Integrated management of land and water resources based on a collective approach to fragmented international conventions

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Interlinked crises of land degradation, food security, ecosystem decline, water quality and water flow depletion stand in the way of poverty reduction and sustainable development. These crises are made worse by increased fluctuations in climatic regimes. Single-purpose international conventions address these crises in a piecemeal, sectoral fashion and may not meet their objectives without greater attention to policy, legal, and institutional reforms related to: (i) balancing competing uses of land and water resources within hydrologic units; (ii) adopting integrated approaches to management; and (iii) establishing effective governance institutions for adaptive management within transboundary basins. This paper describes this global challenge and argues that peace, stability and security are all at stake when integrated approaches are not used. The paper presents encouraging results from a decade of transboundary water projects supported by the Global Environment Facility in developing countries that test practical applications of processes for facilitating reforms related to land and water that are underpinned by science-based approaches. Case studies of using these participative processes are described that collectively assist in the transition to integrated management. A new imperative for incorporating interlinkages among food, water, and environment security at the basin level is identified.

Keywords: integrated land and water management; water security; transboundary basins; stakeholder participation; water governance; Global Environment Facility

1. INTRODUCTION

Thirty years after the Stockholm Conference, a decade after Rio, and directly following the WSSD, the International Year of Freshwater, 2003, still finds the world community facing many crises. The crises related to land degradation, food security, water quality degradation, ecosystem decline, water insecurity, poverty, and economic losses from extreme hydrologic events are all interlinked, the root causes stem from government policy failures, and both the North and the South have much work to do to address the issues. Despite dire warnings, the most that could be accomplished at the WSSD was to set targets for reducing by one-half the number of people without access to drinking water supplies and basic sanitation by the year 2015. Although the need for improvement in basin planning was included in general terms in the WSSD action programme, the issue of transboundary freshwater basins, constituting *ca.* 45% of the land area of the globe and providing *ca.* 60% of global surface freshwater, was conspicuously controversial and missing from the programme.

This paper explores the nature of these interlinked crises and the international legal framework that is sectoral and fragmented in nature, or in the case of transboundary freshwater is still missing. Opportunities are identified for the convention objectives to be attained through cross-

sectoral and integrated approaches to the management of land and water resources. Because many land-use decisions are also water-use decisions, land management and water resource management must be considered collectively to make progress. Furthermore, vapour flows within the hydrologic cycle that support biomass production can no longer be ignored in favour of emphasis on more easily seen water in rivers, lakes and groundwater. This collective approach relies on hydrologic units as the basis for achieving integration of land and water resource sector policies and programmes as well as the development of institutions through legal reforms, including institutions for conservation of groundwater supplies. Investments and pilot projects alone have not proved sufficient as evidenced by deepening of the interlinked crises on every continent.

For the past decade, countries have begun testing application of the needed policy, legal, and institutional reforms for implementing these more integrated approaches through the GEF. A focus is provided on large, transboundary water systems as the entry point towards improving integrated approaches. Participative processes are described in the paper that actively involve national inter-ministerial committees for building cross-sectoral capacity, confidence, and trust to work on a hydrologic unit basis as well as across international borders in large basins. The important role of undertaking science-based assessments to unravel complexities and set priorities for building institutions is described, as is the importance of harnessing stakeholder participation

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through on-the-ground demonstrations. Several case studies for specific multi-country basins are described.

2. LINKED GLOBAL CRISES

The arithmetic is gloomy for freshwater basins and the people living in them. The impending freshwater crisis was described by the World Commission on Water (2000). Whereas the population of our planet tripled in the last century, water use increased sixfold. Currently, 2.4 billion people lack access to basic sanitation and 1.1 billion people lack access to safe water sources. Although nearly two billion people live with water scarcity today, the number is expected to rise to about four billion—half the planet—by 2025 unless radical reforms emerge. Agriculture, much of it subsidized with wasteful irrigation, is responsible for over 70% of water use globally. Three billion people live on less than US\$2 per day, 800 million people are malnourished.

Given existing policies, demand for water withdrawals will probably increase 40% by 2025 as projected by the Commission to meet increased needs for irrigation to feed a growing world, fuel increased industrial activity, and meet human water consumption needs. Existing water withdrawals, mostly for wasteful irrigation, have already created an unprecedented environmental disaster with the world's aquatic biodiversity, and about one-half of our planet's wetlands have already been lost. Rivers, lakes and deltas have already dried up with overuse, and poorly treated or untreated human sewage fouls most major rivers and coastal ecosystems.

The Commission's projected 40% increase in water withdrawals will trigger massive ecosystem collapse and social unrest, especially in downstream coastal areas as noted by GESAMP (2001). There is just not enough water in many basin systems to support projected increases. The GESAMP assessment has described the collapse of coastal and marine ecosystems around the world from sewage, mud, and fertilizer nitrogen as well as the loss of coastal wetlands such as mangroves to short-lived aquaculture facilities to produce foreign exchange and to river flow depletion resulting from irrigation and groundwater pumping. As noted by GESAMP, the benefits are short-lived and the resulting loss of reproductive habitat diminishes life in the oceans.

Similar trends exist with land degradation. Approximately 70% of drylands in agricultural use are degraded and desertification damages *ca.* 30% of the world's land area (Secretariat for UNCCD 2002). Drought and desertification threaten the livelihoods of over one billion people in 110 countries around the world, costing about \$42 billion annually. In addition, conversion of wetlands to uses such as agriculture and deforestation of basins continue to take a toll on watersheds and their ecological and hydrologic functioning, increasing vulnerability to repeated droughts and floods. When fluctuating climatic regimes are added to this situation of watershed deterioration, the resource base can no longer sustain populations. Indeed, the International Federation of Red Cross and Red Crescent Societies (2002) noted in its annual assessment that for the first time in history, natural and

environmental disasters have displaced more people than war, with about 34 million people affected. The number of people affected by insecurity has increased fourfold since the 1970s according to the assessment, further adding disproportionately to poverty.

Water supply and basic sanitation access improvements mandated by the WSSD in Johannesburg in 2002 constitute an essential step forward, but they are by no means sufficient to resolve the water-related crises. Critical policy, legal and institutional reforms and trillions of dollars of additional investments have been identified as needed over the next decade. By focusing on more irrigation for food production and increased sectoral investments for water supply and basic sanitation, the year 2015 may be characterized by: (i) a world of standpipe infrastructure piping polluted water; (ii) basic latrines leaking contamination to groundwater supplies or releasing untreated sewage to waterways; (iii) poorly functioning water supply impoundments, hydropower investments, and irrigation works filled with eroded soil; (iv) empty standpipe water systems resulting from water shortages caused by upstream wasteful irrigation works constructed to meet the food crisis; (v) abandoned community standpipes and latrines resulting from out-migration to peri-urban areas of mega-cities, and (vi) an eroded, degraded rural landscape with depleted soils and depleted biodiversity unable to produce sufficient food and livelihoods for people.

Sector by sector development of freshwater basins has resulted in unprecedented degradation of the water ecosystems that entire nations depend on for economic and human security. Although extensive drainage of wetlands and provision of irrigation in the green revolution of the 1970s bought time in feeding a growing humanity, it left a legacy of disenfranchised poor people and degraded waterbodies that still await remediation (Duda & El-Ashry 2000). Recent global assessments made by the World Resources Institute (Revengea *et al.* 2000), which were partly funded by the GEF, show that aquatic ecosystems are the most damaged and most threatened ecosystems on our planet. These assessments provide a new driving force under the CBD to divert water back from existing irrigation and treat sewage discharges so that damaged ecosystems may be restored as a cost-effective intervention for poverty reduction and for the protection of global public goods.

Resource depletion and economic damage from fluctuating climatic regimes are growing more significant each decade and are further endangering our life support systems. Climatic fluctuations, in particular, represent an unprecedented threat to social stability, community livelihoods, and food security. Economic losses from disasters like floods and droughts are doubling about every 10 years and have reached almost US\$1 trillion over the past 15 years, posing enormous losses for the insurance industry (Innovest SVA 2002). As a result of resource depletion and increasing climatic fluctuations, people will be forced to relocate. The water and land ecosystems that they depended on for livelihoods and protein will no longer be able to provide sufficient benefits in their degraded condition. As a result, most of the world's population will for the first time become urban in character, creating more intractable problems in megacities, and societal insecurity may lead to political insecurity.

Conflicts between competing sectoral uses of water are becoming more common and are threatening internal as well as external security for many nations. The degradation caused by river pollution and flow depletion now crosses national borders and reaches downstream coastal zones, resulting in irreversible saltwater intrusion and coastal ecosystem degradation. Transboundary basins cover *ca.* 45% of the planet's land area and contain 60% of freshwater. When downstream impacts are coupled with depletion of coastal oceans through overfishing, future flashpoints for disputes among nations and for internal social unrest are developing over conflicting uses of basins and marine ecosystems. Nothing less than the economic security of nations and the social viability both inland and coastal communities is at risk.

3. ROLE OF INTERNATIONAL CONVENTIONS

The world community uses intergovernmental negotiating processes to develop international treaties that serve as the principal source of legally recognized rights and obligations among states. Many of the subjects of such global conventions are controversial, and the most that can be expected in some cases are framework conventions representing the lowest common denominator necessary to reach agreement on an issue. Four single-purpose international conventions are directly related to the linked crises affecting land and water resources: the CBD, UNFCCC, UNCCD and the UNCLOS. No freshwater-related convention has entered into force that outlines the behaviour of parties for balancing uses of water within their sovereign jurisdictions or for linking land management with water management. Short descriptions of four relevant framework conventions follow.

(a) *Convention on Biological Diversity*

The CBD was negotiated in various sessions leading up to the Earth Summit in 1992, where over 100 nations signed the treaty. About 185 parties had become signatories by the time of WSSD. The CBD reflects a growing consensus that biodiversity conservation and management is an integral part of sustainable development. Many sectors of a nation's economy depend directly or indirectly on the diversity of ecosystems and poor people, in particular, use these assets to provide protein and livelihoods.

The Convention's objective is the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits from its use, including genetic resources. Each party has a responsibility for conservation and sustainable use of its own biological diversity through its own processes, activities and institutions. Implementation is through national strategies, plans, and programmes that integrate with decision-making in sectoral activities. Countries are asked to establish priorities and then report them to the CBD through strategies, plans, and reports. Developed nations are to provide financial resources to developing nations and the GEF has been named to operate the financial mechanism for the Convention.

(b) *United Nations Framework Convention on Climate Change*

The UNFCCC was also negotiated in the sessions leading to the Earth Summit in 1992. The Convention aims

to minimize the negative impacts of global warming by returning concentrations of greenhouse gases in the atmosphere to safe levels. However, it does not define 'dangerous levels' and was truly a framework convention in that much 'unfinished business' remained, including development of commitments for industrialized countries that were subsequently outlined in the Kyoto Protocol. The Protocol sketched out features of its 'mechanisms' and 'compliance' systems but did not determine the rules for operation. The 'rules' were subsequently adopted in the 'Bonn Agreements' and 'Marrakesh Accords' during 2001. By 2002, 186 governments had become parties to the Convention.

All parties must prepare and regularly update national climate change mitigation and adaptation programmes, including measures to address sources of greenhouse gas emissions and to protect and enhance 'carbon sinks and reservoirs' (such as forests). They must promote the development, application, and transfer of climate-friendly technologies and practices as well as the sustainable management of carbon sinks. All parties are required to make preparations to adapt to climate change, compile inventories of greenhouse gas emissions, and submit reports (known as national communications) on the actions they are taking to implement the Convention. Consistent with the Kyoto Protocol, industrial nations are to demonstrate their leadership in addressing climate change by adopting climate change policies and measures aimed towards the non-legally binding target of returning their greenhouse gas emissions to 1990 levels by the year 2000. Developed nations are also required to provide financial resources to developing nations. As with the CBD, the GEF has been named to operate the Convention's financial mechanism, and programmes for addressing adaptation were under development as of 2002.

(c) *United Nations Convention to Combat Desertification*

During the 1970s, desertification and land degradation attracted global attention in Africa and a 'Plan of Action' was adopted by the world community. As with other international 'plans', funding was inadequate and progress was disappointing. At the Earth Summit in 1992, an agreement was struck to give the subject more attention, and by 1994, 102 countries concluded negotiations in Paris on the new treaty known as UNCCD. Its objective is to combat desertification and mitigate the effects of drought. It is designed to be implemented through national action programmes prepared by national consultative committees with the support of international cooperation and through four regional action programmes contained in annexes to the Convention. By 2002, 184 nations became parties to the convention.

With its bottom-up approach through participatory community involvement in the national action programmes, parties are called upon to improve living conditions for the poor residing in drylands and to address root causes of desertification through changes of legislation and policies. Developed country parties are to provide financing and other forms of support through bilateral and multilateral financial mechanisms. A 'global mechanism' was established to improve coordination of existing funding. Unlike CBD and UNFCCC, the GEF

was not originally asked to operate the financial mechanism. However, at WSSD in 2002, a call was made for the GEF to become a financial mechanism. At the GEF Assembly in October, 2002, land degradation and desertification became one of the five focal areas, and a subsequent Conference of the Parties of the UNCCD is expected to request the GEF to become a financial mechanism.

(d) *United Nations Convention on the Law of the Sea*

First discussed in 1967, UNCLOS was eventually adopted in 1982 as an unprecedented attempt by the world community to regulate all aspects of the resources of the sea. It entered into force in 1994 and by 2002, 137 nations and the European Union had become parties. The Convention establishes basic obligations of states to protect, conserve, and manage the marine environment in various zones within and beyond national jurisdiction. Within continental shelves and exclusive economic zones, individual coastal states have been designated certain powers. UNCLOS defines the rights and obligations of states fishing on the high seas and calls on states to prevent, reduce, and control pollution from land-based sources, the atmosphere, dumping, vessels, and installations used to explore and mine the seabed. It outlines the general obligation for all states to take measures against pollution, including the establishment of national rules, standards, practices and procedures as well as cooperating with neighbouring states at the regional level.

As a framework convention, UNCLOS was designed for subsequent regional agreements to be adopted for specific shared waters, and no financial mechanism was established for its pollution and fishery provisions. Although specific treaties were subsequently enacted related to fisheries, only a voluntary action programme exists related to Articles 207 and 213 on pollution and other land-based activities that degrade coastal waters. In late 1995, an intergovernmental meeting was convened in Washington where 109 countries adopted the 'Washington Declaration' and its GPA for the Protection of the Marine Environment from Land-based Activities. The GPA does not include a financial mechanism; however, it invited the GEF to build upon the work of the GPA and fund activities consistent with the GEF Operational Strategy.

One additional single-purpose instrument deserves mention. After 24 years of work, the International Law Commission of the United Nations adopted a set of 32 draft articles in 1994 which were adopted with revisions by the United Nations General Assembly in 1997 as the 'Convention on the Law of the Non-Navigational Uses of the International Watercourses' (Wouters 2002). The convention includes language similar to the 1966 Helsinki Rules requiring riparian states along an international watercourse to exchange data, cooperate in management, protect basin ecosystems, and notify each other of possible adverse effects of planned actions. Despite the draft convention being open for signature for the past 5 years, very few nations have signed. This leaves a gap in the global convention framework on freshwater, which in turn leaves a gap when integrated approaches are pursued among conventions. Whereas concerns about climate change, biodiversity loss and desertification have led to

global conventions with at least a start towards reversing the situation through initial commitments of the parties, the political economy of water and its characteristics as a social good have served as barriers to global commitments on water resources.

Fragmentation through single-purpose secretariats for single purpose conventions and different focal points for each may result in narrow implementation. Single-purpose international and bilateral agency programmes often encourage development of single-purpose, sector-by-sector country programmes in the developing world that further fragment the situation. With attention to implementation and reporting by political unit and single-purpose theme rather than by hydrologic unit, opportunities to tackle inter-linkages among the crises may be missed and lack of funding may narrow implementation further as ministries compete for funding. As convention implementation matures, priorities need to be set to deal with important issues first, and integrated approaches need to be pursued based on collective responses to the international commitments to address the limiting factor of water and cope with limited financial resources.

4. PILOTING INTEGRATED APPROACHES THROUGH THE GLOBAL ENVIRONMENT FACILITY

The GEF was established in 1991 as a pilot multilateral financial mechanism to test new approaches and innovative ways to respond to global environment challenges in its four focal areas of climate change, biodiversity conservation, ozone depletion, and international waters. Land degradation was also addressed as it relates to the focal areas. After 18 months of negotiations, agreement was reached in 1994 to transform the GEF into a permanent financial mechanism. The restructured facility, with its US\$3 billion trust fund, is open to universal participation, with 173 countries currently as members. The GEF Council, which establishes the policies, consists of 32 constituencies representing all participating nations. Following restructuring, the Council adopted an Operational Strategy (GEF 1996) defining the strategic framework for action for the Facility in its focal areas as a major catalyst for improving the global environment within the context of sustainable development.

The GEF builds upon a partnership among the UNDP, the UNEP and the World Bank. These three implementing agencies can access funding on behalf of developing countries and those in economic transition for activities consistent with the Operational Strategy. In restructuring the GEF, governments ensured that it fully embodied the principles that were set out in the Rio conventions and in the action programme known as Agenda 21. The GEF has been named as the financial mechanism for the UNFCCC and the CBD and serves as a mechanism for international cooperation in providing new and additional finance to meet the agreed incremental costs of measures that achieve global environment benefits. In its first decade, GEF allocated US\$4.2 billion in grant finance in its focal areas supplemented by \$11 billion in co-finance for over 1000 projects in 160 developing countries, with most of the finance devoted to climate and

biodiversity projects consistent with guidance provided by the conferences of the parties (GEF 2002a).

(a) *Global Environment Facility international waters focal area*

In the international waters focal area, countries face complex water-related environmental problems that are transboundary in nature. The Operational Strategy approved by the GEF Council outlines that the GEF will contribute primarily as a catalyst to the implementation of comprehensive, ecosystem-based approaches to managing the transboundary waters and their drainage basins as a means of generating global environmental benefits. The GEF implementing agencies assist countries to find means of collaborating with neighbouring nations so as to change the way human activities are undertaken in the different economic sectors that place stress on the water environment, so that transboundary conflicts, water, and environmental problems in the watersheds can be resolved. The goal is to help each of the countries use the full range of technical, economic, financial, regulatory and institutional measures needed to operationalize sustainable use strategies for transboundary waterbodies and contributing basins. This often involves a change in activities occurring on the land so that stress on the waterbody may be reduced. Consequently, integrated approaches to land and water resource management often constitute the solution to the priority problems.

The Operational Strategy (GEF 1996) recommends the use of several tools to facilitate building capacity, trust, and confidence among nations to focus on shared basins as well as country commitments to reforms and investments that take an integrated approach to land and water resources. The key tools are known as the TDA, the SAP, national interministerial committees, and local demonstration activities. The strategic approach often followed is to start with the entire multi-country basin, move into single-country tributary basins for demonstration activities related to integrated land and water resource management, and then assist the nations in undertaking policy, legal and institutional reforms to replicate successful demonstration activities, often in concert with investment lending from multilateral finance institutions or donor organizations.

(b) *Transboundary diagnostic analysis/strategic action programme process: a tool to facilitate integrated approaches*

Typically, GEF assistance to countries for addressing international waters issues starts with an initial strategic project involving the collaborating nations in the basin. The countries often establish country-level inter-ministerial committees to participate in the projects and frequently start out by examining scientific information on the ecological status and sectoral uses of the waterbody or transboundary basin. This analysis is ideally collated into a TDA that reflects participation of both the science and management communities in the countries within the philosophy of joint fact-finding (Duda 1994; Ollila *et al.* 2000). The aim is to produce a science-based assessment of the key transboundary problems and their root causes through a causal chain analysis. In this way a process of joint fact-finding can assist the countries and different

Figure 1. Growth of the GEF allocation (black diamonds) and co-finance (grey squares) in the international waters focal area over 10 years.

stakeholders to become cognisant of the top priority transboundary concerns, learn to use participative processes, and focus on just several key issues. Programmes that address all issues are often doomed to failure, so establishing integrated approaches to just one or two key transboundary issues is recommended to start.

Through political processes, the countries can then establish priorities for action and agree to work on them individually and jointly. The complex situations can be divided into smaller, manageable ones with a series of country-specific actions needed for their resolution. This helps to provide focus to multi-country collaboration. These country-specific reforms and investments for addressing the priority problems are then compiled into a SAP following participation of stakeholders in the processes. If the countries are willing to enact the reforms, make the needed investments, and work together as specified in their SAP, the GEF may then support the implementation work alongside other funding sources with a regional implementation project or targeted single country projects. Periodically, the TDA and SAP would be revisited for improvements, continued challenges, new issues and thereby contribute to the development of an adaptive management framework. This approach was approved by Council in its Operational Strategy (GEF 1996) and was described by Duda & La Roche (1997).

Support for process tools can provide added value in facilitating a collective response to single purpose conventions by assisting countries to focus on top priority issues (often related to the other focal areas) in an integrated fashion and by calling for the necessary country-driven policy/legal/institutional reforms and investments. The processes of using national interministerial committees, developing TDAs and SAPs and conducting on-the-ground demonstrations that involve stakeholders and local communities are the key instruments that achieve country-driven commitments to integrated management of land and water resources. Figure 1 shows the historical growth in funding provided under the international waters focal area during its first decade.

In its first decade, *ca.* 13% of GEF finance has been allocated to its international waters focal area to encourage such integrated approaches. A GEF commitment of \$554 million has leveraged about \$940 million in co-finance for 73 projects from 1991 to 2002, resulting in a \$1.5 billion portfolio of projects. One of the global projects (known

Figure 2. Number of approved GEF international waters projects (open bars) and those under development (closed bars) in different regions of the world.

as IW:LEARN) involves structured learning, exchanges of experience and knowledge management among the projects in the portfolio and represents a partnership among all three GEF implementing agencies. In addition to the distance learning and South-to-South exchanges of experiences undertaken through IW:LEARN, the accumulated experiences and knowledge are captured on a Web site for use by the portfolio (www.iwlearn.net). Fully 141 different nations are collaborating on these GEF international waters projects. Figure 2 shows the current situation in terms of projects in this focal area.

(c) *Integrated approaches facilitated through the Global Environment Facility*

Approximately one-half of the GEF international waters portfolio has undertaken or is undertaking the TDA/SAP, science-based processes that may lead to country-driven reforms for undertaking integrated approaches to improving land and water resource management. Twenty of the transboundary projects cover mostly freshwater basins, including a large multi-country groundwater and recharge area system in South America. Many of these projects address the downstream needs of coastal and marine ecosystems. Table 1 identifies these transboundary freshwater basins and LMEs undertaking such strategic work with GEF assistance that links better land management with water resources improvement.

Early indications are promising as noted by the recently conducted independent evaluation of GEF's first decade (GEF 2002b). The TDA/SAP process was found to be a valuable, participative tool and essential for securing country-driven, political commitments to needed reforms for addressing basin-specific land and water problems. In fact, the evaluation team recommended use of the process for the new focal area of land degradation/desertification so that root causes of land degradation may be participatively

addressed and presumably the needed institutional and legal reforms can be integrated with those developed through similar processes in the international waters focal area.

(d) *Case studies of science-based approaches used in the Global Environment Facility transboundary projects*

The following sections present several examples from Africa, Asia, Latin America and Eastern Europe for developing integrated land and water or collective approaches to multiple global convention issues through the TDA/SAP process. Following these examples, highlights of several case studies of countries beginning implementation of such approaches related to land and water resource management and water scarcity are outlined. Materials are available on the GEF IW:LEARN website (www.iwlearn.net) and in a GEF monitoring review (Ollila *et al.* 2000).

(i) *Bermejo Bi-national Basin*

The Bermejo River Basin of Bolivia and Argentina originates in the Andes and covers an area the combined size of Hungary and Bulgaria in a semi-arid upper basin and humid lower basin. Excessive levels of sediment from deforestation and inappropriate agriculture practices, important transboundary biodiversity, and existence of a binational commission for hydropower development of the basin made the area attractive for a GEF international waters project. An initial 2 year project supported development of the TDA/SAP coupled with demonstration activities in basin management and land degradation control. A key objective was involvement of local stakeholder groups in the basin for determining their sustainable development future.

Table 1. GEF transboundary water projects under development or implementation in river basins or LMEs that use participative processes for producing a TDA/SAP.

basin project	number of participating nations	region
Lake Ohrid	2	E. Europe
Danube	13	E. Europe
Dnipro	3	E. Europe
Bermejo	2	Latin America
San Juan	2	Latin America
Guarani Aquifer	4	Latin America
River Plate-Maritime Front	2	Latin America
Okavango	3	Africa
Senegal	4	Africa
Volta	4	Africa
Nile	10	Africa
Niger	8	Africa
Lake Tanganyika	4	Africa
Lake Victoria	3	Africa
Lake Malawi/Nyasa	3	Africa
Lake Chad	5	Africa
Maputu	3	Africa
Tumen	5	Asia
Aral Sea Basin	5	Asia
Caspian Basin	5	Asia
Black Sea LME	6	E. Europe
Benguela Current LME	3	Africa
Red Sea LME	6	Africa
Mediterranean LME	20	Africa
Guinea Current LME	16	Africa
Gulf of México LME	3	Latin America
Humboldt Current LME	2	Latin America
Bay of Bengal LME	6	Asia
Yellow Sea LME	3	Asia
South China Sea LME	6	Asia
Pacific Warm Water Pool LME	12	Asia

The project was able to evoke considerable involvement and excitement from NGOs and sub-national levels of government as well as the bi-national commission for the basin, with over 2000 people participating as noted in the evaluation of the project (UNEP 2000). This lesson about the participation of local stakeholders in the identification and planning of both demonstration activities as well as necessary multi-country strategic work (TDA and SAP) is important for commitment to implementation of integrated approaches to land and water management. The attention of local community stakeholders was achieved by pilot interventions in improved agriculture practices, water harvesting, pasture/grazing improvement, water harvesting, and reforestation for watershed stabilization and carbon sequestration. This made the basin land and water management problems and potential solutions more concrete to the wider public, including farmers, whose behaviour in using poor land management practices created the transboundary sedimentation problems to begin with. These successful demonstrations may reduce the risk of implementation failure by creating community buy-in and on-the-ground development benefits.

The bi-national commission and its subsidiary country agencies in Argentina and Bolivia (including interministerial committees) ensured that the project was country driven. Good collaboration occurred among the nations in both harnessing public interest with on-site demon-

strations and participation activities of a transboundary strategic nature. Originally, a series of 16 dams were proposed for hydropower production in the basin. This was quite controversial, especially among NGOs. Through public participation in the project, the bi-national commission that was originally created to develop hydropower transformed itself into a force for considering sustainable development options. Whereas the two most appropriate dams may be pursued once Argentina's economy improves, a focus on the transboundary environment and on strategic processes for participation and practical measures consistent with sustainable development created local, national and international buy-in for integrated approaches that collectively respond to the three Rio Conventions while addressing transboundary water issues.

After completion of the TDA/SAP in 2000, a follow-on implementation project was approved by the GEF Council in 2001 for \$20 million (\$11 million GEF) to assist with implementing priority measures identified by the SAP. The project broadens and deepens the interventions in the basin addressing land degradation, biodiversity, and fluctuating climate in a collective manner, including biodiversity protection through a transboundary protected corridor as requested by communities. The project is facilitating investment follow-up with the Inter-American Development Bank and establishing framework legislation for addressing water scarcity through fiscal/financial/legal

mechanisms, including water-use charges and water quality improvement measures (see the project Web site at www.cbbermejo.org.ar).

(ii) *Lake Tanganyika Basin*

Lake Tanganyika is the fourth largest lake in the world. The UNDP assisted Burundi, the Democratic Republic of Congo, Tanzania and Zambia in addressing transboundary degradation of their shared lake basin through a GEF project in the late 1990s. High-level officials from each nation participated in a Steering Committee responsible for the project. Various programmes were established with the objective of helping the riparian countries produce an effective and sustainable system for managing and conserving the biodiversity of the lake. By involving local communities in its design, the programmes embraced the dual needs of development and conservation so that livelihoods of the people (sustainable use of the resource of the biodiversity) can be maintained into the future. The programmes varied from biodiversity to fisheries, impacts of sedimentation, catchment degradation, pollution, economic issues, education and development of a joint GIS for sharing scientific and management data.

Consistent with the international waters portion of the Operational Strategy, the project adopted the approach of joint fact-finding in compiling information so all countries could review it and update it through GIS technology. The resulting TDA sets priorities for two or three top priority shared water issues based on existing science. Pollution discharges in Bujumbura, Burundi, and Kigoma, Tanzania, were cited as hotspots for abatement activities. Excessive sediment loading from certain river basins, mostly in Burundi, the Democratic Republic of Congo and Tanzania, was determined to be a priority for accelerated attention, and overfishing was identified as important because of the large commercial fishery, its economic importance to certain nations, and the transboundary nature of the stock and pattern of landings and markets.

The project formulated an SAP that addressed integrated land and water resource management in the basin to reduce eroded soils impacting the lake and reduced stress through fisheries reforms. Publications are available on the Web site (www.ltbp.org). The Web site was essential because the project location was remote from national capitals, and a firewall for internal use was useful in exchanging information in this remote area. Of note has been the broad network in the scientific community within the countries and abroad that has been involved with the project that brought best available science to management decision making.

The Lake Tanganyika governments have completed the fourth draft of an international treaty to affirm their political support for the restoration and protection of the Lake Tanganyika ecosystem. The convention would establish a Lake Tanganyika Authority consisting of a joint Management Committee and a Secretariat to assist the nations in achieving sustainable management of the lake basin, in conserving its biological resources, and in reversing degradation of the catchment area draining to the lake to cope with the climate. Various protocols specify progressively more stringent country commitments as implementation proceeds. A GEF project to implement this collective

approach to integrated land and water resource management is under development.

(iii) *Benguela Current large marine ecosystem*

The Benguela Current LME is a large coastal upwelling off the coasts of South Africa, Namibia and Angola. The cold current creates benefits such as the world's second largest fishery but also creates a desert climate and water scarcity for those living in basins draining to the LME. Livelihood, protein and economic opportunities are limited. The three governments requested assistance from the GEF for a project focused on sustainable management and use of living marine resources, reducing mining impacts, and environmental variability, ecosystem forecasting, management of land-based pollution, protection of biological diversity, and capacity strengthening for ecosystem forecasting so as to adapt to fluctuating climatic conditions that threaten the fishery. During a 12 month project development period, the three countries reached consensus on a strategic approach for the project, based on the preparation of a TDA/SAP, which was signed in 2000 by three ministers from each nation (see www.ioinst.org/bclme). This is significant because the national dialogues fostered by national interministerial committees proved to be an important factor in aligning different ministries related to land and water activities to work in an integrated fashion.

The countries are establishing an IBCC as part of the GEF project to strengthen regional cooperation on the transboundary issues. The IBCC is to be supported by a project coordinating unit and science-based advisory groups which produced the TDA during preparation. Within a period of 5 years the IBCC is to become a fully functioning Benguela Current Commission with signature of a treaty by the end of the project. In addition to joint management of fisheries, the IBCC will develop a regional framework for enhancing consultations for the purpose of mitigating the negative impacts of mining particularly with regard to any potential or actual conflicts among fisheries and coastal and offshore diamond/gold mining and oil and gas exploration and/or production. This is important to ensure that land-based activities do not destroy the sea-based livelihoods in this area of coastal deserts.

In addition, the fluctuating climatic regime has got worse over time during years of El Niño conditions, and biodiversity of coastal waters including seals, sea lions and penguins depends on a balanced ecosystem (UNDP 1999). The TDA/SAP process resulted in a project that collectively addresses the key transboundary issues in this area of land–water interactions: not only fluctuating climate and biodiversity but also transboundary fisheries and habitat loss and/or pollution loading from mining through joint management and sound science.

(iv) *Danube–Black Sea Basin*

Seventeen countries drain to the Black Sea LME, 15 of which are eligible for GEF assistance. Germany and Austria are also located in the basin and contribute significantly to the key transboundary pollution problem plaguing the Danube Delta and Black Sea—coastal nutrient over-enrichment, or eutrophication—especially nitrogen (Mee 1992). Several other key transboundary issues such as hotspots of toxic substances and overfishing were

identified in both the Danube TDA and SAP and the Black Sea Basin TDA and SAP. Materials are available on the Web sites (www.icpdr.org for the Danube Basin and www.blacksea-environment.org for the Black Sea LME).

Initial assistance began in the early 1990s when both sets of nations (13 for the Danube Basin and six for the Black Sea) began joint planning activities under recently signed regional environmental conventions. The Danube basin effort was separate from the Black Sea countries in the early 1990s and resulted in a plan that did not sufficiently address the downstream pollution impacts to the Black Sea. A small project was then approved to undertake the TDA/SAP process following adoption of the Operational Strategy in 1995. The processes were successful in the upstream Danube basin countries with their agreeing to make commitments for policy/legal/institutional reforms and investments in the agriculture, municipal, industrial, and environmental sectors in their SAP. The focus is on nitrogen reduction from land-based activities to restore the delta and the Black Sea as water-related needs for reducing pollution from land management activities are given priority in reform programmes and investments.

The commitments made in the two SAPs to integrate land and water resource management programmes to restore the Delta and Sea also included a 'cap policy' on nutrient releases at 1997 levels as an interim objective for countries to hold the line on nutrient releases. This includes Germany and Austria, which agreed to nutrient reduction measures (principally agriculture nutrient reductions) in the SAP as part of improved, joint management commitments in the basin under their basin treaty. The GEF is funding a last regional project implementation for each basin focusing on nutrient reduction reforms and is supporting a unique strategic partnership with the 17 countries known as the 'Nutrient Reduction Investment Fund' through the World Bank for streamlined assistance to single-country sectoral investments that reduce nutrients and restore floodplains for multiple purposes. The \$70 million fund is being provided in three tranches and matched three to one with external finance, including lending operations. Details of the Strategic Partnership are at www.worldbank.org/blacksea-danube.

The Black Sea is already improving in water quality and ecological indicators as a result of nutrient reduction after the fall of the Iron Curtain (Kideys 2002). The 10 years of GEF interventions have accelerated the process of enacting reforms and investments to reduce land-based sources of pollution and help to ensure that future increases are minimal. The approach involved collectively addressing key transboundary water issues through improved land management while protecting biological diversity and adapting to fluctuating climate (reducing urban flooding) by restoring floodplains previously drained.

(e) *Demonstration projects for case studies of integrated management*

(i) *Rio Sao Francisco Basin*

Brazil's Rio Sao Francisco traverses many climate zones and five states on its way to the Atlantic Ocean. At

2700 km in length, the basin is as large as the Danube or the Colorado and faces similarly complex water problems from single sector development projects in the mining, irrigation, hydropower and urban water sectors. The projects did not take environmental considerations into account, adding environmental problems to the water and land-use conflicts in the basin caused by lack of an integrated approach.

The GEF is providing \$4.8 million to assist the government with its \$17 million in co-finance to help balance multiple uses of water and land resources in the basin as the means of addressing cumulative environmental problems at the coast consistent with the GPA and UNCLOS. The project is using the national equivalents of a TDA and SAP to produce a national Watershed Management Programme of reforms and investments for the basin that integrates land and water use considerations. Several of the states are semi-arid in nature, and development of a basin management committee among the states and the national government ministries under Brazil's new water law is a key feature.

In addition, other institutions under the new water law are to be tested and developed in the project, including a framework for allocation of water rights, development of use regulations, and initiating a programme of water charges so that stakeholders may participate in the balancing processes under Brazil Federal Law 94331/97. A financially sustainable basin management agency is being created to facilitate integrated land and water resource management that incorporates ecological needs of the basin and the downstream coastal area. The mechanisms being tested for market incentives through economic instruments may have broad application in Brazil and elsewhere (see www.oas.org/usde/SAFUP/sf).

(ii) *Guarani aquifer system*

One of the world's largest transboundary aquifer systems underlies portions of Argentina, Brazil, Paraguay and Uruguay. The countries, as a result of experiencing use conflicts and pollution of their groundwater system, have approached the GEF for a project addressing joint management of the aquifer and its recharge area. A \$27 million project with \$13 million GEF finance is under implementation. It is using the same processes of producing a TDA and a SAP to develop commitments to sustainable use and protection of this economically important groundwater system.

The key policy/legal/institutional reforms relate to the creation of a framework for shared management of the aquifer system, including joint institutional-legal arrangements and data sharing on water use and quality. The project is advancing policies related to legal and institutional frameworks that are fragmented or non-existent in the four nations and at their sub-national governance levels. The elements of the SAP are to include legislation and programmes regarding groundwater resources at the national level, which also influences provincial or state legislation where application of the integrated approaches for protecting the recharge area and managing the groundwater resource will be needed. This is another good example of integrating land and water resource

management (see the Web site at www.oas.org/usde/guarani.htm).

(iii) *Bohai Sea, Yellow Sea and Hai He Basin in China*

Complex problems related to water pollution, groundwater depletion, river flow depletion, habitat loss and overfishing plague the North China Plain down into the Bohai Sea and the connected Yellow Sea, shared by the Koreans and China. A GEF international waters project known as PEMSEA (see www.pemsea.org) has been underway since 1994 in East Asia assisting the 11 participating nations in conducting geographical-specific demonstrations on how to implement integrated approaches to land and water management in coastal basins. Among the successes of using single-country equivalent processes to the TDA/SAP approach is the commitment made by China to restore the Bohai Sea downstream of Beijing. With GEF assistance over several years, an agreement known as the Bohai Sea Declaration was signed in 2000 among three provinces, the large municipality of Tianjin and the national government to express political support for the restoration. This agreement is the closest multi-jurisdictional restoration effort to the Chesapeake Bay Agreement in the United States that exists in developing nations.

As part of the Declaration, billions of dollars in sewage and industrial pollution abatement investments will be undertaken by the government over the next decade. An additional project for the shared Yellow Sea has been approved to address improved management of the marine ecosystem. What has been missing is land-based pollution reduction from agriculture, abatement of small city sewage discharges and reversal of river flow depletion from excessive groundwater pumping for irrigation, as well as developing institutions for integrated management in the basin. A project focusing on these interventions for the Hai He Basin is under development for a projected \$62 million with \$17 million in GEF grant finance.

With a drainage area of some 200 000 km², the Hai He Basin is quite large, and establishment of an integrated approach for basin management among all jurisdictions will be a significant effort. In addition, actual pollution reduction and flow improvements are to come from reuse of municipal sewage treated to an extra level, by substituting as irrigation water instead of pumped groundwater. This reuse will keep the nutrients on the land to grow crops instead of causing coastal pollution and will reduce aquifer over-pumping, which will help maintain river flows to nurture important wetlands that now are dry during drought years.

Additional agronomic practices are being discussed related to timing of irrigation and conservation of soil water so that the vapour flow, often referred to as 'green water' (Falkenmark 2003), may be effectively used in food production while minimizing river and aquifer depletion. In this case, integrated approaches to land and water will have biodiversity, pollution reduction and economic benefits to farmers while addressing the key water problems. In addition, as in the Danube-Black Sea example, multiple GEF projects, each addressing a piece of the puzzle for simplicity, can be nested in a geographical area to achieve more integrated approaches to land and water resources.

(iv) *Groundwater and drought mitigation in the Limpopo Basin*

With assistance from the World Bank, a GEF international waters project is under development with Limpopo Basin nations and the Southern Africa Development Community to demonstrate the use of groundwater reserves to mitigate the impact of repeated droughts in the basin. Through the Limpopo Permanent Technical Committee, the project is to enhance institutional capacity in participating nations to develop and implement drought management policies. This project represents one in a series of new demonstrations of ILWRM that collectively address: (i) adaptation to fluctuating climatic regimes in a basin; (ii) a priority transboundary water issue (in this case back-up drinking water supplies); (iii) improved land management practices (including aquifer recharge area protection); and (iv) securing sufficient water flow for wetland biodiversity assets in the basin. In addressing four focal areas of GEF, this project may have global implications for collectively addressing the three Rio conventions and water issues.

5. A NEW IMPERATIVE FOR INTEGRATED APPROACHES

With the successful conclusion of the WSSD, a new imperative exists to address linkages among the global crises that lead to poverty, hunger and natural resource depletion. There is just not enough water left as a result of governance failures to meet the competing needs for the future in several countries. If this new imperative is not actively pursued, food, water and environment insecurity will destabilize several nations, and Millennium Development Goals will not be reached. At the WSSD, the world community finally recognized the value of water-related ecosystem goods and services to poverty reduction and the global economy. The work of Costanza *et al.* (1997) in estimating their annual value at many trillions of dollars has contributed to this change of policy. The challenge now is whether the world community has the tools, political will and resources to reverse ecosystem losses and to create institutions to balance future uses.

The early results reported here from several GEF projects illustrate practical steps forward to improve land and water management regimes in hydrologic units towards the type of basin-specific hydro-solidarity needed to achieve sustainable development. Although water professionals have understood for years that the answer lies in 'IWRM', many best practice cases of integrated management do not exist, as noted by White (1998) and Duda & El-Ashry (2000). The correct terminology may not be IWRM but rather the more explicit term 'ILWRM'.

Processes piloted by GEF serve as tools for involving different levels of stakeholders and have created political buy-in for reforms on integrated approaches. This buy-in starts with a science-based transboundary diagnostic study that often involves joint, multi-country fact-finding and participation of the university and research communities in developing nations. As a result, needed reforms across sectors have some substantive basis within hydrologic units for securing multiple benefits in different areas to build a broad base of support. The international waters

focal area of the GEF has demonstrated that a collective response to single-purpose conventions basin by basin can make initial progress in reversing the global degradation and depletion of land and water resources. A new imperative for broadening and deepening the initial results is now required to reduce the impact of interlinked global crises on people and their environment and in the process work towards peace and stability.

If the global water crisis was solvable by individual sub-sectors like irrigation or urban water supply, it would have been solved already. The existence of linked land-related crises and the trend towards decentralization of government functions can fragment and dilute the capacity of public authorities and makes harnessing stakeholder involvement in catchments and basins even more important. The GEF has demonstrated tools for harnessing these stakeholders within multi-jurisdictional hydrologic units consistent with the new imperative. Early results from case studies in this paper suggest that the best way of overcoming barriers to improved management of land and water resources in specific basins is by developing a geographical-based, collective response to many global driving forces for change that take advantage of funding opportunities available for developing the necessary institutions and mobilizing different levels of stakeholders.

6. SUMMARY

The early results from case-study projects have demonstrated that science-based, joint fact-finding among participating nations can serve as an important catalytic tool for breaking complex situations down into manageable components and for developing political buy-in through different levels of participation of different nations. This may be enhanced if official inter-ministerial committees of national and sub-national governments in each country are involved in the joint institutions to undertake the work instead of developing a supra-national international organization to do the work for the countries. In addition, the process of jointly producing such a 'study' or analysis fosters participation of the science community and creates an initial product that may be used to begin participation of civil society in the processes.

In addition, the process tools for helping nations to determine what specific actions on policy, legal and institutional reforms they will collectively and individually undertake to balance competing demands on water systems have proved to be effective for securing country-driven, political commitments to those reforms. Formulation of this programme of actions and establishment of an institution to track its implementation also provide instruments for civil society participation. The land linkage must also be included because land-use decisions often represent water-use decisions and because rural areas must be sustained for poverty reduction and food security. The GEF has stressed the development of institutional structures for land and water-related policy reforms in its international waters focal area. This includes reforms in national institutions that are able to clarify rights of stakeholders to access of land and water resources, both representing keys to poverty reduction. Water rights, water allocation systems, land tenure

reforms, pricing policy reforms, basin management institutions promoting cross-sectoral and multi-jurisdictional land and water management are all pieces of the puzzle to address the linked water and environment crises.

In fact, several of the basin projects are national in extent and the processes are proving valuable for agreeing on cross-sectoral management among different states or provinces. Multilateral and bilateral development institutions represent the key to achieving this new imperative by mainstreaming these science-based approaches in their regular work. Institutions can either continue to pursue fragmented, sectoral interests or they can support country-driven priorities developed through science-based approaches that balance conflicting uses of land and water resources within specific hydrologic units.

In the past, donor-driven and agency-driven 'white elephants' have been created in developing nations by working directly with local communities in a thematic and sectoral fashion while by-passing development of regional, national and basin institutions (Therkildsen 1988). The Operational Strategy adopted in 1995 has taken the longer, more difficult route of facilitating the creation of institutions capable of operating in an adaptive management mode and demonstrating ILWRM. This approach is consistent with the message delivered at WSSD by the World Bank in its World Development Report 2003 (World Bank 2002). The Report examined sustainable development successes and failures, and as a result highlighted reforms needed for building institutions as the key element to foster sustainable development. GEF water initiatives have focused on collective responses to land, water and biodiversity issues by using water resources and basin ecosystems as the entry point for developing institutions with adaptive management frameworks and where appropriate helping countries prepare for fluctuating climatic regimes.

Balancing human security needs with ecological security needs is difficult. Effective implementation of political commitments for operating institutions established with GEF assistance and scaling up demonstrations undertaken with limited finance must become the responsibility of participating nations and regular programmes of multilateral/bilateral institutions. The new global imperative for ILWRM will not be achieved without the active advocacy of these important institutions in support of this long-overdue transition to sustainable development.

The opinions expressed in this paper are those of the author and not necessarily those of the World Bank Group or the Global Environment Facility.

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GLOSSARY

- CBD: Convention on Biological Diversity
 GEF: Global Environment Facility
 GIS: geographical information system
 GPA: Global Programme of Action
 IBCC: Interim Benguela Current Commission
 ILWRM: integrated land and water resources management
 IW:LEARN: International Waters Learning and Resource Network
 IWRM: integrated water resources management
 LME: large marine ecosystem
 NGO: non-governmental organization
 SAP: strategic action programme
 TDA: transboundary diagnostic analysis
 UNCCD: United Nations Convention to Combat Desertification
 UNCLOS: United Nations Convention on the Law of the Sea
 UNDP: United Nations Development Programme
 UNEP: United Nations Environment Programme
 UNFCCC: United Nations Framework Convention on Climate Change
 WSSD: World Summit on Sustainable Development