Volume 10(3) September 2001

LIMNOLOGY AND OCEANOGRAPHY
BULLETIN

Published by the American Society of Limnology and Oceanography

ASSESSING THE STATUS OF INTERNATIONAL WATERS

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The Global International Waters Assessment (GIWA) is currently conducting a strategic assessment of the status of environmental problems and their impacts on nature and human society at a strategic and global level. The GIWA project is an initiative of the United Nations Environmental Program (UNEP) and was created as a response to the need for funding priorities. The financial resources that are available for remedial actions for environmental problems in international waters are limited, and the Global Environment Facility (GEF) therefore commissioned GIWA to produce globally comparable assessment results that can be used for funding priorities. The GIWA project is meant to provide the GEF with objective and strategic guidance for prioritizing its future interventions in the International Waters Focal Area. This requires a holistic evaluation of the state of freshwater catchments and their associated marine areas globally, and an analysis of the socio-economic causes of the key issues contributing to degradation of water resources in the most impacted areas. The project will provide background and analytical information to identify priorities for remedial and mitigatory actions in international waters, achieving environmental benefits at national, regional, and global levels.

GIWA aims to evaluate a myriad of environmental and socio-economic aspects in sub-regions of the planet's surface, including both marine and freshwater systems. However, GEF is only concerned with international waters whose shared water bodies have a transboundary (across borders) separation of causes (i.e., human activities) and impacts (i.e., negative changes to environment); this represents the major limitation to the scope of the project. The project (UNEP, 1999) is executed by the UNEP Division of Early Warning and Assessments in

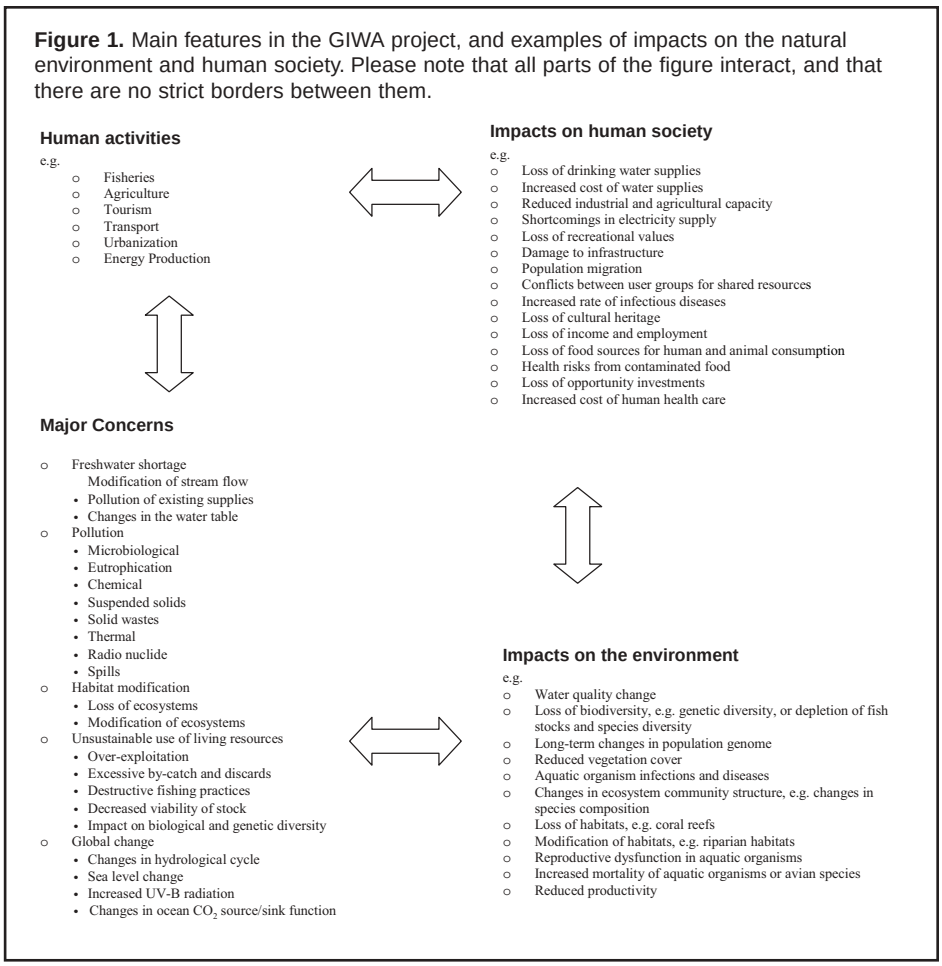

Figure 1. Main features in the GIWA project, and examples of impacts on the natural environment and human society. Please note that all parts of the figure interact, and that there are no strict borders between them.

The Limnology and Oceanography
Bulletin

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The *L&O Bulletin* is published quarterly by the American Society of Limnology and Oceanography, 5400 Bosque Blvd., Suite 680, Waco, TX 76710 USA. Postage paid at Waco, Texas. POSTMASTER: Send address changes to ASLO Business Office, 5400 Bosque Blvd., Suite 680, Waco, TX 76710 USA.

Subscription price to regular members is included in annual dues. Information on institutional subscriptions is available upon request from the ASLO Business Office.

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collaboration with the University of Kalmar, Sweden, and other regional and intergovernmental bodies, and funded primarily by GEF. Although the coordination office of GIWA is located in Kalmar, Sweden, the assessment work is conducted by local and regional experts around the globe.

Shared resources of fish stocks in the oceans, and the use of rivers flowing through several countries are typical examples of GIWA issues in international waters. Where water resources are shared between two or more countries, environmental problems are transboundary in nature and often impossible to solve from a solely national approach. Therefore, analyses of environmental issues and remedial actions in international waters must be approached from an international perspective. GIWA has identified five major concerns that comprise the areas where environmental degradation impacts human life and welfare, health, and the economy: freshwater shortage, pollution, habitat modification, unsustainable use of living resources, and global change (Figure 1). Within these five concerns, 22 key issues related to the degradation of international waters are the main focus for GIWA analyses. GIWA's ultimate objective is to reveal the root causes of identified environmental degradation. By assessing the details of impacts on the natural environment and human society, and linking these impacts with the sectors of society, the causal chain back to the societal root causes are established; this process is illustrated in Figure 1.

A large number of institutions, research institutes and programs study water issues. Nevertheless, the majority of these are small and limited in their scope. GIWA is unique in its globally holistic approach, and crosses "borders" (literal and figurative) in many respects. The project covers all types of waters, including rivers, lakes, aquifers, glaciers, wetlands, estuaries, and ocean waters. GIWA examines problems from the perspectives of the environment itself, as well as of the human society and welfare. Therefore, the sub-region task teams are composed of environmental scientists, socio-economists, and other national and regional experts from the different nations in the sub-region under study. In addition to the use of local expertise, the assessment work is based on current knowledge. In particular, GIWA is not conducting new sampling or practical studies, but utilizes existing data and knowledge, and compiles these into the comprehensive assessment.

THE GIWA NETWORK

The geographic scope of GIWA is global, but with a defined regional focus. For the purpose of conducting the GIWA assessment, the world is divided into 66 sub-regions as basic units, defined by a catchment area and associated coastal waters. A typical GIWA sub-region is the Aral Sea, which comprises the Aral Sea and coast, the river systems Syr Daryra and Amu Daryra, and their drainage basins. This sub-region expands into 5 countries, Kazakhstan, Kyrgystan, Tajikistan, Turkmenistan, and Uzbekistan. In each of the 66 sub-regions, a local organizer/contact and host institution(s) are selected to organize and oversee the GIWA work. The selection process is carried out by the GIWA Core Team and approved by the GIWA Steering Group. The local organizer and host institutions are selected based on their reputation, competence, capabilities, and their track records for undertaking international assessment projects. Participants from GEF-eligible countries receive financial support from the Core Team to enable their participation, but participants from non GEF-eligible countries cover their own costs as an in-kind contribution to the project.

The local organizer assembles a team of regional experts. Selection of the expert group is considered to be one of the most critical elements for the success of GIWA. The team members must be recognized local experts in their field. The team has to cover all relevant disciplines, such as hydrology, oceanography, biology, health, and economics. The experts are typically from the fields of natural and environmental sciences, sociology, economics, and health sciences, and are recruited from universities, research institutes, governmental agencies, and the private sector. All countries in a sub-region must be represented in the sub-regional task team.

THE ASSESSMENT PROCESS ITSELF

The GIWA process is divided into several stages. Each stage is conducted by using a particular methodology (GIWA Core Team, 2001) developed within the project. The GIWA methodology is based on local expertise and is not uniform for each sub-region.

Scaling and Scoping. "Scaling" is the definition of the geographical boundaries of the aquatic system to be assessed. Thereafter, "scoping" is conducted - identification of the relevant issues and concerns in the system that should be prioritized for further examination in the subsequent stages. The team essentially addresses the questions: What are the key aquatic systems within the sub-region? What are the issues that should be analyzed further? These tasks are performed in a workshop-like manner. The scoping exercise uses a qualitative approach. The expert group scores the issues on a scale of 1-4 based on their expert evaluation, discusses the justification for the score, and agrees by consensus on the final ranking and identification of the critical concerns in the sub-region.

Detailed Impact Assessment. The next stage of assessment is a detailed analysis of the environmental issues and concerns, and their impacts on the environment and society.

Although the detailed impact assessment also relies on qualitative descriptions, this exercise is supported and supplemented by quantitative data obtained largely by monitoring programs in the sub-regions. For the critical concerns (identified in the scoping stage), available data describing the impact of the issue are collected and analyzed within a socio-economic context. An essay-type assessment report is produced. Using eutrophication as an example, this would involve identification of the problem algal species, the frequency and spatial distribution of blooms, the type and concentration of nutrients that support the algal blooms, descriptions of the toxicity of the algae, and impacts on habitats and the aquatic ecosystem, biodiversity etc. In socio-economic terms, this involves describing any impacts on: fisheries revenue (monetary value) and volume of fish landed, tourism and other commercial interests, employment (due to loss of fisheries and other commercial activities), social life and recreation (due to degradation of beaches), and human health (due to malnutrition, toxic substances, or bacterial infections).

Causal Chain Analysis. The two previous assessment stages have already been developed and implemented, but the stepwise analysis of the linkages between the identified problems and their underlying root causes ("causal chain analysis") is still being developed. Some questions that need to be addressed include: What are the immediate causes, and root causes of the problems? What are the barriers to overcoming the identified impacts (e.g., failure to implement existing regulations, market distortions)? Based on the Detailed Impact Assessment (above), the linkages between environmental issues and their underlying root causes are identified through the various sectors of society. The root causes are grouped and sectored so that options for remedial actions can be easily mapped to the root cause. Thus, the root causes will fall within the following categories: marked (excessive demand), legal failures, educational and capacity failures, lack of investments, and lack of technology.

The shortage of freshwater from a reduction in steam flow provides an example of causal chain analysis. The immediate cause may be high water consumption from irrigation for agriculture and from human use in urbanization. The underlying root cause for agriculture is the human population's need for food. The underlying root cause for urbanization is population growth and the demographic trend that people move to cities. Failures in governance by political initiatives, although difficult, to encourage urban growth in regions less vulnerable to water shortage is another possible root cause. In this respect, "governance" is also introduced as a means to intervene in the causal chain. Governance in this context is understood as: implementation of laws, rules, and regulations, capacity building and education, and investments in public infrastructure. It is assumed that through governance, the exploitation of water resources can be managed to sustainable limits.

The Scenario and Policy Options Analysis. This final assessment stage is also under development. It involves the identification and evaluation of different policy options and potential mitigation actions designed to achieve significant environmental benefits. An overall question to be addressed in this stage can be: What are the alternatives for remedial actions in transboundary waters from the environmental and economic perspectives?

EXAMPLES OF ASSESSMENT RESULTS

The first stage of GIWA, Scaling and Scoping, has already been conducted in several sub-regions. In Table 1, the very preliminary scoping results for five different sub-regions, the Benguela Current, Black Sea, Caspian Sea, Aral Sea, and Baltic Sea, are shown. The table demonstrates how the results can be illustrated and compared. At this first stage of assessment, experts screened all GIWA concerns and issues. The experts carried out the assessments of the environmental and socio-economic impacts under present and future conditions. They also identified overall impacts and priorities for further analysis. Often there were several issues regarded as having severe impacts. In these cases, an in-depth discussion by the experts, considering amongst other things the linkages between different issues and future impacts, was used to agree on what issue should be put forward as a top priority for further analyses.

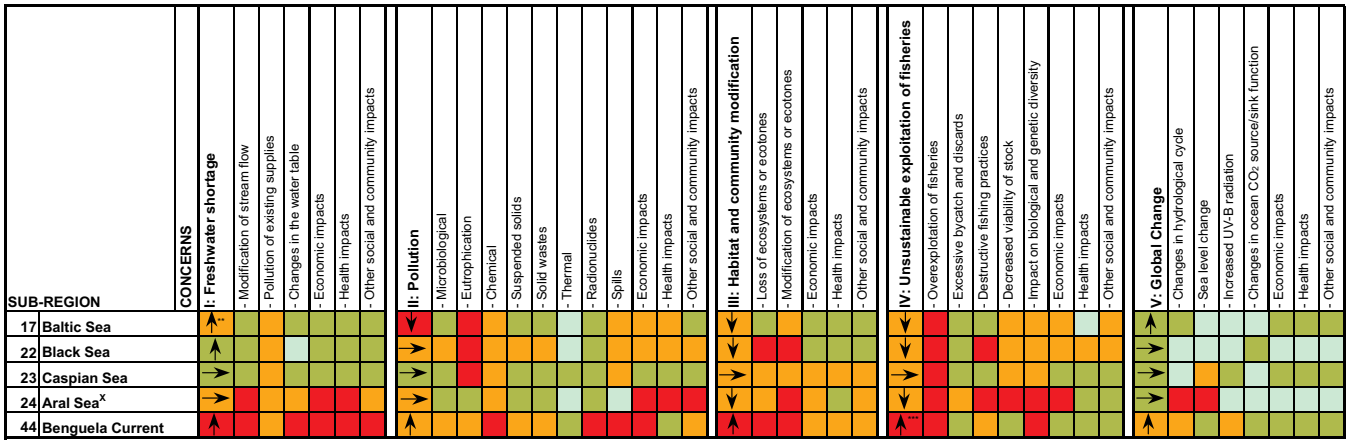
The Team Leader of the Benguela Task Team is Dr. Kim Prochazka, International Ocean Institute, University of the Western Cape (South Africa). The Benguela Current expert group has met for the scoping workshop (Pochazka, 2001) and concluded that modification of stream flow is one of the most important issues in sub-region. The Benguela Current system extends from the northern border of the Cabinda Province southwards around Cape Point. The majority of rivers in the sub-region (>65%) only flow periodically. All of these river systems are dammed, most multiple times, and they are grossly over-utilized to the extent that some never flow into the sea. Permanent rivers are limited to the less arid parts of the sub-region. Although they suffer from a range of problems, the most important are also changes in river flow. Every river in the sub-region is modified by impoundment and is over-utilized, resulting in significant decrease in river flow. Up to 75% reduction in stream flow has been recorded (e.g., Berg River). In many cases these rivers have ceased to flow permanently and have become intermittent, resulting in

temporal, rather than spatial, fragmentation of the habitat. The scoping exercise indicates that this has a major socio-economic impact, impeding economic growth and probably causing significant health losses in parts of the population. These impacts will be further evaluated, detailed, and quantified in a Detailed Impact Assessment study to follow.

The GIWA Leader of the Black Sea Task Team is Professor Felix Stolberg, assisted by Dr. Olena Borysova of the Department of Environmental Engineering, Kharkiv Academy of Municipal Economy (Ukraine). In the Black Sea, the expert group identified eutrophication as the critical environmental issue (Stolberg et al., 2001), confirming a large number of previous studies on this issue (NATO, 2000). Eutrophication and other types of ecosystem degradation have led to reduced biodiversity and imbalanced ecosystems in the Black Sea. In the past 25-30 years, the Black Sea has been transformed from a diverse ecosystem supporting varied marine life to a "eutrophic plankton culture" that provides environmental conditions unsuitable for most organisms higher in the food chain (Kideys et al., 2000). The fisheries yield has declined dramatically to an 80% reduction in the total catch within the last few years. Moreover, only 6 out of 26 species of commercially valuable fish available during the 1960's remain in exploitable quantities. Since fisheries are extremely important sources of income and protein, their collapse will have adverse effects on the economy and protein consumption of people, particularly those inhabiting the Black Sea coast. The effect on employment in the fishery sector has been no less dramatic. One estimate puts the total job losses from the collapse of Black Sea fisheries at some 150,000 (Stolberg et al., 2001). The number of people indirectly affected in the Black Sea fishing communities is certainly much higher.

The socio-economic value of the Black Sea is high. It is the only marine area available to millions of Eastern European citizens, and tourism should be a major revenue source for all Black Sea countries. As it is, the number of people vacationing in the Black Sea has fallen dramatically in recent years and the total loss of income may be as high as $400 million. Even if this cannot be accounted for by environmental degradation alone, it is obvious that polluted beaches and coastal waters account for a significant part of the economic losses.

Table 1. Scoring Matrix for the GIWA Concerns and Issues



KEY:

x = Pollution mainly: salinisation of soils, surface and ground waters

Present situation

= No impact
= Slight impact
= Moderate impact
= Severe impact

Likely direction of future changes

= increased impact
= no changes
= decreased impact

* = Uncertain if the present situation is No impact or Slight impact
** = Uncertain regarding direction of future changes
*** = Uncertain if the Present situation is Moderate impact or Severe impact

CONCLUSIONS

The task of GIWA is highly ambitious. The assessments need to be comprehensive, including analyses of the impacts of environmental problems in international waters on the human society and nature, and analyses of the root-causes behind the problems. Additionally, scenarios must be developed, and different policy options and their possibilities to improve the situation analyzed. The assessment of impacts on the environment should be made from the perspective of the intrinsic value of aquatic ecosystems, while the assessment of socio-economic impacts must be focused on human use of the environment. The GIWA assessment protocol to date is an effective tool for identifying critical environmental concerns, their impact on human life and welfare, the economy and health of the population, as well as the underlying root causes of the environmental problems and threats. The first sub-regional results indicate that severe environmental problems prevail in international waters where causes extend across national borders, and that these problems are likely to increase in the coming years unless remedial actions are taken. When all stages of the GIWA assessment are completed, including the causal chain analyses, the sub regional findings will provide guidance for governance and future intervention at technical, management, socio-economic, and policy levels.

Important achievements by GIWA are being made on many levels. However, one of the more subtle ones is that experts from different countries in a region sit down together at the fairly informal GIWA workshops and simply talk. These personal connections between experts, bridging languages, economic status of their countries, and ethnic/cultural backgrounds, are, apart from the assessment results themselves, very important achievements. GIWA is dependent on many contributors in order to secure the complete success. Local experts in all disciplines are welcomed to participate in the GIWA project, in expert panel workshops, thematic teams, and study groups. If you would like to know more about GIWA's activities, visit our web site, www.giwa.net, or contact us at info@giwa.net.

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