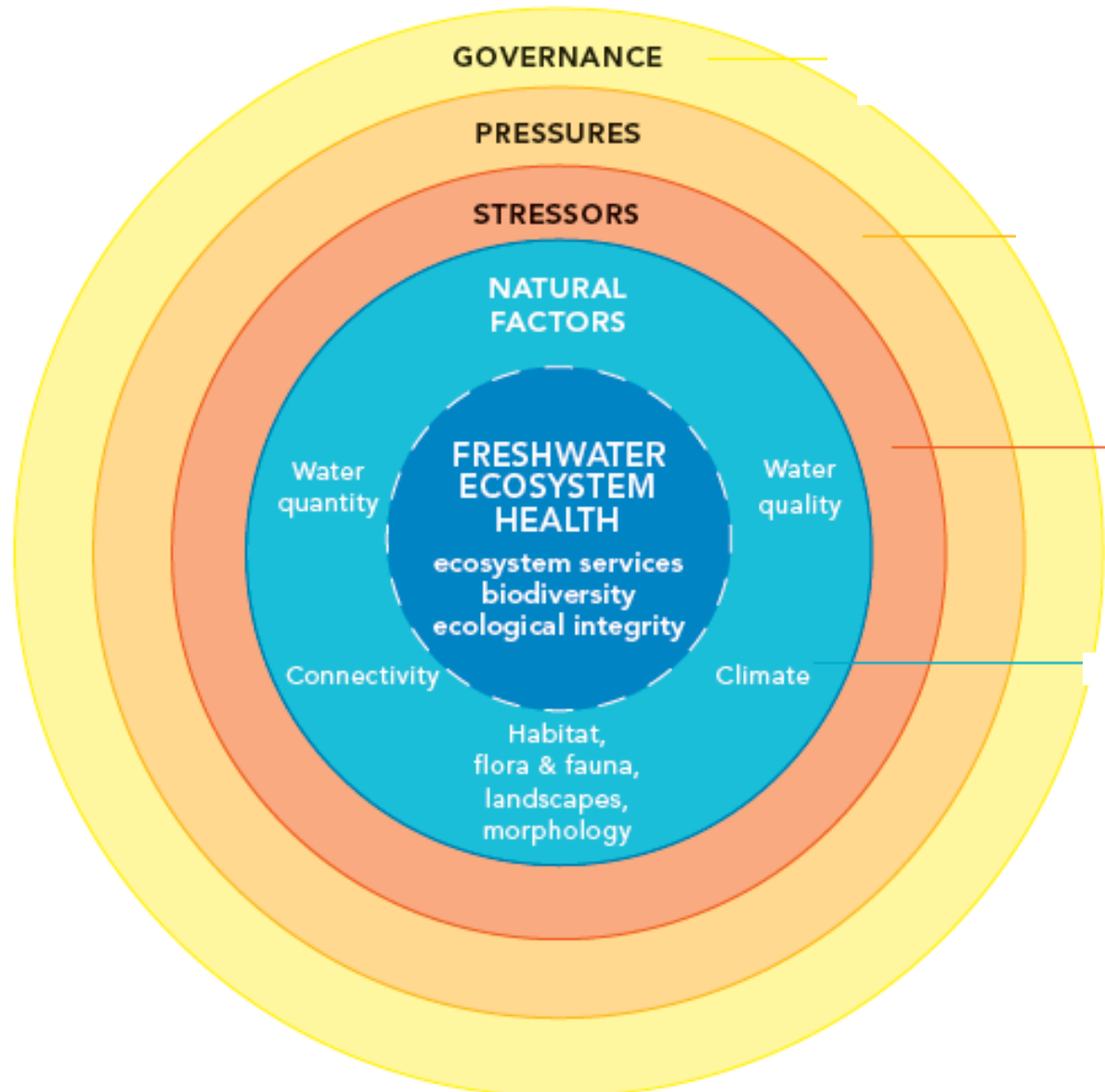
# Enforcement – Table of 11

Spontaneous Compliance	1. Knowledge of regulations
	2. Cost/Benefit ratio
	3. Degree of Acceptance
	4. Loyalty/Obedience
	5. Informal Monitoring
Monitoring	6. Informal Report Probability
	7. Monitoring Probability
	8. Detection Probability
	9. Selectivity
Sanctions	10. Chance of Sanctions
	11. Severity of Sanctions





# Implementation Framework



# Implementation Framework

- Governance
  - Institutions, Basin Organizations, Ethics, Value Systems, Population Dynamics, Multi-Stakeholders, Financial Mechanisms
- Pressures
  - Recreation, Human Settlements, Hazard Security, Terrestrial Biomass Production, Transport-Infrastructure, Hydropower Generation, Biomass Extraction, Water Withdrawal
- Stressors
  - Water Infrastructure, Flow Alteration, Modification Aquatic Habitat, Biological, Chemical, Thermal Water pollution
- Natural Factors
  - Water Quality, Connectivity, Habitats, Climate

# Summary

- Each country needs clear process to set Water Quality Guidelines and Implementation Strategy
- Integrated Ecosystem Health approach is needed
  - Human Use
  - Aquatic Systems
- Develop international water quality criteria for toxic substances in fresh water ecosystems



Thank you for your attention

