Water quality data in practice

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Introduction

A global perspective on collecting, quality assuring and sharing water quality monitoring data

1. UNEP GEMS/Water
2. The UNEP GEMStat water quality information system
   1. Data availability
   2. Data collection
   3. Data sharing
3. Expectations for data exchange harmonization
The UNEP Global Environment Monitoring System for Freshwater (GEMS/Water)

• Established in 1978
• Mandated by United Nations Environment Assembly (UNEA)

Global Environment Monitoring Unit
Nairobi, Kenya

GEMS/Water Data Centre
Koblenz, Germany

GEMS/Water Capacity Development Centre
Cork, Ireland

Assessments

Data

Water quality monitoring

Capacity development

Networks

National and Collaborating Focal Points
Regional Support Networks
The UNEP GEMStat water quality information system

Data used for:
- United Nations assessments
- Scientific studies on water quality on regional and global scales
- Data products
## GEMStat data availability

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<th></th>
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<th>Lake/Reservoir</th>
<th>Ground-water</th>
<th>Wetland</th>
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<td>Biological</td>
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<td>Organic</td>
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<tr>
<td>Inorganic</td>
<td></td>
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<td></td>
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</tr>
<tr>
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</table>

### Physical vs. Biological parameters:
- Physical: 24 parameters, 1 value
- Biological: 9 parameters, 892042 values

### Organics vs. Inorganics:
- Organic: 276 parameters, 1 value
- Inorganic: 175 parameters, 299198 values

### Instrumental vs. Indicator parameters:
- Instrumental: 3233 parameters, 1 value
- Indicator: 1 value

### Other categories:
- Flux: 6 parameters
- Optical: 1 value
- Temperature: 1 value
- Suspended Solids: 1 value
- Indicator Organism: 1 value
- Phytoplankton: 1 value
- Pigment: 1 value

### Data availability:
- Data for 7662 stations are available.
- Data for 13233 total stations are available.

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**Map showing data availability across the world:**

- The map shows the distribution of data availability for different parameters grouped by continent.
- Colors represent the percentage of data availability, with darker shades indicating higher availability.
- The global coverage is diverse, with significant data availability in certain regions.

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**Graph showing number of values by parameter group:**

- The graph illustrates the distribution of values across different parameter groups.
- Parameters are categorized into groups such as Nutrients, Organic, Inorganic, Flux, Suspended Solids, etc.
- The y-axis represents the number of values, and the x-axis represents the years from 1960 to 2020.
- The graph highlights the increasing trend in data availability, indicating a growing emphasis on environmental monitoring.

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**Parameter Groups:**

- The pie chart further breaks down the data distribution across different parameter groups.
- The chart visually represents the proportional contribution of each group to the total data available.

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**Map showing recent data entries:**

- The map highlights recent data entries by region.
- Each region is color-coded to represent the most recent data entry date.
- The data is marked by dot clusters indicating the density of recent entries.
- The map provides a geographical insight into where recent data is most frequently reported.
GEMStat data collection

Summarized Data Submission Steps

1. **Review** of existing entities (monitoring locations, water quality parameters and analytical methods), which were submitted by the Data Provider in the past.

2. **Registration** of new entities, **updating** information on already registered entities, and **compiling a submission** of water quality data.

3. **Submitting the data** and the registered entities to the GEMS/Water Data Centre (data-submission@gemstat.org).
GEMStat data collection

Challenges with Global Water Quality Data

- Great variety of submitted data formats and structures
  - Excel tables
  - Word tables
  - Databases
  - Text files
  - APIs
- Different naming conventions
- Different reporting units
### GEMStat data collection

**Challenges with Global Water Quality Data**

- Unclear metadata
  - Parameters?
  - Reference systems?
- Missing data and metadata
  - Units?
  - Sampling and analytical methods?
  - Station metadata?
    - Waterbodies/sampled features

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<th>TA</th>
<th>TH</th>
<th>DO</th>
<th>Turb</th>
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<td>17</td>
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</table>
GEMStat data sharing

Visualisation

https://portal.gemstat.org
Expectations for data exchange harmonization

- Further develop and publish upper-level ontologies/vocabularies for water quality parameters, analytical methods, ...
  - Governance?
- Encourage data providers to share data as open as possible referencing international licenses (compatible)
  - Creative Commons or Open Data Commons
- Further develop and agree upon standard protocols and formats for making data accessible
  - OGC data format standards (WaterML 2 WQ)
  - OGC APIs (SOS, EDR)
- Develop tools to deal with complex standards
Thank you for your attention!

Contact:
Philipp Saile (saile@bafg.de)
Head of the GEMS/Water Data Centre

https://gemstat.org