

Water quality data in practice

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WEATHER CLIMATE WATER

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)

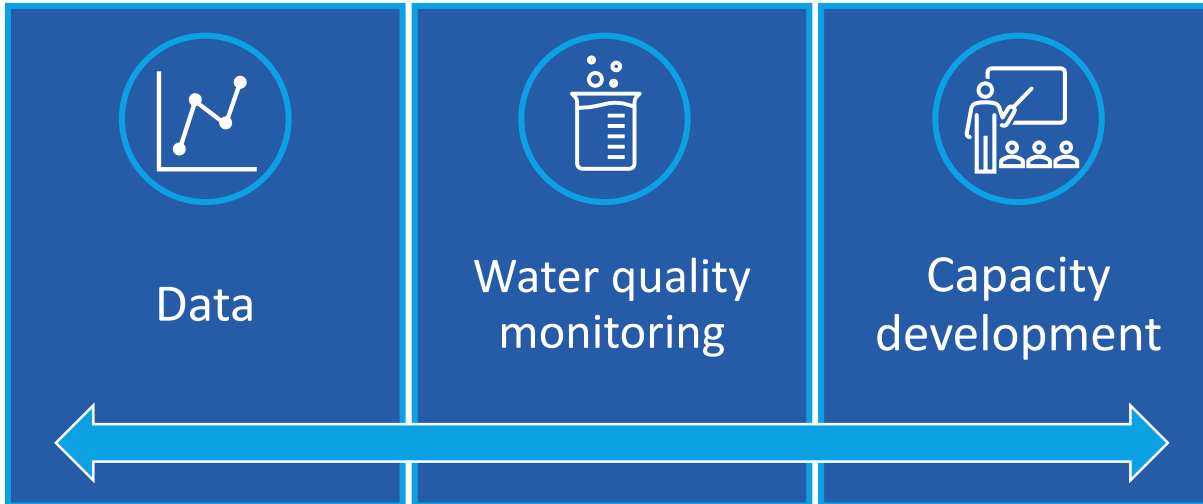
- Established in 1978
- Mandated by United Nations Environment Assembly (UNEA)



Global Environment Monitoring Unit
Nairobi, Kenya



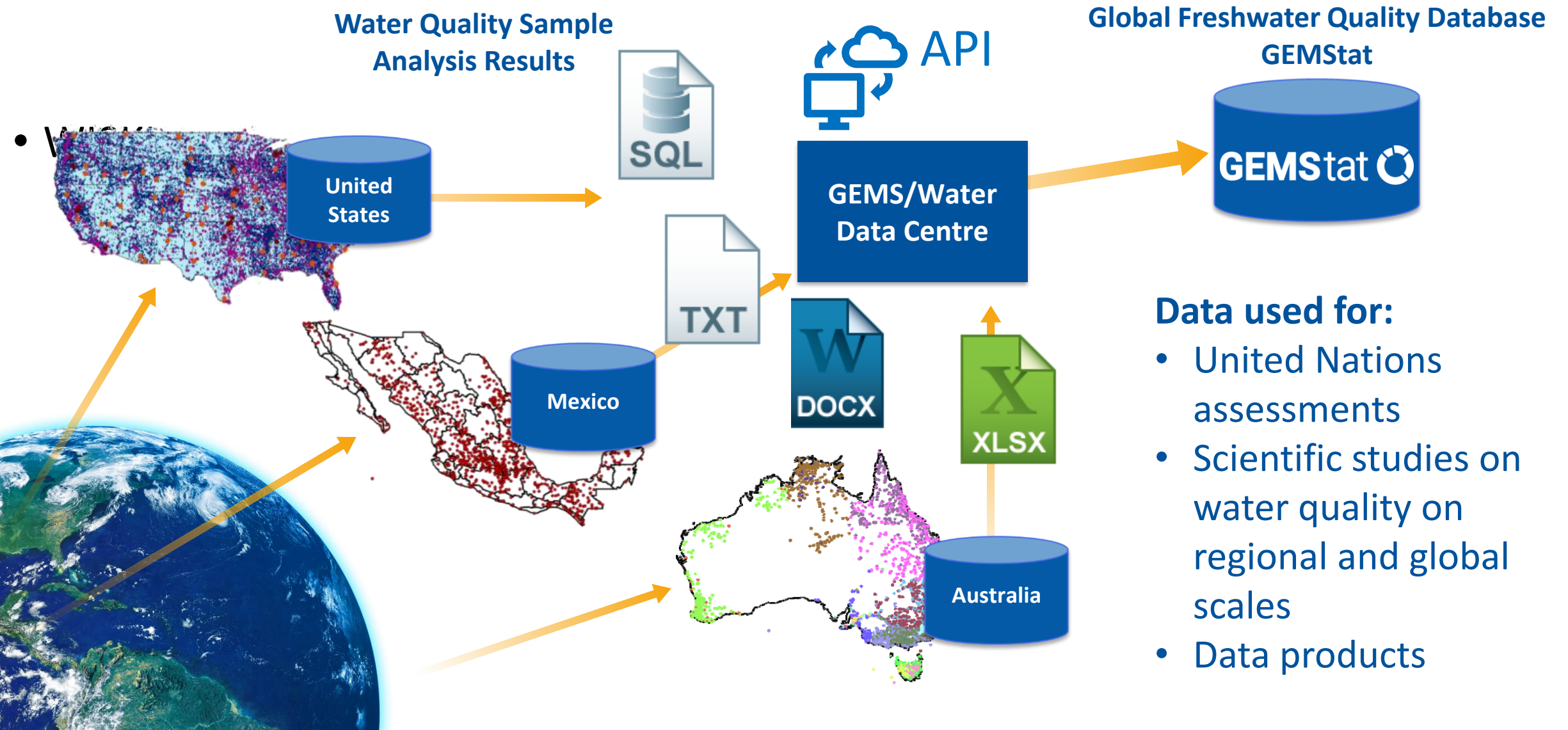
GEMS/Water Data Centre
Koblenz, Germany



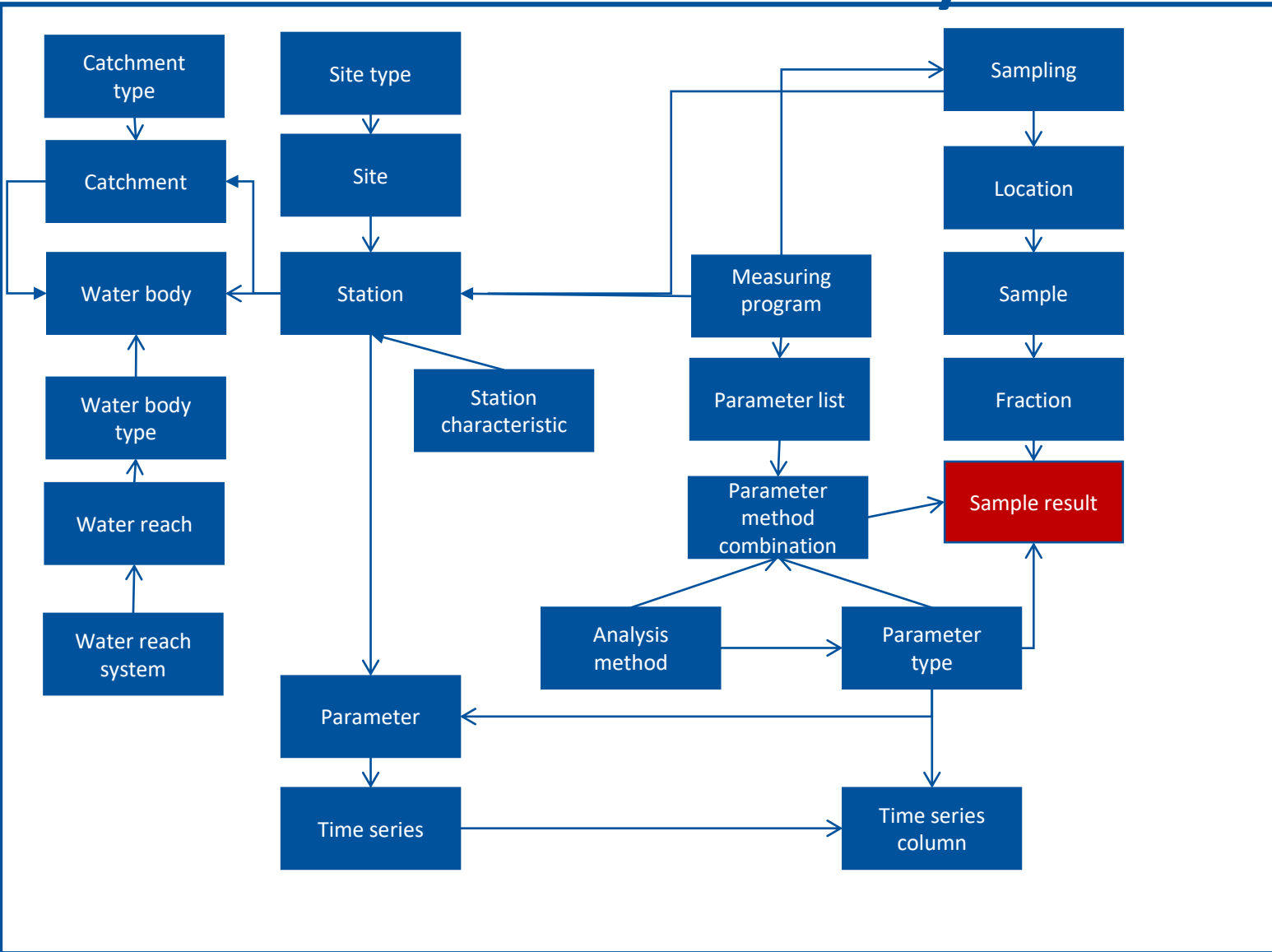
GEMS/Water Capacity Development Centre
Cork, Ireland



The UNEP GEMStat water quality information system



GEMStat system architecture

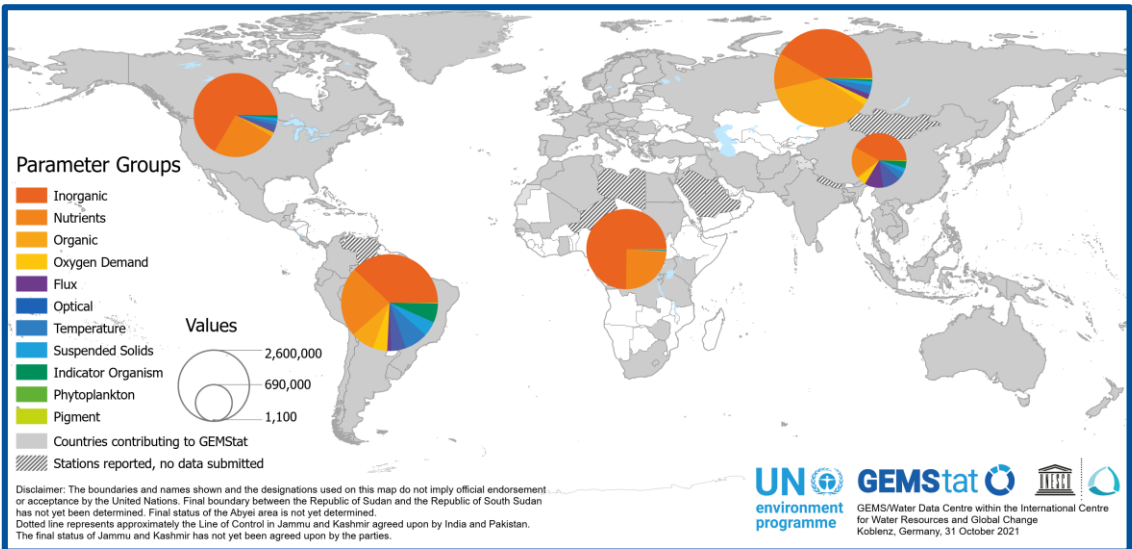
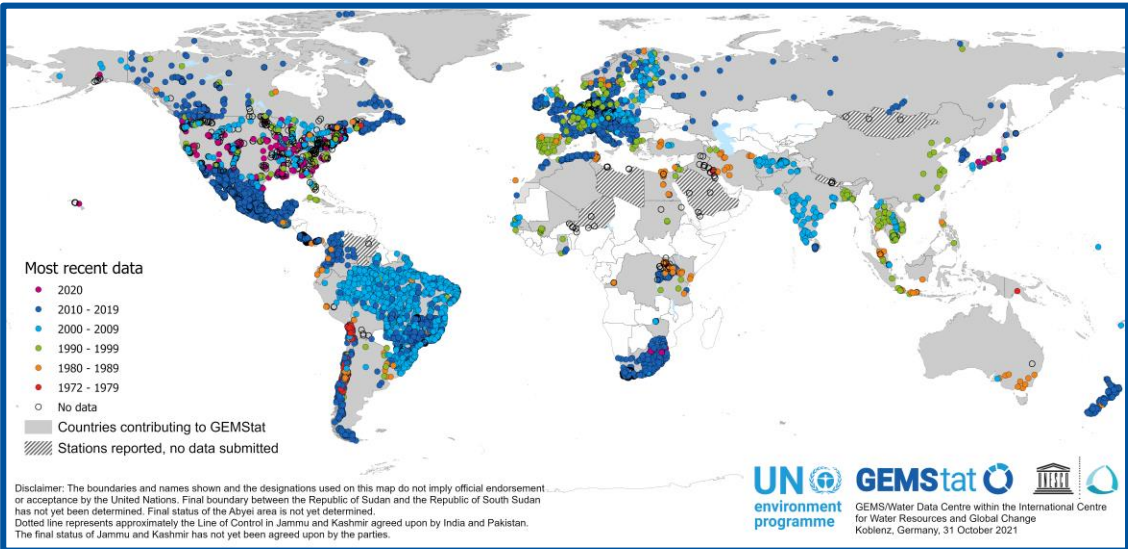
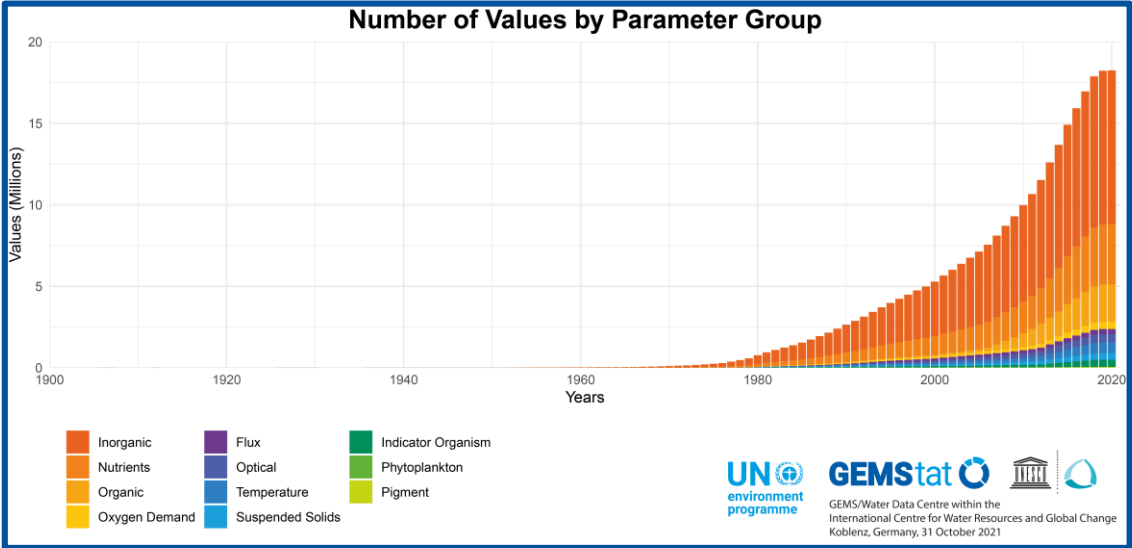


This section shows the user interface and data integration capabilities of GEMStat. It includes:

- GEMStat O**: A screenshot of the web application interface showing a map of Australia with sampling locations marked.
- Webservices**: Represented by cloud icons with download and upload arrows, indicating data exchange capabilities.
- WISKI**: A data integration tool, represented by server icons with download and upload arrows, used for Import/Export and Quality Assurance.
- Database**: A cylinder icon representing the data storage component.
- Discharge data**: A line graph showing discharge over time, with the GRDC logo below it. A green arrow points from this data to the WISKI integration point.

GEMStat data availability

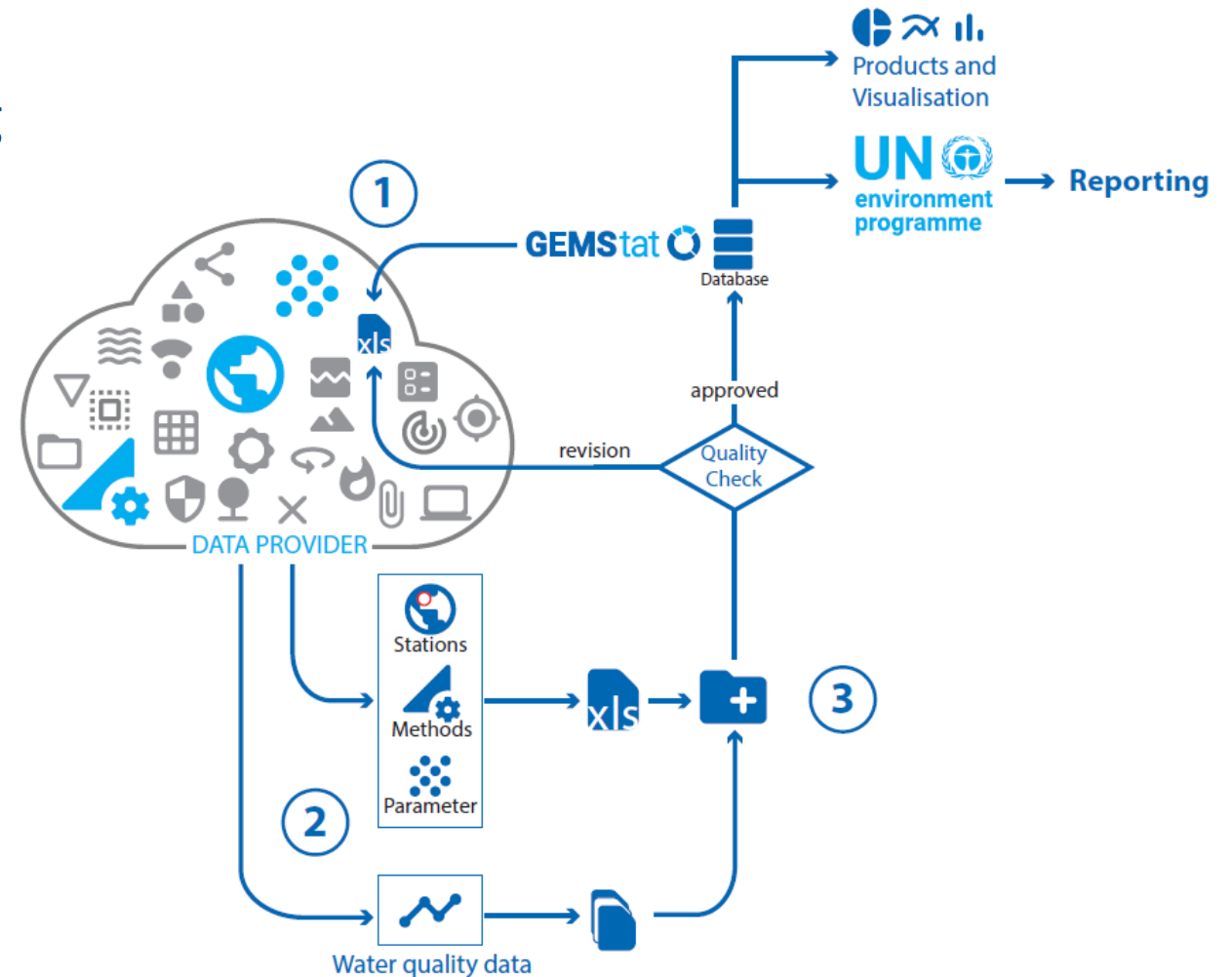
	River	Lake/ Reservoir	Ground- water	Wetland	Total
# Stations	7662	1197/791	3561	20	13233
	Physical	Biological	Organic	Inorganic	
# Parameters	24	9	276	175	516
# Values	1892042	493368	2299198	9440086	18269203



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

The image displays three overlapping screenshots illustrating data collection challenges:

- Excel Spreadsheet:** Shows a table for 'Station name : Han River' with columns for parameters (pH, E.cond, SS, Ammonium Nitrogen, DO, F-, Cl-, SO₄, Na, Mg, Ca, T-P, Alkalinity, Temperature, BOD, F.Coli, Cd, Cu, Pb, Hg, Cr, Zn) and their values for different dates (January 6th and January 20th).
- Word Document (Analytical Results):** Shows a table with columns for various water quality parameters: pH, EC, TURB, TEMP, DO, COD, BOD, Cl, D-Cr, D-Pb, PO₄, NO₃, Total Coliform, and Faecal Coliform. The data is organized by date (e.g., 01/15/LS, 02/15/LS, etc.).
- Word Document (Major Ions):** Shows a table with columns for Action, Station ID, Date of Sampling, Time, Depth, Integrated, Parameter, Valid Flags, Record, Parameter, and Valid Flags. The data lists various sampling events and parameters.

GEMStat data collection

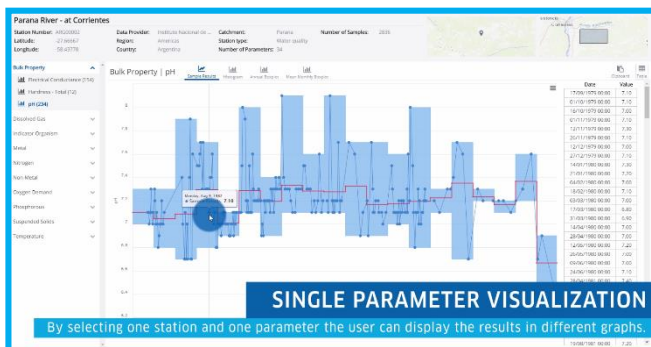
Challenges with Global Water Quality Data

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

STATION	Date	Time	Long.	Lat.	Depth	Secchi	TA	TH	DO	Turb	Cond	pH	Redox	Temp
Samunyi RM	18-Dec-13	09:49	34.41647	-0.51892	1.3	0.62	68	38	2.26	25.7	160.5	7.41	17	24
Oluch RM	18-Dec-13	11:33	34.50118	-0.46207	2	0.34	62	40	6.97	289	152.5	7.87	-49	26.2
Mirunda (RM)	19-Dec-13	12:19	34.34233	-0.49338	1.4	0.4	44	62	7.32	248	148.3	7.71	-31	28.7
Sori	20-Dec-13	14:33	34.16403	-0.84513		1.2	40	36	6.6	107	6.26	7.33	-18	27.3
Kuja RM	21-Dec-13	10:50	34.14307	-0.90677	1	0.1	52	40	3.8	310	116.3	6.29	26	23.9
Kadimo Bay (Anyanga)	22-Dec-13		34.0908	-0.08544	1.2	1.1	46	24	7.35	7.16	106	8.48	-61	27.6
Usenge Beach	22-Dec-13	18:06	34.06362	-0.07072		1.5	36	66	6.44	2.69	107.6	7.61	-26	27.8
Yala RM (Goye)	23-Dec-13	07:31	34.03563	-0.06894	1		48	56	3.08	3.9	104.5	6.82	5	25.3
Bulwani	23-Dec-13	10:22	33.99582	0.00707	2.3	1.1	42	34	1.47	6.51	86.1	6.92	43	23.4
Sio RM	23-Dec-13	16:05	34.00782	0.21936	1.2	0.8	42	34		11.6	113.5	7.95	-25	27.6
Lwanda Kotieno	24-Dec-13	13:42	34.29225	-0.38361		1.2	46	42	6.78	11.9	127.4	6.99	9	27.9
Asembo Bay	25-Dec-13				3.1	0.4	64	44	6.81	47.7	149.8	7.72	-44	25.8
Nyando RM	26-Dec-13	09:57	34.83022	-0.2623	1.8	0.3	112	66	3.77	61.2	184.7	6.88	16	26.9
Kisumu Bay	26-Dec-13	12:09	34.44568		1.9	0.1	264	44	6.15	85.9	159	7.48	-2	25.7
Homa bay	19-Dec-13	09:36	34.27764	0.30916	3.88	0.6	64	56	5.33	27	154.6	7.84	-42	25.8
Got Kachola	21-Dec-13	09:28	34.1355	-0.93565	0.5		50	44	1.03	4.43	95	7.12	11	24.5
Bridge Island	22-Dec-13	10:36	34.06792	-0.2068	39.8	2.7	44	44	6.5	2.69	104	7.1	5	25.4
Asat RM	25-Dec-13	11:06	34.5165	-0.18528	1.6	0.4	60	68	5.92	69	153	7.51	-25	26.7
Kendu Bay	25-Dec-13	15:56	34.67217	-0.35298	1.5		62	42	4.4	79.6	158.1	7.15	19	28.6
Fisheries Pier	26-Dec-13				1.9	0.1	264	44	11.83	27.3	169.7	8.48	-75	31.6

GEMStat data sharing

Visualisation



GEMStat Data Portal

Filter: 13,233 / 13,233 Stations

Text filter: Search

Parameter group: All

Parameter: All

Catchment: All

Region: All

Country: All

Station type: All

Date range: 01/01/1906 - 31/03/2022

264 selected station(s)

Download

Download Sample Results from 264 Stations

Please provide your contact information and details for the requested download. A download link for the request data will be sent to the email address entered

Name:

Email address:

Institution:

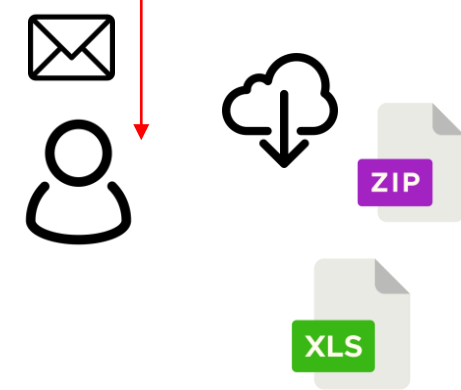
Working sector:

Position (Optional):

Country: Afghanistan

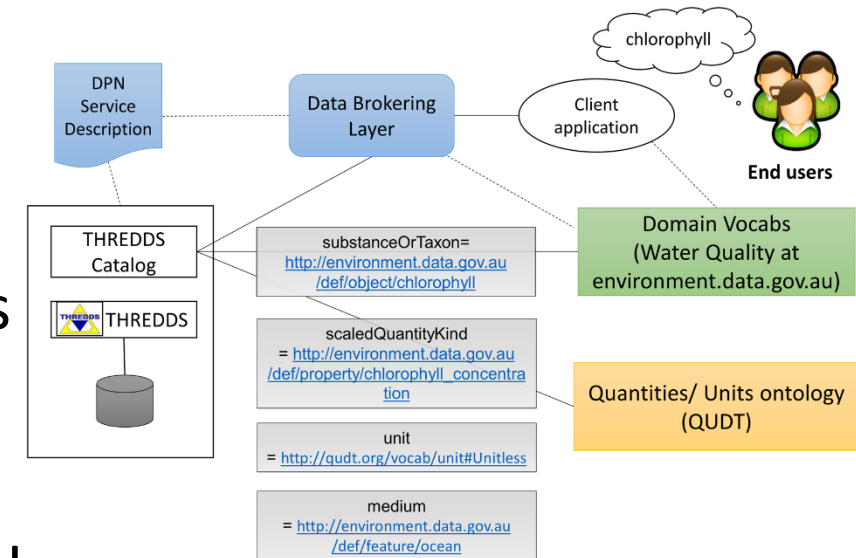
Address (Optional):

Purpose of download:



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:

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United Nations
Educational, Scientific and
Cultural Organization



International Centre
for Water Resources and Global Change
under the auspices of UNESCO

bfg Bundesanstalt für
Gewässerkunde



GEMStat 

<https://gemstat.org>