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# The Global Environment Facility: International Waters Coming Into Its Own

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*Lisa Jorgenson*

## Introduction

International waters as a focal area has come into its own, helped by Global Environment Facility (GEF) Council approval of the Operational Strategy in October 1995. This document served two important functions. First, it provided a framework for 'programmatically cohesiveness and integration among the many entities that participate in the GEF, including the three implementing agencies (United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), and the World Bank), the Scientific and Technical Advisory Panel (STAP), the GEF Secretariats, and the international conventions for which the GEF provides operational support and funds for implementations'.<sup>1</sup> Second, the Operational Strategy provided the first structural definition of the kinds of project that could be funded under the GEF International Waters programme and the criteria they need to meet.

This chapter explores how international waters became a focus of the GEF, and how the programme was redefined by project operations during the pilot phase. It investigates whether there is an adequate science base to help frame the issues, and what the barriers to progress are for international waters in the future.

The GEF was agreed upon by a tripartite agreement between the implementing agencies in October 1991 and established by a resolution of the board of directors of the World Bank on 14 March 1991 as a grant mechanism to provide financing for projects in four focal areas: ozone layer depletion, global warming, biodiversity, and international waters. During the first three years of the pilot phase of the GEF organized a participatory council structure and co-ordinated the management of a project portfolio between the World Bank, UNDP, and UNEP for a broad range of environmental projects.

The core fund to finance the GEF during the pilot phase was \$US800 million, contributed or pledged by 28 countries, including 12 developing countries. Under co-financing and parallel financing arrangements, another \$US325 million was subscribed by Australia, Belgium, Canada, Japan, Norway, Switzerland, and the United States.<sup>2</sup> The GEF operational phase began in 1995, with \$US2 billion to manage over three years in grants and concessional lending.<sup>3</sup> The GEF International Waters programme now accounts for about 13 per cent of the GEF funds.

From the start, international waters differed from two of the other focal areas, climate change and ozone depletion. These two had clearly defined objectives as the result of independent scientific assessments and international conventions: the Vienna Convention in 1985, followed by the Montreal Protocol on Substances that Deplete the Ozone Layer in 1987; the International Waters programme is the only part of the GEF that has not been vetted through international conventions. The programme had to find its vision in the context of a wide variety of international treaties and conventions, the law of the sea, ocean dumping, marine and fisheries protection, ship wastes, and reduction of land-based sources of pollution.<sup>4</sup> While it was clear that the International Waters programme had to take all agreements into account, none of them entailed the unifying global dimension that was the GEF trademark.

Agenda 21, adopted in Rio in 1992, included a lengthy paper which presented a picture of overcrowding of water interests. Stresses from land and sea at many levels were creating a synergy of multiple stresses collapsing the capabilities and productivity of water systems. The paper was unable, however, to find a thread that defined a global problem or to articulate a unifying intervention initiative.

The International Waters programme needed to define which water issues were 'international', considering that donor funding was traditionally organized around country accounts; it needed to bring together development specialists in marine and freshwater systems, drinking water and sanitation, irrigation, and energy generation; and it needed to span international scientific communities in fisheries, water temperature and complex hydrological cycles, loss of wetlands and coral reefs, and estimates of population and development pressures on freshwater allocations. Without a clear basis in science to help frame the 'bigger picture', the International Waters programme struggled with isolated frameworks of disconnected networks.

The challenge for the GEF is to help integrate the resources available and bring them to bear according to a vision of integrated problem management. The merits of the International Waters programme has been to translate this vision into practice.

## History of the GEF: International Consultation

### *The Consensus Process*

The idea behind the formation of the GEF began in the mid-1980s when commercial and international financial institutions were struggling with the debt crisis and the problem of facilitating economic development.

The GEF emerged in response to concern about recently discovered global environmental problems. As awareness of the global nature of the environmental condition dawned on the public and decision makers alike, it was clear that nations had to act together. Developing countries were needed as active participants in these efforts, and the idea took hold of creating a new mechanism for the specific task of providing finance to developing countries for global environmental purposes.

In early 1989 the senior French delegate to the Intergovernmental Negotiating Committee that led the United Nations Framework Convention on Climate Change (UNFCCC) began to deliberate upon different kinds of funding mechanism to sustain this collaborative process. He asked the French Treasury to review several proposals, which they did by setting up discussions with industry and with other financial ministries. They found that the traditional philosophy of international development—promoting development, expanding economic markets, and income distribution from the industrialized countries to the developing—was beginning to look inadequate. A more relevant way to evaluate international development was to evaluate the economic return of spending more money within your own country as opposed to the economic return of investing that dollar abroad. This was an early insight into the global economy.<sup>5</sup> The French were concerned about how to elicit more immediate improvements under the Mediterranean Action Plan in the North African countries, and were distressed by the Bangladesh floods and the consequent wiping out of their aid programmes.

At the Annual Meeting of the World Bank in September 1989, the French Finance Minister, Pierre Beregovoy was ready and proposed a special environmental envelope to ‘enhance the normal resources of the International Development Association’. The French proposed that ‘The sum of SDR1 billion would be required, and for its part France is ready to provide F900 million over three years (corresponding approximately \$US100 million).’<sup>6</sup> The proposal took everyone by surprise. The Germans immediately responded they would support the offer. The Senior Vice-President of Finance at the World Bank, Ernie Stern, however, asked for the proposal to be put in abeyance until the International Development Association (IDA) budget replenishment discussions were completed (at the time, the World Bank was developing a budget initiative to organize the new Environment Department). The result was

that Pierre Beregovoy departed from his formal remarks outlining international waters as one of the four focal areas and staff scrambled to integrate the whole statement into the written record.

In March 1990 the World Bank convened a meeting in Paris to discuss a framework for how a Global Environment Facility could operate. The meetings included representatives from UNDP, UNEP, and finance ministers from many European countries. At this meeting UNDP proposed a broader approach to the issue of international waters, and UNEP strongly advocated a regional seas programme as part of the plan. The original French proposal had by now been modified, giving weight to the old proverb ‘Success has many fathers’.

The idea of the GEF was presented to the governments of the more industrialized countries. Representatives of the World Bank travelled to many of these countries, soliciting their support and trying to build a consensus. In September 1990 the parties met again, but the debate seemed to be stagnating. The main constraint during the negotiations was lack of support for a new formal international organization. Another difficulty was that the industrialized countries feared the amount of funding required, and developing countries were concerned about a shift from development assistance to the environmental realm, if the programme was given too wide a definition. Commitment from the Japanese for funding support helped to bridge the differences, and this meeting became the turning-point for the more industrialized countries and multilateral funding organizations to form the GEF.

The resulting facility was designed as a three-year pilot programme. One reason advanced in favour of a pilot phase was that no agency had experience in addressing specifically global concerns. The GEF would use the pilot years to test approaches and ideas in practice. Another reason was that the participating countries had different visions for the GEF. A number of European countries, for example, preferred the GEF to become a central financial instrument to which existing and future global environmental conventions could be linked. Other countries saw it from the perspective of development assistance. The USA considered a specific mechanism for global environmental problems to be a temporary corrective measure that should be phased out when all development efforts had been reoriented to include global aspects as part of the regular process, and it never put money into the pilot phase. By agreeing on an exploratory pilot phase, resolution of these conflicting visions was delayed, and the GEF could focus on getting some operational experience.

The pilot facility was a unique management arrangement. The original French proposal was that the GEF should be an arm of the World Bank. However, a number of participating

countries felt that the relevant UN organizations ought to be brought in, and as a result, UNDP and UNEP were included in the tripartite management structure. Although all three agencies were called implementing agencies, this betrays the different roles they played, and it is a fitting description only of UNDP. The World Bank continued as the dominating agency. It was expected to implement the majority of projects, serve as Trustee, and be in charge of preparing and conducting the meetings of the participating countries. UNEP was not technically an implementing agency inasmuch as it did not execute projects. Instead the main roles of UNEP were to ensure that GEF activities conformed with multilateral agreements, and to organize and provide support for the STAP.

The management arrangement was put to the test when the operational phase formally began in June of 1991. No sooner had work begun than the appropriateness of the GEF became questioned in the context of the preparatory processes for United Nations Conference on Environment and Development (UNCED) and the Conventions for Climate Change and Biodiversity. The environmental debate shifted toward an increasing recognition of linkages to development and industrial structure, and between local and global issues. Old development paradigms were seriously questioned, and from some perspectives, GEF was viewed as a product of outdated thinking, a top-down, sticking-plaster mechanism that reflected the priorities of the North. The dominant role of the World Bank was particularly controversial, since this agency was seen as one of the main engines of large-scale projects and structural adjustment programmes of the kind that were widely regarded as exacerbating the environmental situation in the South. The debate was particularly contentious as long as some critics suspected that the GEF would be proposed as a major vehicle for funding of parts of Agenda 21, the Rio plan for further action.

In May 1992 the GEF was accepted as the interim financial mechanism for the Vienna Convention and the Montreal Protocol, thereby breaking the deadlock on funding that threatened overall agreement in time for Rio the following month. At UNCED, Agenda 21 took note of the GEF and encouraged reform of its structure.

The process of restructuring the GEF began in late 1992. At Rio, the world community had legitimized a broad interpretation of environmental problems as expressed by the concept of sustainable development, as well as a number of principles—such as transparency and universality—that were to guide the process of reorientation towards sustainability. When the minimum contribution for membership was abandoned in late 1992, a large number of developing countries became GEF participants. The developing countries that had become mobilized in the context of Rio now turned their attention to the restructuring

of the GEF; the industrialized countries, by contrast, continually emphasized the need for a mechanism that would operate efficiently. The period following UNCED had been a disappointment in terms of the willingness of industrialized countries to provide additional financial resources for sustainable development and the GEF became the chief remaining hope that such funds would materialize. In both cases, the two sets of principles were used in support of a governance system that translated into a different power balance between the South and the North.

The outcome was that in March 1994 the GEF was restructured into a permanent mechanism that had to contain and balance a wide range of perspectives. Like most international instruments, the pilot facility had been set up in a manner that reflected the viewpoint of one professional group. It differed from most other instruments in that it was developed with the financial perspective on global environmental issues of the World Bank and the original participants (two-thirds of which were from the North, and which were frequently represented by financial branches), rather than with a political perspective. Initially, this perspective was challenged within the GEF by UNDP and UNEP, and outside primarily by Northern non-governmental organizations (NGOs). After Rio, when a much broader range of people turned to the GEF, its constituency changed. Most of the Southern countries, for example, brought delegations from their more politically oriented UN missions and the NGO community was expanded to reflect the views of Southern networks.

Thus the restructured GEF differs from many other international instruments in that it is a forum for multifarious constituencies, representing, at minimum, the perspectives of finance, development, environment, international politics, and, through the STAP, various scientific communities. This range of perspectives is both a strength and a weakness. It is only through engaging a wide spectrum of people that environmental issues can be effectively addressed, but in the sense that GEF is unlikely to conform the preferences of any constituency, it runs the risk of each group reverting to forums which more closely reflect their views.

#### *Learning from Experience*

In July 1996 the GEF International Waters programme represented about 13.5 per cent of the GEF funding, with \$US156.37 million, supplemented by an additional \$US157.20 million from other sources. The project enjoys a fairly high level of outside funding, although one-third of the funding projects have no co-financing.

During the first three years of the GEF pilot phase, the International Waters programme was defined largely by its project portfolio. There was general uncertainty among the GEF delegates as they reviewed potential project portfolios

about what 'international waters' really were (see Appendix A), although oceans were easy to agree upon as international waters.

In the pilot phase, six of the first international waters projects dealt with ship waste. These ship waste projects were not tightly bound to the implementation or incremental costs of helping countries comply with MARPOL, but were demonstration projects and thus differed from ozone reduction and climate change projects.

Two of the six projects devoted to ship wastes concentrated on oil. Other ship waste projects took on larger challenges. The Organization of Eastern Caribbean States Ship Waste Management project became a model of the 'stakeholders' concept. It organized a group of nations to define among themselves a new protocol for cruise ships to package and land their garbage. The cruise ship industry took on a major role in designating the best ports for off-loading certain kinds of waste like cans and bottles to take advantage of economies of scale and relieve ports of providing duplicate services. This project extended further into training and improving the management of garbage collection and landfills as well as citizens' action networks to clean up onshore refuse to prevent it from washing into the ocean and creating negative tourism.

China Ship Waste was an ambitious technological project to develop a state-of-the-art ship-to-shore computer tracking system to report ship waste being off-loaded to port reception facilities. The only existing model was a fledgling effort by the Port of Rotterdam. The computer technology has still not been fully developed, but the global attention to ship wastes, as exemplified by these two projects, may have helped to create the climate for the signing by 16 maritime administrators for the Asian Pacific region of the Tokyo Memorandum of Understanding (MOU) in 1993. This established the first international enforcement mechanism for ships that do not meet basic environmental criteria.<sup>7</sup>

During the pilot phase the GEF had a harder time defining the relationship of marine systems with near-shore and freshwater hydrological systems. The Black Sea and the river Danube came in as the first semi-enclosed seas and freshwater systems. There were originally five other projects, but lacking clear guide-lines, task managers found it easier to seek funding under the biodiversity programme. The Danube delta project was split into two biodiversity projects and lost its international management focus as Romania and Ukraine each managed the delta within their national context, making the purchase of compatible global information system (GIS) equipment difficult. Another freshwater system, the Ghana Coastal Wetlands Management project, also became a biodiversity project, although it managed to reroute the sewage treatment outfall from the city of Accra as part of its project. The Seychelles Islands also became a

biodiversity project, even though it shared a common project design feature with the Black Sea and the river Danube, a 'project co-ordination unit' to co-ordinate all previous donor investment and develop a strategic action plan to prioritize donor investments in the future. These features of the pilot phase project became part of the core requirements in *International Waters: Operational Directive*, and the co-ordination of stakeholders, demonstration technologies, and donors in a strategic action plan.

As projects were adopted and moving towards the operational stage, the need for a better definition of term 'international' became apparent. The search for scientific measurements and means to describe indicators became more pressing; the task managers needed monitoring and evaluation guide-lines. The World Bank, with the help of the Finance Ministries of France and Sweden, convened a series of meetings in Paris and Stockholm to discuss how to monitor and evaluate international waters projects. In these meetings, the idea of the GEF International Waters programme broadened to include river basins, and toxic chemical run-off.<sup>8</sup> The United Nations Department for Development, Management, and Support Services (UNDDMS) helped describe transboundary groundwater systems for the Advisory Committee.

Ship wastes were redefined to address the more intractable problems of ballast water and chemical washing, using improved international data. Ships contribute about 12 per cent of total pollution estimated in international waters.<sup>9</sup> The typical cruise ship generates 4.5 tons of garbage per day and many do not have on-board compactors and incinerators to process it.<sup>10</sup> Ships account for an estimated 26 per cent of the world's oil pollutants—1.5 million tons of oil per year. Although chemical ships represent only 30 per cent of the oil-tanker fleet, it is estimated that chemical contaminants are entering the marine environment at the same volume as oily wastes from ships. World-wide ship traffic increased from 1974 to 1994 by 24 per cent. During this period the number of ships carrying chemicals increased by 86 per cent, while the oil-tanker fleet decreased by 2 per cent.<sup>11</sup> Noxious liquid substances can be reduced in new tankers by more efficient tank-stripping systems, but it remains a substantial environmental hazardous for the shipping fleet at large and is very destructive to marine life.

The advisory meetings also became a forum to explore better terms for scientific measurement. In marine science, the oceans had been organized into large marine ecosystems (LMEs), summarizing the known work in this field into 49 LME areas in the world, and describing for each the scientific issues most prominent in the research literature of international scientists.<sup>12</sup> This work drew together research from hundreds of scientists and provided evaluation on seven of the 49 global areas that are near fishery collapse, because

of stress caused by pollution or over-fishing, either for meat fish or for bony fish, which make up 52 per cent of world fish catches and are being over-harvested for fishmeal feedstock for pigs and chickens and for fertilizers.

The work on LMEs became the benchmark to increase scientific information on large lakes. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) produced a summary of all scientific research of Lake Victoria. The Society of International Limnologists created a databank of tropical lake experts and areas of published research. The Food and Agriculture Organization (FAO) developed a database on global coastal management projects and produced published guide-lined incorporating fisheries and deforestation to coastal waters. River basins are still to get to this level of global scientific interplay of information. (See Appendix B.)

### *International Waters as Part of the Operational Strategy*

To distinguish the GEF concept of 'international waters' from the legal definition under the United Nations Law of the Sea Convention, the GEF operational strategy turned its focus to 'transboundary' water resources, emphasizing pollution and water resource management through a participatory process of binational and multinational 'stakeholders'. Three categories of international waters projects were set out:

1. *Water-based Operational Programme.* The objective is to help groups of countries work collaboratively to learn about and resolve through a strategic action plan transboundary water-related environmental concerns. The GEF programme will include a representative number of projects concerned with 'freshwater basins (both surface and groundwater transboundary basins) as well as large marine ecosystems (or perhaps limited oceanic areas) . . . to ensure balanced coverage of a wide range of geographic and climatic settings'. This emphasized a multi-country approach to learning about and collectively addressing imminent threats to their transboundary water resources.

2. *Integrated Land and Water Multiple Focal Area Operational Programme.* The objective is to provide funding for integrated freshwater basin and coastal area management, including irreversible damage from desertification and deforestation, and joint biodiversity-international waters projects in areas such as reefs, mangroves, and wetlands that serve as nurseries for the ocean's living resources. This funding area is designed to help groups of countries and small island developing states develop strategic action plans.

3. *Contaminant-based Operational Programme.* The objective is to provide funding for innovative technology and demonstration projects designed to measure contaminants, manage and reduce significant toxic

pollutants, and mitigate hazardous effects of ship wastes and ballast water that are transported over long distances in the atmosphere, rivers, or ocean currents. This category of projects is designed to promote innovative solutions, and is not tied to a multi-country collaborative process.

### **Science Merging and Collating Data Management Systems**

The search for global scientific unifying themes for international waters is ongoing. The International Waters programme did not start with much in the way of underpinnings from the international scientific society. In retrospect, it is clear that opportunities were allowed to slip by.

In 1986 the World Meteorological Organization (WMO) organized a task group of over 150 scientists to report on the scientific evidence of ozone depletion. Its report identified the kinds of chemicals that damage the ozone layer, and the way in which they do so, but did not address very extensively the economics and politics of the problem, or the impacts of increased UVB radiation. However, this work did help to prepare delegations for the Montreal Protocol meetings. Similarly, the Intergovernmental Panel on Climate Change (IPCC) was organized in 1988 by WMO and UNEP as a concerted effort to connect the diplomatic world with current scientific knowledge and to provide more momentum to resolving the problem of climate change. Consisting of more than 1,400 government scientists from around the world, it became the expert body on climate change issues. The IPCC was entrusted with the task of forming three work groups. Work Group 1, made up of climatologists, was to collate data and estimate the extent of climate change based on varying levels of anthropogenic emissions of greenhouse gases. Work Group 2 was a multidisciplinary group formed to assess the impacts of climate change. Work Group 3 had the task of formulating strategies and policy options for coping with climate change. The IPCC accomplished the first task of providing balanced scientific judgments, but the other two work groups were substantially delayed.<sup>13</sup> The *Impact Report* of December 1995 provided guidance on the issues that affect climate change, but not about the economic costs and benefits. If these two work groups had functioned better earlier, it would have been very beneficial to the GEF International Waters programme.

One contribution the WMO made to the programme was to publish an inventory of all the water-monitoring, stream gauge, and precipitation capabilities around the world. It revealed that only 60 per cent of countries have even basic networks.<sup>14</sup> A second legacy was the formation of the Alliance of Small Island States (AOSIS), a subgroup of the developing countries during the UNFCCC negotiations. This alliance

was to provide one of the first country constituencies for international waters projects.

Lacking a designated science consortium for the International Waters programme, the pilot phase did not benefit as much from guidance from the STAP. The STAP was set up by the GEF to provide strategic advice on scientific and technical issues, conduct a selective review of projects, and manage a roster of experts. The Panel is made up of 12 international scientists, of whom one or two were water experts. During the pilot phase the STAP opened the way for freshwater and water scarcity investigations, but these projects were turned down by the GEF Council. The Panel also prepared a preliminary paper summarizing international water problems, but it received little attention or input from the larger science community.<sup>15</sup> The resource accounting issues in climate change, such as vegetative changes in forestry, which can also be incorporated as predictive tools to track the loss of moisture from hydrological systems, did not cross over into international waters projects in the pilot phase. While the new STAP appointed in 1995 included three multidisciplinary scientists to represent the subjects of coastal management and desertification, it did not include an international freshwater expert.

In the 1990s the scientific definition of 'international waters' did benefit from the rapid development of many new databases (see Appendix B). First, the ability to start manipulating population densities to track in-migration to coastal and watershed areas became available with the release of military census data after the Cold War. Correlating this population data with established estimates of water resources began to clarify trends in water use. It became possible to overlay population data on GIS data to project growth in river basins and coastal zone areas. The calculations are stark. Human appropriation, now, of renewable fresh water is estimated to be 26 per cent of the total terrestrial evapotranspiration and 54 per cent of the run-off that is accessible. By the year 2025 total human appropriation is estimated to be 70 per cent of accessible run-off. Harvesting more of the freshwater run-off with new dam construction may increase accessibility by 10 per cent over the next 30 years, while during this time the population is projected to increase by 45 per cent.<sup>16</sup> Over the last 30 years the amount of water available per capita in the water-rich countries of northern Europe and in America has decreased by about 12 per cent. In Africa and in many places in Asia per capita water availability over this period has declined by 60 per cent.

Second, remote sensing began to provide much more detailed vegetative mapping, and new assessments on desertification and the declining hydrological capabilities of many freshwater systems became available. Estimates on water resources, calculated by major world water basins,

are now being revised. This will allow population estimates to be evaluated on a dynamic number of the carrying-capacity of known water resources.

Many scientists began deciphering patterns with the new satellite data. Networking with research institutes correlating observations around the world on computers and on the Internet created new forms of information management. In the fall of 1995 ocean temperature data, ordinarily collected to track red tides, became matched with unusually warm water temperatures and world wide bleaching of coral reefs, and the predictable migration of certain kinds of fisheries off shore outside the 200 mile limits of national waters and fishery management. Lake levels and evaporation started to be tracked. Satellite data was used to track oily ship wastes discharged at sea.<sup>17</sup>

Third, the NGO community, whose participation in the GEF Council had been hotly debated during the formulation of the GEF, began to collate data and made significant contributions to the GEF process by making more information available to many more users. Legal information became much more accessible when the International Union for Conservation of Nature and Natural Resources (IUCN) in collaboration with the Consortium for International Earth Science Information Network (CIESIN) established a world wide web site, which made the text and computerized list of parties ratifying and signatories of 150 environmental treaties available on the Internet. A more complete list of the IUCN environmental laws is now being made available on the Internet through the Library of Congress in Washington. FAO in Rome also has one of the world's best collections on national and international water laws, but their system is currently available only on microfiche. The World Conservation Monitoring Centre (WCMC) in Cambridge produced a biodiversity database, mapping all the GISs into one biodiversity map library as well as creating a database of all the donors funding biodiversity sites around the world. Worldwatch in Washington began calculating all the known fishing-fleets using improved technology estimates of fish stocks to find that only 87 per cent of the known world fishing-fleet can be amortized.<sup>18</sup>

Fourth, information technology has allowed all the donor nations to create the Data Activity Index (DAI.INDEX), a CD-ROM listing all the development projects. This is a great tool for countries to develop strategic action plans. One limitation, however, of the DAI.INDEX is that donor activities that affect a common international water body must be pieced together by locating projects along country shore-lines. International waters is only just emerging as a global concept.

## International Businesses

International businesses first got involved in the ozone layer negotiations when they were challenged with the prospect of being regulated and were pressed on the way they operated their businesses. The chemical manufacturers were active participants during the ozone negotiations. International businesses played an active role in the reduction of chlorofluorocarbons (CFCs), halons, and other ozone-depleting substances, and in developing and marketing bridge and substitute chemicals. Hundreds of very inventive practices were initiated by private businesses. Piloting these technologies in East European countries is supported by the GEF. However, the international businesses involved with international water issues have been relatively quiet.

The International Waters programme has been helped by the French and Swedish water management companies both early on, with the French proposal for the GEF, and later. The water management companies have much to offer towards improving the efficiency of municipal water systems. Other categories of industries, however, have not been very active at the project level. This may be because they prefer the increased transactional time of working with regular commercial banks, and country-sponsored banks; an example of this in the United States is the Export/Import Bank (EXIM).<sup>19</sup> Seeing business support weakening for government funding as a result of these changes in the way business is being done present a major challenge for the World Bank and the United States Agency for International Development (USAID), as they face their present reorganizations.

The International Waters programme has attracted industries involved with global information technology. Computer systems monitoring water quality among the 11 countries of the river Danube have been developed. The amount of consultant resources needed to agree on the common protocols regarding monitoring of river systems led to a common criticism in the pilot phase that many projects were consultant-driven instead of country-driven. One problem is that most of the information generation equipment exported on the market today was not even invented two years ago,<sup>20</sup> and require newly trained technicians. However, GEF demonstration projects are now readily exportable. The computer software itself is easily translated and can be interactive in almost all the 11 Danube countries' languages and alphabets. GISs face another problem of young technology—to make systems made by separate manufacturers communicate and report joint results.<sup>21</sup> GIS interactive protocols are in the early stages of development.

Shipping industries have played a very constructive role in the Caribbean projects. The international petroleum industry will jointly participate in the new International Waters GEF Regional Oil Spill Response project. The

International Tanker Owners' Pollution Federation (ITOF) is now negotiating to combine their database on oil-spill readiness with the International Maritime Organisation (IMO).

One outcome of the river Danube project was the Sophia Agreement, which banned the use of phosphate detergents from all 11 countries within the watershed area. Detergents contribute about 5 per cent of the phosphate load in rivers and contribute to algae production. More serious are the problems of polyacrylate, and oestrogen mimickers such as nonylphenol added to liquid detergents to lower the surface tension, both of which are not biodegradable. The detergent industries already package and market detergents designed for all kinds of special markets such as enzyme-free, hard-water, and super detergents.<sup>22</sup> This industry is not active in other GEF projects.

Industries producing water-filter technologies, water-efficient irrigation technologies, or low-flow power generation have also not joined the collaborative process. Without better accounting of resources to provide goals and define net savings from more efficient water management, it will be hard for international business to identify opportunities in the GEF. For example, if a GEF international waters project could buy back an ecological allocation of river water in exchange for the water savings created by fitting a more efficient irrigation system, it could attract businesses demonstration projects.

## National Implementations and Barriers to Further Progress

### *Goal Setting versus Consultation*

Many developing nations regarded the first greening efforts as something imposed by industrial countries to relieve their own industrial pollution. This has been a prominent problem in debates on climate change and ozone depletion, but is not significant in the GEF International Waters programme. The programme, now asking countries to prepare strategic action plans, is in the early stages of consultation and setting goals.

### **Goal Setting**

The Climate Change programme has had the benefit of a common global measure. Greenhouse gases can already be compared on the basis of the number of tons of carbon dioxide equivalent reduced. The process of describing reductions in energy efficiency has not always been easy, developing from the 'binding Toronto Targets', to 'goals', and the final word 'aims', which was written into the Climate Change Convention. In July 1996 the first 'enforceable targets' were agreed upon by international parties in Geneva. The GEF International Waters programme is still at the

stage of dealing with local issues—still unable to set simple targets.

One of the problems with setting global targets is to provide better information on water resources. There are a few country resource accounting systems that include water resources, but they are not well designed to address international waters. In the 1990s the World Bank began to require countries to submit national environment action plans (NEAPs) as part of the its loan strategy. A review of 32 of the first NEAPs submitted to the World Bank showed very little similarity among similar countries in how they evaluated or addressed future water problems. By 1995 more than 75 countries had submitted NEAPs to the World Bank. One of the selection criteria for international waters project funding is consistency with national planning documents. These documents, however, are a long way from performing for the International Waters programme the role that the 'US Country Studies' programme provided as the base accounting system for each country on global climate change.

The US Country Studies programme, begun in 1992 and joined by other donors, has provided \$US35 million in financial and technical expertise to 55 countries. Under the UNFCCC, developing and transition countries are required to supply greenhouse gas emission inventories and report mitigation strategies. These Country Studies have greatly improved the scientific tools for resource accounting, and are now being used to prepare national climate change action plans.<sup>23</sup> The Sub-Saharan African Hydrological Assessment undertaken by UNDP, the World Bank, WMO, the African Development Bank, UN Department for Economic and Social Development (UNDESD), and UNESCO is a start on this.<sup>24</sup>

### Consultation

A 20-year review of nine countries and how they made environmental decisions shows that governments by their nature are consensus builders. NGOs can play a useful role by raising awareness of how national resources are not being used for the public good. However, this study concludes that without a strong scientific basis for goals for the future, like the discovery of the ozone hole and the relationship of CFCs to ozone depletion, or the reduction of 10 million tons per year of sulphuric acid for acid rain, the public interest will not be sustained, and government alone can not drive the initiative forward to create environmental regulations and enforceable policies.

This dilemma is illustrated by the UNEP Regional Seas programmes, which have been largely collaborative, formed around large groups of countries and LMEs based in ecologically decreet basins of the ocean studied by consortiums of international scientists assessing the stress

factors. A new paper prepared by World Conservation Monitoring Centre has proposed the integration of the international waters regulatory structures and science represented by these two programmes.<sup>25</sup> It identifies how LME areas can be nested into the larger regional sea designated areas to provide better science and serve these areas by providing better inventories of resources, identifying losses, and isolating the major stress factors.

### *Piecemeal versus Trend Setting Projects*

Much of the international development community depends on exporting models of economic development or technology that have been tried and built somewhere else. Their experience is project-based. One of the advantages of global environmental projects is their ability to link specific projects to overall global trends. For the International Waters programme this is still evolving. For many of the donor countries and developing countries the connection between water resources and economic development is not close enough to control destructive fishing-fleets, or to make the link between irrigation and fisheries or the early evidence of wells going dry and depleting the recharge capabilities of groundwater. GEF international waters projects have the enormous job ahead of defining local needs and strategic goals, and driving technical and economic development to respond.

### *Stakeholders versus Scientific Information Technologies*

During the pilot phase, several GEF international waters projects formed among the stakeholder countries' networks of work groups. In collaboration with a consortium of international scientists these work groups produced evaluations on a wide range of subjects and this level of collaboration, or 'twinning', has been quite successful.

None of the GEF projects in the pilot phase deal with water efficiency, but several of the new projects will. This area needs scientific help and it is one area where historical data from remote sensing and satellite data can be useful.<sup>26</sup> The pressure on rivers to perform to higher levels for irrigation, to provide sites for low-flow dams for power generation, and to conserve more fresh water from being lost to run-off weigh heavily against demands for the last trickle of water at the mouth of the river, the ecological allocation.<sup>27</sup> In this race, cities requiring more water usually win. It is well documented that the human capacity to absorb all the carrying capacity of a river will surely destroy the rich fisheries and food sources generated in the wetlands and mangroves at the mouth. The river Darling basin, where only 22 per cent of the water reaches the mouth of the river, reports a loss of 80 per cent of its fisheries. Other examples are the Nile, the Ganges, the Rio Grande and Colorado river—

Sea of Cortez, the Chao Phraya basin in Thailand, the Amu Dar'ya, and Syr Dar'ya–Aral. In the Aral Sea, where over-irrigation has diverted so much water that the Sea itself can no longer support life, the fledgling efforts of the international donor community to restore some of the shore habitats still have only a preliminary involvement by the upstream irrigation communities. The International Waters programme is left to find a solution to the Bangladesh problem originally pondered by the French.<sup>28</sup>

#### *Donor Co-ordination versus Grassroots*

One of the main successes of the GEF International Waters programme has been the organization and work generated by networks of research groups established between countries to set priorities, and the development of strategic action plans. Matched with the computer database DAI.INDEX, economic investment strategies can be put in place much faster without the piecemeal approach to each project.<sup>29</sup> Among the new portfolio of the International Waters programme nearly all the projects have strategic action plans.

#### **Conclusion**

The GEF Operational Strategy gave the International Waters programme its first framework, but it is still nascent in many ways. The international waters projects have been successful in a catalytic role, melding many individual problems in water into one programme. The programme has been successful in attracting co-financing. The jog of finding additional international funding has been delegated to the strategic action plans at the project level, but they are being given many new tools.

Help to organize donors and other parties began in December 1995, when the Global Water Partnership was formed by representatives of 56 institutions, including UN agencies, multilateral banks, national governments, private industry, and professional associations to encourage development aid agencies, governments, and other stakeholders to organize a reinforced network, adopt

mutually complimentary policies and programmes, and build better information networks to forge new collaborative arrangements.<sup>30</sup>

Help to quantify and stimulate basic water resource accounting is on the way. 'The Freshwater Resources of the World: A Comprehensive Assessment' will be introduced to the United Nations in the fall of 1997.<sup>31</sup> This assessment will evaluate the present availability, quantity, and quality, and uses of water resources in the world displayed by different regions and river basins. It will also begin to identify interlinked forces driving trends in water use and international priority areas for action.

It will be a challenge to provide a global context for national parties to review water issues, for science to provide better information to conceptualize resource allocations, and for business to deliver more efficient water technologies. The biggest barrier for the GEF International Waters programme is to move away from piecemeal developments and account their projects as incremental solutions in a larger trend. It is as if the GEF began with a programme for international air instead of separate issues of ozone layer depletion and climate change.

Perhaps the GEF International Waters programme has had to depend too much on the project phase to define its mission. Ozone depletion and global warming have had the benefit of substantial international attention and investment in science to help determine and direct these programmes. Without scientific efforts, the water problem may be unable to overcome the traditional funding matrix of the international development community established in country accounts, and professional parameters that divide drinking water and sanitation, irrigation, energy, and fisheries.

Is the GEF Council, constrained by conventions and development world preferences, able to provide the vehicle to authorize more science? Perhaps it needs to set aside part of the project funds to finance some of this project integration. Otherwise another funding source will have to be found. More integration of existing scientific knowledge would lead to more efficient and successful international waters projects. Global water is just on the edge of being discovered.

## Appendix A. GEF International Waters Projects: Pilot Phase and New Project Portfolio

Key: \* Projects began in the GEF pilot phase  
 † Projects in the GEF operational phase  
 ‡ Projects with project development funding (PDF)  
 \*\* IW projects started in the pilot phase that found funding under the GEF Biodiversity programme

| Type of project   | GEF financing–(co-financing)<br>(\$USm.) |
|---|--|
| <b>Water Based Operational Programme</b>  |  |
| Industrial Water Pollution Control in the Gulf of Guinea Large Marine Eco-system (regional)   | 6.00 /(0)                                |
| Environmental Management of the river Danube (11 riparian countries of river Danube)  | 8.50 /(35.00)                            |
| † Lake Victoria Environmental Management (Kenya, Tanzania, Uganda)  | 35.00 /(35.00)                           |
| ‡ Implementation of the Strategic Action Plan in the river Danube basin (regional)  | 0.29 /PDF                                |
| <b>Integrated Land and Water Multiple Focal Area</b>  |  |
| <i>Semi-enclosed seas and marine ecosystems</i>   |  |
| Environmental Management and Protection of the Black Sea (regional)   | 9.30 /(23.30)                            |
| Ship-Generated Waste Management (Organization of Eastern Caribbean States)  | 12.50 /(28.5)                            |
| Wider Caribbean Initiative for Ship-Generated Waste (Wider Caribbean)   | 5.50 /(0)                                |
| Protection of Marine Ecosystems of the Red Sea Coast (Yemen)  | 2.80 /(0)                                |
| ** Seychelles Biodiversity Conservation and Marine Pollution Abatement  | Biodiversity                             |
| ** Ghana Coastal Wetlands Management  | Biodiversity                             |
| † Gulf of Aqaba Environmental Action Plan (Jordan)  | 2.70 /(7.77)                             |
| † Strategic Action Programme for the Red Sea and Gulf of Aden (regional)  | 0.34 /(0)                                |
| ‡ Development of a Self-Sustaining Mechanism to Ensure the Environmental Management of the Black Sea (regional)   | 0.05 /PDF                                |
| <i>Lakes and freshwater systems</i>   |  |
| Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika   | 10.00 /(0)                               |
| Lake Manzala Engineered Wetlands (Egypt)  | 4.50 /(6.63)                             |
| ** Romanian Danube Delta Biodiversity   | Biodiversity                             |
| ** Ukraine Danube Delta Biodiversity  | Biodiversity                             |
| ** Lake Malawi/Nyasa Biodiversity Conservation  | Biodiversity                             |
| ‡ Lake Ohrid Conservation and Management (Albania, Macedonia)   | 0.23 /PDF                                |
| ‡ Integrated Management of the Lake Chad Basin  | 0.35 /PDF                                |
| <i>River basins</i>   |  |
| ‡ Dnieper River Basin, Assessment of Priority Transboundary Water-related Environmental Problems and Preparatory Phase of a Strategic Action Programme (Ukraine, Belarus, Russia) | 0.26 /PDF                                |
| ‡ Tumen River Development Programme (North-east Asia)   | 0.24 /PDF                                |
| ‡ Bermejo River Binational Basin (Argentina, Bolivia)   | 0.23 /PDF                                |
| <b>Contaminant-based Operational Programme</b>  |  |
| Oil Pollution Management for the South-west Mediterranean Sea (Algeria, Morocco, Tunisia)   | 18.30 /(0)                               |
| Prevention and Management of Marine Pollution in the East Asian Seas (regional)   | 8.00 /(3.4)                              |
| China Ship Waste Disposal (China, six-port demonstration project)   | 30.0 /(15.0)                             |
| Support for the Regional Oceans Training Programmes   | 2.60 /(2.60)                             |
| ‡ Regional Oil Spill Response (Africa)  | 0.14 /PDF                                |
| TOTAL   | 156.39 /(157.20)                         |

Source: GEF (1996), *Quarterly Operational Report*, July.

## Appendix B. International Scientists and Management Databases Useful for International Waters Projects

### International Donor Co-ordination

DAI.INDEX, a database of all the projects funded by the multilateral and bilateral international assistance programmes of 23 of the industrialized countries. (IDRC, Coordinating Unit for INDEX, Ottawa, Canada, fax: +613-563-3858, e-mail: index@idrc.ca.)

Strategy for International Fisheries Research (SIFR), established in 1992 by the World Bank, UNDP, FAO, and Commission of European Community to match donors with research priorities of developing countries. Ottawa, Canada. Brian Davey, fax: +1-613-236-6163, e-mail: bdavey@idrc.ca

### Treaties and Laws Affecting the Environment and Compliance

IUCN and CIESIN, International Laws and Agreements: Policy Instruments Database (1995). Internet: <<http://www.ciesin.org/TG/PI/TREATY/envagree.html>> or <<http://www-int.worldbank.org:80/html/libraries/legad/treaty.html>>, e-mail: hgeller@ciesin.org, fax: +1-202-775-6622, or +1-517-797-2822.

Ship Wastes/Port State Control databases. Ship compliance with environment regulations, Tokyo MOU, Capt. Rejean Lanteigne, Canadian Coast Guard, tel: +1-613-991-4962.

### Resource Inventories

#### Water Availability

'Monograph on World Water Resources at the Beginning of the 21st Century', UNESCO, I. A. Shiklomanov, fax: +33-1-45-67-5869.

'Monograph on Groundwater Resources of the World and their Uses,' UNESCO, Habib Zebidi, tel: +33-1-45-68-3998, fax: +33-1-45-67-5869.

'Freshwater Resources of the World: A Comprehensive Assessment', Stockholm Environment Institute, Fall 1997 (forthcoming), tel: +46-8-24-84-41, fax: +46-8-723-03-48, e-mail: gbjorklund@nordnet.se

WMO (1995), 'Hydrological Information Referral Service-INFOHYDRO Manual', WMO No. 683.

UNDP, WB, ADB, WMO, UNDESD, and UNESCO (1996), 'Sub-Saharan Africa Hydrological Assessment', Forty Country Reports on Hydrological Monitoring, e-mail: gmathews@worldbank.org  
Satellite data on vegetative mapping. Example: National Oceanic and Atmospheric Administration (NOAA), Office of Satellite Operations <<http://psbsgi1.nesdis.noaa.gov:8080/EBB/ml/nic0.html>>, e-mail: pcelone@nesdis.noaa.gov, <<http://psbsgi1.nesdis.noaa.gov:8080/IPD/IPD.html>>

#### Marine Resources

17 August 1996 the Japanese launch a new ocean colour imagery satellite. This data tracks turbidity and coastal conditions.

COOMBSPAPER Data Bank is an electronic repository of research materials dealing with the Pacific region, South-east, and North-east Asia. Dr T. Mathew Ciolek, Australia National University, Canberra. Internet: <<http://wuarchive.wustl.edu> (128.252.135.4) doc/coombspapers>

Coral Reef Bleaching: A. E. Strong, C. S. Bertiantos, C. Daily, and J. Sapper (1996), *Improved Satellite Techniques for Monitoring Coral Reef Bleaching*, NOAA/NESDIS (Washington: NOAA). Internet: <<http://pabpgil.nesdis.noaa.gov:8080/PSB/EPS/SST/contour.html>>

#### Large Lakes

Global Lakes Database at the Department of Space and Climate Physics, University College London, monitors short- and medium-term lake volume changes and regional climate change. The programme focus is on semi-enclosed lakes, 59 per cent of which are located on the

Asian continent. Fax: +44-1-48-327-8312, e-mail: emb@mssl.ucl.ac.uk

Large Lakes Project, UNESCO, will produce monographs for Lake Victoria, Tanganyika, and Malawi compiling research of the last 15 years on hydrology, limnology, and pollution. Frits Roest, fax: 0-317-418552, e-mail: roest@iac.agro.nl

International Decade of East African Lakes (IDEAL) maintains a database of scientists and limnologists actively working on African lakes. Tom Johnson, Duluth, Minnesota, fax: +1-218-726-6979.

The Society of International Limnologists (SIL) has a database of tropical lake experts world-wide and the lakes they have studied. Brij Gopal, New Delhi, fax: +91-11616-5886, e-mail: Brij@juniv.ernet.in

#### Coastal Development

FAO/CAMBIS Database is world-wide listing of projects and programmes in International Coastal Area Management. FAO, Rome, tel: +39-6-579-52251, fax: +39-6-522-53152.

NetCoast is a network for coastal zone management and related policy and research areas. Fax: +31-70-311-4380. E-mail: czmc@rikz.rws.minvenw.nl. Internet: <http://www.minvenw.nl/projects/netcoast/>

#### River Basins

UNEP/ University of Texas, Rapid Assessment, fax: +1-617-266-8303, e-mail: pkirshen@tellus.com

UNDP, River Basins, Roberto Lento, fax: +1-212-906-6970, e-mail: roberto.lento@undp.org

FAO, River Basin Planning, Wulf Klohn, fax: +39-6-522-6275, e-mail: wulf.klohn@fao.org

World Bank, 'River Basin Development and Management: A Diagnostic Tool', M. Koch-Weser, fax: 522-1664, e-mail: mkochweser@worldbank.org

#### Forestry

The FAO Forestry Resource Assessment Project in Rome tracks forestry trends from 1960. K. D. Singh, tel: +39-6-5228-2965, fax: +39-6-5960-2863.

The International Society for Mangrove Ecosystems (ISME), in Okinawa, Japan tracks world-wide data, fax: +81-98-895-2864.

#### Fisheries

'Report of the Global Fisheries Workshop', 27 Oct. 1994. Reporting remote sensing technology available for monitoring fish stocks. US State Department., David Hougan, tel: +1-202-647-3073.

#### Population Pressure

OECD: Club de Sahel and World Resources Institute in Washington have developed a population database for Africa with GIS data sets for towns, roads, and market centres, including agricultural statistics, boundaries of protected areas, forests, and wetlands.

WRI: Norbert Henninger, tel: +1-202-662-2553. The population database was compiled by the National Center for Geographic Information and Analysis (NCGIA): Uwe Deichmann, tel: +1-805-893-8652, e-mail: uwe@ncgia.ucsb.edu. The data is compatible with other projects such as the African 30-minute Digital Elevation Model produced by the EROS Data Center, Sioux Falls, or the African watershed boundaries produced by UNEP/GRID, Sioux Falls, S. D. Ashbindu Singh, tel: +1-605-594-6107, e-mail: grid@grid.cr.usgs.gov

International Institute for Applied Systems Analysis in Austria provides population data at the second and third levels on the Internet. Wolf Ludz, tel: +43-22-36-71-521, fax: 43-22-36-71-313.

## Sources of Pollution

The Dutch consulting firms have developed several industrial pollutant discharge modelling systems with water quality health effects. One example is the Decision Support System for Industrial Pollution Control Database Model with RIVM, I. Sebastian, Jan Linders, fax: +31-30-274-2971. Internet: <www://ESD.Worldbank.org/ENVPE/dss.htm>

Information on actions of international organizations and regulation by country of toxic chemicals direct use, release, and discharge. The Pollutant Release and Transfer Register. Internet: <http://irptc.unep.ch/prtr/welcome.html>

*Toxic Watch 1995: Toxic Chemicals in the Environment*, diagnostic on all US reporting requirements that tracks the purchase of toxic substances and their use in the manufacturing process to the final disposal or release required by all US report requirements regulating the waste stream. INFORM, Alexandria, Virginia, tel: +1-703-683-6695.

Pesticide import and export databases are available from the UN Industrial Development Organization, UNIDO: Global Reports in Vienna, Austria, Sami Sharmy, fax: +43-1-231-1-56, Internet: <http://www.unido.or.at/about/outline.html> and from Stanford Research Institute, world import-export pesticide data available by subscription, Palo Alto, tel: +1-415-326-6200.

## Notes and References

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  2. Ian A. Bowles and Glenn T. Prickett (1994), Reframing the Green Window: An Analysis of the GEF Pilot Phase Approach to Biodiversity and Global Warming and Recommendations for the Operational Phase (Washington: Conservation International/Natural Resources Defence Council), 28.
  3. Mohamed T. El-Ashry (1995), 'Realism on the Environment: Good Policy Matters to Effectiveness of Any Sustainable Development Financing, but the Financing Must be There', The Earth Times, vii/17 (24 Oct.), 9-10.
  4. 'Conventions and agreements relating to land-based sources of pollution, port reception facilities, coastal dumping, offshore facilities, emergency response, marine fisheries, protected areas designations, hazardous substance transport and disposal, international trade, endangered species, and the biodiversity, climate change, and desertification conventions all play a role in achieving global protection of international waters. The RAMSAR convention, in particular, is important for identifying wetlands in need of protection. Four new initiatives and their associated action programs also have special linkages. The Barbados Programme of Action for the Sustainable Development of Small Island Developing States, the Intergovernmental Conference to Adopt a Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (adopted as the "Washington Programme of Action" in November 1995), the U.N. Convention to Combat Desertification, and the recently negotiated Agreement of Straddling Fish Stocks and Highly Migratory Fish Stocks (with parallel negotiations on a technically oriented Code of Conduct for Responsible Fishing, consisted with (UNCLOS) have action programs associated with them' (GEF (1996), Operational Strategy, 60). For a more complete review, IUCN
- (1995), The Law of the Sea: Priorities and Responsibilities in Implementing the Convention (Gland: IUCN).
5. Informal discussions with Pierre Pissaloux, formerly Chef de Bureau, Direction du Trésor, Paris, and Thierry Baudon, formerly with the World Bank, Paris, Mar. 1996.
  6. Statement of the Board of Governors at the Annual Meeting by Pierre Beregovoy, Minister of State for Economy, Finance and the Budget, and the Governor of the Fund of France, 26 Sept. 1989; cited in Helen Sjöberg (1994), From Idea to Reality: The Creation of the Global Environment Facility, GEF Working Paper No. 10 (Washington: World Bank), 15.
  7. Enforcement of international standards for ship safety and pollution prevention by the port state is known as port state control (PSC). Traditionally, maritime safety and pollution prevention at sea and in ports have been considered the responsibility of the state in which the vessel is registered (flagship), the ship-owner and the operator, and the crew. Port states have found it desirable to extend their jurisdiction to include foreign flag vessels in their internal waters for the purpose of protecting their coastline and harbours. Several regional regimes have evolved to increase the effectiveness of PSC measures through the collective Memorandum of Understandings (MOU) and to develop shared databases of ship inspection reports. These include the Paris MOU in San Merlot, the Latin American Agreement in Buenos Aires, and the Tokyo MOU maintained by the Canadian Coast Guard. Only the Tokyo MOU has the authority to impound ships for environmental violations.
  8. The UNEP Land Based Source Conference, Washington, Nov. 1966, provided the international forum to address these issues directly, calling for a global reduction of 12 substances.
  9. International Maritime Organization, cited in UNCTAD.
  10. World Bank (1992), Infrastructure and Urban Development Department: Advisory Note No. 1 (Washington: World Bank), 2.
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US/EPA and US/Geological Survey maintain a GIS map system to estimate the use of 96 herbicides, annual sales of nitrogen fertilizers, livestock holdings, and cropping patterns for the conterminous United States available on Internet: <http://h2o.usgs.gov/pubs/bat/bat000.html>

## Country Capacity Databases

### *Oil Spill Contingency Plans*

The International Tanker Owners Pollution Federation (ITOF), has a database of country profiles identifying the location of available equipment world-wide and how fast it can be deployed, the spill response management of a country, the spill notification point, country policies on using chemicals, or different types of clean-up procedures. It also includes the status of ratifying MARPOL and its separate annexes, OPRC, and UN compensation treaties. ITOF, London, Joe Nicoles, tel: +44-1-71-621-1255.

### *Global Waste Survey*

The International Maritime Organization inventoried the ship-to-shore waste disposal facilities for more than 105 countries. More in-depth studies were done for a group of countries in East Africa and the South China Sea to track how ship wastes are handled by local landfills and incineration facilities, and recycling capabilities. IMO, London, Adrian Ross, tel: +44-1-71-587-3238.

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16. Sandra L. Postal, Gretchen C. Daily, and Paul R. Ehrlich (1996), 'Human Appropriation of Renewable Freshwater', *Science*, 271 (Washington: AAAS), 785–8.
17. 'Two Eyes are Better than One', *Science*, 271 (Washington: AAAS), 725. NASA and the German national space agencies have a co-operative agreement to product a radar scan on oil in the North Sea, Oct. 1994. This is an experiment to see if the radar environment satellite networks can be used to track ship pollution (Werner Alpers, Institut für Meereskunde, University of Hamburg).
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24. The Sub-Saharan African Hydrological Assessment (1993), *Forty Individual Country Studies* (Washington: World Bank).
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27. The Murray–Darling River Basin Commission, Australia, after 15 years of negotiating, requires a sharing of the river waters among the states, a flexible amount to be assessed each year, with a specified volume to be reserved to protect the integrity of the entire water system.
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29. Jessica Matthews (1996), Untitled article, *Foreign Affairs*, 75/5 (New York: Council of Foreign Relations, Nov.).
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