River Basin Management Cycle Training Series

06 - Assessment of Water Quality and Quantity

german cooperation
DEUTSCHE ZUSAMMENARBEIT

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NAMAMI GANGE

INDIA-EU WATER PARTNERSHIP

Outline

Unit	Topic
1	**Introduction to River Basin Management**
2	**Clear Governance and Coordination Structure**
	Governance (legal aspects and framework)
	Basin Coordination Structures (basin institutions and stakeholder engagement)
3	**Basin Characterisation**
	DPSIR Assessment
4	**Determining Basin Vision and Objectives**
5	**Design/ Adaptation of Monitoring Networks and Programmes**
6	**Assessment of Water Quality and Quantity**
7	**Implementation of RBM**
	River Basin Plans and Programme of Measures (PoM), Financing and Review of PoM
8	**Solutions through Exchange, Information Flow and Cooperation**

6 Assessment of Water Quality and Quantity

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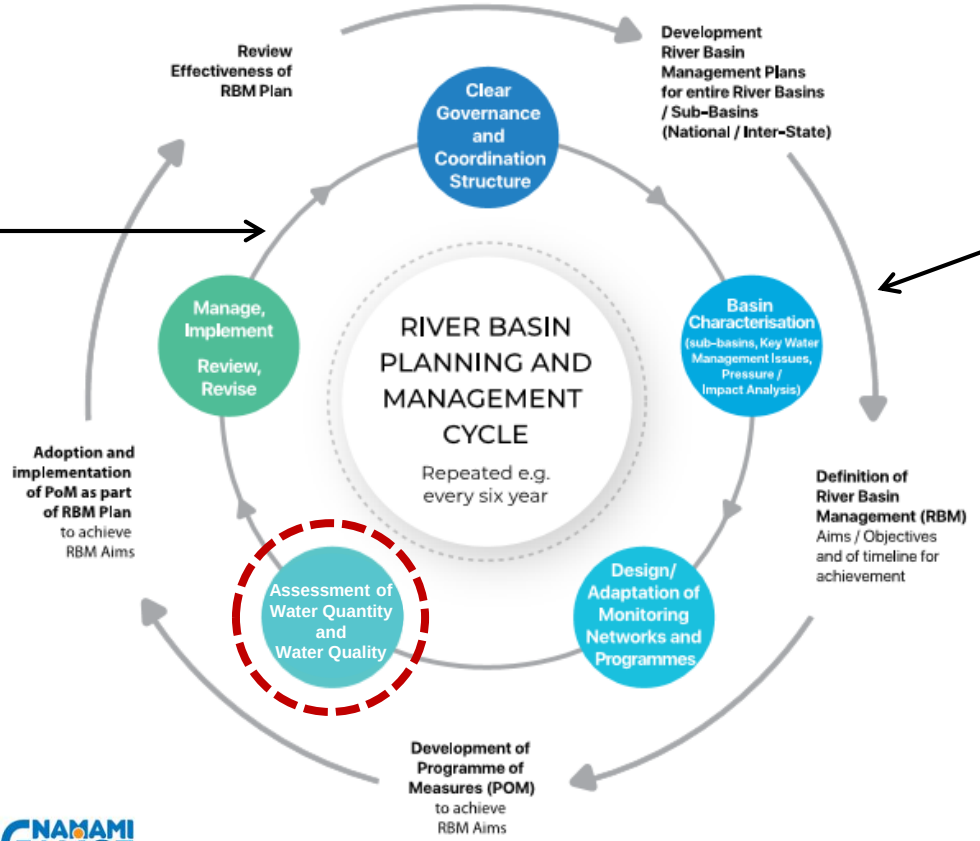
The River Basin Planning and Management Cycle

„Inner cycle“
Technical/
operational level“



„Outer cycle“
Planning and
decision making
level

The Overall Objective from Assessing Water Quality and Quantity

- Understanding the current status of water quantity and quality
- Delineate interventions by authorities
- Feed models
- Develop remediation programmes
- Verify the effectivity of the programme of measures directed to assure the adequacy of water quantity and quality
- Identification of unknown environmental pressures
- Establish a cost-effective monitoring programme

Water Quality: A Combination of Three Quality Elements

Quality elements (QE) of ecological status as defined by the Water Framework Directive

Quality element	River	Lake	Transitional water	Coastal water
Biological quality elements				
Phytoplankton	X	X	X *	X
Large algae/angiosperms			X	X
Macrophytes/phytobenthos	X	X		
Macro-invertebrates	X	X	X	X
Fish	X	X	X	
Hydromorphological quality elements				
Continuity	X **			
Hydrology	X	X		
Morphology	X	X	X	X
Tidal regime			X	X
Chemico-physical quality elements				
General chemico-physical parameters	X	X	X	X
Specific pollutants	X	X	X	X

* Not available; this parameter cannot be assessed in German transitional waters of the North Sea due to the high level of turbidity.
** An assessment method for fish ladders, downstream fish passes and sediment continuity is currently under development.

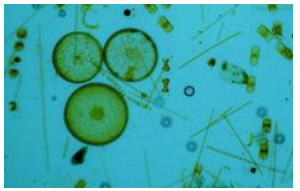
Source: German Environment Agency in accordance with the Ordinance on Surface Waters (OGewV)

Key: Assessment not required; X Assessment method available; X Assessment method currently being trialled; X Assessment method not yet available

Source: UBA (2017) Waters in Germany, page 26, table 5

Biological Quality Elements

- The “biological quality elements” included in the EU WFD are:
  - Phytoplankton
  - Large algae/ Angiosperms
  - Macrophytes/ Phytobenthos
  - Macroinvertebrates
  - Fish
- Prior to the EU WFD, Germany looked only at macroinvertebrates (index of sabrobia) to describe water quality



Source: Arle et al. (2015) Monitoring surface waters in Germany under the EU WFD

Hydromorphological Quality Elements

Various river cross-sections showing disturbances of the river hydro-morphology (left-hand side) and a graphic outline of a hypothetical river flowing into a delta (right-hand side)

Hydromorphology – Barriers to Connectivity

Hydromorphology – Channelisation

Hydromorphology: stream in „ideal“ condition

Sources: REFORM Project: How to improve hydro-morphological assessments of rivers and streams? EPA Ireland, Hydro-morphology. Article by Quinnlan, E. and Ziegler June 2018

Hydromorphological Quality Elements

- **Hydrology**

Hydrologic water balance equation

→ Forms the backbone of water resource management and can be calculated for a basin or region

$$P = ET + R + \Delta S$$

P is Precipitation, ET is Evapotranspiration, R is Runoff, ΔS is change in storage

- **River hydromorphology** considers:

— The physical character of surface waters

— Their connectivity

— Status of riverbanks and sediments

— Information about flow regimes and water quantities

→ Good hydro-morphological conditions support aquatic ecosystems; thus, it also considers structures and substrates of riverbeds and riverbanks and riparian zones

Chemico-Physical Quality Elements

- **Water Quality**

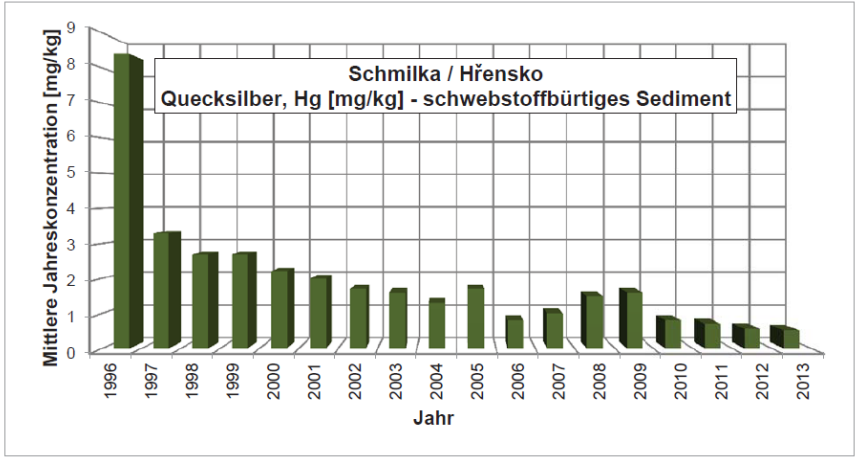
Includes:

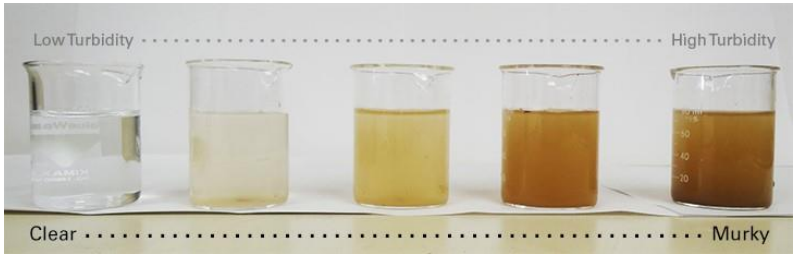
— **Physical characteristics**

e.g. temperature, turbidity

— **Chemical characteristics**

e.g. pH, EC, salt content and ions such as K+, Na+, Ca+2, Mg+2, Cl-, SO4-2, HCO3-, fluoride, silica, Persistent Organic Pollutants (POP) such as pesticides, heavy metals, or micropollutants such as pharmaceuticals or hormones





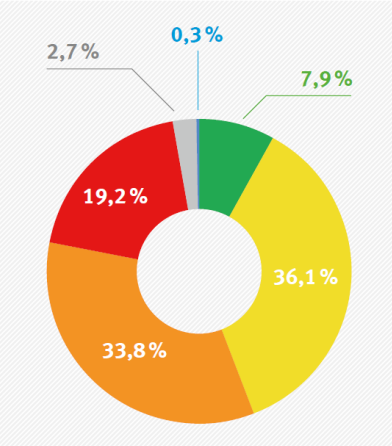
https://blogs.worldbank.org/water/how-test-water-quality-here-are-some-low-cost-low-tech-options

EU Water Assessment: Colour Codes

	High status or reference conditions (RC)
	Good status (slight deviation from RC)
	Moderate status (moderate deviation)
	Poor status
	Bad status

Ecological status:

- Biology
- Hydromorphology
- Physico-chemical status
  red (bad) and blue (high quality)



Example: Germany in 2015

89% of Germany's water bodies are in a moderate, poor or bad ecological status

Source: UBA (2017) Waters in Germany

Continued engagement pre and post webinar

1. For queries and related engagements contact GIZ colleagues:

Delhi Office:

- **Dr. Sumit Gautam (sumit.gautam@giz.de)**
- **Ms. Chhavi Sharda (chhavi.sharda@giz.de)**

Uttarakhand (Dehradun) Office:

- **Mr. Merajuddin Ahmad (merajuddin.ahmad@giz.de)**

2. E-Learning platform - http://78.46.247.119/

(Temporarily hosted on AHT servers and will be transferred to the servers of training institutes.)

Contact: **Rania** -taha@aht-group.com/ **Rebecca -** roblick@aht-group.com

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Registered offices
Bonn and Eschborn

India office:

GIZ Office New Delhi
46 Paschimi Marg, Vasant Vihar
New Delhi 110057

Postal address:

Support to Ganga Rejuvenation
B-5/2, Safdarjung Enclave
New Delhi 110 029
India
E: martina.burkard@giz.de/
chhavi.sharda@giz.de/
sumit.gautam@giz.de

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