

# W<sup>GEMS</sup> Water

WATER QUALITY

**2005 State of the UNEP GEMS/Water Global Network and Annual Report**

United Nations Environment Programme  
Global Environment Monitoring System (GEMS) Water Programme



## Mission

To be the leading provider of data and information on the state and trends of global inland water quality required for their sustainable management, to support global environmental assessments and decision-making processes.

## Structure

Established in 1978, the Global Environment Monitoring System (GEMS) Water Programme is the primary source for global water quality data. It is a multi-faceted water science centre oriented towards building knowledge on inland quality issues worldwide. Key activities include monitoring, assessment and capacity building. The twin goals of the programme are to improve water quality monitoring and assessment capacity in participating countries, and to determine the state and trends of regional and global water quality.

These goals are implemented through the GEMS/Water data bank, GEMStat, with water quality data from more than 100 countries, and over two million entries for lakes, reservoirs, rivers and groundwater systems. GEMS/Water activities add value to country-level data by creating global and regional water quality assessments. The programme also carries out assessments on a range of water quality issues and methodologies. GEMS/Water data have been used by many organizations, including the UN system and universities around the world. GEMS/Water is part of the Division of Early Warning and Assessment (DEWA) of the United Nations Environment Programme (UNEP). Governance and strategic guidance for GEMS/Water is provided by a Steering Committee, while scientific expertise is enhanced by a Technical Advisory Group.

Annual Report 2005

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## View from the Executive Director of UNEP



In my time as Executive Director of UNEP, I have attempted to strengthen the freshwater assessment component of UNEP's work, particularly in light of important international goals and commitments. UNEP plays a key global role in trying to ensure that freshwater concerns and activities are better integrated in the broader sustainable development framework. Through policy advice, expert information and capacity building, UNEP helps governments, business and civil society make better choices.

UNEP offers a number of tools - all hinged on science, assessment and policy linkages - to address water and sanitation issues and the global decline in freshwater quantity and quality. Because of the fundamental relationship between water quality and health, I am pleased that UNEP's GEMS/Water Programme is making a contribution to solving these problems. A key challenge, particularly in developing countries, is to improve the collection, management, analysis, and sharing of reliable water quality data through innovative, cost-effective approaches, enabling countries to manage their water resources better and to participate effectively in international environmental assessments.

In May 2005, UNEP convened the second Technical Advisory Group meeting for GEMS/Water, which focused on improving global water quality assessment and monitoring. The recommendations arising from the meeting have influenced GEMS/Water's key activities.

This report reviews GEMS/Water's efforts over the past year to broaden global data coverage, to improve data access and analysis methods, to develop indicators, to contribute to assessments of environmental conditions and threats, and to keep aquatic environmental protection firmly positioned in the international sustainability agenda. A common thread connects these core activities: the global quest for healthy and sustainable water resources.

As the time left for achieving the Millennium Development Goals draws near, I urge governments to intensify their efforts and work even more closely with UNEP's GEMS/Water Programme to protect the water environment on which our development depends.

A handwritten signature in blue ink, which appears to read "Klaus Töpfer". The signature is written in a cursive style.

*Dr. Klaus Töpfer*

## View from the Director, GEMS/Water Programme



As many of our readers know, water is vital to the survival of ecosystems, and in turn ecosystems help to regulate the quantity and quality of water. This complex reciprocal relationship requires constant assessment and monitoring as a result. Our Programme serves to provide water quality monitoring and assessment results at regional and global levels. To be comprehensive and valuable to decision-makers and all governance processes, we must have as much governmental participation as possible. All Governments benefit from participating in GEMS/Water, including from the perspective of implementing policy commitments and achieving targets. A summary of your country's participation in GEMS/Water's global database is listed at the back of this report.

To enable countries to participate effectively, GEMS/Water helps monitoring institutions in many countries attain an impressive level of scientific excellence. We focus on areas which need the most attention: building monitoring networks across Sub-Saharan Africa, Central Asia, Small Island Developing States, and parts of Latin America. With greater capacity for full and active participation in global monitoring activities, global assessment and early warning will become more rigorous and policy relevant.

This past year, GEMS/Water worked to strengthen strategic direction, which is helping us to address chronic challenges of quantity, quality and accessibility of data, and to contribute to the broader community as much as possible. Many results have been achieved relating to GEMS/Water's core activities: data warehousing, data integrity, capacity building and assessments. The new global database GEMStat was launched, while new publications include the Analytical Methods guide, this report, newsletters, and several technical papers. GEMS/Water has become increasingly engaged with water assessments, including the Global Environment Outlook, the Global Biodiversity Outlook, the Millennium Assessment, the World Water Development Report, and indicators development work.

Strong and meaningful linkages within the UN system are central to the continued success of GEMS/Water activities. The ability to respond to the information needs of our UNEP counterparts, such as the GPA, UCC-Water, IETC, and others, is a priority. At the UN system-wide level, our activities are mutually supportive with those of IAEA, UNESCO, WMO, WHO, CBD, FAO, UN-ECE, UN-Water, and others. Some of our collaborations are highlighted in this report. I would like to thank the GEMS/Water Steering Committee and Technical Advisory Group for their continued leadership and cooperation.

A handwritten signature in blue ink that reads "Richard D. Roberts".

*Dr. Richard D. Roberts*

# Goals and Targets for Global Water Quality Assessment

## 12 Principles for an Effective Global Water Quality Monitoring Network

- |  |   |   |   |
|--|---|---|---|
| 1. Identify management and policy information needs                                      | 4. Co-locate water quality and quantity stations  | 7. Promote free access to information interoperability and comparability of methods         | 10. Be able to support key environmental water assessments and reports                              |
| 2. Define data and information needs and then design the monitoring network to meet them | 5. Decentralize, and enough monitoring stations to have accurate and reliable global coverage | 8. Maintain systems up-to-date (IT, analytical etc.)  | 11. Strengthen existing network infrastructure and institutions rather than creating new ones       |
| 3. Ensure reliable and timely data collection and reporting                              | 6. Meet developing country needs and build capacity to participate                            | 9. Link to institutional arrangements with regulatory ability (i.e. to establish standards) | 12. Improve coordination among the 24 UN bodies involved in water, sanitation and ecosystem health. |

### Strengthened Mandate and Accountability

At the 23rd Governing Council, February 2005, Decision 23/2: Updated water policy and strategy of the United Nations Environment Programme, strengthened GEMS/Water's mandate as:

10. Requests the Executive Director to facilitate the further development of the United Nations Environment Programme Global Environment Monitoring System on Water to ensure:
  - (a) Its continued role as a major global water quality assessment and monitoring programme;
  - (b) Its continued role as the repository for global water quality data and its growing role in the development of water quality indicators to support achievement of the water-related goals contained within the Millennium Declaration and the Plan of Implementation of the World Summit on Sustainable Development;
  - (c) Its continued provision of inputs to the World Water Assessment Programme and the World Water Development Report.

GEMS/Water has renewed its participation at the CSD (sessions 12 and 13) as a UNEP contribution to the implementation of the international water and sanitation targets. This activity was reported in the 2004 Sanitation Report of the Secretary General:

The Global Environment Monitoring System (GEMS)/Water Programme of the United Nations Environment Programme (UNEP), a global water quality monitoring and assessment programme, provides information on the state and trends of global inland water quality. The programme works with more than 100 partner countries and counterpart organizations within and outside the United Nations system to build capacity in developing countries for collecting and managing information on water quality. GEMS/Water has recently broadened the scope of its datasets to cover parameters related to wastewater and sanitation, including metals, persistent organic pollutants, water-borne pathogens and micropollutants.<sup>1</sup>

Building on this general role, the Strategic Business Plan 2002-2007 for GEMS/Water describes the work plan, timeline and budget for producing a series of outputs designed to help the programme successfully achieve its mandate. The rationale behind the Plan is that reliable, consistent and appropriate information is the key to understanding and improving the world's supply and quality of inland water. All operational activities and results have been organized into four core areas.

#### CORE ACTIVITIES AND RESULT AREAS

1. Global Water Quality Assessments
  2. Global Water Quality Data
  3. Data Integrity (QA/QC)
  4. Building Water Quality Monitoring Capacity
- and a cross-cutting function:*
5. Organizational Performance

<sup>1</sup> E/CN.17/2004/5 Sanitation Progress in meeting the goals, targets and commitments of Agenda 21, the Programme for the Further Implementation of Agenda 21 and the Johannesburg Plan of Implementation. Report of the Secretary-General, section C. Monitoring water quality and sanitation, paragraph 45.



## 2nd Technical Advisory Group

UNEP convened the 2nd meeting of the Technical Advisory Group (TAG) for GEMS/Water from 2 to 4 May, 2005. The meeting was hosted by IAEA in Vienna, and brought together technical and scientific experts from United Nations bodies and other partners committed to environmental water quality and sustainability. Deputy Secretary General Dr. Werner Burkart of IAEA opened the sessions. Discussions led to the accomplishment of three central objectives:

1. Agreement and support for the direction of core activities articulated in the programme of work; that the approach is sound, from a scientific and technical perspective.
2. Ideas and new projects to develop alone or in partnership with other organizations - especially new technologies and data sources.
3. Commitment to promote GEMS/Water through networks and partners.

Highlights included the role of GEMS/Water's reaching the World Summit targets by focusing on water quality; improving data integrity; increasing global data coverage; and building regional and local capacity. Details and plans for fulfilling these aims have been compiled in the *Technical Advisory Paper No.2: Goals and targets for global water quality assessment*, as the main product of the meeting.

TAG participants included UNEP, IAEA-IHS, World Bank, FAO, GRCD, IGRAC, BGS, GEMS/Water- Japan, Belgium, Iraq, South Africa and Zimbabwe. Participants enjoyed the opportunity to tour IAEA laboratories. IAEA is commended for its active cooperation. The third advisory meeting is scheduled for autumn 2006.



### Where will GEMS/Water be in 10 years?

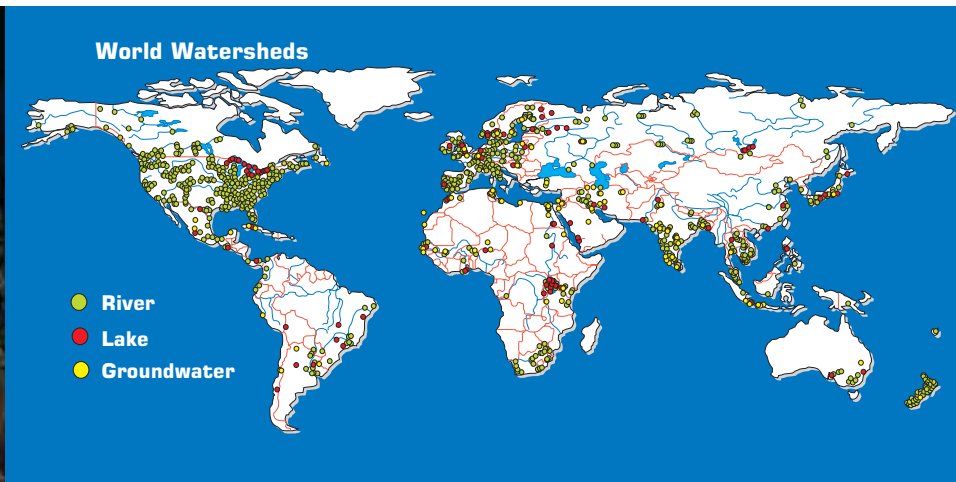
- focused far more on assessments than data collection
- data gateway function more than warehouse
- interoperable at international levels

# Year in Review: Global Water Quality Data

## Results:

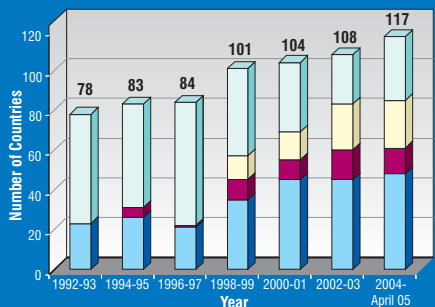
Development and maintenance of global water quality data and information systems to improve accessibility to credible and comparable data; and contribution to the development and use of indicators for better understanding and decision-making of inland aquatic environmental and human health issues, and in support of MDG/WSSD and other internationally agreed goals and targets.

## Increasing Global Data Coverage



Regions	No. of Stations	No. of Data Points	Physical / Chemical	Nutrients	Major Ions	Metals	Organic Matter	Organic Contaminants	Hydrological and Sampling Variables	Microbiology	Date Range
Africa	176	170378	45529	39504	75152	6580	1757	556	193	1107	1977 - 2005
Americas	664	323599	79405	52407	68297	92214	7316	4548	7641	11771	1965 - 2004
Asia	329	654757	206742	110237	141029	90909	45334	10030	13612	36864	1971 - 2004
Europe	316	878471	237227	136943	132127	179677	67207	23809	64521	36960	1978 - 2004
Oceania	94	331758	189178	80327	11026	2986	14134	1438	31020	1649	1979 - 2004
<b>Total</b>	<b>1579</b>	<b>2358963</b>	<b>758081</b>	<b>419418</b>	<b>427631</b>	<b>372366</b>	<b>135748</b>	<b>40381</b>	<b>116987</b>	<b>88351</b>	<b>1965 - 2005</b>

## Increased Participation



■ Must Reactivate Countries  
■ New & Negotiating Countries  
■ Reactivated Countries  
■ Active Countries

## Increase in Global Network

Key Indicators	1992	Baseline 2000	2005	2008 Targets	2011 Targets	2015 Targets
Global Coverage through participation/data submission	58	69	76	114	152	191 UN member states
Global Coverage through proactive data collection	n/a	n/a	80	140	200	261 countries and areas
Watercourse Coverage	69	69	112	162	232	263 major international basins

## Access to Data and Information through GEMStat Results for 2005

More than 4,300 visitors went to [www.gemstat.org](http://www.gemstat.org) for water quality data and information this past year. GEMStat, a new global water quality online database was launched last World Water Day, 22 March 2005, to strengthen the scientific basis for global and regional water assessments, indicators and early warning. Between March and December, a total of 4,319 visitors from around the world accessed.

GEMS/Water's mandate is to collect data and information on inland water quality for international assessments and reports. The water quality data in GEMStat cover both surface and groundwater resources, with over two million data points for 100 parameters covering nutrients, organics, metals, ions and is expanding to address emerging issues. Monitoring stations include baseline, trend and flux stations. Despite the growing use and access to global water quality data, there are many gaps that need to be filled, especially in terms of geospatial and temporal coverage. All readers are invited to visit [www.gemstat.org](http://www.gemstat.org) and comments and feedback designed to improve the site are most welcome.



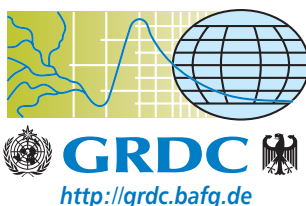
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
# Visits	544	754	427	480	406	392	416	411	489
# Countries	58	79	46	62	46	49	59	50	51

## Coordination with the Global Runoff Data Centre

### GEMS-GRDC Common Stations



GEMS/Water coordinates station and data collection issues with our hydrological counterpart, the Global Runoff Data Centre of WMO. GRDC collects water quantity data and information, and maintains and develops a global water quantity database of 7,242 stations from 154 countries for the year 1807 to 2004. The longest single record is 37 years. The primary mission is to obtain, compile and interpret flow data for major river systems of the world and contribute to the international water assessment programmes of the United Nations. GRDC also carries out external contracted studies primarily with universities. GEMS/Water participated at GRDC's 7th biannual steering committee meeting which took place in July 2005.





## Participation at the 3rd Regional Coordinating Meeting of the Global Network of Isotopes in Rivers

The International Atomic Energy Agency (IAEA) convened the 3rd Regional Coordinating Meeting of the Global Network of Isotopes in Rivers in Vienna, November 26 to December 3, 2005. The Global Network of Isotopes in Rivers (GNIR) is an IAEA Coordinated Research Project (CRP) that is investigating the value in establishing a global monitoring network of isotopic composition of runoff in large rivers. The purpose of the 3rd Research Coordination Meeting (RCM) was to: 1) provide a rationale by scientific and practical justification for establishing a river isotope monitoring network; 2) develop a draft protocol for such a network; 3) outline the operation of the network; and 4) establish a procedure for compiling and synthesizing case studies from the CRP. A report from the 3rd RCM will be used by IAEA to enable an extension of the CRP until 2008.

Isotope signals in river discharge can improve description and quantification of river hydrological cycles. Isotopes can be used to quantify water origin, mixing history, water balance and residence times, surface-groundwater exchange and renewal rates, and evaporation-transpiration partitioning. Isotopic measurements can also be applied to better understand pollution sources, as well as hydrologic changes related to climate and land use changes. Stable isotopes such as  $^{18}\text{O}$  and  $^2\text{H}$  are most commonly measured in rivers, but others such as  $^{15}\text{N}$  in nitrate,  $^{13}\text{C}$  in particulate organic matter, and water  $^3\text{H}$  content can also be measured.

GEMS/Water is interested in assisting IAEA with establishing contact with national water monitoring agencies globally, in developing a sampling and analytical protocol for a GNIR, and in establishing operational guidelines for a GNIR. It would be valuable to investigate the relationship between water quality and river isotopes and to explore the use of isotopes as tracers of water pollution. The conclusion of the meeting affirmed the feasibility of establishing a Global Network of Isotopes in Rivers (GNIR). IAEA confirmed its interest in integrating a GNIR with existing water monitoring networks such as GEMS/Water.

The proposed GNIR should be based on the GEMS/Water design and, where possible, river isotope monitoring overlap with water quality monitoring. The GNIR would specify only a minimum protocol for the collection of river isotope data and subsequent submission of data. The importance of metadata that describe sampling and analytical protocols and any pertinent details of the station location was stressed.



## Policy, Standards and Guidelines

### Drinking Water Quality Guidelines and Standards: A Global Summary

A new publication, “Drinking Water Quality Guidelines and Standards: A Global Summary” provides an overview of drinking water quality and standards in use around the world. The international governing community has agreed, through the Millennium Development Goals, to “reduce by half the proportion of people without sustainable access to safe drinking water by 2015.” Reaching this goal requires ensuring that the quality of drinking water is assessed and monitored. Typically, drinking water quality is assessed by comparing a water sample against drinking water quality guidelines or standards. Used rigorously, drinking water quality guidelines and standards can provide for the protection and promotion of human health.

The document refers to both *guidelines* and to *standards*. The World Health Organization (WHO) Drinking Water Quality Guidelines provide international norms on water quality and human health that are used as the basis for regulation and standard setting in developing and developed countries worldwide. These guidelines are adopted by many countries as national guidelines to follow, but may not necessarily be enforceable by law. By contrast, drinking water quality standards are primarily set by nation states and can be enforceable by law.

## Science-Policy Linkages

The widely-accepted framework of DSPIR (Drivers- State- Pressures- Impact-Responses) should be used to guide state and trend assessments of quality of the world’s water resources.

### Towards a new DSPIR Framework for Water Quality of Surface and Groundwater Ecosystems

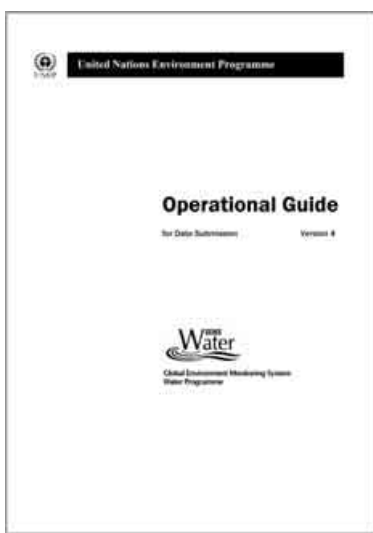
Service and Use (Drivers)	Human Health Drinking Water	Agriculture	Municipal/ Industrial, Energy	Ecosystem Stability, Structure & Health	Tourism & Recreation
Pressures	Pollution	Run-off, Pollution from fertilizer and pesticide use.	Pollution from effluents Construction and other supporting infrastructural impacts	Human activities Climate change and variability	Pollution
Parameter (state)	Total Coliform Faecal Coliform Pathogens POPs DOC Chlorophyll A Turbidity	Salinity Nutrients Chlorophyll A Pathogens Pesticides Suspended solids	Nutrients Temperature Oxygen Pathogens Organic contaminants. Other contaminants such as metals. BOD and COD Heavy Metals (particularly in Sediment)	Temperature pH Conductivity Major ions Oxygen Nitrogen Phosphorus Suspended Solids Biodiversity*	Parasites Pathogens Chlorophyll A Nutrients
(Impact)	Gastrointestinal outbreaks, potential death especially to the vulnerable Lost productivity and economic losses.	Eutrophication, and pesticide and faecal contamination of receiving waters.	Thermal and contaminant pollution of receiving waters affect food chains, biological productivity and species composition.	Loss of species. Altered food webs Increased/decreased biological productivity	Closed beaches, leisure boating restrictions, and effects on other water uses.
Response	Water guidelines and standards Treatment plants.	Green belts and riparian buffer strips Prevention of direct inputs of contaminants Appropriate practices to minimize impacts through agricultural best management practices Constructed wetlands.	Guidelines and standards. Treatment facilities Polluter-pays principal.	Appropriate treatment facilities for point sources but limited responses for climate change and variability.	Guidelines and standards Water use advisories.

## New Operational Guide

### Redesigned operational guide simplifies data submission

This document outlines the process for how UN member states, through their identified Focal Points, can contribute to the global water quality database, GEMStat, by submitting national environmental water quality data. This activity forms the basis by which Focal Points can participate in, and benefit from, GEMS/Water activities. Using this guide, governments and other organizations can increase their participation in data-related activities. Information and guidance are provided on:

- Objectives and benefits of global and regional water quality monitoring networks;
- The selection of stations from where relevant water quality data are to be collected;
- Methods that are useful in the monitoring of water quality and quantity;
- Water quality parameters that GEMStat warehouses, and associated database codes;
- The procedure for the submission of data to GEMStat, including spreadsheet and text forms, and GEMSoft, a data submission software; and
- Other topics.



## Year in Review: Global Water Quality Assessments

### Results:

Enhanced awareness of, and cooperation on, water quality and water quality monitoring, problems and emerging issues, among governments and the public, to better support sustainability

Integrating water quality into integrated water resource management approaches so that pollution prevention and successful water treatment systems are able to reduce harm to water courses flowing to coastal areas

Water quality data, indicators and assessments as contributions to regional and global environmental water assessments such as the Global Environmental Outlook, the Global Biodiversity Outlook, the Millennium Assessment, and the World Water Development Report.



## Source Drinking Water Quality Index

Indicators and indices can improve global water quality assessments

As the lead UN body on environment, UNEP had been tasked by UN-Water to lead on water quality and aquatic ecosystem data and information inputs to the World Water Assessment Programme, and the main WWAP output, the World Water Development Report. Part of this task involves developing global water quality indicators and ultimately, a global water quality index.

UNEP delegated this responsibility to the GEMS/Water Programme, with direction to convene an experts workshop designed to implement the indicators and index requirements. The workshop was convened at IAEA in Vienna, May 4th to 6th, with indicators experts from CEISIN, IAEA, Australia, Canada, South Africa, and Zimbabwe. Input was also received from EEA and OECD.



The group reviewed the topic of water quality indicators/indices and made recommendations on approaches and actions for GEMS/Water to consider. These results are captured in a meeting report and roadmap, which are now underway. Pilot initiatives include developing a Drinking Water Resource Index, a compilation of standards and guidelines, a guidance document on indicator development, and an assessment of eutrophication.

The development and use of indicators is a continuous and iterative process, in which assessments using water quality indicator/indices should get sound technical evaluation and review. To meet this need, the experts workshop will meet periodically to review and refine progress.

## Water Quality and Aquatic Biodiversity Indicators

The Convention on Biological Diversity (CBD) convened the 1st meeting on Biodiversity Indicators Partnership (BIP) between 10 and 14 December in Cambridge, UK. To implement a Conference of the Parties decision, the first BIP meeting was designed to cover the “2010 Biodiversity target” including indicators and targets for water ecosystems. Members of the BIP are required to complete an Indicator Development Template that outlines the status, data and methodology used, and principal users of the indicator, as well as the approach to be taken to further develop the indicator over the next three years (Phase 1) to best track progress toward the 2010 target.

GEMS/Water is the lead intergovernmental agency for the development of Water Quality of Freshwater Ecosystems indicators, that fall under the designated “ecosystem integrity and ecosystem goods and services” focal area. As the lead, GEMS/Water is responsible for the preparation of the Indicator Development Template for water.

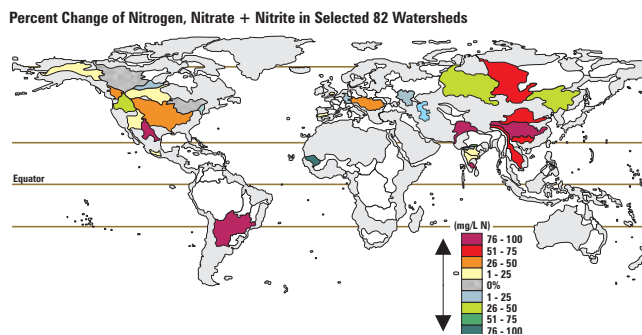
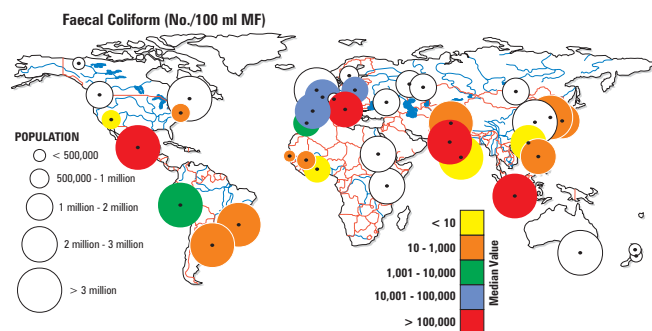
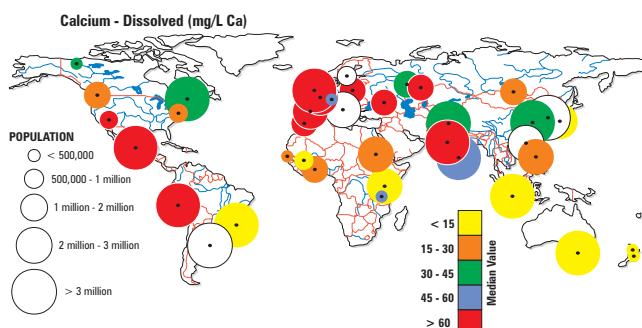
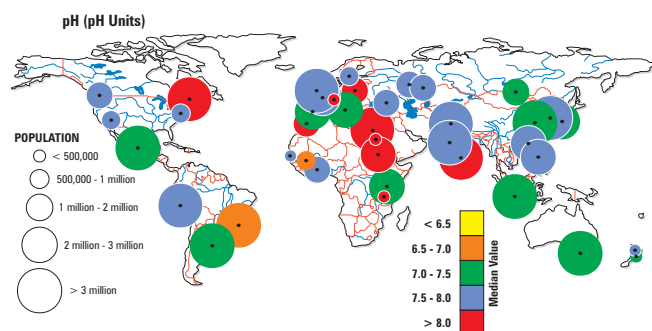




## Participation at the Advisory Panel of Global Terrestrial Network for Hydrology

The Global Terrestrial Network for Hydrology (GTN-H) is a joint effort of WMO's Hydrology and Water Resources Programme (HWRP), the Global Climate Observing System (GCOS) and the Global Terrestrial Observing System (GTOS). The GTN-H is a global hydrological "network of networks" for climate that is building on existing networks and data centres and producing value-added products through enhanced communications and shared development. The goal of the GTN-H is to meet the needs of the international science community for up-to-date hydrological data and information to address global and regional climate, water resources and environmental issues.

GEMS/Water has been responsible for the delivery of Project 3.1, Mapping of biogeochemical fluxes. The objective of this project was to develop a pilot web mapping application that presents global characteristics of biogeochemical fluxes for selected large rivers from several countries.





## Year in Review: Data Integrity (QA/QC)

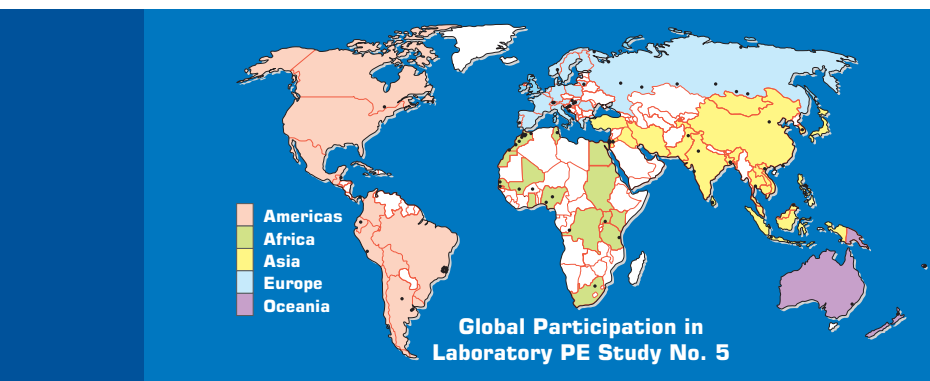
### Results:

Increased reputation as a credible and reliable source for global water quality data and information, to add value to local-level data collection, and appropriate monitoring and observation technology

Data verification and integrity mean reliable information, but QA/QC work is often more complex and detailed than it appears.

### 5th Laboratory Performance Evaluation Complete Labs benefit from performance evaluation (PE) studies

The 5th Lab PE Study has been completed, with the aim of evaluating the reliability and comparability of water quality data from laboratories in UN member states worldwide. Sixty-eight laboratories from 38 countries submitted results in the PE-05, with global and regional representation being somewhat improved from previous studies. Participating labs each received tailored performance evaluation reports to assist them in taking appropriate corrective actions to analytical procedures, where necessary, so that laboratories can improve their own analytical capabilities.



Suggestions were also given on how data quality information can add credibility to water quality assessments by identifying the specific analytes or geographical regions for which water quality assessments and decisions should be made with more caution. Study results are anonymous. Funds provided by the International Atomic Energy Agency (IAEA), to support the participation of 14 African and Asian nuclear research institutes is gratefully acknowledged.



### New 6th Laboratory Performance Evaluation

The 6th Laboratory Performance Evaluation (PE) study is underway, involving laboratories from nearly 50 countries. The purpose of the PE study is to ensure the validity of, and comparability between, water quality datasets, which are required for global environmental water quality assessments. 108 sample sets were distributed to labs around the world, with 93 of the labs returning data. Test samples for PE Study No.6 consist of one Quality Control (QC) sample with known concentration levels, and one Performance Evaluation (PE) sample with unknown concentration levels for each parameter group. The target analytes include nutrients, demand analyses (BOD, COD, and total organic carbon), minerals, pH, solids (residue analyses) and trace metals.

Certified quality control (QC) standards allow laboratories to verify their ability to generate accurate data for their parameters, and to apply corrective actions to analytical procedures, if necessary. Following submission of measurement data on the known and blind test samples, each participant receives a tailored data quality assessment that illustrates their analytical performance for each analyte for which they provided measurement results.

The results of the 6th PE study will be published in 2006, and will include analyte-specific evaluations using confidential lab codes assigned to each participant.

In the long term, we anticipate the on-going series of PE studies will generate a trend of improved quality of data submitted to GEMStat, the global water quality database.



# Year in Review: Building Capacity in Water Quality

## Results:

Increased participation and involvement in water quality monitoring, assessment and reporting in developing countries and countries with economies in transition to better achieve international objectives for water and health.



### Expert Workshop on Developing Francophone Africa

GEMS/Water, with the International Environmental Technology Centre (UNEP-IETC) and the Associ   du Bassin du fleuve Niger (Niger Basin Authority, ABN), convened a three-day workshop that brought together 32 ministry staff, academics and experts from eight of the nine riparian countries of the Niger basin. The workshop was held in Ouagadougou, Burkina Faso, from July 26-28 2005, and was hosted by the Ministry of Agriculture, Hydrology and Hydrological Resources of Burkina Faso.

A future workshop to include francophone North African countries from outside the Niger River basin is planned for 2006, to further strengthen francophone African countries and to increase participation in GEMS/Water activities and assessments.



### Building Monitoring Capacity in Southern Africa: best practices

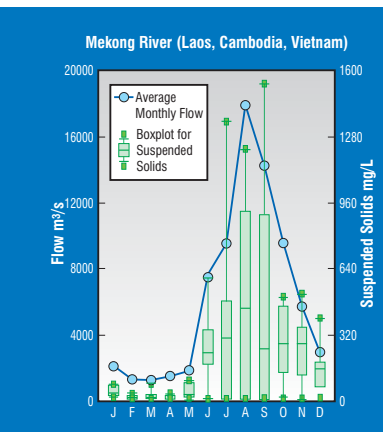
A second workshop "Building Monitoring Capacity in Southern Africa: best practices" was held 1-2 December 2005 in Pretoria, South Africa. Focal points from GEMS/Water-South Africa and GEMS/Water-Zimbabwe (South Africa Department of Water Affairs and Forestry, and the Zimbabwe Ministry of Water Resources respectively) developed a "best practices" framework for representing their countries internationally. The long-term aim is to establish a Southern Africa regional network including other countries. Plans are underway to hold a second workshop in Mozambique in mid-2006.

### GEMS/Water Japan convenes the 3rd International Workshop on the Mekong River Ecosystem Monitoring Project (MeREM)

GEMS/Water participated at the 3rd MeREM workshop with GEMS/Water-Japan (National Institute on Environmental Studies) in December in Viet Nam.

The main objective of the meeting was to review completed and on-going activities and to discuss possible activities for the 2006-2007 biennium. The global GEMS/Water will continue to help guide the Mekong River project, which is now forming linkages with other groups working in the basin. Capacity building in both chemical and biological water quality monitoring will provide new information for this important river system.

The second MeREM journalist-scientist workshop was also held in Viet Nam. Journalists from each of the riparian countries are invited to come and learn about the activities of MeREM through its technical presentations and site visits.



Station - Mekong	Median Value
1 H010501 Thailand	0.315
2 H011201 Lao PDR	0.155
3 H011901 Lao PDR	0.182
4 H013101 Thailand	0.246
5 H013801 Thailand	0.269
6 H013901 Lao PDR	0.126
7 H019802 Cambodia	0.123
8 H019801 Cambodia	0.154
9 H019803 Cambodia	0.135
10 H988109 Vietnam	0.230
11 H019805 Vietnam	0.242
12 H019806 Vietnam	0.259

Station - Bassac	Median Value
13 H033402 Cambodia	0.185
14 H039801 Vietnam	0.181
15 H019803 Vietnam	0.217

## Participation at UNEP's Groundwater Vulnerability Workshop in Africa

UNEP convened an International Workshop: Groundwater Protection in Africa between 28 and 30 November 2005, in Cape Town, South Africa, in collaboration with universities and other intergovernmental institutions such as AMCOW, UNESCO IHP, IAEA, the World Bank and GEMS/Water. The main objectives were to build on the recent

groundwater pollution vulnerability and risk assessment in 11 African countries, and to work towards a groundwater protection strategy suitable to Africa's physical and socio-economic environment.



## Participation with Other Agencies

Member, Scientific Advisory Committee, UNESCO IHP VI Ecohydrology and IETC Phytotechnology

Member, Scientific Committee, International Lake Environment Committee (ILEC)

Member, Scientific Board, International Centre of Ecology, Polish Academy of Sciences

Member, Steering Committee, UNESCO-IHP and IAEA Integrative Science Initiative

Member, Steering Committee, Global Runoff Data Centre (GRDC)

Member, Editorial Board, Aquatic Ecology

Member, Interdisciplinary Committee, World Cultural Council

Member, Advisory Committee, UNEP-DEWA North America

Member, UNEP-GEO Data Working Group

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Member, UN Intersecretariat Working Group on Water Statistics

Contributor, UN-Water and World Water Assessment Programme (WWAP)

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Associate Editor, Canadian Journal of Fisheries and Aquatic Sciences

Science and Technology Advisor, LakeNet

Co-editor, UNESCO Ecohydrology & Hydrobiology

Observer, UN-Water

## Financial Status

Since GEMS/Water is functionally part of UNEP, it does not have separate legal status, and relies on a UNEP General Trust Fund, with Canada's financial and in-kind support. The General Trust Fund for GEMS/Water was established under the auspices of UNEP in 2002, with an initial contribution from Canada of US \$1.0 million over three years. This General Trust Fund is the main mechanism for financing core activities.

Financial health and prospects are improving, and the number of projects and new partnerships are ongoing. Nevertheless, the Trust Fund must be replenished for 2006-2007 to ensure the successful implementation of our expanding work programme, and to meet the demands of the broader assessment community. GEMS/Water is counting on the Government of Canada to replenish the Trust Fund, as a key commitment to UNEP.

In addition, GEMS/Water benefits increased contributions from a broader donor base. We achieve this by building new strategic partnerships, ensuring good quality products, and strengthening local activities.

Financial resources have been gratefully received from sources listed below.

### Funds & Resources Summary

Source	AMOUNT (US\$) 2003	AMOUNT (US\$) 2004	AMOUNT (US\$) 2005
<b>In - kind</b>			
NWRI - Environment Canada	30,000	30,000	17,000
	220,000	230,000	230,000
GEMS/Water Japan	15,000		9,900
<b>Sub-total</b>	<b>265,000</b>	<b>260,000</b>	<b>256,900</b>
<b>Core Funds</b>			
	<b>AMOUNT (US\$) 2003</b>	<b>AMOUNT (US\$) 2004</b>	<b>AMOUNT (US\$) 2005</b>
Canada - Department of Foreign Affairs	115,000	118,000	127,500
General Trust Fund	385,000	390,000	425,000
UNEP - Secretariat	50,000	50,000	60,000
<b>Special Projects</b>			
ILEC	5,000		3,500
Un of Nicaragua Water Resources	7,000		
Auditor General of Canada	7,000		
IAEA		13,000	3,200
MRC		1,200	2,800
UNESCO - IHP	8,000	3,000	10,300
UNESCO - SIL		5,785	
UNEP - IETC			21,200
CBD			1,600
<b>Sub-total</b>	<b>570,000</b>	<b>580,985</b>	<b>655,100</b>
<b>Total per Year</b>	<b>842,000</b>	<b>840,985</b>	<b>912,000</b>

# State of the GEMS/Water Global Network

## Thank You to Focal Points and Data Providers

National focal points (NFPs) are appointed and funded by member countries and are in charge of national cooperation with GEMS/Water and national coordination of activities related to the GEMS/Water programme of work. Collaborating Focal Points play similar roles as do NFPs, although they are institutionally different; CFPs are non-governmental organizations, universities, and other institutes. Full specifications of the roles of GEMS/Water, NFPs and CFPs are provided in *NFP Specifications*.

• *Data for Western Europe are often contributed by the European Environment Agency focal point.*

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# Statistical Summary of Countries and Areas

## Data Submissions as of January, 2006

Countries and Areas	Last Updated	No. of Stations	No. of Parameters	No. of Data Points	No. of Records	Temporal Coverage	Coverage by River Basin	Population	Network Readiness Index	Basin Name
<b>Afghanistan</b>	2005	----	----	----	----	----	yes	29,928,987	----	Aral Sea, Hari/Hariud, Helmand, Indus, Kowl E, Murgab, Tarim
Albania	----	----	----	----	----	----	yes	3,563,112	----	Danube, Drin, Lake Prespa, Vijose
<b>Algeria</b>	2005	30	10	2257	8	2004	yes	32,531,853	80	Daoura, Dra, Guir, Lake Chad, Medjerda, Niger, Oued Bon Naima, Tafna
American Samoa	2002	----	----	----	----	----	no	57,881	----	
Andorra	----	----	----	----	----	----	yes	70,549	----	Ebro, Garonne
Angola	----	----	----	----	----	----	yes	11,190,786	----	Chiloango, Congo/Zaire, Cuvelai/Etoshia, Kunene, Okavango, Zambezi
Anguilla	----	----	----	----	----	----	no	13,254	----	
Antarctica	----	----	----	----	----	----	no	1000-4000	----	
Antigua and Barbuda	----	----	----	----	----	----	no	68,722	----	
<b>Argentina</b>	2005	14	87	19260	1247	1979-2004	yes	39,537,943	76	Aviles, Aysen, Baker, Carmen Silva/Chico, Comau, Cullen, Gallegos-Chico, La Plata, Lake Fagnano, Palena, Pascua, Puelo, Rio Grande (LA), San Martin, Seno Union/Serrano, Valdivia, Yelcho, Zapaleri
Armenia	----	----	----	----	----	----	yes	2,982,904	----	Kura-Araks
Aruba	----	----	----	----	----	----	no	71,566	----	
Ashmore & Cartier Islands (Australian)	----	----	----	----	----	----	no	----	----	
<b>Australia</b>	2004	11	102	21121	2053	1979-2004	yes	20,090,437	11	Murray-Darling
<b>Austria</b>	2000	6	15	612	57	1995-1996	yes	8,184,691	19	Danube, Elbe, Po, Rhine
Azerbaijan	----	----	----	----	----	----	yes	7,911,974	----	Astara Chay, Kura-Araks, Samur, Sulak
Bahamas, The	----	----	----	----	----	----	no	301,790	----	
Bahrain	----	----	----	----	----	----	no	688,345	33	
Baker & Howland Islands	----	----	----	----	----	----	no	----	----	
<b>Bangladesh</b>	1998	9	19	4446	438	1979-1995	yes	144,319,628	100	Fenney, Ganges, Kamaphuli
Barbados	----	----	----	----	----	----	no	279,254	----	
Belarus	----	----	----	----	----	----	yes	10,300,483	----	Daugava, Dnieper, Neman, Samur, Vistula/Wista, Volga
<b>Belgium</b>	2005	49	97	60868	----	1978-2004	yes	10,364,388	26	Rhine, Schelde, Seine, Yser
Belize	----	----	----	----	----	----	yes	279,457	----	Belize, Grijalva, Hondo, Sarstun
Benin	----	----	----	----	----	----	yes	7,460,025	----	Mono, Niger, Oueme, Volta
Bermuda	----	----	----	----	----	----	no	65,365	----	
Bhutan	----	----	----	----	----	----	yes	2,232,291	----	Ganges
<b>Bolivia</b>	----	2	21	625	33	1979-1982	yes	8,857,870	99	Amazon, Cancoso/Lauca, La Plata, Lake Titicaca-Poopó, Zapaleri
Bosnia and Herzegovina	----	----	----	----	----	----	yes	4,025,476	89	Danube, Krka, Neretva
Botswana	----	----	----	----	----	----	yes	1,640,115	50	Limpopo, Okavango, Orange, Zambezi
Bouvet Island (Norwegian)	----	----	----	----	----	----	no	----	----	
<b>Brazil</b>	2005	1176	67	21274	----	1979-2004	yes	186,112,794	46	Amazon, Chuy, Corantijn/Essequibo, La Mirim, Maroni, Oiapoque/Oyupock, Orinoco
British Indian Ocean Territory (British)	----	----	----	----	----	----	no	----	----	
British Virgin Islands (British)	----	----	----	----	----	----	no	22,643	----	
Brunei Darussalam	----	----	----	----	----	----	yes	372,361	----	Bangau, Pandaruan
Bulgaria	----	----	----	----	----	----	yes	7,450,349	73	Danube, Maritsa, Nestos, Rezvaya, Struma, Velaka
Burkina Faso	----	----	----	----	----	----	yes	13,925,313	----	Komoé, Niger, Volta
<b>Burundi</b>	----	1	----	----	----	----	yes	6,370,609	----	Congo/Zaire, Nile
<b>Cambodia (Dem. Kampuchea)</b>	2001	5	18	1739	100	1993-1995	yes	13,607,069	----	Mekong, Saigon, Song Vam Co Dong
<b>Cameroon</b>	2005	----	----	----	----	----	yes	16,380,005	----	Akpa, Benito/Ntem, Congo/Zaire, Cross, Lake Chad, Niger, Ogooue
<b>Canada</b>	2004	70	107	281497	----	1965-2004	yes	32,805,041	10	Alek, Chilkat, Columbia, Firth, Fraser, Mississippi, Nelson-Saskatchewan, Skagit, St. Croix, St. John (NA), St. Lawrence, Stikine, Taku, Whiting, Yukon
Cape Verde	----	----	----	----	----	----	no	418,224	----	
Cayman Islands (British)	----	----	----	----	----	----	no	44,270	----	
<b>Central African Republic</b>	2004	----	----	----	----	----	yes	3,799,897	----	Congo/Zaire, Lake Chad, Nile
Chad	----	----	----	----	----	----	yes	9,826,419	----	Lake Chad, Niger
<b>Chile</b>	----	3	36	4498	291	1979-1988	yes	15,980,912	35	Aviles, Aysen, Baker, Cancoso/Lauca, Carmen Silva/Chico, Comau, Cullen, Gallegos-Chico, Lake Titicaca-Poopó System, Lake Fagnano, Palena, Pascua, Puelo, Rio Grande (LA), San Martin, Seno Union/Serrano, Valdivia, Yelcho, Zapaleri

Countries and Areas	Last Updated	No. of Stations	No. of Parameters	No. of Data Points	No. of Records	Temporal Coverage	Coverage by River Basin	Population	Network Readiness Index	Basin Name
<b>China</b>	2003	12	100	41173	1619	1980-1997	yes	1,306,313,812	41	Amur, Aral Sea, Bei Jiang/His, Beilun, Ganges, Har Us Nur, Ili/Kunes He, Indus, Irrawaddy, Mekong, Ob, Pu Lun To, Red/Song, Salween, Sujfun, Tarim, Tumen, Yalu
Christmas Island	----	----	----	----	----	----	no	361	----	
Cocos Islands (Australian)	----	----	----	----	----	----	no	628	----	
<b>Colombia</b>	----	3	52	1409	72	1981-1988	yes	42,954,279	66	Amazon, Orinoco, Catatumbo, Jurado, Mataje, Mira, Patia
Comoros	----	----	----	----	----	----	no	671,247	----	
Congo, Republic of the	----	----	----	----	----	----	yes	3,039,126	----	Chiloango, Cong/Zaire, Nyanga, Ogooue
Cook Islands (New Zealand)	----	----	----	----	----	----	no	21,388	----	
Coral Sea Islands (Australian)	----	----	----	----	----	----	no	----	----	
Costa Rica	----	----	----	----	----	----	yes	4,016,173	61	Changuinola, Chiriqui, San Juan, Sixaola
<b>Côte d'Ivoire</b>	2004	12	11	131	4	1997-1999	yes	17,298,040	----	Bia, Cavally, Cestos, Komoe, Niger, Sassandra, Tano, Volta
Croatia	----	----	----	----	----	----	yes	4,495,904	58	Danube, Krka, Neretva
<b>Cuba</b>	2005	3	34	359	18	1993-1995	no	11,346,670	----	
Cyprus	----	----	----	----	----	----	no	780,133	37	
Czech Republic	----	----	----	----	----	----	yes	10,241,138	40	Danube, Elbe, Oder/Odra, Vistula/Wista
<b>Democratic Republic of the Congo</b>	----	1	16	16	1	1984	yes	60,085,804	----	Chiloango, Congo/Zaire, Nile, Zambezi
<b>Denmark</b>	2001	6	17	3335	617	1979-1996	yes	5,432,335	4	Wiedau
Djibouti	----	----	----	----	----	----	yes	476,703	----	Awash
Dominica	----	----	----	----	----	----	no	69,029	----	
Dominican Republic	----	----	----	----	----	----	yes	8,950,034	78	Artibonite, Massacre, Pedemales
<b>Ecuador</b>	1997	3	32	1419	111	1979-1986	yes	13,363,593	95	Amazon, Chira, Mataje, Mira, Patia, Tumbes-Poyango, Zarumilla
<b>Egypt</b>	2005	10	15	2284	210	1979-1980	yes	77,505,756	57	Jordan, Nile
El Salvador	----	----	----	----	----	----	yes	6,704,932	70	Goascoran, Lempa, Paz
Equatorial Guinea	----	----	----	----	----	----	yes	535,881	----	Benito/Ntem, Mbe, Ogooue, Utamboni
Eritrea	----	----	----	----	----	----	yes	4,561,599	----	Baraka, Gash, Nile
Estonia	----	----	----	----	----	----	yes	1,332,893	25	Gauja, Narva, Pamu, Salaca
Ethiopia	----	----	----	----	----	----	yes	73,053,286	----	Awash, Gash, Juba-Shibeli, Lake Turkana, Lotagipi Swamp, Nile
Falkland Islands (British)	----	----	----	----	----	----	no	2,967	----	
Faroe Islands (Denmark)	----	----	----	----	----	----	no	46,962	----	
<b>Fiji</b>	2004	1	29	3002	266	1980-2004	no	893,354	----	
<b>Finland</b>	2002	12	68	12488	1796	1979-1998	yes	5,223,442	3	Kemi, Naatamo, Olanga, Oulu, Pasvik, Tana, Tome/Tomealven, Tuloma, Vuoksa
<b>France</b>	2002	20	50	71014	4856	1979-1996	yes	60,656,178	20	Bidasoa, Ebro, Garonne, Po, Rhine, Rhone, Roia, Schelde, Seine, Yser
French Guiana (French)	----	----	----	----	----	----	yes	195,506	----	Amazon, Maroni, Oiapoque/Dyupock
French Polynesia (French)	----	----	----	----	----	----	no	270,485	----	
Gabon	----	----	----	----	----	----	yes	1,389,201	----	Benito/Ntem, Congo/Zaire, Mbe, Nyanga, Ogooue, Utamboni
<b>Gambia, The</b>	2004	----	----	----	----	----	yes	1,593,256	74	Gambia
Georgia	----	----	----	----	----	----	yes	4,677,401	91	Coruh, Kura-Araks, Sulak, Terek
<b>Germany</b>	2002	20	50	34791	3273	1979-1995	yes	82,431,390	14	Danube, Elbe, Oder/Odra, Rhine, Wiedau
<b>Ghana</b>	1997	4	42	2127	208	1991-1995	yes	21,029,853	65	Bia, Komoe, Tano, Volta
Gibraltar (British)	----	----	----	----	----	----	no	27,884	----	
<b>Greece</b>	2000	6	14	3385	482	1990-1995	yes	10,668,354	42	Lake Prespa, Maritsa, Nestos, Struma, Vardar, Vijose
Greenland (Denmark)	----	----	----	----	----	----	no	56,375	----	
Grenada	----	----	----	----	----	----	no	89,502	----	
Guadeloupe (French)	----	----	----	----	----	----	no	448,713	----	
Guam (USA)	----	----	----	----	----	----	no	168,564	----	
<b>Guatemala</b>	----	4	14	459	33	1981-1982	yes	14,655,189	88	Belze, Candelaria, Coatan Achute, Grijalva, Hondo, Lempa, Motaqua, Paz, Sarstun, Suchiate
Guernsey (British)	----	----	----	----	----	----	no	65,228	----	
Guinea	----	----	----	----	----	----	yes	9,467,866	----	Cavally, Cestos, Corubal, Gambia, Geba, Great Scarcies, Little Scarcies, Loffa, Moa, Niger, Sassandra, Senegal, St. John (Africa), St. Paul
Guinea-Bissau	----	----	----	----	----	----	yes	1,416,027	----	Corubal, Geba
Guyana	----	----	----	----	----	----	yes	765,283	----	Amacuro, Amazon, Barima, Corantijn/Essequibo
Haiti	----	----	----	----	----	----	yes	8,121,622	----	Artibonite, Massacre, Pedemales
Heard & MacDonal Islands (Australia)	----	----	----	----	----	----	no	----	----	
Holy See (Vatican City)	----	----	----	----	----	----	no	921	----	



Countries and Areas	Last Updated	No. of Stations	No. of Parameters	No. of Data Points	No. of Records	Temporal Coverage	Coverage by River Basin	Population	Network Readiness Index	Basin Name
Honduras	----	----	----	----	----	----	yes	6,975,204	97	Choluteca, Coco/Segovia, Goascoran, Lempa, Motaqua, Negro
<b>Hong Kong SAR</b>	2004	2	21	3296	314	1979-2004	no	6,898,686	7	
<b>Hungary</b>	2000	4	71	15513	671	1979-1996	yes	10,006,835	38	Danube
Iceland	----	----	----	----	----	----	no	296,737	2	
<b>India</b>	2005	72	28	215956	11969	1978-2004	yes	1,080,264,388	39	Fenney, Ganges, Indus, Irrawaddy, Kaladan, Kamaphuli
<b>Indonesia</b>	1993	22	63	30712	906	1979-1994	yes	241,973,879	51	Fly, Sembakung, Sepik, Tami, Tjeroaka-Wanggoe
<b>Iran</b>	1993	20	34	6159	463	1980-1992	yes	68,017,860	----	Astara Chay, Atrak, Bahukalat/Dasht, Hari/Harirud, Helmand, Kowl E, Kura-Araks, Tigris-Euraphrates
<b>Iraq</b>	----	10	----	----	----	----	yes	26,074,906	----	Tigris-Euraphrates
<b>Ireland</b>	2001	4	18	4249	401	1979-1996	yes	4,015,676	22	Bann, Castletown, Eme, Fane, Flurry, Foyle
Isle of Man (British)	----	----	----	----	----	----	no	75,049	----	
<b>Israel</b>	----	2	37	5141	305	1980-1981	yes	6,276,883	18	Jordan, Tumen, Wadi Al Izziyah
<b>Italy</b>	2000	16	21	10352	1051	1979-1995	yes	58,103,033	45	Danube, Isonzo, Po, Rhine, Rhone, Roia
Jamaica	----	----	----	----	----	----	no	2,731,832	49	
Jan Mayen (Norwegian)	----	----	----	----	----	----	no	----	----	
<b>Japan</b>	2004	27	271	148946	6051	1979-2002	no	127,417,244	8	
Jarvis Island (USA)	----	----	----	----	----	----	no	----	----	
Jersey (British)	----	----	----	----	----	----	no	90,812	----	
Johnston Atoll (USA)	----	----	----	----	----	----	no	396	----	
<b>Jordan</b>	2000	4	59	893	48	1987-1999	yes	5,759,732	44	Jordan, Tigris-Euraphrates
Kazakhstan	2005	----	----	----	----	----	yes	15,185,844	----	Aral Sea, Ili/Kunes He, Ob, Oral/Ural, Pu Lun To, Volga
<b>Kenya</b>	----	11	56	2524	242	1977-1988	yes	33,829,590	75	Juba-Shibeli, Lake Natron, Lake Turkana, Lotagipi Swamp, Nile, Umba
Kingman Reef (USA)	----	----	----	----	----	----	no	----	----	
Kiribati	----	----	----	----	----	----	no	103,092	----	
<b>Korea, Democratic Republic of (North)</b>	----	----	----	----	----	----	yes	22,912,177	24	Amur, Han, Tumen, Yalu
<b>Korea, Republic of (South)</b>	2005	3	39	10296	528	1982-2005	yes	48,422,644	----	Han
<b>Kuwait</b>	----	2	----	----	----	----	no	2,335,648	----	
Kyrgyzstan	----	----	----	----	----	----	yes	5,146,281	----	Aral Sea, Ili/Kunes He, Tarim
<b>Lao, People's Republic of</b>	2001	15	21	28872	1502	1985-1995	yes	6,217,141	----	Ca/Song Koi, Ma, Mekong, Red/Song Hong
Latvia	----	----	----	----	----	----	yes	2,290,237	56	Barta, Daugava, Gauja, Lielupe, Neman, Pamu, Salaca, Samur, Venta
Lebanon	----	----	----	----	----	----	yes	3,826,018	----	An Nahr Al Kabir, Asi/Orontes, Jordan, Tumen, Wadi Al Izziyah
Lesotho	----	----	----	----	----	----	yes	1,867,035	----	Orange
Liberia	----	----	----	----	----	----	yes	3,482,211	----	Cavally, Cestos, Loffa, Mana-Morro, Moa, St. John (Africa), St. Paul
<b>Libyan Arab Jamahiriya</b>	----	5	----	----	----	----	yes	5,765,563	----	Lake Chad
Liechtenstein	----	----	----	----	----	----	yes	33,717	----	Rhine
<b>Lithuania</b>	2005	4	36	1282	45	1991-2004	yes	3,596,617	43	Barta, Daugava, Lielupe, Neman, Venta
<b>Luxembourg</b>	2000	1	20	1158	101	1979-1995	yes	468,571	17	Rhine, Seine
<b>Macau (China)</b>	----	----	----	----	----	----	no	449,198	----	
Macedonia, The former Yugoslav Republic of	----	----	----	----	----	----	yes	2,045,262	85	Drin, Lake Prespa, Struma, Vardar
Madagascar	----	----	----	----	----	----	no	18,040,341	87	
<b>Malawi</b>	2005	----	----	----	----	----	yes	12,158,924	93	Congo/Zaire, Ruvuma, Zambezi
<b>Malaysia</b>	1994	8	80	13723	641	1979-1992	yes	23,953,136	27	Bangau, Golok, Pandaruan, Sembakung
Maldives	----	----	----	----	----	----	no	349,106	----	
<b>Mali</b>	1997	11	34	1596	81	1987-1996	yes	12,291,529	92	Komoe, Niger, Senegal, Volta
Malta	----	----	----	----	----	----	no	398,534	28	
Marshall Islands (USA)	----	----	----	----	----	----	no	59,071	----	
Martinique (French)	----	----	----	----	----	----	no	432,900	----	
Mauritania	----	----	----	----	----	----	yes	3,086,859	----	Atui, Senegal
Mauritius	----	----	----	----	----	----	no	1,230,602	47	
Mayotte (French)	----	----	----	----	----	----	no	193,633	----	
<b>Mexico</b>	1998	16	91	32398	2157	1979-1996	yes	106,202,903	60	Candelaria, Coatan Achute, Colorado, Grijalva, Hondo, Rio Grande (NA), Suchiate, Tijuana, Yaqui
Micronesia, Federated States of	----	----	----	----	----	----	no	108,105	----	
Midway Islands (USA)	----	----	----	----	----	----	no	----	----	
<b>Moldova, Republic of</b>	2005	----	----	----	----	----	yes	4,455,421	----	Danube, Dniester, Kogilnik, Sarata
Monaco	----	----	----	----	----	----	no	32,409	----	

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<b>Mongolia</b>	2004	4	9	212	24	2004	yes	2,791,272	---	Amur, Har Us Nur, Jenisej/Yenisey, Lake Ubsa-Nur, Ob, Pu Lun To
Montserrat (British)	---	---	---	---	---	---	no	9,341	---	
<b>Morocco (Maroc)</b>	2005	8	75	20720	210	1985-2004	yes	32,725,847	54	Daoura, Dra, Guir, Oued Bon Naima, Tafna
Mozambique	---	---	---	---	---	---	yes	19,406,703	96	Buzi, Incomati, Limpopo, Maputo, Ruvuma, Sabi, Umbeluzi, Zambezi
Myanmar	---	---	---	---	---	---	yes	42,909,464	---	Ganges, Irrawaddy, Kaladan, Kamaphuli, Mekong, Pakchan, Salween
Namibia	---	---	---	---	---	---	yes	2,030,692	55	Cuvelai/Etoshia, Kunene, Okavango, Orange, Zambezi
Nauru	---	---	---	---	---	---	no	13,048	---	
Navassa Island (USA)	---	---	---	---	---	---	no	---	---	
<b>Nepal</b>	---	3	---	---	---	---	yes	27,676,547	---	Ganges, Indus
Netherland Antilles (Netherlands)	---	---	---	---	---	---	no	219,958	---	
<b>Netherlands</b>	1996	15	74	105554	16182	1979-1996	yes	16,407,491	16	Rhine, Schelde
New Caledonia (French)	---	---	---	---	---	---	no	216,494	---	
<b>New Zealand</b>	2005	81	87	309070	15262	1979-2004	yes	4,035,461	21	Waikato
Nicaragua	---	---	---	---	---	---	yes	5,465,100	---	Choluteca, Coca/Segovia, Negro, San Juan
<b>Niger</b>	2005	9	---	---	---	---	yes	11,665,937	---	Lake Chad, Niger
<b>Nigeria</b>	2004	---	---	---	---	---	yes	128,771,988	86	Akpa, Cross, Lake Chad, Niger, Oueme
Niue (New Zealand)	---	---	---	---	---	---	no	2,166	---	
Norfolk Island (Australian)	---	---	---	---	---	---	no	1,828	---	
Northern Mariana Islands (USA)	---	---	---	---	---	---	no	80,362	---	
<b>Norway</b>	1996	18	39	8473	696	1981-1993	yes	4,593,041	13	Glama, Jacobs, Kemi, Klaralven, Naatamo, Pasvik, Tana, Torne/Tornealven
Oman	---	---	---	---	---	---	no	3,001,583	---	
<b>Pakistan</b>	2004	7	65	32632	1554	1979-2003	yes	162,419,946	63	Aral Sea, BahuKalat/Dasht, Helmand, Indus, Tarim
Palau	---	---	---	---	---	---	no	20,303	---	
Palestine	---	---	---	---	---	---	yes	3,761,904	---	Jordan
Palmyra Atoll (USA)	---	---	---	---	---	---	no	4-20	---	
<b>Panama</b>	---	3	33	4149	180	1979-1986	yes	3,039,150	69	Chanquinola, Chiriqui, Jurado, Sixaola
<b>Papua New Guinea</b>	---	1	6	6	1	1979	yes	5,545,268	---	Fly, Sepik, Tami, Tjeroaka-Wanggoe
Paracel Islands	---	---	---	---	---	---	no	---	---	
Paraguay	---	---	---	---	---	---	yes	6,347,884	98	La Plata
<b>Peru</b>	---	10	27	893	58	1979-1983	yes	27,925,628	90	Amazon, Chira, Lake Titicaca-Poopó System, Tumbes-Poyango, Zarumilla
Peter Island (Norwegian)	---	---	---	---	---	---	no	---	---	
<b>Philippines</b>	2004	4	66	4262	483	1979-2004	no	87,857,473	67	
Pitcairn Islands (British)	---	---	---	---	---	---	no	46	---	
<b>Poland</b>	2004	8	70	75820	2350	1991-2003	yes	38,635,144	72	Danube, Dniester, Elbe, Lava/Pregel, Neman, Oder/Odra, Prohladnaja, Vistula/Wista
<b>Portugal</b>	2001	13	66	17577	1245	1980-1994	yes	10,566,212	30	Douro/Duero, Guadiana, Lima, Mino, Tagus/Tejo
Puerto Rico (USA)	2002	---	---	---	---	---	no	3,916,632	---	
Qatar	---	---	---	---	---	---	no	863,051	---	
Reunion (French)	---	---	---	---	---	---	no	776,948	---	
Romania	---	---	---	---	---	---	yes	22,329,977	53	Danube
<b>Russian Federation</b>	2004	43	39	138403	23,554	1980-2003	yes	143,420,309	62	Amur, Daugava, Dnieper, Don, Elancik, Har Us Nur, Jacobs, Jenisej/Yenisey, Kemi, Kura-Araks, Lake Ubsa-Nur, Lava/Pregel, Mius, Narva, Neman, Ob, Olanga, Oral/Ural, Oulu, Pasvik, Prohladnaja, Pu Lun To, Samur, Sujfun, Sulak, Terek, Tuloma, Tumen, Volga, Vuoksa
<b>Rwanda</b>	2004	---	---	---	---	---	yes	8,440,820	---	Congo/Zaire, Nile
Saint Kitts and Nevis	---	---	---	---	---	---	no	38,958	---	
Saint Lucia	---	---	---	---	---	---	no	166,312	---	
Saint Vincent and the Grenadines	---	---	---	---	---	---	no	117,534	---	
Samoa	---	---	---	---	---	---	no	177,287	---	
San Marino (an enclave in central Italy)	---	---	---	---	---	---	no	28,880	---	
Sao Tome and Principe	---	---	---	---	---	---	no	187,410	---	
<b>Saudi Arabia</b>	---	4	---	---	---	---	yes	26,417,599	---	Tigris-Euphrates
<b>Senegal</b>	2001	11	55	777	59	1986-2000	yes	11,126,832	---	Gambia, Geba, Senegal
Serbia and Montenegro	---	---	---	---	---	---	yes	10,829,175	79	Danube, Drin, Krka, Vardar, Struma
Seychelles	---	---	---	---	---	---	no	81,188	---	
Sierra Leone	---	---	---	---	---	---	yes	6,017,643	---	Great Scarcies, Little Scarcies, Mana-Morro, Moa, Niger

Countries and Areas	Last Updated	No. of Stations	No. of Parameters	No. of Data Points	No. of Records	Temporal Coverage	Coverage by River Basin	Population	Network Readiness Index	Basin Name
Singapore	----	----	----	----	----	----	no	4,425,720	1	
<b>Slovakia (Slovak Republic)</b>	2004	----	----	----	----	----	yes	5,431,363	48	Danube, Oder/Odra, Vistula/Wista
Slovenia	----	----	----	----	----	----	yes	2,011,070	32	Danube, Isonzo
Solomon Islands	----	----	----	----	----	----	no	538,032	----	
Somalia	----	----	----	----	----	----	yes	8,591,629	----	Awash, Juba-Shibeli
<b>South Africa</b>	2005	26	21	182650		1990-2005	yes	44,344,136	34	Incomati, Limpopo, Maputo, Orange, Umbeluzi
South Georgian & South Sandwich Islands (British)	----	----	----	----	----	----	no	----	----	
<b>Spain</b>	2001	21	45	17145	1240	1979-1995	yes	40,341,462	29	Bidasoa, Douro/Duero, Ebro, Garonne, Guadiana, Lima, Mino, Tagus/Tejo
Spratty Islands	----	----	----	----	----	----	no	----	----	
<b>Sri Lanka</b>	2005	21	20	4411	334	1979-2005	no	20,064,776	71	
St. Helena & Dependencies (British)	----	----	----	----	----	----	no	7,460	----	
St. Pierre & Miquelon (French)	----	----	----	----	----	----	no	7,012	----	
<b>Sudan</b>	1993	4	27	4423	241	1980-1992	yes	40,187,486	----	Baraka, Congo/Zaire, Gash, Lake Chad, Lake Turkana, Lotagipi Swamp, Nile
Suriname	----	----	----	----	----	----	yes	438,144	----	Amazon, Corantijn/Essequibo, Maroni
Svalbard (Norwegian)	----	----	----	----	----	----	no	2,701	----	
Swaziland	----	----	----	----	----	----	yes	1,173,900	----	Incomati, Maputo, Umbeluzi
<b>Sweden</b>	2001	15	39	15845	1256	1978-1995	yes	9,001,774	6	Glama, Klaralven, Tome/Tomealven
<b>Switzerland</b>	2003	7	31	103892	4561	1978-2002	yes	7,489,370	9	Danube, Po, Rhine, Rhone
Syrian Arab Republic	----	----	----	----	----	----	yes	18,448,752	----	An Nahr Al Kabir, Asi/Orontes, Jordan, Nahr El Kebir, Tigris-Euphrates
Taiwan	----	----	----	----	----	----	no	22,894,384	15	
Tajikistan	2004	----	----	----	----	----	yes	7,163,506	----	Aral Sea, Tarim
<b>Thailand</b>	1997	7	54	5574	305	1978-1993	yes	65,444,371	36	Golok, Mekong, Pakchan, Salween (Chao Phraya)
Timor-Leste (East Timor)	----	----	----	----	----	----	no	1,040,880	----	
Togo	----	----	----	----	----	----	yes	5,681,519	----	Mono, Oueme, Volta
Tokelau (New Zealand)	----	----	----	----	----	----	no	1,405	----	
Tonga	----	----	----	----	----	----	no	112,422	----	
<b>Trinidad and Tobago</b>	2004	----	----	----	----	----	no	1,088,644	59	
<b>Tunisia</b>	----	7	15	681	70	1980-1982	yes	10,074,951	31	Medjerda
<b>Turkey</b>	2003	14	55	12072	1280	1971-2002	yes	69,660,559	52	Asi/Orontes, Coruh, Kura-Araks, Maritsa, Nahr El Kebir, Rezvaya, Tigris-Euphrates, Velaka
Turkmenistan	----	----	----	----	----	----	yes	4,952,081	----	Aral Sea, Atrak, Hari/Harirud, Murgab
Turks & Caicos Islands (British)	----	----	----	----	----	----	no	20,556	----	
Tuvalu	----	----	----	----	----	----	no	11,636	----	
<b>Uganda</b>	----	17	21	2858	538	1978-1980	yes	27,269,482	77	Congo/Zaire, Lake Turkana, Lotagipi Swamp, Nile
Ukraine	----	----	----	----	----	----	yes	47,425,336	82	Danube, Dnieper, Dniester, Don, Elancik, Kogilnik, Mius, Sarata, Vistula/Wista
United Arab Emirates	----	----	----	----	----	----	no	2,563,212	23	
<b>United Kingdom</b>	2004	28	94	130527	6146	1980-1999	yes	60,441,457	12	Bann, Castletown, Eme, Fane, Flurry, Foyle
<b>United Republic of Tanzania</b>	2003	9	47	2389	254	1978-1993	yes	36,766,356	83	Congo/Zaire, Lake Natron, Nile, Ruvuma, Umba, Zambezi
<b>United States of America</b>	2005	516	72	61377	8063	1976-1997	yes	295,734,134	5	Asek, Chikot, Colorado, Columbia, Firth, Fraser, Mississippi, Nelson-Saskatchewan, Rio Grande (NA), Skagit, St. Croix, St. John (NA), St. Lawrence, Stikine, Taku, Tijuana, Whiting, Yaqui, Yukon (Alabama & Tombigbee, Hudson, Sacramento, Susquehanna)
<b>Uruguay</b>	1994	5	38	3525	156	1981-1987	yes	3,415,920	64	Chuy, Lagoon Mirim, La Plata (Uruguay)
Uzbekistan	----	----	----	----	----	----	yes	26,851,195	----	Aral Sea
Vanuatu	----	----	----	----	----	----	no	205,754	----	
Venezuela	----	----	----	----	----	----	yes	25,375,281	84	Amacuro, Amazon, Barima, Catatumbo, Essequibo, Orinoco
<b>Viet Nam</b>	2002	52	22	84213	4765	1985-1995	yes	83,535,576	68	Bei Jiang/His, Beilun, Ca/Song Koi, Ma, Mekong, Red/Song, Saigon, Song Vam Co Dong
Virgin Islands (USA)	2002	----	----	----	----	----	no	108,708	----	
Wake Island (USA)	----	----	----	----	----	----	no	----	----	
Wallis & Futuna (French)	----	----	----	----	----	----	no	16,025	----	
Western Sahara	----	----	----	----	----	----	yes	273,008	----	Atui
Yemen	----	----	----	----	----	----	no	20,727,063	----	
Zambia	2004	----	----	----	----	----	yes	11,261,795	81	Congo/Zaire, Zambezi
Zimbabwe	2004	----	----	----	----	----	yes	12,746,990	94	Buzi, Limpopo, Okavango, Sabi, Zambezi

#### Source:

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