

WATER ASSESSMENT

**for Sustainable
Development**

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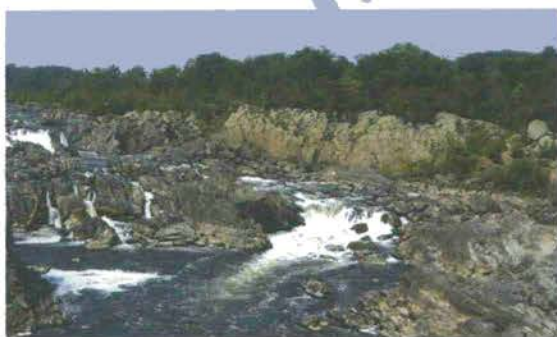
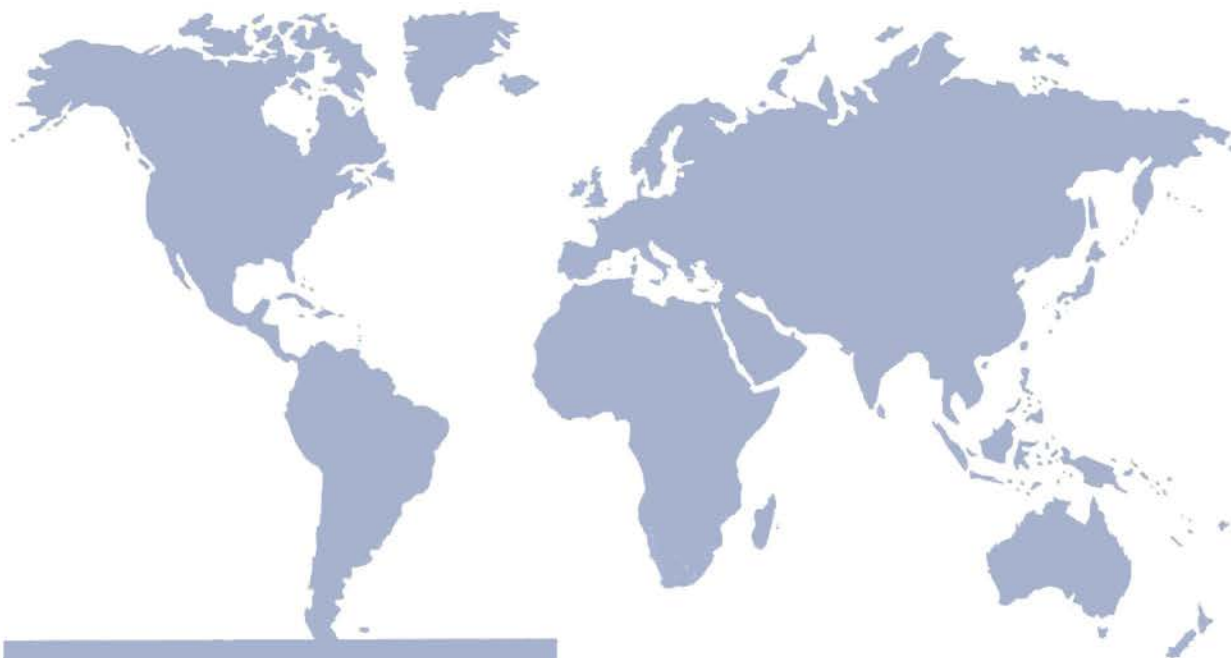
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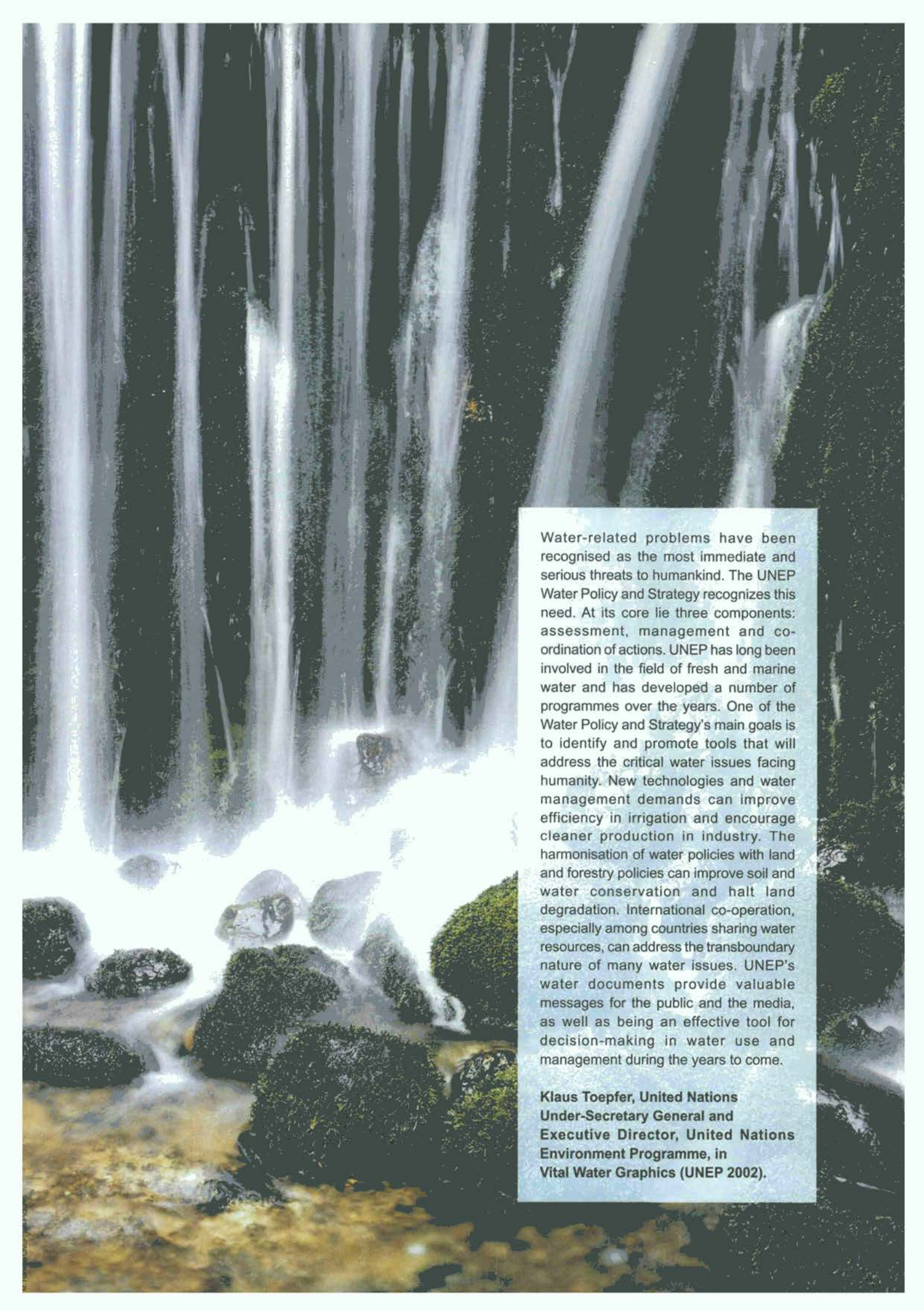
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A large waterfall cascading over dark, mossy rocks in a lush forest. The water is white and frothy as it falls, creating a misty spray at the base. The surrounding vegetation is dense and green, with moss growing on the rocks. The overall scene is serene and natural.

Water-related problems have been recognised as the most immediate and serious threats to humankind. The UNEP Water Policy and Strategy recognizes this need. At its core lie three components: assessment, management and co-ordination of actions. UNEP has long been involved in the field of fresh and marine water and has developed a number of programmes over the years. One of the Water Policy and Strategy's main goals is to identify and promote tools that will address the critical water issues facing humanity. New technologies and water management demands can improve efficiency in irrigation and encourage cleaner production in industry. The harmonisation of water policies with land and forestry policies can improve soil and water conservation and halt land degradation. International co-operation, especially among countries sharing water resources, can address the transboundary nature of many water issues. UNEP's water documents provide valuable messages for the public and the media, as well as being an effective tool for decision-making in water use and management during the years to come.

**Klaus Toepfer, United Nations
Under-Secretary General and
Executive Director, United Nations
Environment Programme, in
Vital Water Graphics (UNEP 2002).**



Introduction

Water is the most important natural resource on our planet: the cornerstone of all life on Earth, and a crucial component of Nature's life support systems. Yet despite huge advances in every sphere of social and scientific development, millions of people continue to suffer from acute – and often fatal – shortages of this vital resource.

The work of UNEP's Division of Early Warning and Assessment has over the past five years confirmed what scientists have long suspected: that many of the diseases and deaths caused by inadequate or polluted water supplies could be prevented by basic improvements in water management policies and practices.

In 2000, the World Health Organisation estimated the number of people without access to clean drinking water at 1.2 billion, while nearly 2.4 billion people lacked access to adequate sanitation services. Polluted water is estimated to affect the health of more than 1.2 billion people. (UNEP, 2002).

By the year 2000, floods accounted for 140 million people out of the annual average of 211 million people affected by natural disasters, while famine affected nearly 42 million. Economic losses from natural disasters increased three-fold between the 1960s and the 1980s. (IFRC World Disaster Report, 2001)

It is clear that poor environmental planning – and, in particular, the lack of investment in data collection and disaster preparedness – is severely undermining socio-economic development in many developing countries. With the continuing acceleration of global warming and rising sea levels, this lack of knowledge and resources has major implications for the future of these countries, and in particular for the security of their existing water resources.

Correcting this situation will require comprehensive global and regional water assessments to increase our understanding of the status of fresh, coastal and marine waters and their movement in the hydrological cycle. Reliable information about water quantity and quality, human water uses, and water problems and their causes will help these countries to properly manage their precious water resources, as a critical part of their ongoing socio-economic development.

The UNEP-DEWA Water Unit supports the United Nations' overall Water Policy and Strategy by providing critical technical support to the water assessment elements of UNEP's groundbreaking Global Environment Monitoring System (GEMS), Global International Waters Assessment (GIWA), and Millennium Ecosystem Assessment (MA). Guided by relevant Governing Council decisions, the Unit carries out regular and comprehensive fresh and marine water assessments in collaboration with partner governments, international institutions, and related UN agencies, such as UNEP's Collaborating Centre on Water.

DEWA water related activities have been implemented so far in close cooperation with the relevant UNEP divisions, including: Division of Policy Development and Law, Division of Environmental Policy Implementation, Division of Environmental Conventions, Regional Office for Africa, Division of Regional Cooperation and Representation, Division of Global Environment Facility.

Through these assessment activities, UNEP also assists governments in working towards achieving their Millennium Development Goals (MDGs) and the targets of the 2002 World Summit on Sustainable Development in the context of Integrated Water Resources Management within river basins at both national and regional levels.

The overall goal of UNEP's water assessment activities is to ensure that there is water for all, as envisaged in Agenda 21:

"To satisfy the freshwater needs of all countries for their sustainable development";
and to fulfil the Millennium Development Goal for water:

"To halve by the year 2015 the proportion of people without access to a suitable source of water and sanitation".

"The importance of aquifers cannot be underestimated. Some two billion people and as much as 40 per cent of agriculture is at least partly reliant on these hidden stores. Groundwater also supplements river flows, springs and wetlands vital for rural and urban communities and wildlife. Indeed most of the world's liquid freshwaters are found not in rivers and lakes, but below ground"
Klaus Toepfer,
UNEP's
Executive
Director
(UNEP, 2002).



Objectives and Activities

The primary objectives of the Water Unit in UNEP-DEWA's Assessment Branch are:

- To assess and analyse fresh, coastal and marine water resources in cooperation with partners and collaborating centres;
- To assess the quality and quantity of freshwater resources;
- To analyse the environmental condition of global and regional fresh, marine and coastal water resources;
- To assess threats, trends and emerging issues facing global and regional fresh, coastal and marine water environments;
- To provide relevant information on major environmental threats, and to promote training and strengthen capacity;
- To provide the environmental information needed by decision-makers for better water and environmental management; and
- To contribute to better ecosystem management, information and knowledge for making sound policy decisions.

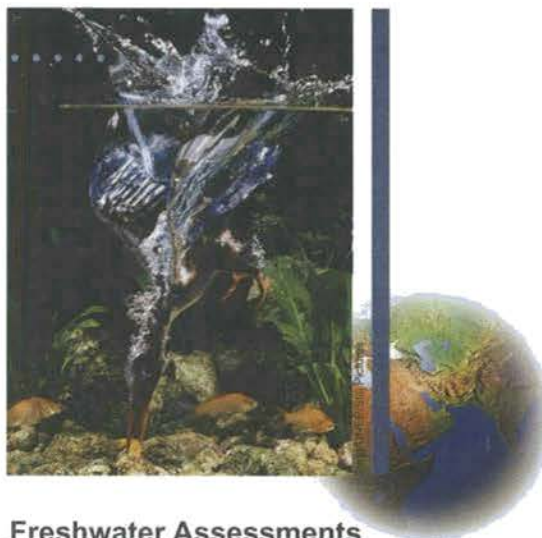
Assessment Activities

DEWA's water assessment activities are incorporated into UNEP's priority water activities by:

- Establishing reliable data systems;
- Mainstreaming of fresh, coastal and marine water assessments in ongoing UNEP activities;
- Building institutional frameworks;
- Disseminating data to relevant partners;
- Undertaking detailed research and development in partnership with active collaborators;
- Collaborating with partners, both within and outside UNEP with interests in fresh, coastal and marine water environments; and
- Promoting training and capacity building for developing country partners.

These water assessment activities fall into three major categories:

1. Freshwater Assessments
2. Integrated Water Assessments
3. Coastal and Marine Assessments



Freshwater Assessments

Global freshwater assessment activities are carried out either in the form of programmes (e.g. UNEP-GEMS/Water) or individual projects. The UNEP-GEMS/Water programme is a global water quality monitoring programme, which collects and assesses water quality data from 104 developing countries. The programme provides information on the state and trends of global inland water quality, which serve as a basis for decision-making processes related to Integrated Water Resources Management in the development and sustainable use of freshwater resources. For more details, see www.gemswater.org.

Groundwater assessments in urban areas aim to fill fundamental information gaps regarding the quantity and quality of urban groundwater aquifers across Africa. Preliminary findings from the DEWA project, *Assessment of Pollution Status and Vulnerability of Water Supply Aquifers of African Cities*, indicate that groundwater in Africa is increasingly contaminated by faecal coliforms, while salt intrusion is rising with increased freshwater abstraction in coastal areas.

The project is in the process of developing a network for sharing information and methodologies for monitoring the contamination of aquifers in Benin, Burkina Faso, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Mali, Niger, Senegal and Zambia. For details, see www.unep.org/dewa/water/default.asp#gwater.

The Global Assessment of Vulnerability of Water Resources to Environmental Change is a framework used to assess the vulnerability of surface and groundwater to human land uses, within an integrated river basin management approach. In Africa, the project has provided significant baseline information on vulnerable aquifers fed by the River Nile in North Africa,

"In 2000, the World Health Organisation estimated the number of people without access to clean drinking water at 1.2 billion, while nearly 2.4 billion people lacked access to adequate sanitation services.

Polluted water is estimated to affect the health of more than 1.2 billion people" (UNEP, 2002).



serious freshwater shortages in West Africa, the variable rain-fed aquifers of Eastern Africa, and the uneven distribution of freshwater in Southern Africa. For details, see www.unep.org/dewa/water/vulnerability/africa.htm. Detailed assessments undertaken on the river and aquifer basins of Central Africa, create a comprehensive River Basin Information System, which serve as a precursor to a global assessment of international and regional freshwater agreements, with a specific focus on groundwater vulnerability.

A Module for the Assessment of the Freshwater Environment is being developed by UNEP-DEWA with key partners and collaborators in order to link the scientific and policy arms of freshwater assessments around the world. The module is designed to minimise the duplication of initiatives and overburdening the scientific community by assisting UNEP and other organisations to identify and fill gaps in their assessments and to strengthen potential linkages between collaborators and experts in the field. The module has three key components:

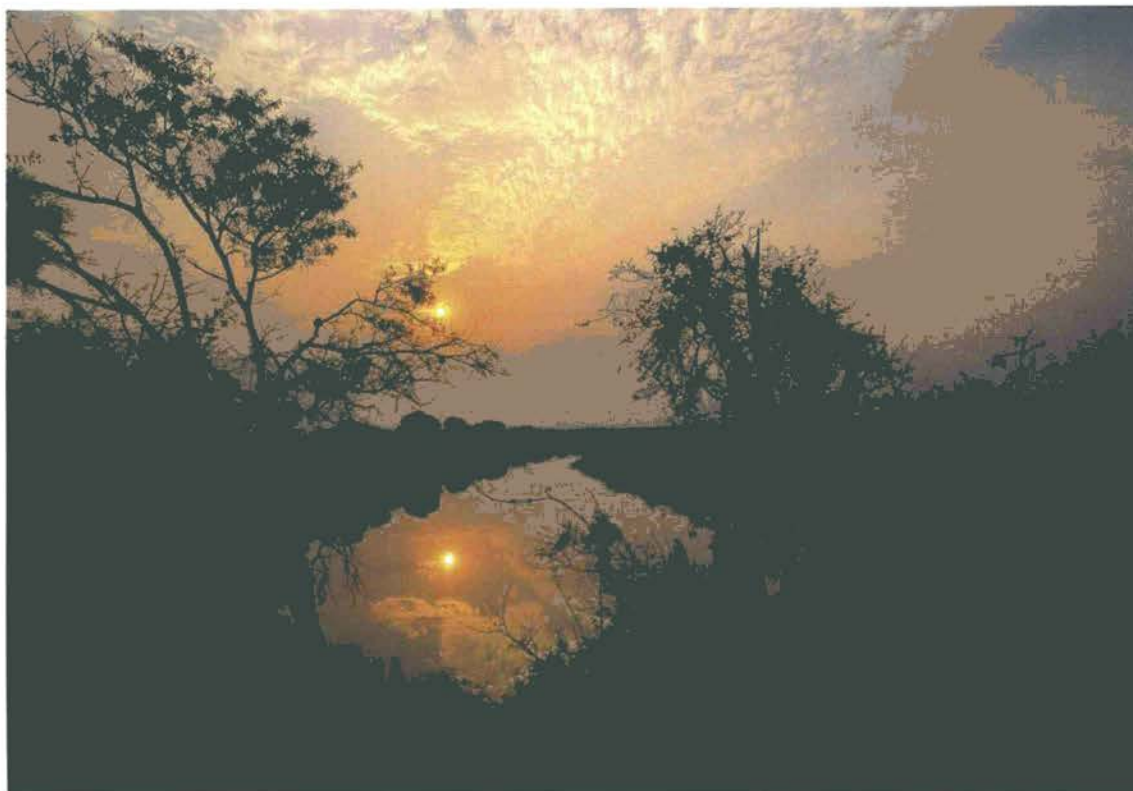
- An assessment component, which identifies areas of scientific consensus and disagreement, knowledge gaps, indicators, models and scenarios, and policy response options concerning key freshwater issues and 'hotspots' of global or regional importance;

- A capacity building component, which provides developing countries and those with economies in transition with assistance in developing conceptual frameworks, methodology, training and technical assistance, in order to develop greater capacity for the integrated management of their freshwater ecosystems; and
- A partnership component, which helps organisations to link and develop cooperation with potential partners in reputable institutions and programmatic structures.

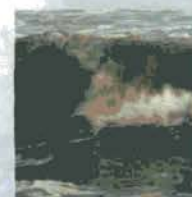
Integrated Water Assessments

Integrated water assessment activities seek to bridge fundamental gaps in the management of fresh and coastal marine waters. A major example is the Global International Waters Assessment (GIWA) Project, which uses existing assessments and scientific expertise to provide governments, decision-makers and funding agencies with accurate quantitative assessments of water trends and issues in 66 transboundary water areas around the world. The project looks at five major areas of concern: freshwater shortages; pollution; habitat and community modification; unsustainable fisheries exploitation; and global environmental change. GIWA has designed a range of assessment products for stakeholders involved in policy and decision-making. For more details, see www.giwa.net.

“To achieve the 2015 Millennium Development Goal (MDG), on sanitation targets in Africa, Asia, Latin America and the Caribbean, an additional 2.2 billion people will have to be provided with sanitation facilities, and water supplies will have to reach an additional 1.5 billion people” (UNEP, 2002).



Steffen Hertzberg/S&P Pictures



“There are currently about one billion people living in coastal urban areas. It is estimated that almost 50% of the world’s coasts are threatened by development-related activities. The coastal areas with the greatest population densities are also those with the most shoreline degradation. The intense pressure on coastal ecosystems calls for preventive and protective action at all levels: local, national, regional and global” (UNEP, 2002).



Peter Arnold/Ste Pictures

The Millennium Ecosystem Assessment (MA) is designed to meet the needs of decision-makers and the public for accurate and comprehensive scientific information concerning the capacity of ecosystems to provide and maintain their natural systems and services. It also deals with the consequences of ecosystem changes for human wellbeing, and provides options for responding to those changes in an environmentally appropriate manner. The MA project helps to identify priorities for action and provides tools for planning and management of water resources, as well as helping to build individual and institutional capacity in participating countries to undertake integrated ecosystem assessments and to act on their findings.

Information gathering activities obtain data on freshwater quality and quantity for the Global Environment Outlook (GEO) project, which provides a synthesis of global and regional assessments of current and future environmental outlooks, as well as the impact of regional and national environmental policies. The GEO data portal also provides vital inputs for the World Water Development Report and the Commission for Sustainable Development reports.

Coastal and Marine Assessments

A Module for the Assessment of the Coastal and Marine Environment is being developed by UNEP-DEWA within the GEO framework, as a follow-up to the Governing Council decision on the Global Assessment of the State of the Marine

Environment. The module contributes to the general UN GMA overseen by United Nations / Division for Ocean Affairs (UNDOALOS) and the Law of the Sea and considers thematic assessments for ecosystem-based management at national, regional and global levels. With input from GEO, MA and GIWA, the module ensures interaction between all stakeholders, particularly governments, in identifying future global and regional assessment priorities, designing quality data controls, and ensuring the highest levels of scientific expertise and independence. The module’s design and methodology will draw on the experience of existing assessments, particularly the robust regional structure of GIWA and the global expertise of GEO and MA.

The module aims to provide a strong element of technical capacity building through the training of national-level personnel, the growth of institutional links with regional bodies, and the development of websites for sharing conceptual frameworks and methodologies. Partners will also be assisted to make full use of – and fill gaps in – their existing technical knowledge and legislation, particularly as pertains to coverage of the high seas and Small Island Developing States. Potential partners include the International Council of Science, the Scientific Committee on Oceanic Research, the International Geobiosphere Programme, Land-Ocean Interactions in the Coastal Zone, the Global Coral Reef Monitoring Network, the Ramsar Convention, and major regional economic groupings such as New Partnership for Africa’s Development (NEPAD) and Association of Southeast Asian Nations (ASEAN).



Andrew Coombe

Our Assessment Roles

The water assessment activities of UNEP-DEWA's Water Unit:

- Assist governments to address the water-related problems and opportunities identified by GEO-3, GIWA, GEMS/Water and other relevant UNEP water programmes and projects;
- Assist developing countries, and those with economies in transition, to fully address freshwater issues, by determining what needs to be done, who should do it, and how it can most effectively be done in partnership with key stakeholders and through the strengthening of local institutions.

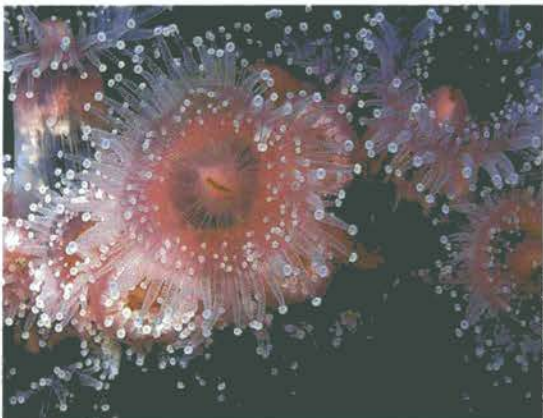
Our Assessment Networks

As a natural benefit of its water assessment activities, the Water Unit in UNEP-DEWA's Assessment Branch maintains strong links with stakeholders at several different levels:

Inter-divisional linkages within UNEP: Regular meetings and joint implementation of water activities help the Water Unit develop strong links with the Division of Policy Development and Law, the Division of Environmental Conventions, the Division of Environmental Policy Implementation, the Division of Regional Cooperation, and the Division of Global Environment Facility (DGEF) coordination offices.



Linkages with other UN agencies and International Non-Governmental Organisations (INGOs): The Unit's assessment activities benefit from close cooperation with UN-Water (the advisory board on water and sanitation to the UN Secretary General), as well as key INGOs and NGOs, including the International Council of Scientific Unions, the World Conservation Union (IUCN), and the World Wide Fund for Nature. Its assessment activities are also closely tied to a variety of multilateral environmental agreements, including the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change, and the United Nations Conference on Environment and Development.



Fred Bravencham/Still Pictures



Claus Meyer/Still Pictures

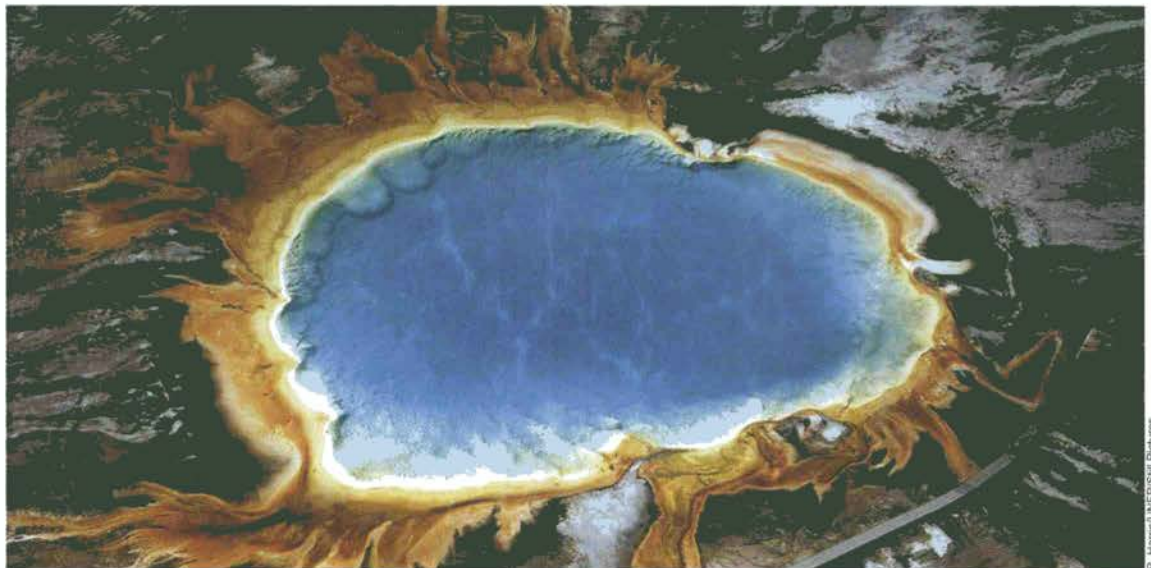
Our Assessment Priorities

- Filling information and knowledge gaps by assisting developing country governments to create databases and websites incorporating fresh, coastal and marine waters assessments;
- Promoting the integrated assessment and sustainable development of marine and coastal areas, their associated river basins and living aquatic resources;
- Facilitating assessments of water stresses and their causes in river basins and coastal and marine environments;
- Monitoring, reviewing and analysing policy responses to existing and emerging water issues; and
- Strengthening consultations and promoting coordination, networking and dialogue between all stakeholders in shared river basins and coastal and marine environments.

"Although freshwater ecosystems such as rivers, lakes and wetlands occupy less than 2% of the Earth's total land surface, they provide a wide range of habitats for a significant proportion of the world's plant and animal species. Many are yet to be discovered. The number of freshwater species worldwide is estimated at between 9,000 and 25,000 (Cosgrove and Rijsberman, 2000). This number is rapidly decreasing due to human interference" (UNEP, 2002).



“Mangrove forests cover less than 8% of the global coastline, and comprise of only a few species. They are vital for coastal protection, water purification, absorbing CO₂, and provide important breeding and nursing grounds for many commercially valuable fish species. Despite their importance, however, mangrove forests are experiencing increasing pressure from timber industries, as well as conversion to agriculture and aquaculture” (UNEP, 2002).

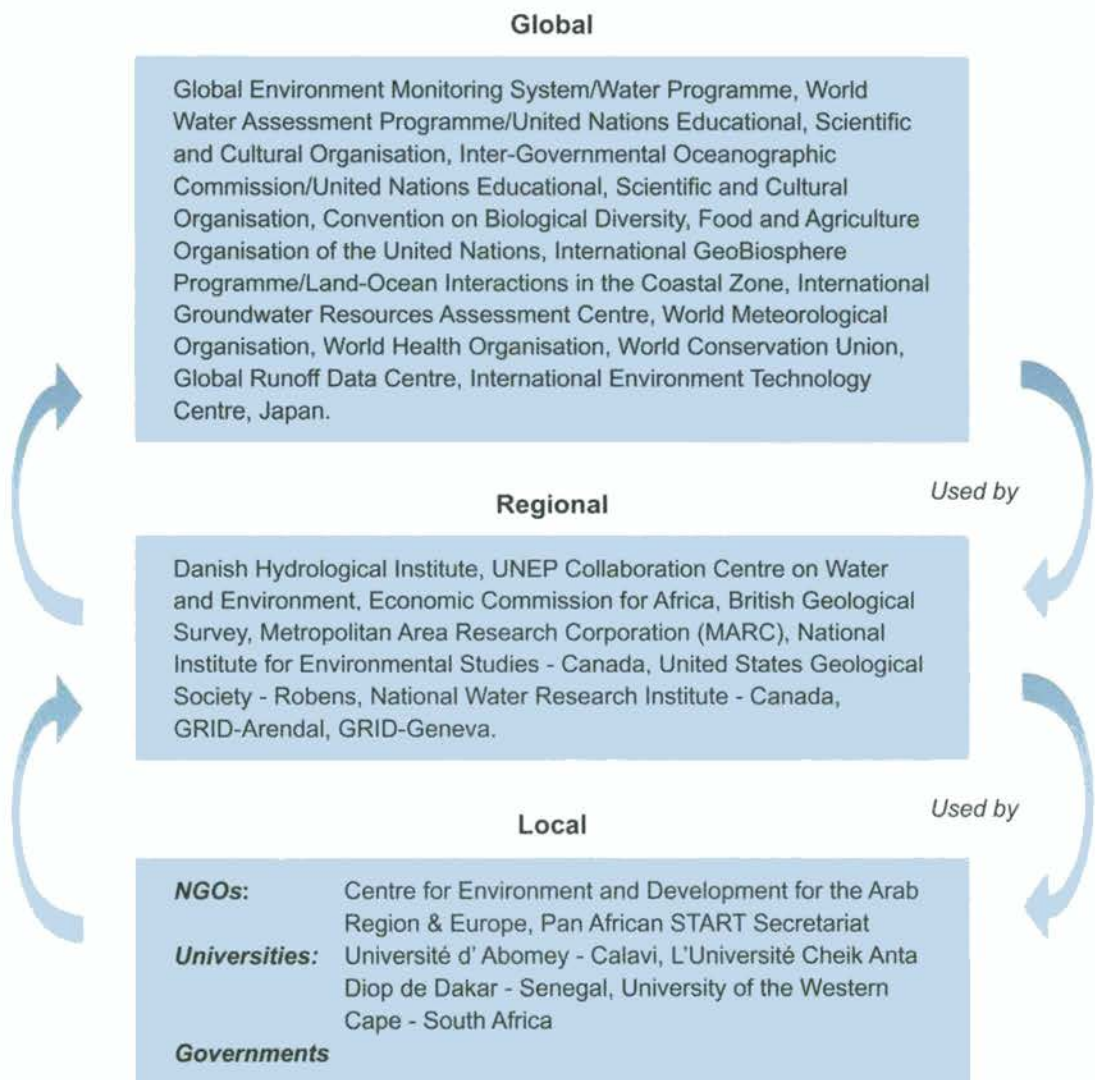


R. Harms/UNEP/Still Pictures

Our Assessment Partners

Our work involves considerable movement of data between stakeholders at different levels, with each

organisation fulfilling its objectives within its capacity and suitable coordination mechanisms:



Our Assessment Outputs

Assessments undertaken by UNEP-DEWA's Water Unit aim to achieve the following specific key outputs:

- Environmental data for global assessments, in collaboration with key partners;
- The identification of assessment priorities for fresh, coastal and marine environments;
- Support for the design and development of agreed guidelines and programmatic approaches to existing regional mechanisms for the environmental assessment and management of freshwater, coastal and marine resources; and
- The development of innovative new approaches and mechanisms for assessing and managing the aquatic environment and its associated resources.

Our Assessment Links

The Water Unit's chief web-based information source is listed at www.unep.org/dewa/water/default.asp

Freshwater Assessment Activities:

GEMS/Water:

www.gemswater.org

Vital Water Graphics Publication:

www.unep.org/vitalwater

Groundwater:

www.unep.org/dewa/water/default.asp#gwater

Vulnerability of Water Resources to Environmental Change in Africa:

www.unep.org/dewa/water/vulnerability/africa.htm

Atlas of International Freshwater Agreements:

www.transboundarywaters.orst.edu/ River Basin Information System (RBIS)

www.watsys.sr.unh.edu/rbis-unesp/

Integrated Water Assessment Activities:

Global International Waters Assessments (GIWA):

www.giwa.net/

Coastal and Marine Assessment Activities:

Global Marine Assessment:

www.unep.org/dewa/water/marineassessment/

Dugong Publication:

www.unep.org/dewa/reports/dugongreport.asp

Ocean Atlas:

www.oceansatlas.org/index.jsp

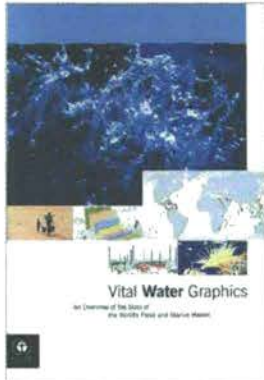
GESAMP:

gesamp.imo.org/

“Freshwater ecosystem alterations (physical, biological and chemical) through dam constructions, inter-basin transfers, alteration for shipping, over abstraction and over exploitation, pollution, and introduction of exotic species generally impact on their hydrology, ecology and socio-economic well being. Half of the world's wetlands (mangroves included), have been lost over the past century” (UNEP, 2002).

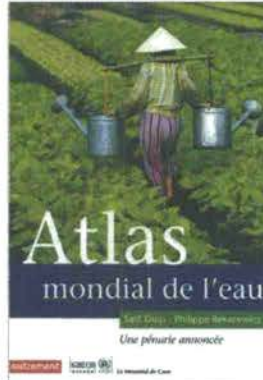


Major Publications 2001 - 2004



Vital Water Graphics: An Overview of the State of the World's Fresh and Marine Waters (2002)
ISBN: 92-807-2236-0

Written by UNEP, this publication presents an easy-to-follow series of graphics, maps and other illustrations that provide a clear overview of the state of the world's fresh and marine water environments.



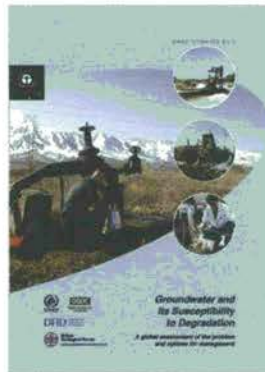
Atlas Mondial de L'eau (2003)
ISBN: 2-7467-0334.3

This is a French adaptation of Vital Water Graphics. It analyses different uses and patterns of water consumption, including some with disastrous environmental impacts, such as the Aral Sea and Lake Chad. Its a powerful tool for all scientists, students and decision-makers involved in environment protection.



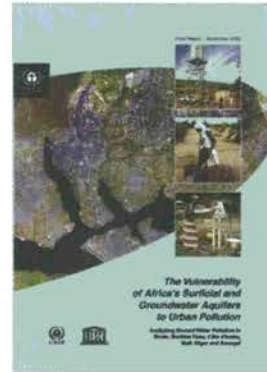
Evaluation of Urban Pollution of Surficial and Groundwater Aquifers in Africa (2003)
ISBN: 92-807-2271-9

This is an external evaluation of a 2002 project addressing aquifer vulnerability in seven West African cities. It also illustrates developing methodologies for groundwater pollution monitoring and early warning systems, and proposes a long-term strategy and action plan for the years 2003-2004.



Groundwater and its Susceptibility to Degradation: A Global Assessment of the Problem and Options for Management (2003)
ISBN: 92-807-2297-2

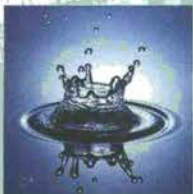
Is an overview of the susceptibility of groundwater to degradation from human activities in rural, urban and industrial settings, this review is intended for planners and other decision-makers at the national and provincial government level, as well as the general public.



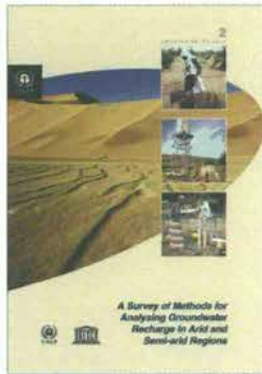
The Vulnerability of Africa's Surficial and Groundwater Aquifers to Urban Pollution: Analysing Groundwater Pollution in Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger and Senegal (Nov 2002)

This report details the goals and challenges of the groundwater project, and provides a synopsis of the activities carried out and the Early Warning Bulletins and Vulnerability Maps detailing the quality and pollution of the water in the aquifers under study. The report also provides an overview of the operational database in Abidjan, which contains detailed information from wells and boreholes in the six cities studied.

"By 1997, there were more than 45,000 large dams worldwide (WCD 2000) and a decline in size and function of several inland ecosystems (e.g. the Mesopotamian Marshlands, Lake Chad, and the Aral Sea) over the last three decades. The Mesopotamian Marshlands in the Tigris and Euphrates river basins were devastated by damming and river channelisation during the late 1980s"
(UNEP, 2002).

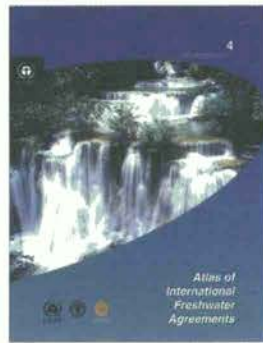


Professor Andrew Dawahazy



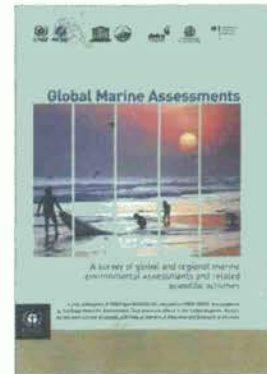
A Survey of Methods for Analysing Groundwater Recharge in Arid and Semi-arid Regions (2002)
ISBN: 92-807-2131-3

Written by water experts from several different countries, this book presents a valuable overview of all the methods identified to date for estimating groundwater recharge, including an assessment of the accuracy and suitability of each methodology.



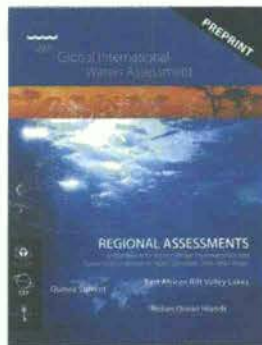
Atlas of International Freshwater Agreements (2002)
ISBN: 92-807-2232-8

Through historical records, maps and information about international treaties involving shared water systems, this publication offers fresh and compelling testimony to water as an agent of cooperation rather than of conflict. It contains valuable information for all water stakeholders, especially those needing to apply or formulate international agreements regarding internationally shared river basins.



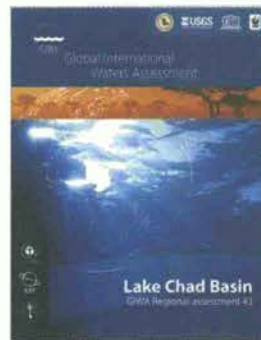
A Survey of Global and Regional Marine Environmental Assessments and Related Scientific Activities (2003)
ISBN: 92-807-2361-8

This report presents part of UNEP's contribution to evaluating the feasibility of establishing a Global Marine Assessment, as a process that will periodically report on the state of the world's marine environment. It presents a snapshot of the marine assessment and related scientific activities in progress at the end of 2002, and recommends various ways in which a Global Marine Assessment could integrate and support these activities.



Regional Assessments of Guinea Current (Region 42); East African Rift Valley Lakes (Region 47); Indian Ocean Islands (Region 45b); Lake Chad (Region 43) (2004)

These GIWA reports show how human impacts on these fragile aquatic ecosystems have increased alarmingly over time. By analysing prevailing demographic, economic, cultural and political trends, these reports provide various policy options that could be deployed to reverse these negative trends - with a particular emphasis on the harmonisation of national and regional water policies with land, agriculture and forestry policies.



Lake Chad Basin (GIWA regional assessment 43) - evaluated the relative importance of different impacts on the international aquatic system of the Lake Chad Basin. Environmental and socio-economic impacts were assessed for present and future conditions, and overall impacts and priorities identified. The assessment ranked freshwater shortage as severe and as the priority concern, which drives many of the other concerns. The concerns were ranked in descending order as a) Freshwater shortage; b) Climate change; c) Habitat and community modification; d) Unsustainable exploitation of fish and other living resources; and e) Pollution. These concerns except for pollution have had a moderate impact in significantly modifying habitats and fluctuations in fish production. The concerns are not as a consequence of direct habitat modification or unsustainable exploitation of fish. The study is beneficial to policy makers as it identifies key components in the causal chain analysis. The report identifies priorities for remedial actions.

"It has been estimated that about 80% of all marine pollution originates from land-based activities. It reaches the ocean directly, via rivers, or through atmospheric depositions. There is a strong link between areas with high densities of industrial activity and zones of seasonally oxygen depleted waters 'dead zones'" (Harrison and Pearce, 2001, from UNEP, 2002).



“Groundwater constitutes about 97% of all freshwater. In areas where surface water is not readily available, groundwater is the primary water source. Groundwater supplies an estimated 20% of the global population who live in arid and semi-arid regions. Globally about 1.5 billion people depend upon groundwater for drinking water supplies” (UNEP, 2002).

Looking Ahead

Over the coming years, the Water Unit in UNEP-DEWA's Assessment Branch will endeavour to:

- Focus on global freshwater vulnerability assessments, with the development of a modular approach that includes:
 - Surface and groundwater assessments;
 - International Freshwater Agreements, including regional approaches;
 - Rural and urban groundwater assessments; and
 - Groundwater quantity and abstraction assessments.
- Focus on the successful completion of GIWA and MA.
- Focus on a catchment approach involving the integration of river basin assessments and interactions with coastal areas.
- Utilise the River Basin Information System (RBIS) to provide real-time data for assessment and management needs.
- Implement UNEP decision GC 22/1/II regarding a global assessment of the state of the marine environment, as UNEP's contribution to the overall global assessment process.
- Develop the 'Module for the Assessment of the Coastal and Marine Environment' within the GEO framework, as part of a reorganisation of in-house coastal and marine activities.
- Implement capacity building activities related to freshwater, coastal and marine assessments in developing countries.

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