WORLD WATER QUALITY ALLIANCE ASSESSMENT – AGENDA SETTING -SERVICES
linking the global water quality agenda to the nexus and national local relevance

Hartwig Kremer, UN Environment,
Water quality in the Agenda 2030 & SDG context

- The 2030 Agenda adds an important new mandate and opportunity for UN Environment

- Within UN-Water, UN Environment is engaged in integrated monitoring and reporting for SDG 6: [www.sdg6monitoring.org](http://www.sdg6monitoring.org)

- UN Environment has global custodianship of data collection for indicators in SDG targets 6.3, 6.5 and 6.6 – all connect to water quality

- UN Environment got the mandate to look into Water Quality globally in depth – including and going beyond SDG 6.3, into emerging issues, global trends, nexus focus, projection, governance and services - [WWQA](https://www.wwqa.org)
Partnering for Global Leadership

About the UN Environment
Freshwater Strategy:

The Freshwater Strategy is firmly embedded and reflected in UN Environment’s mandate to help countries achieve the 2030 Agenda for Sustainable Development, besides SDG 6 also 11.5 as well as 16.1.
Global water pollution crisis

• Human activity and population growth put tremendous pressure on the world’s freshwater resources.

• 80 percent of world’s wastewater discharged untreated, threatening both human health and ecosystem services

• There has been a 30% decline in biodiversity health since 1970. More than 40% of freshwater fish species in the United States and Europe were in imminent danger of extinction (Millennium Ecosystem Assessment 2005).

• Pollution through pathogens, organic matter, chemicals and salinity are of particular concern – up to 1/3 of all rivers could be affected.
Recent findings – the Snapshot of the World’s Water Quality (UNEP 2016)

• Wastewater production at least doubling by 2050
  → Sewerage connections increasing
• But not wastewater treatment
  → More untreated wastewater to rivers and lakes

Nexus with human health:
Health risk of contaminated rivers & lakes → contact with surface waters → washing, cleaning, drinking

Nexus with food security:
95% inland fishery production from developing world;
200 million Africans consume fish regularly;
rapidly growing demand for irrigation from surface and groundwaters
Key findings on water quality (UNEP 2016) The Snapshot Report

- **Water pollution has worsened** since the 1990s in almost all rivers in Latin America, Africa and Asia.
- **Severe pathogen pollution** already affects around one-third of all river stretches in Latin America, Africa and Asia.
- The number of **people at risk to health** by coming into contact with polluted surface waters may range into the **tens of millions** on these continents (842,000 deaths from diarrheal disease in 2012).
- **Severe organic pollution** already affects around one-seventh of all river stretches in Latin America, Africa and Asia.
- **Severe & moderate salinity pollution** → one tenth of all river kms
- The **food security from inland fisheries is threatened** in a number of countries in Africa and Asia.
- **Emerging and persistent water quality problems** in industrialized countries – e.g. pharmaceutical residues, eutrophication
- **Majority of rivers** in developing countries **still in good condition** → Great opportunities for short-cutting further pollution and restoring the rivers that are polluted. → **Mix of management & technical options supported by good governance**
Key findings on information and data
World Water Quality Assessment

• There is a **substantial** data and information gap

• **Very low density of monitoring stations regionally** in the only global data bank (UN-Environment GEMStat)
  
  • typical minimum density of around 1.5 to 4 stations per 10,000 km² of river basin area in the USA and Europe.
  
  • The average density for the Latin American continent is 0.3 stations per 10,000 km², for Africa 0.02 stations per 10,000 km², and for Asia, 0.08 stations per 10,000 km²

• **Significant inconsistencies** between global assessment and regional knowledge/information and service needs

• **Efforts and priorities** on data-deficient basins **needed** => for management

• **New Data Sources** (EO, Citizen Science, Machine Learning (e.g. WB study)) advanced modelling/downscaling – from global comparison (Agenda 2030) to national/local relevance and services
The challenge of the dynamic SDG Interlinkages (here South East Asia)
Institute for Global Environmental Strategies (IGES)
Strategic and Quantitative Analysis Centre

UNEA-3 Water Quality Resolution (Res. 3/10) OP 16
“Assist countries to…” “in collaboration with national governments, local authorities and, as appropriate the private sector”:

- Assist in WQ monitoring, capacity-building, and data management; information WQ testing for contaminants (new and emerging)
- Strengthening capacity to reach wastewater targets including wastewater treatment options
- Tools to address water pollution and ecosystem health, implement IWRM, address water-related impacts of disasters
- Assessments, propose solutions, policies and technologies of invasive species, pharmaceutical contaminants, emerging pollutants; develop WWQA by UNEA-5;
UNEA-3 Water Quality Resolution (Res. 3/10) OP 16

“Assist countries to…” “in collaboration with national governments, local authorities and, as appropriate the private sector”:

- Support countries **data collection, analysis** and sharing to implement w-r SDGs, **drawing on EO and global data**; provide necessary technical support monitoring/reporting SDG 6
- Develop programmes that invest in land and ecosystem management to prevent pollution
- Create enabling environment **including policies, laws and regulations, technologies and finance for water pollution including ww management**
- **Clean and recover** polluted water bodies
Example: Resolution on addressing water pollution to protect and restore water-related ecosystems (Res. 3/10)

FRESHWATER ECOSYSTEM MANAGEMENT
Framework for Ecosystem Management
Identifies main activities for countries to sustainably protect and restore freshwater ecosystems – needs implementation;
Integrated Water Resources Management (IWRM)
Develop tools to support countries, in addressing water pollution and ecosystem health; implement IWRM approaches; and address water-related impacts of disasters
Support for data collection, analysis and sharing
Data and technical analysis for integrated water resources management, with new partnerships on Earth Observations;
Monitoring and Reporting for SDG 6
UN Environment supports countries for indicators 6.3.2, 6.5.1 and 6.6.1 – additional support needed for capacity-building

WATER QUALITY MONITORING; APPRAISAL and SERVICES
• Strong mandate to support countries in WQ monitoring, monitoring network design, capacity development and data management
• Build upon the GEMS/Water Trust fund to ensure necessary resources
• Support countries in data collection, analysis and sharing, incl. SDGs indicator 6.3.2 reporting, potentially drawing upon Earth Observations and global data

WORLD WATER QUALITY ASSESSMENT (WWQA)
Develop, in cooperation with the science innovation community and other relevant organizations in and beyond UN-Water, a global water quality assessment for consideration at UNEA-5, taking into account, among others, emerging pollutants.....

SUSTAINABLE WASTE-WATER MANAGEMENT
Supporting the implementation of SDG indicator 6.3.1.
Supportive policies
Support countries to develop policies, guidelines and standards for sustainable wastewater management
Innovative financial mechanisms
Collaborate with private sector to invest and upscale business models for wastewater management tapping into innovative financing mechanisms
Addressing emerging pollutants
Pharmaceutical contaminants, personal care product including proposed solutions, policies, and technologies
Capacity-building through the Global Wastewater Initiative
• MOOC, webinars, Wastewater Atlas
Global Environment Monitoring System for Freshwater (GEMS/Water)

1) Global Monitoring Network

2) GEMSstat

3) Capacity Development

4) SDG indicator 6.3.2 on ambient freshwater quality

Good ambient water quality? We support you in the calculation of SDG indicator 6.3.2
Spatial Data Gaps in GEMStat

Station Types
- Groundwater station
- Lake station
- Reservoir station
- River station
- Wetland station

- Stations reported, but no data submitted
- Countries contributing to GEMStat

- 52 years temporal coverage
- 4,000,000 values
- 75 participating countries

- 250 parameters
- > 4,000 stations
Capacity Development in Water Quality Monitoring

- Training Courses (online and workshops) on all aspects of WQ monitoring, incl. data management
- University accredited courses
- Technical assistance in WQ monitoring
SDG indicator 6.3.2: *Proportion of bodies of water with good ambient water quality*

- Methodology development
- 2017 data drive: data from 50 countries
- Technical support: tutorials, webinars, helpdesk

19 African countries engaged during 2017 data drive
Exploring new sources of water quality data

SPONGE – Spaceborne Observations to Nourish GEMStat

Development of water quality monitoring products for selected water bodies in Guatemala, Ghana, Finland, Japan and Tanzania

Landsat-8 RGB image and reference station locations (left) and C2RCC backscattering index (right) for the *Anabaena Sp.* bloom in Lake Atitlan, August 4 2016
GEMS/Water: Postgraduate Diploma, Training Modules (stand alone) workshops in all global regions, in-country support on water quality monitoring and SDG reporting, guideline publications and helpdesk, Methodology updating.

UNEP Framework for national ecosystem targets

UNEP/ES/10 Water & Pollution Data & Data services

UN-Water/Science

UN-Water/Science Community

SDG 6: Water & Environment

UN-Energy: Climate

UN-Health: Food, Nexus

UN-Environment

UN-Water, and SDI

Business Models, Innovation and Technology, SCENIORS, Climate Change, Emerging Water Quality

UN-Water and Quality Regular

UN-Environment GEMS/Water: Quality control, assurance, Standardisation, Regional cooperation (e.g. EEA, AMCOW), Analysis and visualisation, Disaggregation, Earth Observation, Citizen Science, Methodology updating.
Roadmap towards a Worldwide Water Quality Assessment

- **Approach:** DPSIR, pre-study, two spatial scales (regional, global)
- **Trademarks of success** (legitimacy, credibility) & Trade-offs

**Review water quality state**  

1. **Baseline assessment**  
   State of water quality

2. **Scenario analysis**  
   Trends over next decades

3. **Mitigation analysis**  
   Technical measures & management approaches

- **SDGs as cross-cutting theme**
  - Governance analysis
    Institutions to protect, restore water quality
  - Increase capacity of developing countries
  - Enable efficient management

- **Interfaces with operational services and policy advice**

- **Identify areas most under threat**
Global Water Quality Appraisal and Services and Innovation

Demand:
Policy Agenda from global, regional, national to local

UN-Environment Assembly Agenda (UNEP/EA3/10_2017)
Policy field and inter-linkages (SDGs, Sendai, Paris, Addis, New Urban Agenda, MEAs)
Private Sector
Donors

Supply and infrastructure:
Scientific and technological innovation; tools and assessments

Surface Waters
Groundwaters
Estuaries

Continued demand/supply dialogue

Demand:
Operational services and policy advice

Water and Health
Water and Food
Water and Ecosystems
Water and Climate

Products: Science and Technology Innovation and Knowledge Services; Relevant Causal Chains between Water Quality, Health, Food and, Agriculture Systems (land use and cover)
1. Reconcile sanitation/treatment and water quality, antibiotic resistances
2. Irrigation and water quality; Pesticide and Nutrient management
3. Micropollutants, Endocrine disruptors
4. Temperature, Dilution and Metabolic Capacities, Cyanophycean

Timeline
2018 Inception & 2019 UNEA 4
SDG 6 Water Science Agenda
2020/21 SDG6/ UNEA 5;
draft global report
2022 SDG6 HLPF
2023 UNEA 6 full global report
2025 UNEA 7 SDGs review
2027 UNEA 8 Rolling STI platform
Global Water Quality and Services Platform Project

UNE Agenda

- What kind of water bodies (river, lake, wetland, groundwater, estuary, ...)
- Which scale (local, national, continental, global, ...)
- What kind of substances (parameters on nutrients/eutrophication, salinization, hazardous substances, pathogen pollution, ...)
- What kind of data source (singular measurements, continuous monitoring, modelling, remote sensing, ...) 
- What kind of case studies could be displayed on causal chains

- Relevance chains: Health, Food, Ecosystems
- Delivery chains: Data drive SDG 6

Timeline

2018 2021 2025 2027

Policy Agenda from global, national to local

Scientific and technological innovations; tools, assessments

Operational services and policy advice

highlighting/updating DPS-IR
A consolidated **Baseline** linking Water Quality and Development triangular Data/Model Driven Approach – highlighting/updating DPS-IR Aimed to align cases – SDG 6/GEMI – WWQA – Snapshot

- **Baseline, NEXUS-Causal Chains, Scenarios, Solutions**
- **Remote sensing, EO, Citizen Science** (Landsat, sentinel missions, JRC, NASA, Copernicus, AfriAlliance (IHE) …)
- **In-situ-Data** (GEMStat, WISE, HYCOS, MCH/WHOS-WMO, GRDC, IGRAC, SDG data drives …)
- **Modelling** (WaterGAP, mHM, IIASA, PBL, …)

**1. Baseline assessment**
State of water quality

**2. Scenario analysis**
Trends over next decades

**3. Mitigation analysis**
Technical measures & management approaches

**4. Governance analysis**
Institutions to protect & restore water quality

**Lakes**

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<th>Lake</th>
<th>Datenbanken (GEMStat/WISE/Wasserblick)</th>
<th>Fernerk.</th>
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**Rivers**

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A consolidated **Baseline** linking Water Quality and Development triangular Data/Model Driven Approach – highlighting/updating **DPS-IR**

Aimed to align cases – SDG 6/GEMI – WWQA – Snapshot

**WWQA input:**
- global dynamics (population, land use, climate etc.)
- users, stakeholders

**scales**
- spatial
  - local
  - regional
  - global
- temporal
  - daily
  - monthly
  - annually

**In-situ data**
**remote sensing**

**models**

**proxies**
- runoff-components
- flow time
- transport-capacities

**scope**
- pollution
- groundwater
- SDG 6.3.2 core parameters
- emerging issues e.g. plastics and AMR

**projections**
- baseline
- global change
- climate change
- case studies
- scenarios

**WWQA products**
- D-P-S-I-R based analyses and assessments
- Globally scaled and comparable baseline
- 2030 Agenda and SDG linkages
- Hotspot analyses
- Intersection and interoperable services
- Co-designed case studies
"Demand and data driven information services to national and transboundary water management"

UNEP, and key partners of the World Water Quality Alliance, follow up to UNEP/EA.3/Res.10 and WWQA Inception, UNEP/WMO Geneva 28-29 November 2018

Work with Countries, AMCO, Partners, Donors to:
- demonstrate the Water Quality - Alliance capacity in supporting the Agenda 2030
- identify / address the needs of national operational services and related products
- demonstrate the role of quality assured data on water quality, and the hydrological cycle
- establish a data, model and observation driven state of water quality, and causal chains in the water, food, health, ecosystems nexus and future scenarios
Emergence of the World Water Quality Assessment, Alliance and Service Platform - History, Status, Projectin

2018 WWQA request for Expression of Interest – UN Water and external (80 approached; 50+ positive responses)

UNEP/EA3/Res 10
Dec 2017 – WWQA Mandate

Snapshot Report & Analytical Brief
UNEP/UN Water 2016

Inception WMO/UNEP, Geneva Nov 2018 – Mapping of expertise/activities – World Water Quality Alliance is formed

9/2019 WWQA 2nd global Meeting – Joint Research Centre of the EU Com., Ispra, Italy

3 African Use Cases WWQA ToR & Servicesheets Co-design test 2019-20 (Volta, Victoria, Cape Town)

Globe WQ – DPSIR – approach (2019-22)...


Full WWQA report, scenarios, platform – UNEA 6 (2023)

WWQ Alliance WGs 2019ff e.g.: Urban Water Quality, Climate, Groundwater, Citizen Science...
Affiliation of further projects; Continued GEMS & GEMI (SDG 6) data drives
Objectives and findings of the Inception and Alliance

- Mapping current WQ activities of UN-Water Members and external experts and how these could fit in WWQA
- Overview of data sources, models, approaches and identify gaps which need to be filled in order to deliver a global assessment and future services in a long term programme approach
- Support the narrative around Water Quality and Sustainable Development in the 2030 Agenda
- Build a World Water Quality Alliance – as interacting Community of Practice - profiling ambient freshwater quality and interlinkages with other 2030 Agenda goals globally and providing innovation expertise and services

Three Working Group Nexus Themes: **WQ – health and cities; WQ and ecosystems; WQ and food**

| Q1: What is your expertise/activity and what data do you have beyond GEMS to describe/contribute to the WQ baseline? | Q2: What is following your expertise/mandate the most serious data/waterbody gap to describe the WQ baseline? |
| Q3: Which kind of scenarios do you use? (specify: temporal/spatial projection and boundary conditions / drivers) | Q4: What are the most important linkages / feedbacks between pressure and impact to be assessed? |
| Q5: What examples you work on in terms of responses (cost-) efficient mitigation / adaptation measures? | Q6: Which operational services shall we engage with to align demand and products we can provide (policy, management and technology, can be UN)? |

- The Alliance shared their expertise and possible commitment:
- Some 18 institutions engage in the health / city nexus incl. ground water aspects
- Some 16 institutions in water and food
- Some over 20 in the ecosystem health and services context

**Open focal recommendations – not yet covered/funded: WQ and Cities/Groundwater WQ – Nexus/New Data/CD**
Objectives and findings of the Inception and Alliance
Current WWQA Funding – Future topical focus (evolving)

- UNEP GEMS/Water: GEMStat (BMU – till 2024 (2030))
  GEMS Capacity Development (Africa/Global) – till 2020 (small scale – Ireland)

- (Integrated Monitoring Initiative (UN-Water): 2nd phase ca 200-230 K/a expected/indicator (here 6.3.2, 6.5.1, 6.6.1)

- WWQA: some 2.5 Mio have been raised in kind by various donors and also voluntary commitment to bring in funded work into the Assessment, Cases and technical work by Alliance Members

Approved and affiliation / leveraging:
PRIMA (EU) up to 4 Mediterranean coastal groundwater cases to be affiliated (approved)
TRACER (Helmholtz Assoc.) – PhD college – 2times 4 years (1-2 FTEs to WWQA tasks)

Gaps: Alliance-Coordination and Working-Groups (UNEP Headquarter FTE, WWQA-WG: Groundwater, Finances and Water Investment, Data, advanced socio economic modelling, Urban WQ; GEMS-SDG 6 and WWQA Capacity development on monitoring and services and in WWQA incl. to define national operational service demand
World Water Quality Alliance – Organisation and Deliverables

Global Community of Practice and Expert STI communication and agenda setting Platform on Water Quality and development
(coordination by UNEP)

TAC
(15 rotating)

SAC
(15 rotating)

World Water Quality Assessment

What: Data, Observation Model Fusion; RD – core activity;
Who: Impl. PIs + complementary contributions from Alliance members

What: Case studies (Causal Chain / Nexus);
What: Regional/National Use Cases (in country participatory process and product piloting)
Who: Impl. PIs + complementary contributions from Alliance members, and contractors

Agenda Setting - WQ emerging topics investigating & products

What: Expert Dialogue and Horizon Scanning of Water Quality status and persistent and emerging issues in a nexus context incl. Finance (Investment), others
Targeted Working Groups (temporary) to investigate, synthesise, communicate, advise
Who: the expert parties to the Alliance, Countries and Donors
How: Moderated UN-Water Expert Group in Water Quality and Waste Water
Annual meetings and Working Groups
Product: e.g. position papers, discussion platform and peer exchange – regular information flow into science policy interface processes
Piloting meaningful active involvement with Civil Society, major groups

WWQ-Alliance Annual Meeting (hosted by members (rotating)
Regular and ad hoc sessions of the UN-Water Expert Group on Water Quality and Waste Water
**WWQ-Alliance – Summary an Timelines**

**WWQA commissioned study**
- Microplastics in freshwater: monitoring and mitigation concepts (Sep 2019)

**WWQA Expert Groups e.g.**
- WQ hotspots & finance (WB. Dev Banks, OECD?, PS)
- Groundwater

**Future WWQA WGs**
- Use needs;
- Product oriented, SMART

**DEM0: Initial Use Cases until 2021**
- Volta, Victoria, Cape Town
- Added value of WWQA concept

**WWQA meeting**
- JRC Ispra Sep. 2019

**Modelling (DPSIR)**
- Baseline + some cases
- First Final Draft UNEA 5 March 2021

**Global DPSIR Assessment**
- +10 Pilots
- Full Final Report and Synthesis for UNEA 6 – March 2023

**e.g. WWQA WG**
- Transboundary systems and water quality

**2030**
Thank YOU

Looking forward to fruitful collaboration with National Water Quality Monitoring Council