

Why a Global International Waters Assessment (GIWA)?

Why GIWA? Six years ago several people had their doubts as to whether a Global International Waters Assessment would be worth the money and effort. Nowadays, it is no longer necessary to justify the creation of GIWA. On the contrary, we will show how important it was that the Global Environmental Facility (GEF) and UNEP, constituted GIWA. Countless water-related assessments focus on specific regions and/or specific issues. But GIWA is unique in its global and holistic policy-oriented approach applying a common methodology to address the major problems in all parts of the global hydrosphere. One major achievement of GIWA will be the GIWA publications which provide advice to GEF and other decision-making organizations. Further assets include the network of regional focal points and teams. GIWA encompasses marine, surface freshwater, and groundwater systems, following the flow of water from the sources in the mountains through the rivers and estuaries into the coastal waters and the shelf seas. GIWA studies the physical, chemical and biological properties of those waterbodies and living resources in relation to the human activities, combining ecological and socioeconomic considerations.

GIWA'S ORIGIN

How did GIWA come about? Its roots can be traced back to the 1982 UN Convention on the Law of the Sea (UNCLOS) with its legal framework of obligations, and to the Agenda 21 of the UNCED, Rio Conference in 1992. It was in Rio that international waters were listed as one of the 4 focal areas for implementation.

International (transboundary) waters are important parts of the global hydrological cycle, which dynamically links freshwater watersheds, groundwater aquifers, coastal, marine and open ocean waters with the atmosphere. For 3 areas—climate change, biodiversity loss, and stratospheric ozone depletion—global assessment procedures were quickly developed, but not so for international waters. Finally, in the mid-1990s 2 initiatives were developed, one by GEF and one by the International Council of Scientific Unions (ICSU) particularly its Scientific Committee on Problems of the Environment (SCOPE). GEF's initiative was primarily land- and nearshore-oriented, while SCOPE extended its view towards the seas and oceans.

At a meeting in November 1994, GEF with its Scientific Technical Advisory Panel STAP began to harmonize its various activities related to international waters shared by 2 or more countries (1). In those days, the GEF considered a number of projects on large marine ecosystems (LMEs) and on major inland waters.

In October 1995, SCOPE was asked by ICSU to undertake a scientific review of the state of knowledge on the oceans (2, 3). From the start it was obvious that SCOPE could do this only in cooperation with other organizations. In February 1996, in Paris, biogeoscience politicians of the

Intergovernmental Oceanographic Commission (IOC), the ICSU Committees on Oceanic Research (SCOR), and on Environment (SCOPE), the International Geosphere-Biosphere Programme (IGBP), STAP, and others came together to plan an ocean assessment. In our discussions we pointed to the linkages of the marine environment and resources to socioeconomic development and population growth and we stressed the need for a close look at the land-sea interactions. The participants agreed on a study which should identify major environmental problems of the oceans, assess their existing and potential impacts, review the state of scientific knowledge and technology and propose a range of options to address these marine problems.

After a further meeting of representatives of international organizations, GEF took the lead and in October 1996 provided funds to develop a large-scale program "to produce a fully comprehensive and integrated Global International Waters Assessment, encompassing the problems of freshwater basins and associated coastal systems from the perspective of water quality and quantity and associated biodiversity and habitats". Three types of products were listed: regionally-based reviews of global issues, global reviews of selected issues, and a global overview of interregional transboundary issues. Although emphasis had shifted from marine to land-based water problems SCOPE and the marine organizations accepted those plans. GIWA was put under the wing of

Table 1. Pre-defined GIWA concerns and their constituent issues addressed with the assessment.

Environmental Issues	Major Concerns
1. Modification of stream flow 2. Pollution of existing supplies 3. Changes in the water table	I Freshwater shortage
4. Microbiological 5. Eutrophication 6. Chemical 7. Suspended solids 8. Solid wastes 9. Thermal 10. Radio nuclide 11. Spills	II Pollution
12. Loss of ecosystems 13. Modification of ecosystems or ecotones, including community structure and/or species composition	III Habitat and community modification
14. Overexploitation 15. Excessive by-catch and discards 16. Destructive fishing practices 17. Decreased viability of stock through pollution and disease 18. Impact on biological and genetic diversity	IV Unsustainable exploitation of fish and other living resources
19. Changes in hydrological cycle 20. Sea level change 21. Increased uv-b radiation as a result of ozone depletion 22. Changes in ocean CO ₂ source/sink function	V Global change

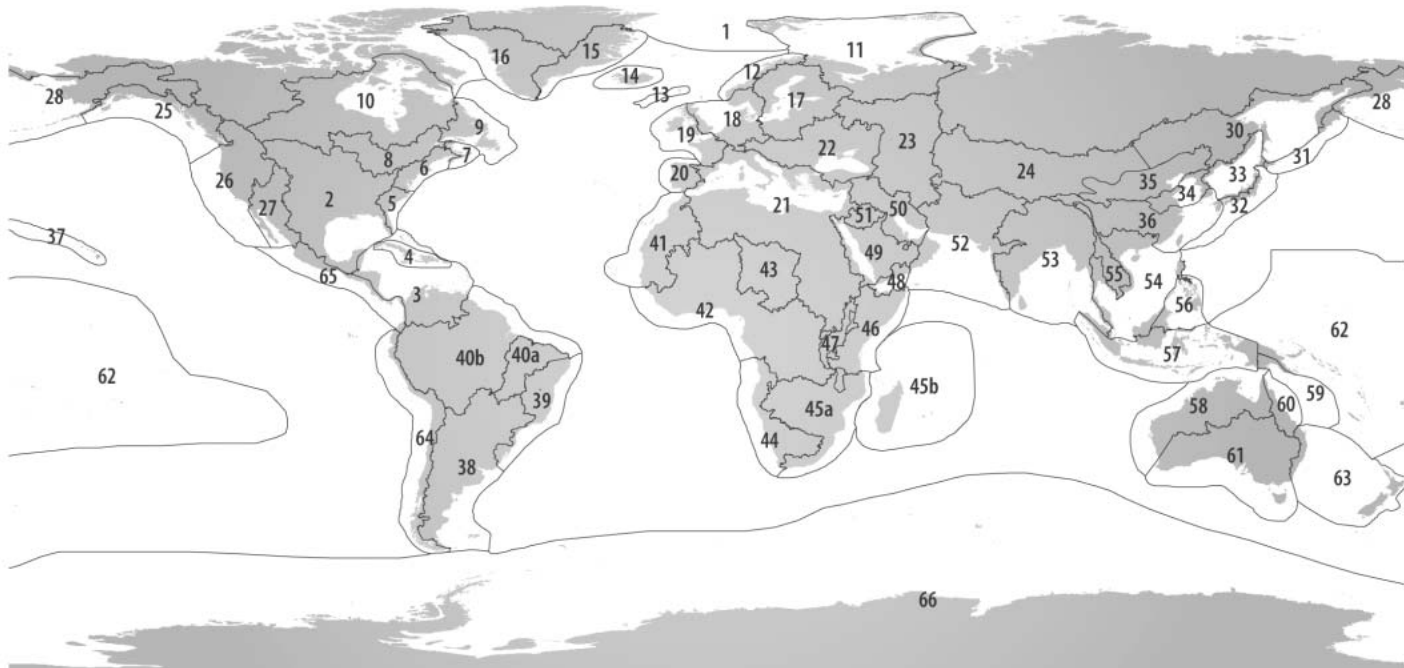


Figure 1. The 66 transboundary regions assessed within the GIWA project.

UNEP. A multiagency Steering Group was established and met first in February 1997, (UNEP/GEF Coordination Unit) (4).

In November 1996, J. Woods (STAP), K. Sherman (for GEF) and G. Hempel (SCOPE) met in London “to explore the combination of SCOPE and GESAMP proposals and to consider the advantages of the Large Marine Ecosystems (LME) approach in such an assessment”. Questions addressed included: What will the Oceans look like in 2020? What can we say about the effects of global warming, eutrophication, pollution, fisheries and ocean engineering? What is the state of our capabilities to analyze and predict—rather than just describe? Analyzes region by region should help GEF in its strategic thinking when selecting, planning and conducting LME projects.

Soon afterwards the blueprint for GIWA was drawn up at 2 workshops in 1997; one workshop theme oriented and one geographically oriented (5, 6). The first group asked: “Which are the major concerns about the interaction between human society and the aquatic resources and habitats at sea, at the shorelines and on land? Is it the shortage of freshwater? Is it the overexploitation of fish stocks and other living resources or the destruction of habitats affecting biodiversity? Is it pollution? How will global climate change affect those issues in the years to come? The answers to those questions were to provide guidance for GEF in the selection of development projects. Five major concerns were identified, constituting 22 environmental issues (Table 1).

The geographical group took a world map and divided it into 66 regions, each comprising one or more large drainage basins, together with the adjacent coastal and offshore regions, but excluding the deep ocean (Fig. 1). Some of the dividing lines were somewhat arbitrary. At sea most of them match the 64 LMEs identified by K. Sherman and his colleagues at National Oceanic and Atmospheric Administration (NOAA) and adopted by UNEP-GEF.

We developed a global matrix of the 66 regions and the 5 major concerns and 22 issues to see which water issues score highest in which parts of the world. This matrix became the backbone of GIWA methodology.

Sweden is the host country for the GIWA Secretariat and Sweden is a major contributor to the common international effort of achieving a more environmentally friendly and sustainable use of water, and aquatic systems’ resources.

GIWA is not working in isolation, but in a complex system of collaboration. It has partners in all regions of the world: many international organizations active on global and regional levels; experts and the regional focal points are working with the assessment. The actual assessment work of GIWA is not done by the Core Team in Kalmar, Sweden, but by local teams in each of the GIWA regions, some thousands of experts and scientists (Fig. 2).

The regional GIWA assessments will be compiled to provide global coverage, and to present a global picture of the transboundary problems in the world’s water systems. Many of the environmental problems in international waters are transboundary in nature, but also national waterbodies are sometimes large enough to have transboundary, sometimes even global effects. All those waters cannot be managed or remedied by a single country alone,

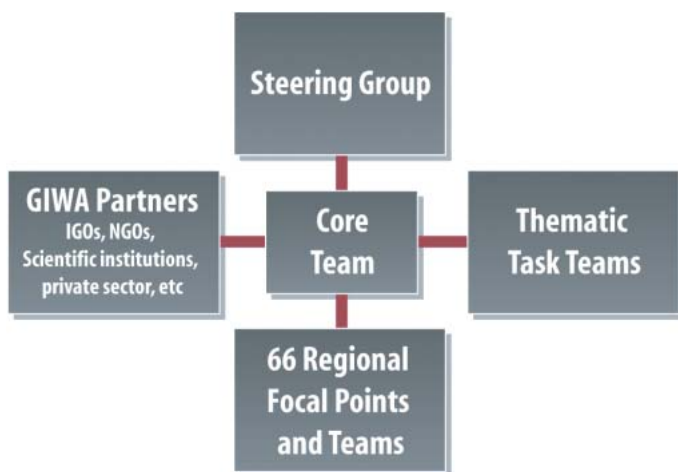


Figure 2. The organization of the GIWA project.

but require international cooperation and intergovernmental agreements. Today, the management responses often lack the cross-sectorial approach that integrates environmental, ecological, and development needs, and even more, far too often the scientific knowledge base required in order to facilitate such international cooperation is absent or at best not available to the policy makers. It is a challenge for GIWA to fill this knowledge gap and to assist countries in building up their scientific and managerial capacity.

THE GIWA REPORTS AND THEIR USERS

The key product of GIWA is a series of regional reports on the state of transboundary waterbodies in relation to 5 major threats: shortage of freshwater; overfishing; pollution; habitat destruction; and global climate change. The reports describe and score those threats region by region, predict future development, discuss their root causes, and provide policy options for sustainable management. The reports apply a uniform methodology and are solidly science-based but user oriented. The report format is shown in Box 1.

Each GIWA assessment report has 3 main sections:

i) The assessment where GIWA concerns are addressed, i.e.: freshwater shortage, pollution, habitat modification, overexploitation of living resources and global climate change. The concerns are evaluated with respect to environmental impact, economic impact, impact on human health, and other social impacts, aesthetic values, etc. The evaluation is on a 4-grade scale; no known impact, slight impact, moderate impact and severe impact. Based on this evaluation a priority scheme is established.

ii) The causal chain analysis where the cause-effect pathways are traced from the socioeconomic and environmental impacts back to root causes, by identification of the pressures and the forces that drive negative development. At the root of the problems are the prevailing trends in the development of demography, economy, poverty, technology, culture, knowledge, governance and policies. The GIWA regional reports address these root causes of international water problems in an illustrative manner and pinpoint the human activities that produce the problem and then identify the factors that determine the ways in which these activities are undertaken.

iii) The policy options. The final ambition of GIWA is to advise on incentives and policy options that can be deployed in order to reverse the negative trend of the aquatic environment. Despite considerable amounts of effort undertaken by many governments and other organizations to address water-related transboundary problems, the evidence indicates that there is still much to be done in this endeavor. The important characteristic of GIWA's policy option analysis is that its recommendations are firmly based on a better understanding of the root causes of the problems. Freshwater scarcity, water pollution, overexploitation of living resources, and habitat destruction are very complex phenomena. Policy options that are grounded on a better understanding of these phenomena will contribute to create more effective societal responses to the extremely complex water-related transboundary problems.

Box 1. FORMAT FOR GLOBAL INTERNATIONAL WATERS ASSESSMENTS (GIWA) REGIONAL REPORTS

Regional definition

Defines the boundaries of the region
Provides an overview of physical and socioeconomic characteristics of the region

Assessment

Presents the results of the assessment of the 5 GIWA concerns and related issues under present and future conditions
Identifies the priority concerns and/or issues in the region

Causal chain analysis

Presents the causal chain analyses of identified priority concerns/issues in the region

Policy options

Presents possible actions to remediate and mitigate the identified priority concern/issue in the region

Executive Summary and Conclusions

The prime users of the GIWA assessment are GEF and other international funding agencies. GIWA assessments will assist them in setting their priorities for management-oriented projects. The regional reports draw attention to particular problems and root causes. Some of them had not been recognized hitherto as deserving priority actions, while other problems that receive high attention by the public and hence by the politicians have less impact on international waters and the global hydrological cycle. The first results of GIWA show, e.g. that overfishing is far more disastrous than pollution in most marine areas. In addition to the regional reports, a brief global résumé and a policy-oriented outlook will be published next year, directly tailored to the needs of political audiences.

There is a continuous debate on how far individual regional reports can be of general use outside the region. GIWA assumes that interregional comparisons can help to solve problems in similar regions and can assist in the development of global policies. Megaregional compilations of the regional reports as well as theme-oriented multiregional analyses shall serve those needs but will take considerable time to produce. It would be of great help, if the data in the regional reports can be collected in one global database which can be readily accessed.

National governments and regional organizations, their administrators and politicians will also become users of GIWA's regional reports. For many regions, particularly in developing countries or those under economic transformation, the GIWA report will be the first comprehensive assessment of their water issues. For those regions the process of compiling the information and of considering the scores, root causes, and possible policy options, is an important step

Box 2. GLOBAL INTERNATIONAL WATERS ASSESSMENT (GIWA) METHODOLOGY (GIWA 2002)

The GIWA methodology in its simple form comprises the following components:

Scaling
Scoping
Causal Chain Analysis
Policy Option Analysis

Scaling is the exercise whereby the hydrological catchments and the receiving seas that comprise the region are identified.

Scoping enables a comprehensive assessment of the current perception of the impacts of each GIWA issue (both environment and socioeconomic), the current trends and the likely future state. Scoping is based on the available information in the region and experts opinion in a consensus building process. The scoping is an estimation of the severity of impacts of the 22 GIWA issues (Table 1) on a global comparative basis, which can serve as a mechanism for prioritization

A documentation of existing information related to all components of the assessment serves *inter alia* to substantiate the experts' conclusions.

Causal Chain Analysis (CCA) traces the cause-effect pathways associated with each significant concern, from the socioeconomic and environmental impacts back to its root causes. Its purpose is to identify the most important root causes of each concern, in order to target them by policy measures for cost-effective remediation or mitigation. It should be stressed that the CCA of GIWA is policy oriented. The core of the GIWA approach to CCA is to look at the factors that directly or indirectly shape the human actions that impact the way in which water and water-related resources are used. These factors are the root causes.

Policy Option Analysis indicates potential management interventions (based on the identification and understanding of root causes) to solve or mitigate the addressed concerns. It is the culmination of the assessment.

in the development of scientific and administrative self-reliance. At the same time it helps the integration of the region into the global partnership of scientists and aquatic administrators.

The GIWA name and brief ensures coverage of the entire globe, and hence the inclusion of industrialized areas, although these are not eligible for GEF funding. For most of those regions, particularly in the northern temperate zones, adequate assessments already exist. For the North Sea, the Baltic Sea,

or the North American waters, GIWA's services may not be needed. These regions have all kinds of organizations, conventions, and fora to potentially develop sustainable water policies. However, industrial world scientists and politicians can use examples from GIWA's work from other parts of the world and take advantage of the lessons learned.

Another category of regional marine assessments is produced in LMEs under the wing of GEF. In those regions close links between the GEF/LME groups and the GIWA focal points and regional teams are mutually beneficial.

When studying GIWA regional reports, governments and scientists are encouraged to inform the GIWA office when they do not agree with specific statements. GIWA and any follow-up of GIWA has to be a continuous process of correcting, broadening, and deepening the reports. This can only be successful with full feedback from the regions and their focal points, and the regional teams of scientists and administrators established under GIWA.

Scientists constitute a further group of GIWA stakeholders. They can use the well-organized multidisciplinary information contained in the regional reports for teaching and for comparative and synthetic studies. There is a broad base of materials for interdisciplinary PhD theses.

Well-educated journalists can also profit from the reports. However, for the media and the general public GIWA needs to present its results in a more general manner. Already, extension activities are being carried out by some of the regional teams and by the core team in Kalmar, fostering public awareness. GIWA's results will be published in a popular book, aimed at an educated public.

THE GIWA METHODOLOGY

The task teams, with very different educational and cultural backgrounds, are unified by a common methodology aiming at rather uniform regional reports. The development of the GIWA methodology was a complex process. How to score pollution or habitat destruction, loss of biodiversity or shortage of freshwater in a uniform way in the Amazon River and the Barents Sea? A set of globally agreed criteria of environmental impacts and their socioeconomic consequences had to be developed. Now the assessment of the GIWA concerns and the analyses of root causes and policy options are carried out in the same way worldwide (Box 2). The methodology has proven to be very robust when dealing with a wide and heterogeneous variety of environmental issues and major concerns and when dealing with very different parts of the globe. The GIWA methodology has the potential to become a widely accepted benchmark for assessments. As such it will be under continued scrutiny and refinement.

THE GIWA NETWORK

Worldwide, hundreds of thousands of scientists, managers, and administrators, are tackling water-related problems as are professional organizations. However, these individuals and organizations are unevenly distributed over the globe. The dialog between the various groups is rather limited. Marine scientists, limnologists, civil engineers, and administrators are mainly concerned with their own subject areas. In certain regions, the communication across political borders is inhibited. GIWA's request for regional assessments has

forced individuals and groups to cooperate. Limited external funding provided some glue. In each region, a focal point and a task team was formed, supported by scientists of the core team in Kalmar and sometimes headed by an external consultant but mostly relying on the existing expertise in the region. The GIWA teams are often the first groupings of this kind in a given region—and hence of great regional and national importance for the development of aquatic science, public awareness of water problems, and for policy advice.

Together the regional teams include about 2000 people. This global GIWA network of focal points and regional teams is an achievement in itself. This network should be supported and used far beyond the termination of the GIWA, if water issues are to be kept under surveillance, making the uniform assessment a continuous process (7).

The GIWA network of regional teams working with a uniform assessment methodology will help regions which are in need of continued assessment of aquatic issues and their sustainable management. In spite of large differences in many regions, the GIWA presents a comparative analysis of the problem areas for the purpose of prioritizing the effort to achieve environmental improvement. Many of the problems are common to these regions. In these regions, as in many other regions globally, habitat destructions and overexploitation of living resources stand out as the most severe problem, even though impacts and options for remediation differ significantly.

GIWA has a limited life time, and will formally end in 2004. Beyond 2004, the assessment process needs to be continued in the same way as, e.g. in the permanent assessment of global climate change. Furthermore, a lot can and should be done in terms of comparative ecological and socioeconomic comparison, and synthesis of the wealth of results in the GIWA reports. Three categories of syntheses might be produced: megaregional (e.g. Sub-Saharan Africa, Latin America); global thematic (e.g. overexploitation, freshwater issues); global physio-geographic (e.g. land-locked waterbodies, nearshore waters). For each of those categories temporary task teams have to be formed in close cooperation with the partners of GIWA in international and national organizations and institutions.

GIWA'S POLITICAL ROLE

GIWA is the framework of UNEP's global water assessment strategy. It is a key element of UNEP's water policy. It was established to fulfill UNEP's responsibility to record and report on critical water resources for the planet, for consideration of environmental benefits and sustainable development management practices; and to provide the background information needed in order to facilitate the intergovernmental agreements and conventions needed in order to fulfill these responsibilities.

One risk is obvious: GIWA's recommendations in spite of their scientific soundness and managerial power might not become noticed or endorsed by governments or donors. Often political will and governance are not strong enough to combat economic selfishness and public negligence. Political considerations might finally overrule the well-founded recommendations. In order to reduce that risk, GIWA has to present and disseminate its messages in a way which will convince politicians of the seriousness of the issues.

GIWA is also an integrated part of the marine activities of the University of Kalmar. This is a genuine win-win situation

where GIWA and UNEP benefit from the marine expertise of the university, and where the university benefits by being connected with an international and global activity in a field of vital importance to its research activities.

The work of GIWA has pinpointed the need for a paradigm shift in the management of the aquatic environment, which would encompass the harmonization of water policies with land, agriculture, and forestry policies and development needs in order to improve water conservation and to secure the sustainable use of the aquatic resources for the benefit of the present and future generations. Therefore, it is hoped that GIWA's work will have a positive impact and will give the required advice and guidance to policy makers which leads to concrete actions on the ground.

References and Notes

1. Global Environmental Facility – GEF 1995. *Scope and Preliminary Operational Strategy for International Waters*. GEF/C.3/7. 19 pp.
2. SCOPE 1997. Minutes and Decisions of the 37th Open Executive Committee Meeting, London 19-21, February 1997, p. 5.
3. SCOPE 1997. Working paper 6.7, Solving Environmental problems of the Oceans. 4 pp. 3 annexes.
4. UNEP 1997. First Meeting of the Steering Group for the Global International Waters Assessment (GIWA). Geneva, 24-27, February 1997. GIWA 1/13, 35 pp.
5. UNEP 1997. *Global International Waters Assessment (GIWA), Expert Workshop on Water-related Issues of Transboundary and Global Concern*, Geneva, 21-25, April 1997. UNEP (Water) GEF-GIWA/2.4, 42 pp.
6. UNEP 1997. Second meeting of the Steering Group for the Global International Waters Assessment (GIWA). Geneva, 14-15, June 1997, 10 pp.
7. GIWA 2002. *Annual Report 2001*, Kalmar 24 pp.

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