WATER SECTOR BOARD DISCUSSION PAPER SERIES

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Strategic Environmental Assessment: Improving Water Resources Governance and Decision Making

Main Report

Rafik Hirji and Richard Davis

The World Bank, Washington, DC

THE WORLD BANK GROUP

Water Sector Board

BNWP

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ABBREVIATIONS

ALT	Binational Autonomous Authority of the TDPS Hydric System (Lake Titicaca)
CBO	Community-based organization
CEA	Cumulative impact assessment
CEA	Country Environmental Assessment
CWRAS	Country Water Resources Assistance Strategy
DRC	Democratic Republic of the Congo
DWAF	Department of Water Affairs and Forestry (South Africa)
EA	Environmental assessment
EFA	Environmental flow analysis (assessment)
EIA	Environmental impact assessment
EMA	Environment Management Act 2004 (Tanzania)
ESW	Economic and sector work
GDP	Gross domestic product
GEF	Global Environment Facility
GIS	Geographic information system
GWP	Global Water Partnership
IAIA	International Association for Impact Assessment
IRC	International Resource Centre (on water supply, sanitation and hygiene, the Netherlands)
IUCN	International Union for the Conservation of Nature
IWRM	Integrated water resources management
LVEMP	Lake Victoria Environmental Management Project
NAWAPO	National Water Policy (Tanzania)
NELSAP	Nile Equatorial Lakes Strategic Action Program
NGO	Nongovernmental organization
NSGRP	National Strategy for Growth and Reduction of Poverty (Tanzania)
OED	Operations Evaluation Department (World Bank)
PLSRPP	Policy, legislation, strategy, program, plan
RBM	River basin management
RWRA	Rapid water resources assessment (Tanzania)
SAP	Strategic action program
SEA	Strategic environmental assessment
SecEA	Sectoral environmental assessment
SDN	Sustainable Development Network (World Bank)
SIA	Strategic impact assessment
SSEA	Strategic/sectoral social environmental assessment
TOR	Terms of reference
TDA	Transboundary diagnostic assessment
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific, and Cultural Organization
WATSAL	Water resources sector adjustment loan (Indonesia)
WMA	Water Management Area (South Africa)
WSS	Water supply and sanitation

Notes:
All dollars are U.S. dollars
All tons are metric tons

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FOREWORD

The World Bank's 2004 Water Resources Sector Strategy advocated a re-engagement in "high risk and high reward" water infrastructure, based on a better understanding of the vulnerabilities of poor nations to climate variability and climate change, an improved understanding of the role of water in growth and poverty alleviation, lessons learned from the World Commission on Dams, the global experience in Integrated Water Resources Management (IWRM) implementation, and the Bank's experience on water and environmental issues. In spite of this Strategy's support for the principles of IWRM, it was becoming clear that there was limited implementation of IWRM in practice (especially with respect to environmental sustainability) in developing countries.

The establishment of the Sustainable Development Network (SDN) has further elevated the Bank's commitment to environmental responsibility. SDN promotes the mainstreaming of the environment and entrenches environmental sustainability as a core element of the Bank's work. To realize its goals, greater emphasis will need to be placed on mainstreaming the environment into upstream processes such as policy, programs, and sector-wide investment dialogue.

In its 2001 Environment Strategy, the Bank committed to use strategic environmental assessments (SEA) to address environmental concerns at the strategic levels of decision making—policies, legislation, strategies, plans, and programs. SEA is also a process for improving public policy design and good governance of natural resources (Ahmed and Sanchez-Triana, 2008). This report highlights the opportunities offered by SEAs for addressing not only the problems that arise when environmental considerations are delayed until project stage, but for improving the inclusion of environmental considerations into IWRM practice.

The report analyzes 10 global case studies of SEAs in the water sector, four national and state water policies, and an in-depth pilot case study of water reform in a developing country (Tanzania). This analysis shows SEA implementation promotes some important IWRM objectives. In short, this alternative route to introducing environmental considerations into strategic water resources decision-making may help overcome the impediments that IWRM has faced in moving from the policy level into practice.

The report was prepared as a collaborative effort of two SDN Departments—the Environment Department and the Energy, Transport and Water Department—of the World Bank. It recommends a framework for expanding use of SEAs for mainstreaming environmental considerations in water resources policy, legislative and institutional reforms, planning, and investment decision-making.

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EXECUTIVE SUMMARY

The overall goal of this report is to help water resources and environment professionals within the Bank and client countries use SEAs to effectively implement the principles of IWRM. The report contains four elements: (1) a review of SEA support for IWRM, (2) an analysis of 10 case studies and four water policies, (3) an in-depth pilot study of water sector reform in a developing country, and (4) a framework for enhancing the use of SEAs in integrated water resources management. The main findings of these elements are summarized below.

I. SEA Support for IWRM

Integrated water resources management (IWRM) has been the accepted paradigm for efficient, equitable, and sustainable management of water resources since the 1990s. It recognizes the dual relationship between the environment and water resources. The environment is both a water-using sector (as in a National Park or a habitat for fish or other species) and as the resource base (wetlands, watershed, and recharge area) a provider of ecological and hydrological services that maintain the water resources in a fit state for all sectors. (Appendices A and B summarize water-related environmental issues.) The GWP promotes IWRM as a process for improving water governance and management.

The World Bank has embraced IWRM as a framework for implementing its 2004 Water Resources Sector Strategy and re-engaging in high risk/high reward water infrastructure in an environmentally responsible manner (World Bank 2004). Developing nations have increasingly accepted IWRM at the national policy and strategy levels. However, the evidence indicates that it is not being put into practice in a comprehensive way. Typically, elements of IWRM are implemented independently to suit requirements. Because of this the Water Resources Sector Strategy suggests that "principled pragmatism" be used in implementing IWRM. Even where some IWRM elements are being implemented, there is little evidence that IWRM adequately incorporates environmental sustainability.

Strategic environmental assessment (SEA) is an environmental planning tool for improving decision making at the strategic level of policies, legislation, strategies, plans, and programs (PLSPP). SEAs include a range of instruments that assess the potential impacts of PLSPPs and the institutional capacity to integrate environmental, social and economic considerations and good governance. Relatively few SEAs have been applied in the water sector, and few regions have introduced systematic procedures for conducting SEAs in the water sector.

Because IWRM and SEAs share many concepts and characteristics, SEAs potentially offer a complementary tool to IWRM to introduce and integrate environmental considerations into water resources policy, planning, and management, and thereby support IWRM. SEAs offer these opportunities at many levels—developing a national or sector water policy, enacting water legislation, drawing up river basin plans, establishing a river basin institution, formulating and implementing a national water supply, irrigation or energy master plan, identifying hydropower, urban water supply or irrigation investment options, supporting transboundary water resources management and development, or instituting and implementing sectoral strategies or programs.

II. SEA Case Studies and Water Policies

This second section describes an analysis of institutional drivers and the procedural and substantive factors that promoted success in SEA. Ten geographically diverse case studies were

selected for analysis from a diversity of sectors and different decision levels - strategy, program, and plan levels. Seven were from Bank-funded projects[1]. The three non-Bank cases were from Australia, Czech Republic, and South Africa

Institutional drivers of SEAs

No judicial drivers were used in the case studies, while procedural (e.g. legislative requirements) and evaluative (i.e. oversighting institution) drivers were used infrequently. Instrumental drivers, such as recommendations from external institutions such as the World Bank were commonly relevant although they were often used voluntarily rather than as formal requirements. Professional drivers were often important, and public pressure was also a significant factor. There were multiple drivers for all case studies. Procedural drivers were not effective unless accompanied by public pressure or strong evaluative drivers.

There were a number of cases where SEAs were initiated, not from the six types of drivers, but because of a belief by government or institutions that it was the correct approach to take. These instances were usually encouraged and supported by a development partner. Trust between the development partner and the government was an important factor when the governments were venturing into new procedures.

Procedural factors

Several lessons about analytic procedures were noted. First, the terms of reference must be clear and well formulated for the SEA to be influential. Second, the SEA team composition needs to be balanced between the sectors contributing to the study, and the team leader needs to have a breadth of understanding of the inter-connections between economic, social, and environmental factors. Third, the assessment methods need to be suited to the characteristics of the issues.

Consultation is essential but does not always need to be widespread; however, it is important to include the stakeholders who will be affected by the decision. The consultation and participation process should be planned to ensure that participants are well briefed and are involved at the appropriate stages of the process.

The spatial scale of the SEA matters. If the area is large, appropriate tools need to be used to conceptualize problems and to engage all stakeholders.

SEAs can span strategic scales. Institution-centered SEAs typically examine the capacities of institutions, the relevance and consistency of policies and legislation, mechanisms to involve vulnerable groups, and political economy factors that affect the implementation of plans and programs that trigger the SEAs.

Substantive factors

The process of interacting with different stakeholders, examining causative influences and longer term consequences, and integrating environmental, social, and economic considerations is as important as the output from the SEA study. This process should commence as early in the preparation of the PLSPP as possible and continue after the study has been completed.

1 Water and Sanitation Sector SEA, Colombia; Rapid Water Resources Assessment, Tanzania; SecEA of Hydropower Development Program, Kingdom of Nepal; SEA of Water Resources Sector Adjustment Loan, Republic of Indonesia; SEA of Palar Basin, India; SIA and CEA of Nam Theun II Hydropower Project, Republic of Laos; and Transboundary Diagnostic Analysis/Strategic Action Program, Lake Victoria Basin, East Africa.

The most effective case studies brought fundamental changes in national policies, laws and institutions. They were undertaken at opportune times when there was political receptivity to change. In some cases, economic arguments played a key role. However, these changes usually took many years. Development partners and the governments needed to stay committed over this extended period.

SEAs need not be environment-led. Some effective SEAs were primarily driven by factors other than the environment, although environmental sustainability played an important role.

Some successful SEAs led to water policy reforms and full implementation of water-related programs such as the establishment of river basin institutions.

Effective SEAs were often relatively cheap, costing less than $100,000.

Lessons from Water Policies

No SEA case studies of water policy were identified. To fill this gap, water policies of three nations (South Africa, Tanzania, and India) and one state (Victoria, Australia) were examined for their inclusion of environmental considerations. All four policies recognized the legitimacy of water for the environment, but the level of detail and commitment to implementing this recognition varied significantly. The Indian policy mentioned criteria for this but provided no detail. The South African and Tanzanian policies devoted greater attention to environmental considerations. The Victorian policy stood out because it was entirely based on the concept of environmental sustainability.

Lessons on SEA Support for IWRM

The major principles of IWRM are: multisectoral water management, participation, and use of economic instruments. The case studies illustrated how the SEAs had contributed to all three principles.

Multisectoral water management

Two cases explicitly contributed to implementing this principle. All cases raised environmental sustainability questions. A number of SEAs were undertaken by multisectoral task forces, potentially contributing to a multisectoral approach to water resources management. All but one case study considered multisectoral impacts.

Some SEAs had long-term influence in supporting integrative approaches to water sector management. The Tanzanian RWRA study catalyzed changes in policy and legislation that have subsequently supported multisectoral approaches. The Palar Basin SEA led to a rollout of water resources SEA studies across Tamil Nadu, India. The Colombia WSS SEA led to progressive water sector reforms and multisectoral involvement.

Participative management

Some institutions, initially skeptical of stakeholder involvement, became advocates of increased stakeholder participation as a result of their experiences during the SEA. In two cases, this interest led to legislative requirements for public participation. These outcomes of the SEAs contributed to improved public governance. A number of the SEAs contributed to decentralization of water resources institutions and the establishment or strengthening of participative river basin institutions.

Economic instruments

The SEAs did little to encourage the use of economic instruments, although one advocated charges to control water use and the discharge of pollution, and another advocated permits for fishing and its export, in order to provide a source of finance for water resources operations. There was no attention to demand management. One case study was focused on improving private sector investment, including a revision of and adoption of less stringent and more defensible water quality standards.

III. In-Depth Pilot Study of Water Sector Reforms in Tanzania

An in-depth water sector reform pilot study on Tanzania complemented the analysis of global case studies and water policies. A series of water sector crises in the 1990s, many of which contained environmental aspects, brought home to water resources managers the need to implement the principles of IWRM, particularly multisectoral management, decentralized decision making, stakeholder participation, and inclusion of environmental water requirements. These principles were embodied in the 2002 Tanzanian National Water Policy. Six water-related SEAs had already been carried out within the evolving institutional environment of Tanzania, even before the 2004 environmental legislation required SEAs—the water and energy sectors are identified as two of four priority sectors in the legislation.

More recent experience in Tanzania has shown that it is not sufficient to have just the water sector sensitized to environmental issues and to have legislative requirements for SEAs. Other water-using sectors (e.g., energy, agriculture, livestock, etc.) also need to reform and harmonize their policies, legislation, and strategies if these advances in water sector management are to be effective. SEAs would be suitable instruments for coordinating these changes across sectors.

IV. A Framework for Expanding the Use of SEAs for IWRM

An important part of the SEA should be focused on assessing the underlying institutional and governance factors. This is important because policy and institutional changes take time and are typically driven by incremental changes in behavior and incentives. Assessing institutional factors helps to better understand, design and incorporate these aspects in the eventual SEA recommendations.

Given the wide range of strategic levels of decision making-policies, legislation, strategies, plans, and programs it is not sensible to have a single, all encompassing template for conducting SEAs for use by Bank operations staff. Appendix C provides a range of possible environmental aspects that could be included in the terms of reference (TORs)for an SEA for water resources PLSPPs. SEAs can also be used to examine sectoral policies and laws for consistency with water resources and support for environmental considerations, and the capacity within a country for recognizing and managing water related environmental issues.

A framework for the Bank to expand the use of SEAs to mainstream environmental concerns into water resources management could consist of four parts:

- *Bridge disciplinary perspectives.* Environmental and water resources professionals could widen their understanding so that the compatibilities between their disciplinary terminology, techniques, and approaches are fully understood, appreciated, and exploited.

- *Establish an enabling environment.* An enabling environment should be developed where sectoral policies are harmonized to (a) mutually support IWRM principles, including environmental protection; (b) undertake SEAs where appropriate; (c) allow a range of SEA types to be used to meet different needs; and (d) promote stakeholder participation in SEAs. Transboundary SEAs require a mutually agreed plan of action and should be overseen by a high-level committee (UNECE 2003). The Bank can help develop this enabling environment by using its influence and knowledge to help introduce SEAs and build up experience.

- *Build capacity*. To ensure that SEAs are properly supported, an understanding needs to be developed, particularly among senior decision makers, of the benefits of SEAs. It is also important for staff from sectoral institutions to know how to work in multi-disciplinary teams to conduct SEAs. Good quality water resources data is needed to underpin SEAs in this sector.

- *SEAs need to be well planned.* Experienced team leaders should be able to deal with the diversity of sectoral issues arising in IWRM; TORs should be clear; analytical procedures should be suited to the problem; and the stakeholder participation should be carefully planned.

CHAPTER 1: INTRODUCTION

Integrated water resources management (IWRM) has been the accepted paradigm for efficient, equitable, and sustainable management of water resources since the 1990s. However, IWRM has, at best, been implemented in a disjointed way in developing countries and environmental considerations have received little attention. This report argues that strategic environmental assessments (SEAs) offer an additional planning tool for integrating environmental considerations upstream into water resources management. A literature review, analysis of ten global case studies, an in-depth pilot study at a country level, and a review of four national and state water resources policies are used to draw lessons and develop recommendations to expand the use of SEAs in IWRM.

Integrated Water Resources Management

There is no unambiguous definition of IWRM, although its broad principles are clear:

- Using a multisectoral approach to water management
- Encouraging stakeholder participation and devolution of responsibility
- Utilization of economic instruments, including private sector participation

To date, many countries have adopted these principles in a piecemeal rather than holistic manner. Although IWRM advocates that water for the environment is a legitimate use within multisectoral management and there is growing awareness of its importance, the reality is that there has been only limited implementation of environmental water management in IWRM.[2] Environmental water management is still generally addressed in an ad hoc manner and rarely as a key element of IWRM. Under such circumstances, environmental considerations in IWRM are often given less priority and they play little role in decisions about water allocation, water quality management, source protection, or the protection of water dependent ecosystems.

Environment Planning Tools

Environmental impact assessment (EIA) was introduced as a planning tool in the early 1970s to integrate environmental considerations into project planning and decision-making. Since then, EIA practice has evolved and matured. Many guidelines are now available to address the environmental impacts of development projects, including those for water-related subsectors such at the International Hydropower Association Sustainability Guidelines, and the IPTRID Sustainability Guidelines for Drainage. The World Bank has produced EA sourcebooks and EA updates covering a wide range of EA-related topics, including those covering various water sectors.

More recently, complementary approaches to the traditional project-specific EIA have been developed to offset the structural limitations of EIAs in project planning. Strategic environmental assessment (SEA) extends the integration of environmental and social considerations from a project level to the levels of policies, legislation, strategies, programs, and plans (PLSPP). One type of SEA, the country environmental analysis (CEA), is used by the World Bank for systematically evaluating environmental priorities in client countries, the environmental implications of key policies, and countries' capacity to address priorities. The shift in Bank lending from a project

2 Environmental flows are still generally only assessed in selected cases and allowed for when an infrastructure project is proposed. They are rarely considered systematically in water policies and laws, or in river basin planning.

basis to development-policy-based, programmatic, and sector-wide lending has provided further impetus for accelerating the use of such strategic tools. This report focuses on the potential of SEAs to both improve the integration of environmental considerations into IWRM and improve the governance of water resources.

Complementarities and Opportunities

Even though SEA and IWRM originated from different professional interests and sectoral concerns, they share many concepts and characteristics. Both include the integration of environmental and social considerations into multisectoral decisions; both promote participatory and consultative approaches to decision-making; both support monitoring and evaluation of outcomes; and both seek to broaden the perspectives of planners beyond immediate sectoral issues. Both are process oriented as opposed to goal oriented and provide opportunities for adaptive learning and management. Both aim to improve the governance of natural resources. Thus, SEAs offer a complementary tool to IWRM to introduce and integrate environmental considerations into water resources policy, planning and management, and thereby support IWRM.

Opportunities to improve the integration of environmental issues in water resources by promoting the use of SEAs occur at many levels: developing a national or sector water policy; enacting water legislation; drawing up river basin plans; establishing a river basin institution; formulating and implementing a national water supply, irrigation, or energy master plan; identifying hydropower, urban water supply, or irrigation investment options; supporting transboundary water resources management and development; or instituting and implementing sectoral strategies or programs.

Objectives of the Report

The overall goal of this report is to assist water resources and environment professionals within the Bank and client countries to use SEAs to effectively implement the principles of IWRM. It (a) delineates environmental issues related IWRM; (b) identifies opportunities for SEAs to addressing these environmental issues; (c) uses the literature and ten Bank and non-Bank case studies to identify procedural and substantive factors and institutional drivers that lead to effective SEAs in the water sector at the policy, strategy, program, and plan levels; (d) reviews four national and state water policies to understand the inclusions of environment; (e) observes the introduction of SEAs in a developing country as an in-depth pilot study to identify practical issues arising from the introduction of SEAs for the water sector; and (f) recommends how the Bank can expand the use of SEAs to improve the integration of environmental issues in water resources investments.

The report draws from the economic and sector analysis (Strategic Environmental assessment and integrated Water Resources Management) completed in June 2007 that can be found in the Bank's SEA toolkit.[3] It and the ESW contribute to the use of SEAs for upstreaming environmental considerations into Bank activities (World Bank, 2001).

Methodology

The report is based on four activities. First, a literature review of IWRM and SEA is used to understand the evolution of and similarities between SEAs and IWRM and to identify opportunities

3 http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/0,,contentMDK:20885941~menuPK:2450778~pagePK:148956~piPK:216618~theSitePK:244381,00.html

where SEAs may be able to assist the promotion of environmental sustainability issues in water resources.

Second, ten case studies of SEAs within the water sector are used to draw lessons on upstreaming and integrating environmental considerations into water resources planning and management. The case studies, covering water sector policies, strategies, programs, and plans, are detailed in Appendix D of the ESW. They are analyzed using the (modified) IAIA good practice principles and the institutional drivers that initiated and sustained them.

Because there are few examples of policy-level SEAs in water resources, the third activity consisted of an examination of the water resources policies of three countries (India, Tanzania, and South Africa) and one state (Victoria, Australia) for their inclusion of environmental concerns related to water resources. These policies are detailed in Appendix E of the ESW.

Lastly, an in-depth pilot study in Tanzania has also been used to examine the opportunities and the practical issues that arise when SEAs are introduced into a developing country that is undergoing water and environmental policy reforms (World Bank, forthcoming b).

CHAPTER 2:
INTEGRATED WATER RESOURCES MANAGEMENT: ISSUES AND RESPONSES

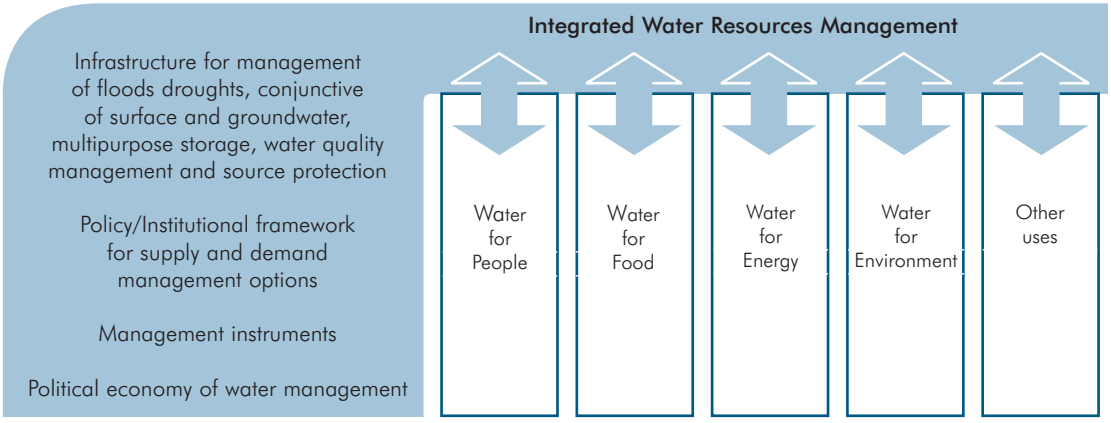
This chapter describes the key environmental considerations for IWRM. It describes how environmental sustainability is a key principle underpinning IWRM. Although IWRM is being increasingly accepted at policy and program levels in developing countries, it is not being implemented widely or effectively. Even where some elements of IWRM are being implemented, there is little evidence that they adequately address environmental issues to ensure sustainability.

Water, Environment, Poverty, and Growth

The environment and water resources have a dual relationship. On the one hand, the environment is a water-using sector; terrestrial and aquatic life requires good quality water in sufficient quantities and qualities for survival and productivity. On the other hand, the environment (as the resource bases) provides ecological and hydrological services that maintain the water resource in a useable state for all sectors. This duality is shown in Figure 1, where the handle and back of the comb (the blue part of the figure) represents the water resource maintained in a healthy state by good environmental management. The teeth (the white pillars of the figure), one of which is the environment, represent the sectors that are reliant on the water resource. In addition, adaptation to climate change is an important priority for the global water resources agenda.

The Bank's 2003 Water Resources Sector Strategy argues for both better management and development of water resources for multiple uses of water—irrigation, energy, fisheries, urban, rural, industrial, livestock, and mining supply. Inadequate water management hits the poor especially hard, because they are usually more reliant on the resource, have fewer options to cope with inadequate access, scarcity, and pollution, and have limited say in decisions. They are often forced to locate in high-risk, less desirable, less productive, and even foul smelling areas such as floodplains, degraded watersheds, steep slopes, land close to sewage treatment plants, stabilization ponds and contaminated sites, or arid and semiarid lands. Such areas are often more vulnerable to disasters—floods and mudslides—the water is more likely to be contaminated with

Figure 1: Conceptual Framework for Integrated Water Resources Management



Source: Adapted from the Global Water Partnership

sewage, industrial pollutants, agro-chemicals, and sediments, and the people are more prone to waterborne diseases.

Environmental Water Resources Issues

Water resources become degraded or their use becomes unsustainable if excessive demand is placed on them from agriculture, power generation, water supply and sanitation, industry, tourism, livestock, transportation, mining, forestry, fisheries, and urban development.

River flow changes affect physical habitat, food sources, and ecological cues (such as spring flushes triggering breeding behavior in some fish species) for aquatic species. Irrigation without drainage can increase soil and water salinity. Water quality changes from bacteriological and chemical pollution can adversely impact human health by increasing morbidity and mortality. Changes in nutrient concentrations from sewage and fertilizer runoff can cause algal blooms as well as taste and odor problems during warm weather; while increases in sediment concentrations blanket habitats and reduce light penetration, affecting photosynthesis. Introduced fauna and flora can affect riverine biodiversity and cause nuisances to human uses.

Lake levels respond to changes in inflows and outflows, with consequent drying or flooding of shoreline habitat and wetlands. Temperature changes lead to shifts in stratification levels with consequent effects on biogeochemistry and food chains. As in rivers, chemical pollution, effluent discharges, and sediment loads can affect lake biota in diverse ways. Introduced flora and fauna can also have major impacts on biodiversity and productivity. Lakes are particularly sensitive long-term indicators of climate change, integrating short-term temperature fluctuations to expose long-term changes.

Groundwater tables rise and fall in response to changes in recharge and extractions. Rising water tables can cause waterlogging and loss of land productivity. Ecosystems, such as some wetlands, depend on access to shallow aquifers and dry out or flood as levels change. Streams and lakes that are dependent on groundwater systems during dry seasons can dry out as water-table levels drop. Human activities can pollute groundwater in the same way as surface water, although this is more likely to affect human use of the groundwater than ecosystems.

Wetlands and riparian habitats (including lake shorelines) are being lost rapidly around the world through encroachment and conversion to agricultural and urban uses, with loss of the many services that they perform for people, including filtering and buffering capacity they provide. They are affected by changes in river flows and groundwater abstractions and are polluted with urban runoff and sewage, industrial effluent, and agro-chemicals. Some of the affected wetlands are internationally important, and are recognized by the Ramsar Convention.

Watersheds and aquifer recharge areas are being lost rapidly through changes in land use and cover from agricultural expansion, conversion of forested land, urban development, and road construction. This is altering the hydrologic responses (runoff, infiltration and recharge rates), increasing soil erosion, sediment transport and deposition and increasing vulnerability to contamination. Encroachment of recharge areas can increase pollution risk and negatively impact groundwater dependent ecosystems.

Climate change is a an issue that cuts across resource the resource spectrum, impacting surface and groundwater quantity and quality as well as the demand for water for multiple

uses. Non-stationary hydrology will also have a major impact on standards and criteria for hydrological analysis and hydraulic infrastructure design.

Appendixes A and B provide more detailed descriptions of these issues.

Government Responses—Policies, Strategies, Programs, Plans, and Projects

The 1992 Dublin Conference on Water and the Environment and the Earth Summit at Rio de Janeiro laid the foundations for integrated water resources management. There is no unambiguous definition of IWRM (GWP, 2000). Instead, it consists of a number of principles, most of which pre-date the Dublin Conference. These principles, which have been expanded, extended and adapted to local circumstances, are:

- Utilizing an integrated approach for water management in association with river basin management (RBM)
- Promoting participation and stakeholder involvement
- Employing economic instruments, including the private sector involvement

The implementation of IWRM in a particular country may incorporate some or all of these principles with different emphases given to the various interpretations of *integrated*, *participation*, and *economic instruments*. The benefits of IWRM arise from the process as much as from the end product. The increased understanding arising from sectors working together; the gathering and sharing of knowledge and information during the study; the consideration of catchment-wide uses and impacts; and the debates about alternative options themselves result in benefits for water resources management. The process of undertaking IWRM also promotes good governance because of the emphasis on participation, knowledge-based decisions and devolution to more local levels. More recently, lake scientists have also argued that lake basin management (traditionally, the domain of limnologists, fisheries experts, and environmental engineers and scientists) is also a part of IWRM (ILEC 2005).

Integrated Approach

Integration is an umbrella term for bringing together components of natural systems and human management systems (GWP, 2000).

The components of natural systems include freshwater and coastal zones; land and water; water for consumptive and non-consumptive uses and water for aquatic ecosystems; surface and groundwater; water quantity and water quality; and upstream and downstream water use. Integrating decisions across these different land and water components ensures that decisions are taken with an understanding of their potential impact on all water resources within the river or lake basin.

The links between activities within a watershed and the effects of activities on receiving waters are not always understood by those without water resources training, such as planners, engineers, and scientists. Ministries remain organized on sectoral lines with nearly impermeable barriers between them, and with technically competent staff who are motivated to pursue narrow sectoral objectives. Consequently, human management systems also need to be linked so that decisions in one sector do not impact unnecessarily on other sectors.

The environment (for example, national parks, fisheries, wetlands) is a legitimate water-using sector that is often neglected or given a very low priority in water allocation and water quality decisions, primarily because it has few or weak advocates. Yet as evidenced by well-known examples such as the Aral Sea, Lake Chad, and the Yangtze River, if environmental considerations are not fully incorporated into decisions, then the ecosystem services on which many people rely can be undermined to the detriment of all water users and society at large.

Participation and Stakeholder Involvement

Stakeholder involvement includes both sectoral-level organizations and utilities, such as irrigation, industry, livestock, mining, hydropower, and water supply authorities, as well as local-level organizations representing irrigator and community groups. The former typically are involved at the national level, while the latter's involvement are at basin and sub-basin levels. In water resource projects, the stakeholders include communities that are both upstream and downstream of the development. In the case of dams, those downstream have traditionally been left out of the decision-making process and are only now being recognized in many countries. The extent of participation can vary from the provision of information to affected groups, to canvassing the objectives and requirements of the affected groups, to full inclusion of interested groups in decisions (World Bank, 1996).

The numerous benefits of stakeholder participation includes improving public acceptance of decisions, improving the quality of alternatives because of the wider range of expertise available, reducing the risk that opposition from disaffected groups will delay implementation of decisions, and increasing the likelihood of compliance with agreements reached during negotiations. Building participation in water resources decisions can also contribute to promoting good governance and accountability in decision-making.

One of the principal tenets of IWRM is that operational responsibility for the allocation and management of water resources should be devolved to the river basin level, with policy development being retained at the national level. It is often difficult to implement this in practice. New river basin organizations are sometimes opposed because they would reduce the power of those in national institutions. In addition, it can be difficult to train engineers in the skills required for water resources management; and new basin level organizations lack the resources to operate effectively. Decentralization is particularly difficult in transboundary basins, where institutions at different stages of development and with different policy and legal imperatives need to coordinate.

Economic Instruments and Private Sector Involvement

Treating water as an economic good and setting a price that reflects its value is a rational approach when good quality water is in short supply and governments want to promote conservation, encourage innovation, and educate water users about the consequences of their decisions. GWP advocates that the price of water should reflect the full cost of water provision, including the full supply cost due to resource management; the operating and maintenance expenditures and capital charges; the opportunity costs from alternative water uses; and the economic externalities, including environmental costs.

However, the experience of implementing this principle is mixed. In some parts of the world, innovative approaches are being used to introduce mechanisms, such as water user charges, pollution charges, fish levies, or payments for environmental services, to offset the cost of

managing the water resources (over and beyond the tariffs charged for drinking water) as well as to support environmental stewardship. In other parts of the world, it has proven divisive, as consumers do not recognize the legitimacy of these costs and object strongly to paying for a resource that had previously been "free."

Governments have turned to the private sector (World Bank, 1997) to manage water resources institutions, particularly water supply and sanitation, irrigation, and hydropower infrastructure. While private sector involvement has achieved many of these aims, it has also failed in many cases, and the provision of these water services has reverted to government-managed institutions.

World Bank Support for IWRM

The World Bank's 1993 Water Resources Policy advocated a multisectoral approach to water resources management. However, a subsequent OED review found that these principles were difficult to put into practice. Given this, the 2003 Water Resources Sector Strategy advocated that IWRM be pursued with "principled pragmatism," meaning that the principles of IWRM should be promoted, in a piecemeal manner if necessary, when opportunities arise while still pursuing the overall goals of efficiency, equity, and sustainability.

Following the adoption of the 2003 Water Resources Sector Strategy, Country Water Resources Assistance Strategies (CWRAS) were introduced to bring coherence to the Bank's support for water management across the resources and service spectrum. CWRAS identify key strategic water resources issues within a country where the Bank can play an important role in assisting with water resources development and management, including environmental issues (Box 1). Typically, they include an analysis of water resources from a multisectoral perspective for guiding the Bank's policy dialogue and investment planning and emphasize the Bank's commitment to IWRM.

There are three entry points by which the Bank can promote IWRM implementation:

Box 1: Country Water Resource Assistance Strategies and the Environment

Seventeen CWRAS were analyzed to determine the extent to which they had included water-related environmental issues (Appendix B of the World Bank, forthcoming a). All 17 CWRAS had taken these issues into account, although to different extents. The CWRAS for Bangladesh, China, Ethiopia, Kenya, Mekong, Yemen, Tanzania, Philippines, and the East Asia Regional SEA had extensive treatment of these issues, particularly issues concerning changes in flows, watershed degradation, and water quality. However, several of them were weak on issues regarding changes in groundwater, loss of wetlands, rising water tables, and invasion of aquatic weeds.

All CWRASs emphasized the need for an integrated approach to water management. For example, the Yemen CWRAS emphasize the need for "reviving watershed management programs using an integrated approach with more focus on upstream communities." The IWRM concept has been treated in all the CWRAS; sometimes with uncritical support, and sometimes with conditional support. For example, the Ethiopian CWRAS states that "while developed countries are appropriately focused on the implementation of IWRM, Ethiopia and other developing countries may do better to adopt a principled and pragmatic approach to management while putting greater emphasis on concurrent investments."

- Reforms to national water policy, legislation, regulations and institutions
- Establishment or strengthening of water resources management authorities or river or lake basin-level management institutions
- Investment projects for single and multiple purpose water use

Policy Reform

A national water resources policy provides a comprehensive umbrella under which the stipulated IWRM principles can be implemented systematically with cross-sectoral support. The Bank has provided assistance through a variety of instruments for countries to reform their water resources policies, legislation, and institutions in line with IWRM principles and the country's economic and social objectives. Water resources policies commonly include IWRM concepts such as cross-sectoral management, separation of regulatory and service delivery functions, devolution of operational responsibility to the basin level, involvement of all stakeholders in decisions and formation of these stakeholder groups, protection of aquatic environments, water resources investments, and, sometimes, charging for water use. Often, aspects of these policy changes are incorporated into law.

The institutional structure needs to be changed to reflect these principles. The traditional centralized water resources department (which is often a relatively weak part of a consumption-oriented Ministry such as water supply or irrigation) needs to be transformed into an independent institution focused on policy development and coordination across sectors; basin-level operational authorities usually need to be established; and representative stakeholder groups need to be formed.

River and Lake Basin Management

The Bank has helped countries establish and strengthen river and lake basin organizations by funding office infrastructure and equipment; hydrometric and water quality monitoring networks; water quality laboratories; technical assistance for water resources assessments, river basin planning, training and financing studies based on IWRM experience in other countries, and helping form water user associations. Experience shows that it takes many years for basin-level organizations to be effective.

Both the Bank and the GEF have supported basin-level organizations for transboundary river and lake basins, although they are primarily coordinating institutions and forums for discussion rather than operational institutions.

Investment Projects

Bank-supported sectoral investment projects (most commonly in water supply/sanitation, irrigation, hydropower development, and flood control) can also contribute toward the principles of IWRM by promoting sectoral involvement in participatory decision making, ensuring that the investments meet environmental and social requirements, and, in some cases, establishing water user representative groups that can participate in national or basin-level decisions. For example, projects funded through sectoral ministries can be used to reinforce IWRM investments through ministries responsible for water resources.

Progress in Mainstreaming Environment in IWRM

IWRM principles are being slowly adopted by national governments. In 2003, GWP conducted an informal baseline stakeholder survey on the readiness of 108 countries (GWP, 2004). About 13 percent of countries surveyed had made good progress toward a more integrated approach, and a further 47 percent had taken some steps in this direction. The remaining countries had hardly made any progress. This level of adoption had improved two years later, when GWP assessed 95 countries for their initiation of new measures to strengthen water resource management and include IWRM elements in their policy documents (GWP, 2006). Approximately 21 percent of the countries had plans or strategies well under way, and a further 53 percent had initiated the development of an IWRM strategy/plan. Neither survey examined the practical implementation of these individual IWRM principles.

Other evidence shows that practical implementation of IWRM lags considerably behind the progress in establishing national frameworks. The World Bank, in an informal survey of India, the Philippines, Nigeria, and Yemen during 1999/2000 and prior to writing its Water Resources Sector Strategy, found that IWRM was being increasingly adopted in principle, but practical implementation was lagging. UNEP examined the practical impediments to IWRM implementation in developing countries (Rast, 1999), and found that they included: (a) lack of proper coordination of management activities; (b) lack of appropriate management tools; (c) inability to integrate water sector policies; (d) institutional fragmentation; (e) insufficiently trained or qualified manpower; (f) shortfalls in funding; (g) inadequate public awareness; and (h) limited involvement by communities, nongovernmental organizations (NGOs), and the private sector.

A study by IRC (Visscher et al., 1999) confirmed that while IWRM principles are internationally accepted and that many governments had developed IWRM policies and legislation, movement toward practical application of IWRM remained slow. The 2006 World Water Development Report (UNESCO, 2006) concluded that "there is now an urgent need to move beyond these preliminary (policy and legislative) steps to widespread implementation" of IWRM.

There is very little information from these studies on the extent to which IWRM has served as a vehicle for promoting environmental water considerations in practice. The informal World Bank survey noted that, in India, environmental concerns had not been integrated into IWRM and that the environment was seen as an add-on rather than a central issue. Another examination of IWRM in South Asia (Mollinga et al., 2006a) found that ecological concerns were just beginning to be addressed within water resources policies, despite considerable lobbying by environmental groups, and that they were seldom included in practice.

The IRC study found that stakeholder involvement is accepted in theory but poorly implemented and not accompanied by support from the higher political levels; decentralization of institutions is often not accompanied by legal frameworks; introduction of charging for water supply is receiving increasing emphasis, but that the charging structure needs to protect basic water users; and the role of women is narrowly interpreted when included at all. Although the study did not specifically investigate the integration of environment into water resources, it found that water source and catchment protection was increasing, but was poorly coordinated between levels and sectors.

The evidence is that IWRM is becoming increasingly accepted in national water resources policies and strategies, but its practical use is still lagging in many countries. Some commentators (e.g. Biswas, 2008), claim that IWRM is so fundamentally flawed in its conception that it is unlikely to

ever be an effective instrument. Nevertheless, the consensus at a recent international conference on practical experience with IWRM was that "IWRM provides a promising approach but it also represents an unattainable ideal. Perfect integration between all sectors, across the hydrological cycle and between all users is unlikely. One cannot wait to achieve this integration before tangible benefits are achieved on the ground." (Anderson et al., 2008) Even where some IWRM principles are being implemented in practice these do not usually include principles aligned to environmental protection or ecosystem management. That is, IWRM is not yet acting as an effective instrument for mainstreaming environmental sustainability into water resources management in developing countries.

CHAPTER 3:
STRATEGIC ENVIRONMENTAL ASSESSMENT: EVOLUTION AND EFFECTIVENESS

Strategic environmental assessment (SEA) provides an important pathway for introducing environmental concerns into water resources management at the strategic level of policies, legislation, strategies, programs, and plans. SEAs are now recognized to include a wide range of instruments that assess both the potential impacts of PLSPPs and the institutional capacity to integrate environmental and economic considerations. SEAs have not been widely employed in the water sector, although their application is growing. SEAs share characteristics with IWRM. The International Association for Impact Assessment has provided criteria for evaluating the procedural and substantive aspects of SEA. The institutional drivers used to explain EIA effectiveness are also suited to explain SEA implementation. These criteria and drivers are described in this chapter and will be applied to evaluate selected case studies of water sector SEAs in the next chapter.

Background

At around the time the water sector was proposing that environmental concerns be part of IWRM, the environment sector was promoting strategic environmental assessments as a tool for integrating environment into the strategic levels of decision-making in many sectors, including the water sector. SEAs complement and extend environmental impact assessments (EIAs) by undertaking environmental assessments of PLSPPs. Thus, SEAs both shift attention about environmental and social concerns, upstream, toward the strategic level and weave those concerns (that is, mainstream) directly into the decision–making process.[4] Strategic here refers to all the stages of decision making that precede the decision to go ahead with a specific project or a set of projects (Figure 2).

There are a number of characteristics that distinguish SEAs from EIAs (Noble, 2000). In particular, SEAs are set in the context of broader visions, goals, and objectives, helping choose a strategy for action and the means to an envisioned end so that environmental impacts can be identified, avoided, minimized, or mitigated at the earliest possible stage of the decision-making process.

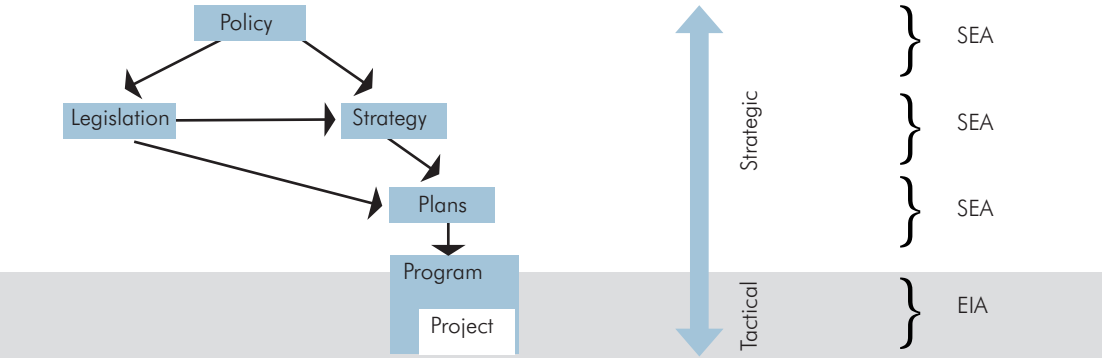
There are a wide range of SEA-type studies, also called para-SEAs in the literature, which "do not meet formal specifications of strict definitions of SEA but which have some of their characteristics or elements and share the same overall purpose of assessing environmental concerns to enable these issues to be taken into account in decision-making and in the preparation and implementation of PLSPP" (Dalal-Clayton and Sadler, 2005). Hereafter, we will include both SEAs and SEA-type studies under the generic term SEA, unless there is a need to distinguish them.

SEAs constitute a family of approaches that can be broadly classified on a continuum from impact-centered SEAs to institution-centered SEAs. The former assess likely environmental and social effects and propose mechanisms to avoid, mitigate, or compensate these effects. In focusing on a proposed sector-wide investment or instrument, they share similarities with EIAs, although shifted upstream to the strategic decision-making level. Impact-centered SEAs for programs and plans are often carried out at the regional level.

Institution-centered SEAs focus on the analysis of institutions and governance structures and frameworks (World Bank, 2005). Institution-centered SEAs are normally applied to policy and

4 OECD (2006) defines SEA as "analytical and participatory approaches that aim to integrate environmental considerations into policies, plans and programmes and evaluate the inter linkages with economic and social considerations."

Figure 2: The Relationship Between Policy, Legislation, Strategies, Plans and Programs and Projects



Source: World Bank (forthcoming b).

legislation because of the greater remoteness of these levels of decision-making from specific actions whose impacts can be assessed. Ahmed and Sanchez-Triana (2008) provide a review of SEAs applied to policies across a range of sectors and point out that they contribute to not only improved environmental considerations but also, more broadly, to improved governance.

Institution-centered and impact-centered SEAs are closely related to the IWRM comb (Figure 1). The former lie in the handle and back (blue part) of the comb because they typically involve assessments of cross-sectoral collaboration, capacity for environmental protection, and the adequacy of policies, laws, plans, and programs. The latter lie in the teeth of the comb because they are sector-specific assessments of the impacts of particular programs or plans. In reality, some SEAs are both institution-centered and impact-centered; an SEA for a large infrastructure program may include an assessment of capacity for undertaking EIAs and the adequacy of legislation, as well as the potential impacts of the investment.

SEAs vary in other ways too (OECD, 2006). They can be:

- Either stand-alone processes running parallel to core planning processes, or processes integrated into the planning, policy/decision-making
- Solely focused on environmental impacts or integrating all three dimensions of sustainability—environment, social, and economic
- Applied for a variety of purposes, from ascertaining the environmental consequences of an existing PPP, to providing inputs into developing a PPP supporting, facilitating, and improving its development, so that it addresses environmental dimensions effectively[5]
- Engaging of a broad range of stakeholders or limited to expert policy analysts
- Conducted in a short time frame or over a long period
- Employed as a quick analysis while others require detailed analysis
- A finite, output-based activity (e.g. a report), or be a more continuous process that is integrated within decision-making, focused on outcomes, and strengthens institutional capacity

5 The diversity of purposes for SEAs has grown significantly over the last decade and is now broad enough to require an analysis of different approaches and methods.

This variety illustrates that SEAs now cover a much wider range of applications than just being EIAs that have been shifted from projects to programs and plans. Many of these varieties of SEAs are included in the case studies examined in Chapter 4. Examples within the World Bank of this wide range of types of SEAs include sectoral and regional environmental assessments and country water resources assistance strategies. The GEF's transboundary diagnostic analyses (TDAs) and strategic action programs (SAPs) are also examples of SEA-type studies (Box 2).

Characteristics of Effective SEAs

There are two broad requirements for effective SEAs: (1) drivers need to be in place to ensure that SEAs are initiated when needed and the recommendations are adopted; and (2) SEAs should follow the procedures established by each country and possess the appropriate substantive content. Sadler (1995) terms the drivers the "institutional controls" and the procedural and substantive criteria the "operational competence" of SEA systems. Both institutional controls and operational competence will be used to analyze water-sector SEA case studies in the next chapter.

Institutional controls for SEAs

Ortolano et al. (1987) introduced six "mechanisms of control," or drivers, that underpin and promote the preparation and implementation of EIAs (Box 3). In general, these drivers also apply to SEAs, although there are differences in emphasis and implementation that are described in the box.

Operational competence of SEAs

A number of reports provide criteria to assess the operational competence of SEAs (Office of the Deputy Prime Minister, 2005; IEMA, undated; IAIA, 2002; Bonde and Simpson, 1999). Perhaps the most comprehensive are the criteria developed by IAIA (2002), following a series of workshops and widespread consultations with experienced practitioners. These criteria were developed

Box 2: Transboundary Diagnostic Analyses and Strategic Action Programs

The GEF International Waters focal area devised the transboundary diagnostic analysis (TDA) process to help overcome the problem of lack of coordination over the management of international waters. A TDA identifies and analyzes the major problems hindering the sustainable use of international waters and their resources; identifies the root causes of the problems; and ideally, provides information and understanding on the types and magnitude of the programs and activities needed to address the problems. A properly conducted TDA will serve as a comprehensive database for the subsequent development of a strategic action program (SAP) comprised of activities, projects, and remedial measures needed to ensure the sustainable use of a transboundary water body and its resources to the overall benefit of all drainage basin inhabitants.

The joint development of a TDA provides riparian countries with a forum for cooperating and collaborating in the exchange of information, and for working together to develop common management goals and/or investments. This cooperative element is probably as valuable as is the assemblage of scientific information.

Source: Mee et al., 2005.

primarily for impact-centered SEAs. An additional criterion—*influence*—that has previously been used in World Bank documents has been added here to assess the long-term impact of the SEA (Box 4).

Box 3: Drivers for EIA Implementation

Judicial drivers. The courts have a formal role in ensuring that government agencies implement EIA provisions in the relevant legislation. Judicial drivers are widely used in the United States, where the judiciary has a constitutionally sanctioned role in reviewing government procedures. Judicial drivers are less important for SEAs than for EIAs, since SEAs are normally undertaken by government agencies that are not subject to the same legal sanctions as private sector developers undertaking EIAs.

Procedural drivers. The legislation, regulations, and guidelines provide formal drivers over the procedures to be followed when conducting EIAs. However, procedural drivers are seldom effective without the availability of other drivers such as judicial or evaluative drivers. By themselves, they can lead to well-written EIAs that are ignored. Procedural drivers for SEAs can be established through either legislation or through administrative orders or cabinet directives. Administratively driven SEAs have the advantage that they can be more flexible in cases where strict adherence to legislated assessment requirements may not be possible.

Evaluative drivers. Evaluative drivers exist when the institution responsible for assessing the quality of EIAs is able and willing to impose sanctions if the EIA is unacceptable. Most EIA legislation provides for the imposition of penalties for noncompliance; however, there can be political pressure to avoid prosecution of transgressors. Unlike EIAs, SEAs are normally conducted by government agencies and so it is important that strong evaluative drivers are present. In some countries, there is an independent agency for assessing the quality of SEAs, but the critical factor is civil society's demand for accountability in strategic decision-making.

Instrumental drivers. The requirements of international development partners provide an additional driver for EIAs. Mawalyosi and Hughes (1998) found that almost all the examples of EIAs in Tanzania had been undertaken because of the requirements of international development partners. Instrumental drivers can play a central role in introducing SEAs in developing countries, where legislative and administrative drivers are absent.

Professional drivers. The professional code of conduct of planners and other professionals undertaking or advocating EIAs (e.g., IAIA) can act as a powerful driver for EIA quality. This driver requires that individuals are well trained in EIA procedures and that their professional organizations are independent of government, have strong codes of conduct, and able to impose their professional expectations on their members. Although professional drivers can be powerful influences in developed countries, they are usually weak in developing countries, where professional planning and environmental agencies are relatively new and do not have much influence.

Public drivers. These drivers, applicable to both EIA and SEAs, rely on informed public citizens who are motivated and confident enough to make their views known to government. They may be more relevant in developed countries, which have a tradition of active public engagement in the decisions of government, but may also be important in developing countries.

Source: Modified from Ortolano et al., 1987.

Box 4: Characteristics of a Good-Quality SEA Process

Process Criteria

Accountable

- Clarifies which are the leading agencies for the strategic decisions to be taken
- Carried out with professionalism, rigor, fairness, impartiality, and balance
- Subject to independent checks and verification
- Documents and justifies how sustainability issues were taken into account in decision making

Participative

- Informs and involves interested and affected public and government bodies throughout the assessment process
- Explicitly addresses their inputs and concerns in documentation and decision-making
- Features clear, easily understood information requirements and ensures sufficient access to all relevant information

Iterative

- Ensures availability of the assessment results early enough to influence the decision-making process and guide future planning
- Provides sufficient information on the actual impacts of implementing a strategic decision, to judge whether this decision should be amended and to provide a basis for future decisions

Substantive Criteria

Integrated

- Ensures an appropriate environmental assessment of all strategic decisions relevant for the achievement of sustainable development
- Addresses the interrelationships of biophysical, social and economic aspects
- Relates to policies in relevant sectors and (transboundary) regions and, where appropriate, to project EIA and decision making

Sustainability-led

- Facilitates identification of development options and alternative proposals that are more sustainable

Focused

- Provides sufficient, reliable, and usable information for development planning and decision-making
- Concentrates on key issues of sustainable development
- Customized to the characteristics of the decision-making process
- Cost- and time-effective

Influential

- Improves the strategic decision and influences future policies by raising awareness and changing attitudes toward sustainable development

Source: Modified from IAIA 2002.

SEAs in the Water Sector

Relatively few SEAs have been carried out in the water sector compared to other sectors such as transport and land-use planning. Most water-sector SEAs have been conducted in developed countries, although such cases are emerging in developing countries. Multilateral lending institutions have supported many of these SEAs. The World Bank has funded numerous sectoral and some regional environmental assessments for water resources (Green and Raphael, 2002) and, more recently, has developed 17 CWRAS.

Other examples of water-sector SEAs in developing countries include the SEA in the 1991 Botswana Water Master Plan, the Regional EA regarding flood protection in Argentina, the transboundary EA of the Nile Basin, and examples mentioned in Chapter 5.

Some regions and countries have introduced systematic requirements and procedures for conducting SEAs in the water sector:

- The UNECE Protocol on SEA (UNECE, 2003) requires that contracting countries conduct domestic and transboundary SEAs during the elaboration of programs and plans in a number of sectors, including water management, when those programs and plans will lead to projects that would require EIAs.
- The EU Directive on Strategic Environmental Assessment (Box 5) requires that all plans and programs that are likely to have an effect on water need to be assessed with an SEA (European Commission, 2001).

Box 5: EU Water Framework Directive (WFD) and SEA Directive

The WFD, adopted by the European Parliament in 2000, was to be established in national legislation by the end of 2003. It contains many of the principles of IWRM, including managing water quantity and quality for surface and groundwater, treating water as having an economic value, and enhancing consultation and participation. Its key requirement is the production of river basin management plans by all EU member countries.

The SEA directive, adopted by the Parliament in 2001, requires member countries to introduce legislation by mid-2004 for SEAs of any plans and programs that may affect the environment; water plans are identified specifically.

SEAs of the river basin management plans are the major area of overlap between these directives, although land-use plans are potentially another topic that would fall under both directives. Article 11 of the SEA directive states that coordinated procedures should be developed where there are such overlapping requirements for assessment. To satisfy both directives, these procedures need to include baseline data, assessment of alternatives, mitigation measures, monitoring procedures, and consultation and participation. Thus, the directives are focused on assessing impacts, and an institution-centered approach may not meet the directive requirements.

Once these coordination procedures are in place, then both directives can be expected to ensure that environmental considerations are included in river basin management plans and possibly land use plans that affect water quality.

Source: Carter and Howe, 2006.

- The South African Department of Water Affairs and Forestry (DWAF) considered SEA as a tool for use in catchment management and planning with the introduction of the National Water Act 1998. Although SEA was not subsequently adopted, the ideas behind SEA have been influential in guiding IWRM in other catchments.
- The pilot study of SEA in the Palar basin in India proved to be a successful method for developing a framework for IWRM and the SEA process is being extended to other sub-catchments in Tamil Nadu State.
- The Tanzanian Environment Management Act 2004 identifies water developments as one of four types of developments where an SEA is specifically required at a pre-project stage.

Because there has yet to be a significant body of water-sector SEAs, there is no baseline of water-sector SEA practice against which to assess individual studies. However, there are many more para-SEAs in the water sector, such as environmental flow assessments (EFA), some of which will be used in the case studies in the next two chapters.

There are common characteristics and approaches in SEA and IWRM. They both:

- Identify and support priority setting and integrate environmental and social considerations into higher level decisions (see Figure 2)
- Are applied at national, basin, and transboundary scales
- Place emphasis on participatory and consultative approaches to decision making
- Use factual approaches and quantitative data where possible
- Promote learning through the process of conducting the study
- Incorporate monitoring and evaluation of outcomes
- Seek to broaden the perspectives of planners beyond immediate sectoral issues
- Contribute to improved governance through their emphases on participatory and knowledge-based decision making

This makes SEAs particularly suited for use in the water sector (Box 6).

There are also differences between SEAs and IWRM. In particular, the former are focused on environmental considerations, while the latter include multiple water-related sectors and issues, including issues that do not have a prominent environmental dimension.

The linkage between SEA and IWRM is explicitly recognized in one of the case studies (the SEA of the Palar Basin in India), where the method used employed characteristics of both IWRM and SEA. "If integrated river basin management is the concept that a river basin should follow, then SEA has the potential to become a useful application tool that could be put into practice by river authorities" (Modak, 2003).

The opportunities offered by SEA to improve the integration of environmental issues in IWRM occur at many levels: developing a national or sector water policy; drawing up river basin plans; identifying hydropower, irrigation, or urban water supply options; supporting transboundary water resources management and development; or instituting sectoral strategies or programs (see Appendix C). Some case studies of these opportunities are examined in the next chapter.

Box 6: SEA Suitability for Water Resources

Advantages of applying SEAs in water resources:

- *Integrated Approach*. SEAs, with their emphasis on a transparent, participatory approach, are well suited to handling the multisectoral nature of water resource management, including environmental water needs and water quality management.
- *External Effects*. SEAs can provide a structured and transparent mechanism for negotiation and decision making in national and international river basins. Within a river basin, upstream and downstream stakeholders have to agree on plans for water management. In other words, SEAs provide the principles for developing water resource management plans at the river and lake basin level.
- *Cumulative Effects*. A number of water resource interventions are, individually, relatively small but, in aggregate, can have major impacts. Examples include smallholder irrigation, groundwater wells, rainwater harvesting in source areas, and pollution from artisanal mining activities. SEAs allow these cumulative impacts to be addressed at an aggregate level.
- *Changing Management Perspectives*. SEAs can support the establishment of a clear policy analysis and decision framework to guide decentralized water management. It is increasingly common to manage water resources at the level of basin water boards or water user associations. The resulting process of decentralization, involvement of civil society, and public-private partnerships requires a clear policy framework. SEAs are an excellent tool for developing this framework.

Source: The Netherlands Commission for Environmental Assessment 2004.

CHAPTER 4:
LESSONS FROM WATER-SECTOR SEAS

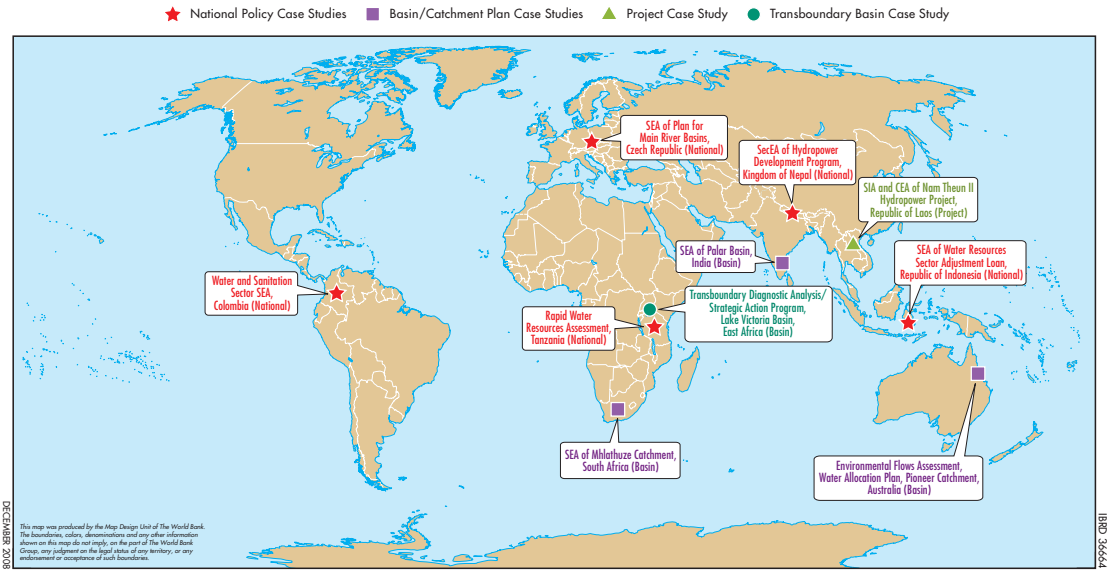
Ten case studies of SEAs in strategies, programs, and plans in the water sector from around the world were assessed for (a) the types of institutional controls (drivers), and (b) their inclusion of the operational competence criteria of the IAIA. The extent to which they promoted the principles of IWRM was also assessed. Even though integrating environmental principles into policies is central to IWRM, no SEAs of water policies were identified for inclusion in the case studies. Consequently, four national and state water policies were reviewed to understand the degree to which each incorporated environmental issues. Summary lessons were drawn from this examination into improving the institutional environment within which SEAs are conducted and the procedural and substantive aspects of SEAs.

SEA Case Studies

Ten SEAs in the water sector were examined to derive lessons on the implementation of SEAs at the transboundary, national, and basin levels. Figure 3 shows the locations of the 10 case studies. The aim was to identify the factors that contributed to the success of these SEAs in terms of their institutional drivers, procedural methods, and substance. The SEAs also provided lessons on the integration of environmental concerns into IWRM.

All Bank-funded SEA and SEA-type studies in the water sector were scanned, and those undertaken since 1995 with good documentation in English and staff available for interview were selected. Multiple examples of the same type of study (e.g., GEF TDAs/SAPs) were dropped. Attempts were made to balance sectoral and geographical coverage. CWRASs were examined separately. This resulted in six Bank-funded case studies (including a Bank-implemented GEF project) and one study funded by the Asian Development Bank and the World Bank. These were supplemented by a water-sector strategic study from a developed country (Australia), one from a country in economic

Figure 3: Location of Ten Case Studies of SEAs in the Water Sector



transition (Czech Republic), and one from a developing country (South Africa). These case studies are described in detail in a separate publication (World Bank, forthcoming a).

Overview of Case Studies

There were no SEAs of water resources policies, although some strategy and program SEAs examined national policies, legislation, and regulations.

Impact and institution-centered SEAs occurred at both the program and strategy levels. The only SEA at the plan level considered only biophysical impacts of development scenarios. The Nam Thuen II SEAs[6] were unusual in that they were part of the environmental assessments for a specific project. Although project-specific, they have been included as program SEAs, since these particular studies examined the sustainability of programs of development beyond the hydropower plant itself.

The case studies (Table 1) illustrate the diversity of origins, sectors, purposes, and methods for the SEAs. The SEAs covered spatial scales from small catchments to large transboundary regions. The Lake Victoria Environmental Management Project Phase II (LVEMP-II) TDA/SAP was the only case study that was fully transboundary in nature, although the Nam Theun II SIA also looked at proposed sectoral developments within countries bordering Laos and their strategic implications for the proposed Nam Theun II development. SEAs cannot always be assigned easily to a particular strategic level. Although the Colombia SEA was initiated to support a national sectoral program, it examined the adequacy of specific sectoral policies and legislation.

These case studies illustrate how SEAs can serve diverse purposes (OECD, 2006). Two of the 10 SEAs—Czech Republic, Nam Theun II—were established to assess the potential social and environmental impacts of a specific draft instrument (an impact-centered SEA) and two more —Indonesia WATSAL and Colombia WSS—assessed the institutional structures within which a proposed program was to operate (institution-centered SEAs). The other six SEAs were undertaken before a specific instrument had been formulated. Three—the Pioneer and Mhlathuze catchment studies and the Lake Victoria TDA/SAP—were used to provide information for a plan, program, or strategy about to be developed (the Mhlathuze SEA had a second objective—to explore the potential of SEAs for catchment water allocation planning across South Africa). The remaining three SEAs—Nepal Hydropower SEA, Tanzanian RWRA, and Palar Basin SEA—were not used to either assess draft instruments or to provide specific environmental input into a new instrument about to be developed. Instead their purpose was to better understand, clarify and structure complex situations and develop a framework for action.

The SEAs also diverged considerably between those that relied on formal analytical methods and those that relied on participative methods. For example, the Pioneer Catchment study used a rigorous analytical procedure, the Benchmark methodology, to assess environmental flow needs. It was conducted as a scientific exercise with no stakeholder input. The Tanzanian RWRA study used existing regional water master plans, a national energy master plan, a national irrigation master plan, and other data and information, coupled with the judgment of 11 professionals from several government ministries to identify priority sectoral issues and river and lake basins requiring priority action. The WATSAL SEA, on the other hand, relied upon stakeholder input to formulate its recommendations. Some studies combined analytical and stakeholder-driven

6 Both a cumulative impact assessment (CEA) and a strategic impact assessment (SIA) were undertaken for the Nam Thuen II project.

Table 1: Characteristics of Ten Case Studies of SEAs in the Water Sector

No.	Case Study	Sector and sub-sector	Strategic Level	Purpose[1]	Scale	
1	Water and Sanitation Sector SEA, Colombia	Water Supply and Sanitation • urban and rural water supply	• wastewater treatment	Program	Assessment	National
2	Rapid Water Resources Assessment, Tanzania	Water Resources • urban and rural water supply • hydropower (Energy)	• irrigation (Agriculture) • environment (Fisheries, Wetlands)	Strategy	Structuring	National
3	SEA of Plan for Main River Basins, Czech Republic	Water Resources • flooding • water allocation	• wastewater treatment	Strategy	Assessment	National
4	SecEA of Hydropower Development Program, Kingdom of Nepal	Energy • hydropower • catchment protection	• environmental water	Program	Structuring	National
5	SEA of Water Resources Sector Adjustment Loan, Republic of Indonesia	Water Resources • flooding • catchment degradation	• urban and rural water supply • irrigation • environmental water	Program	Assessment	National
6	Environmental Flows Assessment, Water Allocation Plan, Pioneer Catchment, Australia	Environment • biodiversity	• irrigation	Plan	Information	Basin
7	SEA of Mhlathuze Catchment, South Africa	Water Resources • rural water supply • forestry	• irrigation • industry	Plan	Information	Basin
8	SEA of Palar Basin, India	Water Resources • urban and rural water supply • urban wastewater	• industrial wastewater	Strategy	Structuring	Basin

(continued on next page)

Table 1: Characteristics of Ten Case Studies of SEAs in the Water Sector (continued)

No.	Case Study	Sector and sub-sector	Strategic Level	Purpose[1]	Scale	
9	SIA and CEA of Nam Theun II Hydropower Project, Republic of Laos	Energy • hydropower • irrigation • flood protection	• urban and rural water supply • fisheries • industry	Program	Assessment	Regional
10	Transboundary Diagnostic Analysis/Strategic Action Program, Lake Victoria Basin, East Africa	Water resources • catchment protection • fisheries • transport	• urban and rural water supply • hydropower • tourism	Strategy	Information	Trans-boundary

Note 1: "Assessment" means the SEA assessed either environmental impacts (impact-centered) or environmental capacity (institution-centered); "information provision" means the SEA preceded the PLSPP and was used to provide environmental information for it; "structuring" means the SEA was used to structure a complex situation.

approaches. The Nepal Hydropower SEA used a formal screening and ranking methodology to identify the most promising options in a power development program, but used stakeholder input to establish the suite of hydropower sites to be assessed, the criteria to be used for the assessment, and the weights to be given to the different criteria.

The Pioneer Catchment was the only study that was restricted to environmental issues; the rest integrated environmental issues with development and management needs related to other water using sectors. All the other studies included social issues (health issues in the case of the Czech Republic SEA) and two (Nepal Hydropower, Colombia WSS) included explicit financial/economic considerations in their assessment of issues and recommendations for sustainable options.

Analytical Method

The case studies were analyzed to identify their institutional drivers (Box 3) and to assess the extent to which they met the procedural and substantive criteria proposed by IAIA (Box 4). The analysis was based on both documentation and interviews. Documentation was initially obtained from published sources, including the archives in the case of the Bank-led case studies. Interviews were then arranged with the team leaders of the projects where they were available and with other team members where the team leader was not available. The interviews particularly focused on the motivations for the study and its subsequent influence, since this information was seldom documented.

Institutional Drivers

Table 2 provides an overview of the drivers that operated in the 10 case studies. None of the case studies resulted from a judicial driver, while procedural drivers were relatively infrequent, reflecting the lack of legislation requiring SEAs. Although instrumental controls were the most frequent drivers, they were often used voluntarily by developing countries. That is, the countries were interested in undertaking SEAs with advice and support from the development partner.

Multiple drivers provide robustness. The case studies make it clear that there is usually not just a single driver for an SEA but a multitude of influences. Thus, a legislative or instrumental requirement may act as the primary driver, but public or professional pressure can be a background, but very powerful, force. In some cases, such as Nam Theun II and the Nepal Hydropower study, international public pressure as expressed by international NGOs played an important role. In addition, the drivers are not static, but can change during the development and implementation of the SEA. There were a number of case studies (Colombia WSS, Nepal Hydropower, WATSAL) where government resistance (or indifference) gave way to support as the study progressed.

The Czech Republic case study illustrates how ineffective a procedural driver can be if it is not backed up by other influences or sanctions. The SEA was undertaken to fulfill a formal legislative requirement, but there was no enthusiasm to take advantage of the opportunity to make the Plan of Main Watersheds more environmentally or socially sustainable. The Pioneer Catchment environmental flows analysis was also initiated because of a legislative driver, but in this case it was backed up by strong public and professional expectations and an effective evaluative mechanism. This implies that usually multiple drivers promote the effectiveness of SEAs.

Table 2: Drivers of SEA Case Studies

	Driver					
Case Study	**Judicial**	**Procedural**	**Evaluative**	**Instrumental**	**Professional**	**Public**
Water and Sanitation Sector SEA, Colombia				Voluntary following dialogue with World Bank	Interest developed during SEA	
Rapid Water Resources Assessment, Tanzania				Voluntary following dialogue with World Bank	Interest in engaging in international best practice	
SEA of Plan for Main River Basins, Czech Republic		Required in legislation	Oversight by Environment Ministry (weak)			
SecEA of Hydropower Development Program, Kingdom of Nepal				Voluntary following dialogue with World Bank	Interest in engaging in international best practice	Pressure from international NGOs
SEA of Water Resources Sector Adjustment Loan, Republic of Indonesia				Voluntary following dialogue with World Bank	Interest in engaging in international best practice	Support from stakeholders emerged during SEA
Environmental Flows Assessment, Water Allocation Plan, Pioneer Catchment, Australia		Required under legislation	Oversight by Water Ministry		Expectation by managers and scientists	Stakeholders expected involvement
SEA of Mhlathuze Catchment, South Africa					Professional interest in trialing SEA	Support from stakeholders emerged during SEA
SEA of Palar Basin, India				Voluntary following dialogue with World Bank	Support from professional staff emerged during SEA	Support from stakeholders emerged during SEA
SIA and CEA of Nam Theun II Hydropower Project, Republic of Laos				Required by development partners	Interest in engaging in international best practice	Pressure from international NGOs
TDA/SAP, Lake Victoria Basin, East Africa				Required by development partners	Basin governments supported TDA/SAP	

Good practice can act as a driver. In a number of instances, none of the recognized drivers triggered the SEA. Instead, there was simply recognition by the government, often supported by an external influence, that an SEA study was the best approach to establishing a systematic strategy. This occurred clearly in the Palar Basin, Tanzanian RWRA, Mhlathuze catchment, and WATSAL case studies, and there were strong elements of wanting to conform to international best practice in the Nam Theun II case study. The Nam Theun II, Nepal Hydropowe,r and WATSAL SEAs occurred at a time when the respective governments wanted to publicly demonstrate their openness; the first and second to help attractive private sector investment, and the third because it followed the end of a long-term repressive regime.

Trust is an important element. Trust between government agencies or between the government and the development partner is a critical, but often unvoiced, component when the government has little or no experience in strategic assessments. Trust was central to the initiation of the Colombia, Nepal Hydropower, Nam Theun II, and Palar Basin SEAs. In the cases of both the Colombia and the Nepal Hydropower SEAs, the governments were initially skeptical, although later some government institutions became strong supporters of the process. Sectoral development-oriented ministries remained unconvinced, and saw their task as constructing and operating infrastructure. The Colombia case study showed the importance of being patient and waiting for the alignment of interest and opportunity; not everyone was ready to support SEA outputs immediately.

Procedural Factors

Table 3 summarizes the major environmental-water issues and the major outcomes to which the SEA contributed.

The objectives of the SEA must be clear. The terms of reference for the Czech Republic SEA did not give adequate guidance for enhancing the environmental sustainability of the Plan for Main River Basins. Similarly, the regional TDA and SAP for the Lake Victoria Basin provided weak design and uncoordinated programs of action for the basin countries. In the SEA of the Mhlathuze catchment, the terms of reference for the study were diffuse and were varied over time. In addition, one of the major clients for the work did not exist when the study started. Consequently, the local influence of this case study was quite limited (although it had significant influence nationally).

The professional composition and leadership of the team is important. The diagnosis of problems and recommended solutions depends on technically competent and empowered study-team members. Diverse skill sets on the team, as in the Tanzanian RWRA, resulted in a more robust analysis. The SEA needs to be led by a person with a broad overview of the issues as well as an understanding of environmental and water resources management

It is notable that there were a number of instances where the Environment Ministry was a reluctant partner in what is essentially an environmental instrument or was unable to provide the necessary leadership. This occurred in the Colombia WSS, the Czech Republic, the Indonesian and Nepal SEAs. In the latter two cases, it was the Planning Commissions, rather than the Environment Ministry, that recognized the benefits from the SEAs and promoted their further use.

Consultation is important, but need not be comprehensive. The stakeholders that need to be consulted can vary significantly and yet still be appropriate, depending on the objectives of the SEA. Consultation in the Tanzanian RWRA was restricted to government agencies and the draft was shared at a national stakeholder forum. On the other hand, the Nepal Hydropower SEA engaged

Table 3: Major Water-Related Environmental Issues and Outcomes

Case Study	Water-Related Environmental Issues	Major Outcomes
Water and Sanitation Sector SEA, Colombia	• Pollution of waterways leading to health problems • Stringent and cumbersome environmental regulations • Inappropriate tariffs for wastewater discharges	• New water sector legislation • Updated environmental regulations • Capacity building for regulators and WSS operators • Upgrades to WSS
Rapid Water Resources Assessment, Tanzania	• Water allocation conflicts • Watershed degradation • Water quality degradation • Water supply and health impacts • Groundwater table decline • Threat to wetlands	• New water policy and bill • Institutional reforms • Improved stakeholder involvement • Investments in three priority basins as second phase • Investments (including river and lake basin plans) in all nine basins in the third phase (ongoing)
SEA of Plan for Main River Basins, Czech Republic	• Pollution from wastewater and industrial discharges • Flooding • Groundwater pollution	• Relocation of wastewater treatment plants • Minimizing ecological impacts from flood protection measures
SecEA of Hydropower Development Program, Kingdom of Nepal	• Catchment degradation • Provision of environmental flows	• Prioritized list of hydropower developments • Widespread acceptance of the hydropower program • Improved attractiveness for private sector investment
SEA of Water Resources Sector Adjustment Loan, Republic of Indonesia	• Flooding • Water pollution from industry, domestic use, and agriculture	• Widespread stakeholder acceptance of reforms • Greater pressure for future consultation • Better targeted and accepted development projects
Environmental Flows Assessment, Pioneer Catchment, Australia	• Loss of freshwater and estuarine biodiversity	• Credible environmental flows input to Water Allocation Plan • Improved water allocation rules for catchment
SEA of Mhlathuze catchment, South Africa	• Water over-allocation • Pressure for water licenses under new National Water Act	• Helped change attitudes to IWRM within national department • Provided evidence of over-allocation
SEA of Palar Basin, India	• Access to water • Water pollution • Sand mining • Land degradation	• Framework for managing water resources and integrating environmental considerations • Transfer of experience to other river basins in Tamil Nadu State

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Table 3: Major Water-Related Environmental Issues and Outcomes (*continued*)

Case Study	Water-Related Environmental Issues	Major Outcomes
SIA and CEA of Nam Theun II Hydropower Project, Republic of Laos	• Loss of riverine and source area biodiversity • Loss of flows in section downstream of dam • Potential impacts on lower Mekong River	• Assessment of regional and cumulative impacts of hydropower and other development
TDA/SAP, Lake Victoria Basin, East Africa	• Decline in lake level with impacts on littoral zone • Soil loss and sedimentation • Excess nutrients and eutrophication • Aquatic weeds • Loss of native fish species • Degradation of fringing wetlands	• Agreed set of regional priorities for basin countries • Supported environmental management components of LVEMP-II project • Provided strategic issues for LVBC

in widespread consultation with all stakeholders from an early stage. The RWRA study was intended to give strategic direction to the Tanzanian government, while the Nepal study was designed to provide national consensus on a medium-scale hydropower development program following a divisive clash over a large-scale hydropower project. In the case of the Pioneer Catchment Environmental Flow Assessment, stakeholders were not consulted at all (although the final report was posted on the internet) because their concerns were assessed though a separate process.

Consultation needs to be planned for local circumstances. The Czech Republic SEA illustrates the importance of having a consultative plan. In that case, the lack of a plan meant that there were no defined target groups or transmission pathways for information. Central stakeholder groups such as local governments were only aware of the SEA report if they had the initiative to locate it on the web. On the other hand, the Palar Basin SEA was staged so as to first build capacity and confidence within the technical support team before engaging the wider stakeholder community. The design of the consultations has to take into account the circumstances of each case. Given the level of distrust of the central government in Indonesia because of corruption and lack of autonomy, the consultations for the WATSAL SEA were facilitated by NGOs assisted by local CBOs to help build trust. For the same reason, the study team returned to all stakeholder groups, in order to build confidence in the actions of the new government.

Spatial scale matters. The Palar Basin provides an example where the scale of the study area was too large for the consultative approach. Many stakeholders had only local knowledge and did not understand the extent of issues elsewhere in the basin. This is being rectified in the follow-on studies, which will be carried out at sub-basin scale. Similarly, the attempt to up-scale the Mhlathuze Catchment SEA to the larger Water Management Area failed, partly because of difficulties in engaging with multiple communities with diverse objectives.

Independent review. Only the Mhlathuze Catchment SEA was independently peer reviewed. The reviews were very revealing and provided the Department of Water Affairs and Forestry with a

much deeper understanding of the SEA's strengths and weaknesses. It is not clear why this quality assurance process was not used more often, especially in cases where professional controls were weak and there was no strong evaluative driver.

The SEA methods and procedures should match the circumstances. The assessment methods need to be able to cope with the characteristics of the SEA. The Lake Victoria TDA/SAP was the most complex of the case studies. Its analytical method gave equal weight to all basin countries, even though some of the major issues (e.g., the recent rapid decline in the level of Lake Victoria) did not affect some of the smaller upstream countries. This resulted in a skewed set of priority actions, with land degradation ranked as a higher priority compared to declining lake levels. The case studies provide a number of examples where the assessment methods were different, but where each was well-suited to the circumstances, for example, the screening and ranking method for the Nepal SecEA, and the planned consultative approach in WATSAL.

SEAs can span strategic scales. There are a number of examples where institution-centered SEAs were undertaken to support a strategy, program, or plan, but where they examined higher and lower strategic decision-making instruments. The Colombia and WATSAL SEAs and the Nam Theun II SIA and CEA made recommendations for reforming the legislative, strategic, and policy frameworks so that programs and projects could be more effective. On the other hand the Nepal Hydropower and WATSAL SEAs, and the Nam Theun II SIA recommended the EA framework to be employed when development projects were to be assessed.

Substantive Factors

SEA is not an event but a process. The process of interacting with different stakeholders, examining causative influences and longer term consequences, and integrating environmental, social, and economic considerations is often as important as the output from the SEA study. "SEA values the process of stakeholder participation as much as it values the outcome itself" (Anon., 2003). The SEA process should commence at the earliest possible stage (Box 7) and continue after the specific SEA study has been completed. Effective SEAs can provide operational input into different stages of water resource planning, often spanning many years after the SEA study is completed. This is illustrated by the Tanzanian RWRA and Colombia WSS SEA case studies. In the latter case, the SEA influenced the design of a subsequent investment load and three consecutive programmatic development policy loans.

SEAs need not be environment-led. The Tanzanian RWRA study and the Colombia and WATSAL SEAs were effective in improving environmental governance, but were not driven by environmental issues. The Colombia SEA was primarily driven by the need to reduce regulatory barriers to private sector investment and to rectify the structural causes of health related problems. All three were pragmatic and examined a wide range of factors that were impeding efficient operations in (a) irrigation, hydropower, water supply/sanitation, health, and protection of water sources (RWRA, Tanzania); (b) health and water supply/sanitation (WSS SEA, Colombia); and (c) flood control, irrigation, water supply/sanitation, and protection of water sources (WATSAL, Indonesia).

It is arguable that these SEAs would have been regarded as peripheral and therefore less influential if they had been restricted to just environmental and/or social issues.

SEAs can catalyze shifts in approach. A number of the SEAs—Tanzanian RWRA, Colombia WSS SEA, SEA of Palar Basin, WATSAL WSS SEA, and Mhlathuze catchment SEA—illustrate how a

Box 7: SEA of Hydrological and Irrigation Plans, Castilla y León, Spain

Castilla y León is the only regional government in Spain requiring SEAs of plans and programs for key development sectors. The joint SEA of the hydrological plan for the Duero Basin (essentially the Castilla y León region) and the irrigation plan for the region was a classic impact-centered SEA with the objectives of identifying potential environmental impacts and developing more sustainable alternatives.

The hydrological plan produced by the national government was largely focused on the development of irrigation infrastructure as a means to overcome the region's structural problems. The regional irrigation plan, in turn, provided details on the new irrigation areas and likely crops to be irrigated.

The SEA showed that the proposed plans would lead to high financial costs and significant negative impacts on the environment. The SEA suggested that the actions proposed in the plans should be modified in order to achieve better effectiveness and efficiency in terms of (a) the investment of public funds, (b) the use of water resources, and (c) the conservation of biological diversity. The SEA concluded that the emphasis should be shifted from *post hoc* assessment of draft plans, as in this pilot study, toward a wider process starting with the early definition of objectives and strategies.

Source: Hedo and Bina, 1999.

strategic study can widen the views of staff and decision makers. This, in turn, lays the foundation for major shifts in approach to water resources management and reforms to the sector. In the cases of the Tanzanian RWRA, and the SEAs of the Palar Basin and the Mhlathuze catchment, these shifts in approach led to the practical introduction of some of the principles of IWRM.

Successful pilot SEAs can lead to full programs. The successful development of the three priority basin water offices in Tanzania has now been expanded to nine offices covering the whole of the country. Similarly, the Palar Basin SEA showed how to systematically develop a plan of action with community support. This plan is being rolled out across 63 sub-basins within Tamil Nadu State, India.

Political economy matters. Most of the effective SEAs were those that addressed or were carried out in the context of important political issues. The Tanzanian RWRA, the WATSAL SEA, and the Colombia SEA illustrate the power of responding to politically recognized crises. In addition, the Colombia case study illustrates the importance of developing economic arguments to show the benefits of undertaking environmental reforms; not all case studies were reliant on economic arguments for influence if there were powerful political imperatives for action (e.g. Pioneer Catchment EFA).

Early outputs maintain interest. The Palar Basin SEA showed that there needed to be clear outputs from an early stage to maintain the interest of stakeholders who were not familiar with consultative processes. The feedback to stakeholders in the Nepal Hydropower SecEA and the WATSAL SEA served the purpose of providing early outputs.

Effective SEAS need not be costly. Table 4 provides the costs and durations of the SEA case studies. Some of the most effective examples were completed in less than 12 to 15 months and cost less than $100,000—a fraction of the cost of the strategy/program/plan they were

Table 4: Cost, Duration, Consultation of Case Studies

Case Study	Duration	Cost	Extent of Consultation*	Level of Influence
Water Supply/Sanitation SEA, Colombia	3 months	$28,000	Moderate	High
RWRA, Tanzania	15 months	$50,000	Limited	High
SEA of Main River Basins, Czech Republic	18 months	$26,000	Limited	Low
Power Development SecEA, Kingdom of Nepal	14 months	$1,200,000	Extensive	Moderate
Water Resources Sector Adjustment Loan SEA, Indonesia	4 months	$70,000	Extensive	Moderate
Pioneer Catchment Study, Australia	N/A	N/A	None	Moderate
SEA of Mhlathuze Catchment, South Africa	24 months	$280,000	Moderate	Low
SEA of Usutu-Mhlathuze WMA, South Africa	36 months	$700,000	Moderate	Low
Palar Basin SEA, India	12 months	$20,000	Moderate	High
Nam Theun II Power, Republic of Laos	N/A	N/A	Limited	Moderate
Lake Victoria TDA/SAP, NELSAP Region	30 months	$1,000,000	Extensive	Moderate

* "Limited" means primarily confined to government ministries; "Moderate" means selected public consultations as well as ministries; "Extensive" means widespread public consultations, sometimes involving multiple rounds.

supporting. For example, the Colombia WSS SEA at a cost of $28,000 influenced the $40m 2001 Water Sector Reform Assistance Project, the $150m 2005 Sustainable Development DPL, the $70m 2005 Water and Sanitation Sector Support Project, and the $200m second Sustainable Development DPL (in preparation). However other effective SEAs were extended and expensive exercises. The cost and time taken are related to whether widespread consultation is required and that, in turn, is related to the purpose of the SEA.

Inclusion of Environment in Water Policies

The lack of SEAs of water resources policies leaves an important gap in the case studies because environmental concerns need to be incorporated into national water policies to give high-level direction to water sector plans and programs. To help fill the gap, three national water policies and one state water policy were analyzed to gauge the extent to which environmental concerns had been incorporated into water policy.

The four water policies were assessed against six criteria—recognition of environment, comprehensiveness, environmental assessment, mechanisms for environmental water, economic instruments, and environmental representation (Table 5). All four policies recognized the legitimacy

Table 5: Summary of Inclusion of Environmental Concerns in Water Policies for South Africa, Tanzania, India, and Victoria (Australia)

	South Africa	*Tanzania*	*India*	*Victoria, Australia*
Environmental recognition	Yes	Yes	Yes	Yes
Comprehensiveness	• Water quantity, quality, ecology • Surface, groundwater • Transboundary	• Water quantity, quality, ecology • Surface, groundwater • Transboundary	• Water quantity Surface, some groundwater	• Water quantity, ecology • Surface, groundwater • Transboundary
Environmental assessment	EIA, no SEA	EIA, no SEA	EIA, no SEA	EIA, no SEA
Environmental water mechanisms	• Environmental water reserve • High priority	• Environmental water reserve • High priority	• No reserve • Medium priority	• Environmental water reserve • No priority stated • Environmental water recovery via water savings • Market mechanisms
Financial instruments	Consider	Gradually adopt	No	• Environmental levy • Trading environmental allocations
Environmental representation	Yes	Yes	No	Yes

of providing water for the environment, but their comprehensiveness of environmental issues varied greatly. The Victorian policy dealt largely with water quantity and river health (aquatic ecology) issues, whereas the other three also covered water quality. The South African policy placed emphasis on managing the whole water cycle, whereas the Indian policy was focused on surface water with some attention to groundwater. Only the Victorian policy describes the role of groundwater in ecosystem functioning.

All four policies endorsed the need for environmental assessments of large-scale water projects. However, none required SEAs of PLSPP. The South African, Tanzanian, and Victorian policies propose the use of a "reserve" of environmental water that would have high priority in water allocation. The Indian policy assigned environmental water to position four in priority of allocation, but provided no discussion of how this would be achieved.

The Indian policy does not mention use of financial instruments to promote water conservation and environmental protection; the South African policy proposes to give consideration to financial instruments; the Tanzanian policy says that water pricing and trading will be gradually adopted; and the Victorian policy provides details of the use of financial instruments, including the trading of environmental water allocations on the water market. The South African, Victorian, and Tanzanian legislation allow for environmental representation on the institutions governing water

resources; the Indian policy does not mention the composition of institutions, primarily because this is a matter for the states.

This topic-by-topic analysis masks the great difference in the extent to which the environment is integrated into the policies. The Indian policy mentions many environmental issues, but provides no direction or depth about tackling them. On the other hand, the South African and Tanzanian policies devote specific sections of their policies to environmental issues and provide sufficient detail to give direction to guide further elaboration in legislation, strategies, and programs. The South African water policy is considered global good practice from an environmental perspective. However, in both the South African and Tanzanian water policies, the environmental aspects are relatively small components of policies that are primarily devoted to development, conservation, and equity issues. The Victorian policy takes a radically different approach. The whole policy is premised on the assumption that consumptive water use is fundamentally dependent on environmentally healthy river and groundwater systems, and so the need to maintain and restore environmental functions (and maintain environmental integrity) permeates the policy.

SEA Support for Integrated Water Resources Management

Two of the SEAs—Palar Basin and Nepal Hydropower SecEA—explicitly recognized that the studies contributed to IWRM, and the Mhlathuze Catchment SEA study was specifically undertaken to explore the use of SEA for IWRM at the catchment level. The Palar Basin was seen as a mechanism for introducing some of the IWRM principles in the absence of IWRM institutions or activities.

The case studies show that SEA can contribute to each of the three principles that underlie IWRM.

Integrated Approach

Multisectoral taskforces. Five of the SEAs—WATSAL Indonesia, RWRA Tanzania, Water Supply/Sanitation Colombia, Lake Victoria SAP,[7] and the Nepal Hydropower SecEA—contributed to integration across sectors by utilizing task forces comprised of staff from different sectoral ministries. In principle, the multisectoral task forces would expose sectoral staff to a wide range of issues and approaches and make the need for an integrated approach to water resources management more apparent. The reality can often be less satisfactory with the lead ministry dominating the task force, and staff from other ministries being disengaged because they view the task force as not really being their responsibility. From the information available, it is not possible to determine the extent to which all ministries actively engaged in these task forces.

Multisectoral assessments. All but the Pioneer Catchment Environmental Flow Analysis assessed impacts on multiple water-dependent sectors. The Nam Theun II CEA and SIA considered the cumulative impacts from hydropower development on irrigation, forestry, biodiversity, mining, water supply, fisheries, agriculture, and human health. However, the Pioneer Catchment study did consider impacts arising from water abstractions for irrigation, stock and domestic use, and urban water supply.

Integration across natural systems. The Palar Basin, Colombia, Nepal, WATSAL, RWRA, and Lake Victoria TDA/SAP studies recognized the need for environmental protection of water source areas

7 International consultants developed the Lake Victoria regional SAP. However, they drew on the five national TDAs, each of which was developed by national inter-sectoral task forces.

as well as in-stream protection. The Pioneer Catchment, Nam Theun II CIA, and WATSAL all assessed impacts in both freshwater and estuarine systems. The Pioneer Catchment, Palar Basin, Colombia, and Czech Republic case studies included considerations of the connectivity between surface and groundwater; and the Pioneer Catchment, Nam Thuen II CEA and SIA studies, and the Nepal Hydropower SecEA considered both upstream and downstream impacts from potential development sites. The new water management law proposed in Colombia includes provision for environmental flows that protect aquatic ecology. These examples illustrate how the SEAs contributed to the integration of environment into natural resources decision-making.

Long-term influence on IWRM. Some of the SEAs had long-term influence in supporting integrative approaches to water sector management. The Tanzanian RWRA was the catalyst for major reforms of the water sector in Tanzania, including an innovative national water policy; strengthening of multisectoral management approaches at both the basin and national levels; and greater attention to the environmental protection of water source areas and water-dependent ecosystems. The success of the Palar Basin SEA has led to this participative, multisectoral approach being replicated in 63 sub-basins across Tamil Nadu State. Although IWRM is not widely practiced in India, the SEA has opened the door for some of its principles to be introduced under another name. The Colombia SEA led to progressive reforms of the water sector, including a new National Water Resources Management law that introduces conservation of important aquatic ecosystems and promotes multisectoral participation on a new National Water Council. The South African government adopted much of the thinking behind the SEA in its reorientation to a multisectoral, participative approach to catchment management.

Participation

SEAs left legacy of participation. The SEAs have probably had more influence on promoting participatory approaches to decision-making than any other aspect of IWRM. All but the Pioneer Catchment, Nam Theun II SIA and CEA, and the Tanzanian RWRA promoted involvement by stakeholders in the SEA. In some cases, this proved so successful, particularly in highly centralized decision making environments, that the government or particular ministries adopted participatory approaches more widely. The Nepal National Planning Commission, although initially skeptical of the SEA, became convinced of the value of widespread public participation and intended to engage in similar participatory exercises for contentious decisions in other sectors.

The consultations that were central to the SEA for the WATSAL loan in Indonesia were so successful that the government adopted this approach through the National Planning Agency and the Ministry of Home Affairs. The Indonesian Inter-Agency Task Force subsequently maintained public consultation as an essential part of the water reforms during 2000–2003. Consultations were used in other strategic water-supply planning, and participation was introduced into programs under the government's own budget until mid-2003. Even though the current Indonesian government has retreated from many of these participatory approaches, there is now an understanding within institutions of the potential of widespread public consultations.

SEAs can lead to legal requirements for participation. The Tanzanian RWRA study did not draw on public information. However, over the following decade, it led to major water sector reforms that included a particular focus on increasing participation in decisions at the river and lake basin level. The Colombia SEA led to legislative changes that included, *inter alia*, a new water management law being drafted that authorized public participation in water resources management (World Bank, 2006a). Thus, apart from directly demonstrating the benefits

of participatory approaches, SEAs can indirectly bring about changes that include greater participation by affected stakeholders.

SEAs can promote transparency. The Lake Victoria regional SAP recommended greater public availability of information, especially on pollution levels, to contribute toward transparency of water resources management and effective access to judicial and administrative proceedings to enable all stakeholders to exercise their rights and obligations effectively. The Colombia SEA also made recommendations to improve the transparency of decision making, partly to reduce the incentives for collusive behavior by managers responsible for overseeing water utilities.

Assist decentralization of decision-making. The contribution of SEAs to the decentralization of water resources institutions and the establishment or strengthening of basin institutions for operational management is most apparent in the Palar Basin SEA, where the study was designed to give direction to the Palar Basin Development and Management Board. This was one of the first river basin authorities in South Asia and had no model on which to base its operations. River basin authorities had been authorized under a 1981 amendment to the 1974 Water Utilization Act in Tanzania, and two had been established at the time of the 1994 RWRA study. However, they were under-resourced, lacked direction, and were not widely accepted by sectoral agencies. The RWRA study identified the most important four basins and provided a clear recommendation for strengthening these river basin organizations.

Economic Instruments and the Private Sector

SEAs introduced economic instruments. A number of SEAs advocated the introduction of economic instruments to control water use, the discharge of pollution, and to provide a source of finance for water resources operations. The Lake Victoria regional SAP proposed the use of economic instruments (e.g., a fish levy) to foster sustainable development by implementing economic incentives for environmentally friendly technologies; the phasing out of subsidies that encourage environmentally unsound technologies, activities, and practices; and the introduction of user fees. Similarly, the Colombia WSS SEA recommended that pollution charges and wastewater standards be modified to promote private sector involvement in water supply. The new water law that was suggested by the SEA includes a provision for water fees that reflect the economic value of water and can include the costs associated with the conservation of natural ecosystems. The Tanzanian RWRA reinforced the use of water use charges on the basis of bulk water use for major users (hydropower, irrigation, and urban water supply).

Limited consideration of demand management. Only one of the case studies—the Mhlathuze Catchment SEA—considered the use of demand management through pricing as a means of restraining the over-allocation of water. However, the outputs of the study were not taken up, because the catchment authority had not been formed.

Limited use of SEAs for private sector participation. Improving opportunities for private sector participation in water supply was one of the driving forces for the Colombia SEA; many of its recommendations are intended to attract private sector investment. These include more rational water quality standards, more transparent oversight of water utilities, improved procedures for environmental assessments, and legislative changes to authorize these changes. The Government of Indonesia, through the WATSAL loan, also sought to increase private sector investment in water-related activities. One of the concerns raised in the SEA stakeholder consultations was the introduction of charges for private sector users of water.

CHAPTER 5:
LESSONS FROM TANZANIAN WATER SECTOR REFORMS

This chapter, based on an in-depth pilot study, examines six SEA case studies designed to promote water resources management within a country in an evolving institutional environment. A sequence of crises led to a recognition within the water sector that the sector needed to be managed according to the principles of IWRM, resulting in a new National Water Policy (NAWAPO) and subsequent reforms. Recently, new environmental legislation has required that SEAs be conducted for all policies, legislation, programs, and plans, and the water sector is specifically identified as one of four priority sectors. The case studies illustrate the progress in implementing SEAs under this evolving enabling environment, as well as some of the lessons that have emerged. However, a recent water crisis has shown that these early advances in water resources sector reforms need to be harmonized across water-dependent sectors if they are to be effectively implemented.

Tanzania was selected for the pilot study[8] because it possesses diverse water resources, including three large transboundary lakes, many river systems, and some major aquifers that provide a diversity of environmental-water issues (World Bank, 2006b). Managing these issues is central to Tanzanian economic growth and poverty reduction (Box 8). The government is embracing progressive water sector and environment sector reforms, including an innovative national water policy and the introduction of SEAs through the 2004 Environmental Management Act. It has already undertaken a number of SEA-type studies, including some in the water sector, providing an opportunity to examine these experiences under a single, but evolving, enabling environment. Lessons from the Tanzanian pilot are complementary to those from the global case studies reviewed in Chapter 4.

Box 8: Importance of Water to Tanzania

Water shortages affect most of the main sectors of the Tanzanian economy. Agriculture is predominantly rain-fed and is susceptible to droughts and floods. Irrigated agriculture, although still underdeveloped, experiences water shortages because of competition from other water using sectors and uncontrolled irrigation expansions. Industry is hampered by blackouts from water shortages for hydropower generation and also relies on water for processing. Mining, the fastest growing sector, partially relies on water for hydropower and for processing, and tourism depends on water for both visitor use and to maintain wildlife habitat. Fisheries, currently accounting for about 11 percent of export earnings, are not affected by drought or flood, but are affected by concerns over water quality and changes in aquatic habitat.

Access to adequate good quality water is central to improving social development. Coverage of domestic water supply remains low; women and children are particularly affected by the time spent gathering water. The poor, in particular, are affected by unreliable and poor quality and/or contaminated sources of water.

Source: World Bank, 2006b.

8 The main output from the pilot study was a technical paper (World Bank, forthcoming b). It provides a framework for introducing SEA into Tanzania's water sector. The paper was developed following extensive consultations, including a multi-stakeholder workshop. Apart from contributing to the completion of the paper, the consultations and workshop raised awareness about SEA and its potential for assisting in water resources management in Tanzania, and provided information for the regulations then being written for SEA and the completion of the draft water resources legislation.

Water and Environment Issues

Until the passing of the Environment Management Act in 2004, Tanzania did not have legislative requirements for environmental assessment, including EIA for project developments. Its water resources development and management occurred in a policy vacuum where little attention was paid to environmental issues, unless required by external institutions. However, a series of crises that had water-related environmental aspects occurred during the 1990s and catalyzed major reforms in the water sector.

These crises included a decline in the level of the Mtera Dam on the Great Ruaha River during the 1990s that led to a reduction in hydropower generation resulting in load shedding and rationing of electricity nationwide during 1991–93. The causes of the decline in reservoir levels were strongly disputed. The generating authority, TANESCO, blamed uncontrolled upstream abstractions for irrigation, while the farmers blamed the low rainfall conditions. Others claimed that poor operational procedures at the reservoirs were the problem.

In the Usangu Plains, upstream of the Mtera reservoir, water scarcity caused tensions over access to both land and water. There was a perception among farmers that increasing numbers of cattle were placing greater demands on water and forage during the dry season, both within and around the wetlands of the plains. At the same time, the gradual expansion of areas under irrigation by farmers decreased land that was previously available for grazing and the availability of water for livestock.

The Great Ruaha River flows through the Ruaha National Park, a wildlife-based tourism industry in that area. The drying of the river caused the animals to move away from the river, affecting the income from tourists. Wetlands on the Usangu Plain have also been affected. The western wetland has almost disappeared and the eastern wetland, which is important for grazing, game animals and fishing during the wet season, has shrunk substantially.

The Lower Kihansi hydroelectric plant was constructed on the Kihansi River within the Rufiji Basin during the mid-1990s. Ecological studies conducted as part of the monitoring during project construction in 1996 found an endemic toad (the Kihansi spray toad) in a rare wetland system in the Kihansi Gorge located downstream from the dam. Operation of the hydroelectric plant would drastically reduce the spray, which sustains the wetland due to the abstraction and diversion of much of the river flow.

Expensive temporary measures had to be taken to safeguard the ecosystem. Following extensive scientific studies, the Rufiji Basin Water Board granted a final water right for the hydroelectric plant to TANESCO in June 2004. It stipulates that an environmental flow requirement be coupled with measures to ensure the conservation of the Kihansi Gorge.

When the Pangani Falls hydropower station (68MW) in the north of Tanzania was nearing completion in the early 1990s, inflows into the Nyumba ya Mungu (NYM) regulating reservoir were much lower than predicted because of uncontrolled upstream abstractions for irrigation. Following the regulation of the river by NYM, a large portion of the largest wetland in the Basin—the Kirua swamp—dried up (IUCN, 2003), with loss of fisheries and recessional agriculture. Flows into the estuary have also been affected by increased saltwater intrusion, but the environmental consequences are not known.

Water and Environment Reforms

These crises reinforced the recommendations of the RWRA that a multisectoral approach to the management of water resources was essential, at least in the heavily used and stressed Rufiji and Pangani river basins. Further, the experience helped water managers recognize that sustaining the existing ecosystems is an important use of water resources and that those considerations must be included in water allocation decisions.

The Lower Kihansi controversy illustrated the limitations of an EIA process that largely ignored the downstream impacts of the dam. It underscored the need for thorough EIAs to be conducted prior to all major infrastructure investments and the need to include environmental considerations in sectoral development policies, legislation, programs, and plans.

The National Water Policy

Tanzania's 2002 National Water Policy (NAWAPO) was introduced in response to some of these serious water resources management challenges. NAWAPO is developed around the principles of IWRM. The environmental aspects of NAWAPO include provision of water for environmental flows, improved control over pollution through requirements for pollution permits and establishment of water quality standards, reductions in diffuse-source pollution through education, and promotion of water conservation and recycling.

A water resources bill (including provisions for basin water resources plans) has been drafted and is expected to be passed by Parliament in early 2009. The bill requires that water resources management plans be drawn up for all river and lake basins, including provisions for water allocation between water users.

The Environment Management Act

The 2004 Environmental Management Act (EMA Act 20, 2004) provides additional planning tools to tackle water-related environmental problems. It deals with the protection of environmentally sensitive areas; the control of pollution and wastes; setting environmental quality standards; and restoring environmentally degraded areas. It contains detailed provisions for undertaking environmental impact assessments, and introduces strategic environmental assessments for all policies, legislation, regulations, programs, and plans that may affect the environment. In particular, SEAs need to be carried out before details are finalized for policies, programs, plans, and projects for hydropower stations and other water uses.

EMA provides a number of drivers for SEAs. It authorizes public participation in environmental management at all levels of decision-making, including in EIAs and SEAs; and provides for the Division of Environment within the vice-president's office to act as the evaluative driver for SEAs. By specifying the types of PLSPP requiring SEAs, the EMA itself acts as a procedural driver.

Existing Experience with SEAs

Although SEAs were not required prior to the passage of the EMA, six SEAs have been carried out in Tanzania over the past 15 years in the water sector. These studies were generally undertaken in response to development partner requirements and included both impact-centered and institution-centered studies. Two cases, the Rapid Water Resources Assessment (RWRA) and the Lake Victoria

TDA/SAP, have been included in the ESW and are described in Chapter 4. The other four cases include the TDA/SAP for the GEF-funded Lake Tanganyika Biodiversity Project, the SEA conducted as part of the Future Dar es Salaam Water Supply Options, the environmental flows assessment being conducted in the Pangani Basin, and the Strategic SEA (SSEA) conducted to examine power generation options in the Nile Equatorial Lakes region (NELSAP). The issues and outcomes from the six cases are summarized in Table 6.

Contribution of SEAs to IWRM

These SEAs have contributed to the general acceptance and use of IWRM principles in Tanzania over the last decade, including the inclusion of environmental requirements in water resources management. The RWRA study laid the groundwork for the NAWAPO, and so contributed to the strengthening of river basin organizations, acceptance of environmental water needs, and recognition of the importance of a multisectoral approach to water resources management. The Lower Kihansi crisis reinforced the need to include environmental considerations in water allocation decisions, to the point where it was a significant influence in the establishment of the 2004 Environmental Management Act. The Lake Tanganyika and Lake Victoria TDA/SAPs reinforced this emphasis from the environment perspective by illustrating how management of lake basins is essential to achieving environmental outcomes. The Dar es Salaam Future Urban Water Options study and the NELSAP SSEA study mainstreamed the inclusion of environmental criteria along with economic and social criteria in options assessment and the development of sectoral programs and plans.

Integrated Approach

An institution-centered SEA promoted environmental integration. NAWAPO and draft legislation that resulted from the RWRA study require basin-level water resource plans to be established, with environmental water provisions being accorded a high priority. As a result, the Pangani Basin EFA study is the only basin-wide environmental flow study in Africa (outside South Africa) being conducted to provide the environmental water requirements for a basin plan. In addition, the regional TDA/SAPs of Lakes Victoria and Tanganyika were strongly supported within Tanzania because of NAWAPO's emphasis on the importance of transboundary water management.

Different levels of understanding in sectoral agencies. As a result of the RWRA and the institutional initiatives that followed from it, the experiences of the Lower Kihansi hydropower plant, the Mtera crisis, and the Pangani Falls hydropower plant crisis, there is now a good appreciation within the Ministry of Water regarding the importance of taking an integrated approach to water resources management. However, there remain different degrees of understanding about IWRM across other sectors, including energy, agriculture and environment sector, and many key lessons have yet to be internalized in these sectors.

Environmental concerns incorporated into lake management. In the case of Lake Tanganyika, the TDA/SAP has led to the establishment of a Lake Tanganyika Authority, with the specific objective of protecting the internationally important biodiversity of that lake. In the case of Lake Victoria, the TDA/SAP has only recently been completed, but is likely to be influential in the operations of the new Lake Victoria Basin Commission.

The Lake Victoria TDA/SAP, Lake Tanganyika TDA/SAP and RWRA studies also promoted a cross-sectoral approach to water resources through the teams that undertook the studies. The institutions

Table 6: Summary Issues and Outcomes of Tanzanian SEAs

Case	Water-Related Environmental Issues	Major Outcomes
Rapid Water Resources Assessment, Tanzania	• Watershed degradation • Water quality degradation • Water allocation conflicts • Groundwater table decline	• New water policy and bill • Institutional reforms • Improved stakeholder involvement • Investments in three priority basins as second phase • Investments in all nine basins in the third phase (ongoing)
Lake Tanganyika TDA/SAP	• Localized effluent discharges • Unsustainable fisheries • Watershed degradation and siltation • Habitat destruction	• Agreed TDA and SAP for lake and basin • Convention between riparian countries • Formation of Lake Tanganyika Authority
Dar es Salaam Future Urban Water Supply Options SEA	• Upstream and downstream environmental effects of potential dam, including flooding of part of game reserve • Environmental impacts from deep groundwater usage	• Identification of two water supply options that minimize environmental and social impacts • Environmental issues to be treated in EIA
Pangani Basin Environmental Flow Assessment	• Reduced flows in Pangani River from excessive water abstraction • Impacts on estuarine ecosystem functions from flow changes • Loss of water to wetlands and fish breeding	• Analysis of environmental effects of eight development scenarios • Tool for use by PBWO in water allocation planning • Development of EFA technique suited to Tanzanian conditions • Training of staff from other jurisdictions
NELSAP Strategic/Sectoral, Social and Environmental Assessment of Power Options	• Impacts of hydropower development on upstream and downstream communities • Effects of hydropower development on wetlands and estuaries • Greenhouse gas emissions from thermal power generation • Cumulative environmental impacts from multiple developments within a river basin • Impact of climate change on water availability	• Regional power development program agreed by countries (to be confirmed) • Transparent decision process including environmental and social impacts attractive to private sector funding • Responds to World Bank Board requirement following Bujagali Inspection Panel
Lake Victoria Basin, East Africa	• Decline in lake level with impacts on littoral zone and navigation • Soil loss and sedimentation • Excess nutrients and eutrophication • Aquatic weeds • Loss of native fish species • Degradation of fringing wetlands	• Agreed set of regional priorities for basin countries • Supported environmental management components of LVEMP-II project • Provided strategic issues for LVBC

that were established as a result of the studies have internalized environmental concerns in their work—the first two at the basin level, and the third nationally. On the other hand, the Lake Tanganyika TDA/SAP was led by environmental institutions and lacked an appreciation of the close connection between the lake and its surrounding basin. The establishment of the Lake Tanganyika Authority without a clear mandate over the basin will complicate the management of environmental issues within the basin.

Options assessments can integrate environmental criteria. The NELSAP SSEA assessment of power options was specifically designed to include environmental along with social and economic criteria in its selection of preferred development options. Given the initial difficulties with limited environmental skills (subsequently rectified), this study illustrates the importance of having a balanced set of skills on the team led by a person with a wide perspective. The Dar es Salaam Future Urban Water Supply SEA also integrated environmental with social and economic criteria to arrive at the preferred development options. Both studies were intended to reduce and minimize impacts in future investments. Neither study was intended to leave a long-term environmental legacy.

Transboundary studies need special attention. Two of these case studies (Lake Tanganyika and Lake Victoria TDA/SAPs) were transboundary and a third was a regional study with some transboundary options (NELSAP SSEA). The Lake Victoria case illustrates the difficulty of undertaking separate national assessments of environmental issues and then combining them into an agreed transboundary set of issues and responses, while the NELSAP SSEA illustrate the importance of choosing an analytical method that suits the problem—in this case, multicriteria analysis with mixed quantitative and qualitative data.

Promoting Participation and Stakeholder Involvement

Engage the affected stakeholders. The earliest of these studies—the RWRA—confined its stakeholder engagement to just government ministries. However, the extent of stakeholder participation in the strategic studies has increased since then with widespread input at national and regional levels into the Lake Victoria TDA/SAP process. Although there are now requirements for stakeholder participation in the EMA and the NAWAPO, these instruments have not been the primary drivers for participatory approaches. Participation has been driven by both instrumental requirements of international donors and the recognition by the agencies themselves that participation leads to more robust plans and programs.

RWRA accelerated the formation of basin-level management. The RWRA facilitated the fundamental shift toward river and lake basins as the management units. It advocated that the two existing basin organizations be strengthened and that seven additional basin organizations be established with operational responsibility for water resources management. Thus it played a major role in establishing the current basin structure for water management in Tanzania in line with IWRM principles.

Employing Economic Instruments

Economic instruments not widely advocated. These SEAs did not explore the use of economic instruments for environmental management, although the RWRA did recommend the use of water user charges for major users to reflect the cost of providing the resource, and the Lake Victoria SAP endorsed the use of a fish levy to charge for the exploitation of a natural resource, with part of the revenue raised to be used for resource protection.

Understanding of IWRM within Water-Related Sectors

Differential understanding of IWRM across sectors. While the water resources sector in Tanzania has now developed a good appreciation of many of the principles of IWRM, the level of understanding lags in other water-related sectors.

The 2004–06 drought again emphasized the need to take an integrated approach to water resources (World Bank, 2006b), taking into consideration such concerns as low reservoir levels and cuts in power production impacts on industrial production, conflicts between irrigators and pastoralists, and diminished flows into national parks and environmentally sensitive areas. The electricity shortages affected industrial and commercial production and had a significant impact on the national economy. Economic growth in 2006/7 declined from 7 percent to 5.9 percent. One of the key reasons was that the water sector reforms were not coordinated with reforms in other water-dependent sectors.

Energy policy lacks water resources appreciation. The 2003 Energy Policy considers environment only in the defensive sense that energy production should minimize environmental impacts and adhere to environmental requirements. It does not allow for the impact of other sectors' environmental performance on energy production, such as the impacts of poor agricultural and forestry management on erosion and sediment transport, leading to siltation of dams and wear on turbines, or the effect of demand for water on electricity generation.

Irrigation planning will require SEA. The Tanzanian Irrigation Master Plan, which identified suitable locations for an expansion of irrigation, was an engineering study that did not take full account of the impacts of this planned expansion on other sectors, including the water and the environment sectors. Some of the main areas identified for further development contain sensitive wetlands and national parks, or are already under stress because of water demands from hydropower or existing irrigation. An SEA will be conducted of the master plan and the new irrigation policy as part of the conditionality for the multidonor Agriculture Sector Development Program.

Wetlands management needs coordination. There has been no overarching national wetlands policy or strategy in Tanzania, although the National Wetland Working Group has the task of coordinating management of wetlands. The Ministry of Natural Resources and Tourism (MNRT) has now drafted a national wetlands strategy (Ministry of Natural Resources and Tourism, 2007) that recognizes these complexities, although it does not resolve them. Illustrating the potential overlaps, the MNRT has recently initiated an environmental flow assessment of the Usangu wetlands, although this initiative appears to be uncoordinated with the concurrent efforts by WWF to secure funds for an environmental flow assessment in the Usangu area. An SEA into wetland management would bring these coordination issues to the fore and provide an opportunity to resolve them.

Need for coordination of land and water policies. The 1995 Land Policy recognizes, inter alia, that land degradation is causing destruction of waterways and environmentally sensitive areas. Under the Land Act No.4 1999, the Minister of Lands has power to declare areas such as mangrove swamps, wetlands, and land near a riverbank or shoreline to be potentially hazardous. However, these powers and similar powers for prevention of degradation of forested lands under the Forest Act 2002 are not coordinated with related powers of the Water Minister under the draft Water Resources Act.

Institution-centered SEAs would be suitable instruments for examining these sectoral PLSPPs and recommending the changes needed to bring about a consistent approach to water resources management.

Conclusion

The RWRA study of the early 1990s was a response to a series of water resources crises, each of which also included environmental aspects. It reinforced the message that a multisectoral approach was needed for water management and that concern for the environment was a legitimate part of water resource management. The Ministry of Water internalized these lessons and developed an innovative water policy that decentralizes operational decision-making to river and lake basins, promotes multisectoral management at national and basin levels, forms water-user associations and promotes stakeholder participation, and pioneers environmental flow assessments for inclusion in basin plans.

However, the 2004–06 Tanzanian drought illustrated that it is not sufficient for just the Ministry of Water to be undertaking these reforms. All relevant ministries also need to harmonize their PLSPPs so they are consistent with a multisectoral approach. Sectoral ministries also require the capacity to engage in IWRM. Ministry staff, especially senior decision makers, need to be introduced to SEA and IWRM and the benefits to all sectors of actively engaging in participatory management of water resources.

CHAPTER 6:
A FRAMEWORK FOR USING SEAS FOR IWRM

Evidence from the 10 case studies, the four national and state water policies, and the pilot study in Tanzania shows that SEAs have contributed toward mainstreaming the principles (related to environmental sustainability) of IWRM. These studies also highlight the weaknesses of SEAs in mainstreaming water resources management principles. The lessons from these analyses are used to develop advice for operations and recommendations for promoting and broadening the use of SEA in water resources management.

Outcomes from Analysis

SEAs have successfully promoted IWRM. The case studies and the Tanzanian pilot study make it clear that SEAs have been successful in promoting the inclusion of environmental concerns into water resources decisions, as well as some of the other principles of IWRM.

All SEA case studies, by definition, promoted the inclusion of environmental matters into water sector decision-making, although only some institution-centered SEAs had a long-term impact. All but one addressed multisectoral issues, and were conducted by multidisciplinary teams, contributing to the longer term multisectoral approach to water resources management. Most of the case studies promoted public participation in water-related decisions (including in countries where there was little tradition of participation), to the point where some government institutions adopted participatory methods for their own activities. Some SEAs promoted greater transparency of water resources decision-making, although it was not clear that this was a long-term change.

The four national and state water policies illustrated different levels of commitment to environmental considerations. While all four included recognition of the legitimacy of environmental concerns, the extent to which they integrated environmental matters into water resources differed greatly. The Victoria (Australia) water policy showed how environmental considerations could be mainstreamed into the water policy, although the policy was restricted to water flow and river health issues. Appendix C lists the opportunities for including environmental considerations in water policies.

SEAs are adaptable instruments for water resources policy and institutional reforms. The 10 case studies provided insights into the diversity of ways in which SEAs can influence the inclusion of environmental concerns into water strategies, programs, and plans at national, basin, and transboundary scales. The SEAs were used for a number of purposes, from the conventional assessment of draft strategies, plans, and programs; to providing environmental input to strategies, plans and programs yet to be formulated; to helping structure and map out a strategy for managing complex situations.

Water using and dependent sectors need to coordinate their reforms. The Tanzanian pilot study illustrated how the water sector had embraced the principles of IWRM, including recognition of the environment as a legally defined use of water. However, other water-dependent sectors (such as energy and irrigation) also need to adopt policies that promote a participative approach to water resource management, including the importance of providing water to maintain environmental functions.

The SEA process is as important as the product. Institution-centered SEAs that examine impediments to improved water resources management, including the incorporation of environmental concerns, can set in train processes that lead to fundamental changes in water management over many years. The Colombia WSS SEA led to major legislative changes and changes in environmental licensing. The Indonesian WATSAL SEA led to a strengthening of environmental assessments of water projects, improved stakeholder representation on basin committees, increased support for WUAs, and a loosening of the role played by dominant groups at district and village levels. The Tanzanian RWRA study laid the groundwork for significant policy, legislative and institutional reforms and investments. These institution-centered SEAs are more influential in the long run than are impact-centered SEAs that identify and ameliorate environmental impacts from specific PLSPPs.

Environmental considerations need to be included throughout the process. The case studies make it clear that SEA should be integrated throughout the development of the PLSPP. Subjecting a draft PLSPP to a post hoc environmental assessment is as limiting for SEAs as it is for EIAs, as is illustrated by the Czech Republic case study and the pilot study in Castilla y León (Box 7).

While there is strong evidence from the case studies and the Tanzanian pilot study that SEA does promote environmental and other improvements in water resources, it is also clear that SEA is not a panacea. Reforms are often required over the long term, and all water dependent sectors need to be actively engaged in these reforms. SEAs can map out the path, but only concerted action across sectors can bring about the necessary changes.

Assistance for Operations

SEAs can be used in a variety of ways.

They can be used to assess whether environmental considerations are adequately incorporated into existing PLSPPs and, if not, make recommendations on their inclusion. SEAs can also assess consistency and support for recognizing and managing environmental issues across water dependent sectors. The topics that could be included in such SEAs are:

- The recognition of environmental policy and legislation as the umbrella under which sectoral environmental issues are handled.
- The assignment of powers between ministers and institutions without duplication for handling water-related environmental issues, including responsibility for issuing licenses and permits, levying charges and fines, and monitoring compliance.
- The assignment of responsibility for establishing water-related environmental standards without duplication between ministries and authorities.
- The establishment of clear procedures that avoid duplication between ministries for assessing environmental water requirements, pollution control permits, and source protection procedures.
- The encouragement of sectoral participation in water resources management committees at the national, basin, and local levels.

As illustrated by the Colombia WSS SEA and the Tanzanian RWRA, SEAs can also be used to assess capacity in the country for recognizing and managing water-related environmental issues. Potential topics for such SEAs include:

- The formation of environmental units within water-related sectoral ministries with responsibility for compliance with environmental legislation and regulations.
- Adequate procedures for detecting and managing environmental issues from monitoring data, including environmental stress in river systems and aquifers.
- The capacity for establishing, overseeing, and assessing EIAs and other environmental assessment procedures in water resources.
- The inclusion of SEA and EIA in water management courses at university and other tertiary institutions.
- Professional training in SEA and EIA for current water sector staff, including senior decision-making staff.
- An understanding of obligations and procedures under international treaties and transboundary agreements.
- Adequate opportunities for public and professional involvement in water resources management.

Recommendations

World Bank water resources and environmental specialists constitute the primary audience for the following recommendations, although these recommendations may also be of value to their counterparts in developing countries. A proposed framework for using SEA in IWRM consists of:

- Bridging the different professional perspectives of the environmental and water resources practitioners
- Building enabling environments and sectoral harmonization that are supportive
- Developing the capacity for conducting SEAs in water resources
- Designing and conducting effective SEAs

Bridging the Water and Environment Disciplinary Perspectives

1. *Environment and water resource specialists need to widen their understandings.* Because SEA and IWRM come from different disciplinary backgrounds, there is a need to bridge their separate, but overlapping perspectives, if SEA studies are to be used as effective tools to implement IWRM principles. SEA practitioners need to understand the principles of IWRM and how it is being promoted and implemented through the World Bank and other institutions. These activities provide entry points for SEA studies at policy, river basin, and infrastructure investment levels, as has been illustrated in the Tanzanian pilot study. At the same time, water resource specialists will need to understand the evolving practice of SEA and its potential for assisting IWRM using both impact- and institution-centered SEAs.
2. *SEA and IWRM terminology and procedural steps should be clarified.* The different and evolving terminologies used by the environment sector (e.g. screening and scoping and impact-centered and institution-centered) and water resource sector (e.g., the Dublin Principles) or different interpretations of the same terms need to be understood and reconciled so that commonalities are more apparent and procedural steps are clearer.
3. *Support and build on ongoing water and environment sector reforms*. Some nations are still in their early stages of implementing environmental reforms, including EIAs. It is important to continue to promote these advances and not introduce SEAs as a panacea to the limitations of EIAs. SEAs are complementary tools and processes to EIAs (Figure 2).

Enabling Environment for Effective IWRM

4. *Harmonization across the water sector is necessary.* The Tanzanian pilot study illustrates the importance of having sectoral policies, legislation, and strategies that are harmonized with water resources policies. An integrated approach to water resources management cannot be carried out by water resources agencies alone; water dependent sectors need to include IWRM principles, including integrated management, in their policies, legislation, and strategies.
5. *Water resources policies can and should support SEAs.* Environment policies can require and mandate SEAs, and water resources policies should be made consistent with this requirement.[9] Through dialogue, the Bank can promote the benefits of institution-centered SEAs in the water sector (consistent with the respective environment policy) and can assist countries to reformulate their policies and legislations when opportunities arise. The alternative is to include requirements for conducting SEA for certain water resource planning and management processes into the relevant water sector policies. However, coordination is essential to ensure there are not duplicate requirements and procedures developed under water and environmental policies and legislation. The analysis of country water policies showed that, at least in that sample of four policies, none of the water sector policies supported SEAs.
6. *Public involvement in water management is important.* Many of the case studies (Nepal Hydropower SecEA, Nam Theun II, WATSAL, RWRA, Lake Victoria TDA/SAP) illustrated the importance of professional and public drivers in water sector SEAs. Actions that improve public participation, promote disclosure, and build a sense of inclusion in decisions will all contribute toward an environment where water sector SEAs can be effective.
7. *Transboundary water SEAs are inherently complex.* Because of the multiple enabling environments, different levels of knowledge and skills, and the varied objectives of basin countries, transboundary water sector SEAs require an agreed plan of action and oversight by a committee of senior decision-makers.[10] Transboundary SEAs can be facilitated through international legal instruments for bi-/multilateral cooperation between the countries (e.g. such as various regional agreements for protection of international river courses, or the Protocol on SEA to the Convention on Environmental Impact Assessment in a Transboundary Context).
8. *Bank influence can convert skepticism to support.* The Bank can use its influence and knowledge to promote trial SEAs in water resources in countries where there may be initial skepticism. The Tanzanian pilot and the case studies provided a number of examples (Colombia WSS SEA, WATSAL SEA, Nepal SecEA, Nam Theun II, NELSAP SSEA and Lake Victoria TDA/SAP) where Bank support was central to the SEAs being undertaken.
9. *A long-term commitment is required to see a measurable impact on water sector reforms*. There needs to be sustained and long-term commitment by the Bank and developing countries to integrate environmental concerns into the enabling environment. The Tanzanian RWRA case study illustrates how it takes many years and successive investments to move from the initial understanding of the need for water sector reform to the formulation and implementation of new policies, legislation, institutional changes, integrated river basin management and development plans, and water resources investments.

Capacity for Water Sector SEAs

10. *Support from senior decision-making levels is critical.* It is particularly important that senior decision makers in environment and water institutions understand the complementarities

9 This approach is consistent with a recent review of SEA legislation in nine countries (Ahmed and Fiadjoe, 2006).
10 GEF has identified this as a critical success factor for TDA/SAPs; it was used in the Lake Victoria and Lake Tanganyika TDA/SAPs.

between SEA and IWRM. Information provided during the Tanzanian pilot study (World Bank, forthcoming b) showed that, even where technical level staff had training in SEA in their university degrees, it was not used because there was no understanding or support at the decision-making levels.

11. *Need for water sector staff to understand different SEA approaches*. The modern SEA system consists of a broad family of approaches. Staff of environment and water resources institutions should be trained in the range of opportunities offered by these different approaches.
12. *Long-term water resources monitoring underpins SEA*. The information base needed to apply analytical SEAs in the water sector requires a long-term water resources monitoring and analysis program. This should include environmental monitoring as well as hydrological and water quality monitoring if the necessary information is to be available for SEA studies. The Lakes Victoria and Tanganyika TDA/SAPs, the Pangani EFA, the Pioneer Catchment EFA, the Nam Theun II, and the NELSAP SSEA all relied on monitoring data for their analyses.
13. *Training and on-the-job experience are important*. There should be a concerted effort to develop SEA expertise in the water sector through training programs and on-the-job experience in developing countries. The Pangani Basin environmental flows study in Tanzania and the Nepal Medium Hydropower SecEA provide examples where international expertise was used to guide and develop local expertise in environmental assessment.
14. *Learning is as important as initial success*. Even imperfect SEAs can—if the lessons from their undertaking are evaluated and considered by the relevant agencies—help in the development of SEA systems. The RWRA SEA spawned a succession of SEA-type studies that progressively built up expertise within the Tanzanian water resources sector.

Design and Conduct of Water Sector SEAs

15. *Multidisciplinary teams and integration are essential for successful SEAs*. Water resources management is inherently multisectoral, and the team members need to have a breadth of understanding of the range of issues and their inter-connectedness from the beginning of the study. This includes an appreciation of the importance of the environment in maintaining water resources fit for consumptive purposes.
16. *Team leadership is critical in water sector SEAs*. The SEA team leader needs to have broad experience, be able to embrace multidisciplinary viewpoints, have a solid understanding of the SEA processes and tools, and an understanding of IWRM principles and its analytical approach. Such people are rare, even in developed countries.
17. *Clear terms of reference are essential*. It is essential to have clarity in the terms of reference for the SEA. They should provide the reason for the SEA, a specific statement of its objectives, the spatial, temporal and institutional scope of the SEA, the methodology to be followed, the breadth and mechanisms of consultation required, an outline of the procedure to be followed, the time to be taken, and the reporting mechanism and pathway by which it will be influential (Mhlathuze Catchment and the Czech Republic SEAs provide examples where clarity was lacking).
18. *Include a focus on the water sector institutional dimension*. Given the positive experience with institution-centered SEAs, an important part of the SEA should be focused on assessing the underlying institutional and governance factors. This is particularly important given the fact that change in these venues takes time and is typically driven by incremental behavior changes and related underlying incentives. Assessing institutional factors helps to understand and factor in these aspects in the eventual SEA recommendations.
19. *Carefully planned participation pays off*. However, there should be a specific stakeholder identification and engagement stage that considers the groups that are central to the

decisions being addressed and states how they are to be engaged. A number of the SEAs examined, including WATSAL and the Nepal Hydropower SecEA, provide successful illustrations of this.

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APPENDIX A. WATER-RELATED ENVIRONMENTAL ISSUES

Surface Waters

Changes in flow. Excessive abstractions of water from rivers and lakes for irrigation, urban supply, inter-basin transfers, or other consumptive purposes can significantly decrease downstream flow rates and diminish aquifer recharge. Conversely, large discharges of water from irrigation areas or urban sources can modify the downstream flow patterns. These, in turn, lead to modified downstream aquatic ecosystems, desiccation of wetlands, reduced capacity for diluting waste discharges, and lowered water tables and seawater intrusion in coastal aquifers.

Apart from abstractions, barriers across rivers for storage or regulation (such as dams for flood control, urban and irrigation water supply and hydropower generation) and estuaries (such as barrages and harbors) can cause changes in flow patterns, increase stratification, and impede the movement of aquatic biota. These changes directly impact downstream communities by, for example, reducing the productivity of rivers, lakes, and estuaries and reducing fish populations because of changes in breeding cues and in physical habitat.

Changes in flow quantities alter water levels in both rivers and lakes, with detrimental effects on sensitive riparian areas such as wetlands and floodplains. These changes can alter the hydrodynamics of lakes, affecting water quality and habitat. In rivers, changes in flow velocity can affect migratory and breeding behavior of some species, as well as affect sediment transport and deposition.

The effects of over-abstraction and impoundments in rivers and lakes are most acute in the arid and semi-arid regions of the world. Flows that are specifically intended to maintain the environmental benefits from river systems for peoples are termed environmental flows. There is growing experience in developing countries in the provision of environmental flows, although it remains one of the weaker aspects of water resources management.

Watershed degradation. Changes in land use in watersheds can release large loads of sediments and attached contaminants into waterways and coastal zones. Typically this arises in the headwaters, where steeper upland areas subject to higher rainfall are converted from forestry to agriculture, although any land use conversion, such as urban expansion, that removes groundcover can cause erosion and sedimentation of waterways and can also impact coral reefs in the nearby marine areas. Poor management of agricultural land is another source of sediment in many countries.

As a result of this degradation, downstream areas can become blanketed in sediment; the lifespan of reservoirs and the output from hydropower plants can be reduced; water supply pumping equipment can be damaged from abrasion; and aquatic life can be affected through reduced primary production and loss of important habitats.

Water quality. Pollution from point sources such as sewage treatment plants, factories, mining operations, and drainage from irrigation districts increases the cost of using the water, affects ecosystem functioning, and impacts on public health. The principal causes of water pollution are (a) poor sanitation and uncontrolled wastewater discharges from urban areas; (b) discharges of untreated storm water contaminated by urban wastes; and (c) waste streams from mining and industrial developments containing heavy metals, organic matter, and chemicals.

Diffuse-source pollution is also a major cause of contamination in many areas, especially where there is little enforcement over the use of agro-chemicals as well as artisanal mining operations. Pollutants from both point and diffuse sources are a threat to human and environmental health, as well as other assets such as fisheries and national parks, which are dependent on high-quality water.

Riverine and estuarine system health. Healthy riverine and estuarine systems require functioning wetlands, floodplains, lakes, and riparian areas that mediate important services such as pollutant removal, amelioration of floods, and provide habitat for economically important fauna and flora. However, these areas can be damaged through agricultural and grazing activities, through land use conversion, and through barriers such as dykes and embankments and flow reduction. In addition, loss of fauna and flora from pollution, overfishing, and loss of habitat can reduce the biodiversity of river and estuarine systems. Introduced plants and animals can also impact on endemic flora and fauna and reduce the services provided by these ecosystems.

Groundwater

Changes in groundwater tables. Groundwater systems are being depleted in many parts of the world, particularly arid and semi-arid areas, because of overpumping for urban and irrigation uses. But changes in the recharge zones of groundwater systems can also affect groundwater levels with urban expansion and increased evapo-transpiration from vegetation, reducing the quantities of water reaching aquifers. Conversely, there are some areas where land use conversion from extensive vegetation to broad-scale agriculture has reduced evapo-transpiration and caused groundwater tables to rise, or where excessive application of irrigation water has resulted in waterlogging and salinization.

These changes affect groundwater dependent ecosystems, such as some wetlands, base-flow dependent riverine systems, aquifer and cave ecosystems, and deeply rooted vegetation. In areas where there is a close hydrologic connection between surface and groundwaters, they can affect water levels in rivers, wetlands, and lakes.

Groundwater quality. Lack of, or poorly operating, sanitary facilities in both urban and rural areas can contaminate aquifers with pathogens and nutrients, threatening the health of communities dependent on these groundwaters. Agro-chemicals, industrial and mining contamination can also infiltrate shallow aquifers, especially if soils are permeable, threatening human health. There are regions of the world where people are exposed to high concentrations of toxic elements that occur naturally in groundwaters, such as arsenic in parts of Bangladesh and fluorine in the East African Rift Valley.

Climate Change

Global warming is altering regional climates in ways that are still to be fully understood. Some regions will experience increases in precipitation, some decreases; some will experience increased cloudiness, some less; and all will experience increases in temperature and sea levels. In most regions, there will be an increase in climate extremes, leading to more frequent and more extreme floods and droughts. These changes will impact both surface and groundwater systems in diverse ways. Total quantities of surface runoff and groundwater recharge will be increased or decreased, and the timing and periodicity of these replenishment events will change. Water quality in rivers, estuaries, and water-bodies will be affected by the temperature rises and changes in flow. Coastal

communities will be affected by both sea-level rise that salinizes coastal aquifers, and from increases in storm frequency.

There will also be second-order effects on water resources, arising from changes in sectoral water use, shifts in production and associated demands on water, population movement away from increasingly arid areas and from vulnerable coastal zones, and changes in water quality as a result of increased temperatures.

APPENDIX B. WATER-RELATED ENVIRONMENTAL ISSUES BY SECTOR

	Agriculture			Water Supply				Sanitation				Hydropower		Industry	Transportation			Flood Control				Fisheries (Nile Perch)	Mining			Forestry		National Parks (Tourism)	Urban Development		Reclamation/Land Devt
	Irrigation & Drainage	Livestock & Range Mgt	Agro industry	Dams	Well Systems	Treatment Facilities	Distribution Networks	Collection Systems	Treatment Facilities	Effluent Disposal/Reuse	Sludge Disposal	Dams	Transmission Corridors		Construction	Maintenance	Traffic Use	Dams	Channel Modifications	Dikes & Levees	Detention Basins		Artisanal gold mining	Commercial gold mining	Sand and gravel extraction	Timber Harvesting	Logging Operations		Solid Waste	Urban Runoff	Cleaning
Aquatic Ecosystems																															
Loss of Aquatic Habitat			•	•	•					•		•	•		•			•	•	•	•		•		•	•				•	•
Elimination of Species					•					•					•					•		•				•				•	•
Introduction of Species		•											•		•		•					•					•				
Elimination/ Degradation of Wetlands	•			•	•							•	•		•			•	•	•	•		•		•	•				•	•
Reduced Ecosystem Productivity	•			•	•					•	•	•	•		•		•	•	•	•	•	•	•		•	•			•	•	•
Water Quality																															
Oxygen Depletion	•		•	•				•		•	•	•		•	•	•		•						•		•			•	•	•
Nutrient Loading	•		•	•				•		•	•	•		•	•	•		•						•	•	•			•	•	•
Nutrient Depletion				•								•		•				•		•						•					•
Elevated Turbidity	•	•	•	•				•		•	•	•	•	•	•		•	•	•				•		•	•			•	•	•
Degraded Water Quality	•	•	•	•				•	•	•	•	•	•	•	•		•	•	•				•	•	•	•			•	•	•
Contaminants in Runoff	•	•				•			•		•		•	•	•	•	•						•	•		•			•	•	•
Effluent Discharge of Contaminants			•							•				•																	

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	Agriculture			**Water Supply**				**Sanitation**				**Hydropower**		**Industry**	**Transportation**			**Flood Control**				**Fisheries (Nile Perch)**	**Mining**			**Forestry**		**National Parks (Tourism)**	**Urban Development**		**Reclamation/Land Devt**
	Irrigation & Drainage	Livestock & Range Mgt	Agro industry	Dams	Well Systems	Treatment Facilities	Distribution Networks	Collection Systems	Treatment Facilities	Effluent Disposal/Reuse	Sludge Disposal	Dams	Transmission Corridors		Construction	Maintenance	Traffic Use	Dams	Channel Modifications	Dikes & Levees	Detention Basins		Artisanal gold mining	Commercial gold mining	Sand and gravel extraction	Timber Harvesting	Logging Operations		Solid Waste	Urban Runoff	Cleaning
Precipitation of contaminants										•	•			•			•						•						•	•	
Atmospheric Precipitation		•	•	•								•		•	•		•	•					•				•		•	•	•
Risk of Hazardous																															
Materials Spills	•	•	•			•		•	•				•	•	•	•	•						•	•			•		•	•	•
Risk of Groundwater Contamination	•	•	•			•		•	•	•	•		•	•	•	•	•						•				•		•	•	•
Disposal of Dredge Materials/ Sludge	•					•					•								•				•	•	•						
Hydrology																															
Altered Hydrologic Regimes	•	•		•				•		•		•			•			•	•	•	•		•			•			•	•	•
Reduced Peak & Ave Flow Rates	•			•								•						•			•										
Alteration of Surface Drainage Patterns	•			•		•				•	•	•	•	•	•			•	•	•	•		•	•		•			•	•	•
Alteration of Surface Groundwater Regime	•			•	•		•	•		•	•	•		•	•			•	•	•	•					•			•	•	•
Water Table Drop	•	•		•	•							•		•	•			•	•	•						•					•
Waterlogging of Soils	•						•	•		•																					

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	Agriculture			Water Supply				Sanitation				Hydropower		Industry	Transportation			Flood Control				Fisheries (Nile Perch)	Mining			Forestry		National Parks (Tourism)	Urban Development		Reclamation/Land Devt
	Irrigation & Drainage	Livestock & Range Mgt	Agro industry	Dams	Well Systems	Treatment Facilities	Distribution Networks	Collection Systems	Treatment Facilities	Effluent Disposal/Reuse	Sludge Disposal	Dams	Transmission Corridors		Construction	Maintenance	Traffic Use	Dams	Channel Modifications	Dikes & Levees	Detention Basins		Artisanal gold mining	Commercial gold mining	Sand and gravel extraction	Timber Harvesting	Logging Operations		Solid Waste	Urban Runoff	Cleaning
Saltwater Intrusion into Estuary and River	•			•	•							•						•													
Erosion																															
Soil Erosion	•	•		•							•	•	•		•			•	•	•			•	•	•	•			•	•	•
Sedimentation of Reservoir and Reduced Storage Capacity				•							•	•			•			•			•		•	•	•	•					•
Changes in Riverine/ Estuarine Morphology				•							•	•			•			•	•	•	•				•	•				•	•
Soil Degradation-Less Moisture Retention	•	•											•		•											•			•	•	•
Soil Compaction-Less GW Recharge		•													•											•			•	•	•
Slope Instability-Increased											•		•		•								•			•				•	•
Potential for Landslides and Slumps																								•							
Public Health																															
Increased incidence of disease	•	•	•	•			•	•	•	•	•	•			•			•			•		•	•		•	•		•	•	

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	Agriculture			Water Supply				Sanitation				Hydropower		Industry	Transportation			Flood Control				Fisheries (Nile Perch)	Mining			Forestry		National Parks (Tourism)	Urban Development		Reclamation/Land Devt
	Irrigation & Drainage	Livestock & Range Mgt	Agro industry	Dams	Well Systems	Treatment Facilities	Distribution Networks	Collection Systems	Treatment Facilities	Effluent Disposal/Reuse	Sludge Disposal	Dams	Transmission Corridors		Construction	Maintenance	Traffic Use	Dams	Channel Modifications	Dikes & Levees	Detention Basins		Artisanal gold mining	Commercial gold mining	Sand and gravel extraction	Timber Harvesting	Logging Operations		Solid Waste	Urban Runoff	Cleaning
Local climatic changes, creating habitat for insect disease vectors	•			•						•	•	•						•			•								•	•	
Risk of injury/ death to humans, animals			•					•	•				•	•	•		•										•				
Water Use																															
Land Subsidence	•																						•								
Soil Salinization	•			•								•						•													
Increases in Agricultural Diseases and Pests Due to Extended Growing Season	•																														
Unplanned or Involuntary Settlements	•			•	•	•						•		•	•		•	•					•			•	•				•
Resource Competition – Water & Food		•		•	•	•						•		•	•		•	•					•	•			•				•
Fuelwood and Construction				•	•	•						•		•	•		•	•					•	•			•				•
Material Deforestation																							•								

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	Agriculture			Water Supply				Sanitation				Hydropower		Industry	Transportation			Flood Control				Fisheries (Nile Perch)	Mining			Forestry		National Parks (Tourism)	Urban Development		Reclamation/Land Devt
	Irrigation & Drainage	Livestock & Range Mgt	Agro industry	Dams	Well Systems	Treatment Facilities	Distribution Networks	Collection Systems	Treatment Facilities	Effluent Disposal/Reuse	Sludge Disposal	Dams	Transmission Corridors		Construction	Maintenance	Traffic Use	Dams	Channel Modifications	Dikes & Levees	Detention Basins		Artisanal gold mining	Commercial gold mining	Sand and gravel extraction	Timber Harvesting	Logging Operations		Solid Waste	Urban Runoff	Cleaning
Erosion From Settlements on Steep Slope				•	•	•						•		•	•		•	•					•				•				•
Poaching		•		•	•	•						•		•	•		•	•					•				•				•
Other																															
Increased Seismic Risk				•								•						•													
Navigational Hazards Barriers to Migration/ Movement													•		•		•								•						
Loss of Recreational Opportunities				•					•	•		•		•	•			•								•			•	•	•

APPENDIX C. ENVIRONMENTAL ASPECTS FOR INCLUSION IN WATER RESOURCES INSTRUMENTS

1. Developing a National Water Policy

Recognizing the Role of Environment

- Make the linkages between environmental health, human health and economic growth clear in water policies
- Recognition of the legitimacy of environment as a water-using sector with equal standing to other water-using sectors

Environmental Impact Management

- Creating a river classification system to establish environmental objectives for river reaches
- Assignment of a priority to water for the environment when allocations are being made from surface and groundwater
- Recognition of the importance of services provided by healthy aquatic environments for water using sectors
- Establishing water quality standards that protect aquatic environments
- Establishing mechanisms to license and control effluent discharges from point and diffuse sources
- Recognizing the need to protect surface and groundwater source areas
- Protection of environmentally productive areas such as wetlands, floodplains, mangroves, estuaries, and near-shore areas.
- Control over introduced plant and animal species that have environmentally detrimental effects
- Inclusion of climate change and managing its effects on water resources as well as aquatic environments

Controls over Environmentally Deleterious Activities

- Use of economic instruments (pricing, markets, etc) to control demand and assign "saved" water and income streams to environmental benefit
- Use of EIA and SEA for water resource developments, plans, programs, and strategies to promote environmental inclusion
- Ensuring environmental representation on national, basin, and catchment water resource institutions
- Including adequate opportunities for public participation, including from environmental groups, in decision making

International Obligations

- Meeting international obligations over environmental protection (Ramsar sites, etc)
- Ensuring environmental issues are included in transboundary water resource management

2. Developing Water Resource Legislation, Regulations, and Guidelines

- Legislate for above policy components such as water quality standards, river classification, water allocation mechanisms, surface and groundwater source protection, enforcement mechanisms, composition of institutions, and public participation

- Include regulations on establishing water quality standards, effluent discharge standards, environmental flow assessments, inclusion of climate change in water related decisions, control of introduced species, and stakeholder participation
- Provide guidelines and best management practices on erosion control and source area protection, riparian zone management, wetland protection and management, and estuarine protection

3. Developing River/Lake Basin Management Plans

- Establish basin objectives that include environmental protection and restoration objectives

Source Area Protection

- Include provisions for protection of surface and groundwater source areas from degradation

Prevention of Pollution

- Include controls over effluent discharges from urban wastewater, industry, mining, and other point sources
- Include mechanisms for reducing diffuse-source pollution using participatory methods, education, demonstrations, etc

Environmental Water Allocation

- Undertake credible assessments of environmental water needs for water for environmental benefit as well as for provision of environmental services for domestic use, fisheries, economically important plants, social and religious needs, etc.
- Include transparent and fair procedures for balancing environmental and other water needs when flow and water quality decisions are being made
- Include provisions for upstream and downstream environmental water needs if infrastructure development is proposed

Environmental Representation

- Include environmental representation in the production and implementation of plans
- Ensure appeal mechanisms allow for fair assessment of environmental concerns

4. Establishing River/Lake Basin/Aquifer Management Institutions

- Ensure representation of river/lake basin boards of environmental interests
- Include sufficient capacity for environmental monitoring, assessments, regulations, and enforcement of water issues within institutions
- Provide resources for water flow and water quality infrastructure to ensure that environmental water provisions are maintained
- Provide training and resources for coordinating across water using sectors and environment
- Provide resources for enforcement of water allocation and water quality decisions

5. Managing Transboundary Water Resources

- Develop common visions for transboundary waters that include environmental goals
- Identify transboundary environmental resources requiring protection (wetlands, fish breeding areas, etc)
- Harmonize water quality and other regulations across borders
- Assess transboundary environmental impacts of national decisions
- TDA/SAP concepts can be useful for developing transboundary action programs
- Include environmental ministries on boards of transboundary institutions

6. Drawing up Sectoral Plans and Strategies

- Include environmental representation on teams developing sectoral plans
- Include provisions for stakeholder participation in sectoral planning, including from environmental representatives
- Use opportunities for impact- and institution-centered SEAs of sectoral plans and programs to promote their sustainability
- Use plans and strategies to develop capacity within sectoral institutions for environmental awareness and conformity with environmental legislation
- Include provisions in sectoral plans for participation in IWRM at national and basin levels
- Include provisions for EIA of potential environmental impacts of development

7. Making Infrastructure Investments

- Ensure EIAs have strong terms of reference, including upstream and downstream environmental flow and water quality issues, effects of climate change on the facility, assessment of cumulative impacts, secondary impacts
- Ensure that EIAs are commissioned early, delivered on time, and acted on in project-level decisions
- Implement EMPs to mitigate environmental impacts of developments
- Include provisions for environmental expertise within infrastructure operating authorities
- Establish a monitoring and reporting program that will track environmental changes

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