

Chapter 10

Planning for Sustainable Lake Basin Management

This chapter covers two broad subjects. The first pertains to planning as a “process” for achieving sustainable use of lake basin resources. Based on the 28 lake briefs, it explores how the terms “plan” and “planning” are used in lake basin management and how they relate to the discussion in the previous chapters. The second subject concerns the integration of planning issues. Specifically, the chapter discusses the process of integration of some important planning factors, including social consensus, scientific knowledge, and time factors.

Planning for Sustainable Lake Basin Management: A General Overview

Planning and objectives

Planning is a process of developing a plan based on a set of goals, typically within a particular time frame and resource constraints. Plans can be developed at different levels of specificity. Effective plans define specific actions to achieve particular goals; their development usually follows known stages of planning:

- Establishment of a goal (or a set of goals) agreed on by the stakeholders
- Development of alternative strategies for reaching the goal
- Selection of the preferred strategy based on an assessment of feasibility
- Implementation of that strategy with mobilization of necessary resources
- Refinement of the strategy through monitoring and evaluation.

The planning approaches employed typically determine the resource, institutional, and human capacity requirements—the levels of institutional responsibilities, policies and political support, involvement of citizens, amount of information and data, technical capacities, and the associated financial resources—for achieving the desired goals.

The viability of a management plan for a specific lake basin depends very much on its relationship with regional and national plans for socioeconomic development and environmental conservation. If the policy and institutional contexts are not properly matched, implementation could become a daunting task. The success of lake basin management hinges greatly on how well the core partnership—the governmental sector, the private sector, NGOs, and other civil society, as well as resource users and stakeholder groups—can work together to develop and enhance the plan.

As discussed in Chapter 2, the incremental changes in the rate of deterioration, loss of values, and increasing scarcity of resources may not be noticeable before the situation reaches an advanced state of degradation, and the likely delays in introducing countermeasures in a poorly developed governance framework for resource regulation and management would aggravate the situation. Often, this happens when the lake basin is subjected to strong development bias with weak management frameworks. Poor understanding about the limits on resources, the costs of externalities such as pollution or erosion, the gradual decline in resource values, or the spread of unsustainable practices caused by the exploitative and unsustainable resource development practices further compounds the problem. Under such circumstances, lake basin management typically aims at bringing about beneficial changes in behavior and policy, adoption of new technologies and practices, improvement and enforcement of environmental regulations and standards, as well as changes in infrastructure investment. Success depends on the quality of governance; that is, the accountability of various organizations; public access to data and information; the transparency with which decisions are made and implemented; the extent to which rights, especially customary rights, are established and respected; and the adherence to policy provided in existing legislation, as well as the regulations and rules that emerge from this legislation (Figure 10.1).

Meeting the planning objectives

Planning has to be accompanied by a system of measuring the extent to which new initiatives have resulted in improvements on these governance components. Not all are measurable, but all can be monitored with appropriate

measures of change. While the above governance components in lake basin management have evolved in many industrial countries, they are still evolving in developing countries. This subject will be discussed later in this chapter.

In developing countries, the political decisionmaker can be a powerful voice in promoting and accelerating the necessary policy and institutional changes (for example, the prominent role played by the Chief Minister for Orissa in the Chilika Development Authority), though we have a long way to go in getting the needed strong political support for lake basin management. Political support and will are indispensable to the success of lake basin management. The fostering of political support must also be reinforced with public support, awareness, and understanding. For that, the impacts of degradation and the benefits of restoration need to be communicated to policymakers in a form they can understand and relate to. In addition, for lake basin management plans to succeed, the role of the “champions” should not be overlooked. Often, they are the ones who can provide or mobilize sufficient political will and support. In many developing countries, political factors are frequently subject to radical change. These instabilities can have major adverse effects on sustained lake basin management. Hence, it is important for a lake basin management plan to allow for flexibility as well as risk mitigation and adaptation.

Identified Forms of Planning for Lake Basin Management

Vision plans

Lake basins are managed for different reasons. They may be managed exclusively for the conservation of valuable natural assets such as biodiversity (Tonle Sap, Tanganyika). They may be managed exclusively for satisfying the human needs from the development of water resource and flood

control (Aral Sea, Lake Chad). Lakes may also be managed for comprehensive regional development, as in the case of Lake Constance, Lake Biwa, and the Great Lakes of North America. The goal of lake basin management could be framed in general terms as the realization of a management system for sustainable development, use, and conservation of basin resources.

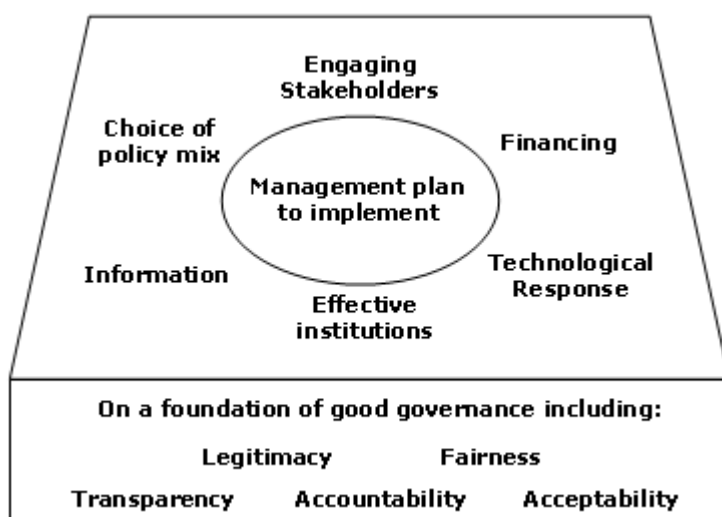
If the goal is to bring the stakeholders together to develop a common agenda for sustainable lake management, then the approach might simply be to collectively develop “a vision plan”, or “a vision statement”. The recently completed Vision and Strategy Framework for Management of Lake Victoria Basin is an example. It lays the foundation for the riparian countries to manage the lake jointly, with aspirations to achieve some high-level agreed goals. Although the lake basin is not one of the 28 LBMI cases, the Lake George Basin Management Plan (paper presented at the African Lakes Workshop) made use of the framework of the World Lake Vision, which developed the seven guiding principles shown in Box 10.1. It is a menu of strategies and opportunities-fundamental components of an integrated framework for identifying significant lake problems and developing practical solutions. The level of institutional commitment and the required financial and manpower resources for this is likely to be quite moderate compared to the level associated with implementation of projects that are typically associated with basin “action plans” or with sector agency “intervention plans.”

Action plans and intervention plans

Typically, “action plans” are short-term plans with different degrees of sectoral commitments, while “intervention plans,” with their planning time horizon ranging widely, generally have sectoral commitments. A typical action plan example is Lake Ohrid Transboundary Watershed Action Plan. The plan included the following four primary action items:

- Reduction of point source pollution through actions that stress septic system management and maintenance, homeowner education, and management of solid waste
- Reduction of non-point source pollution through actions that focus on implementing conservation practices on farms and restoring impaired stream reaches
- Habitat protection and restoration through wetlands inventory and the establishment of a no-net-loss policy, identification and protection of fish spawning habitat, and inventories of the native flora and fauna in the watershed
- Comprehensive planning through the establishment of micro-watershed planning

Figure 10.1. A Conceptual Framework of Lake Basin Management



committees, and by creating a GIS system and building the planning capabilities within the municipalities.

While the action items such as above would require funds from various sources, they are also to be coupled with local actions, initiatives and commitments.

The sector agencies of the governments are responsible for developing short-term management intervention plans both for development and conservation/remediation purposes. A 1993 Water Quality Agreement for Lake Champlain signed by the states of New York and Vermont and the Province of Quebec in 1993 included as a joint intervention project a phosphorus load reduction strategy from point and non-point sources. A recent (2000) review of progress of the above project showed that all the three participant States had considerably exceeded their reduction commitments. This review also highlighted one of the limitations of such sectoral plans. In this case, the nutrient reductions were being offset by nutrient load increases in other sectors, principally conversion of agricultural land to urban uses.

Comprehensive plans

Unlike a vision statement, implementing a lake basin management plan requires prescribing details of the long-term structural and non-structural actions to be carried out. The long-term goals must be met by a range of relevant organizations. Since the implementation of the plan may be longer than the time frame for usual budgetary considerations, the agencies responsible for carrying out the plan may or may not be endowed with the needed level of financial and manpower resources. For the plan to be viable, it usually has to be scaled down to meet budgetary constraints, and to be revised over time. A comprehensive plan is often developed on the basis of holistic considerations for achieving sustainability objectives to effect changes in the environmental status indicators with

long-term institutional and financial commitments. The plans for Lake Biwa basin management have been developed not only for Lake Biwa, but also for the Yodo River Region and beyond, including the entire Keihanshin Belt zone of economic and regional development. It covers the period from 1972 to 1997 for comprehensive development and management of lake basin resources (Lake Biwa Comprehensive Development Plan or LBCDP), and from 1999 through 2050 for their comprehensive conservation (Lake Biwa Comprehensive Conservation Plan or LBCCP). The Lake Conservation and Management Project of Lake Bhopal, also known as the Bhoj Wetland Project, envisages tackling various issues associated with conservation and management of the upper and lower lakes of Bhopal under a multi-pronged strategy. Although these issues are deeply interrelated and inter-linked, for operational and management convenience they are addressed under different independently executed sub-projects. The proposed action plan is not a one-time quick solution, but should trigger a chain reaction to promote sustainable management. The project identified 16 sub-projects.

On a grander scale, the lakes across the world have had a long history of human interventions, not so much as part of a long-term view of lake basin management but as part of fulfilling the need at the time of the region or even the nation in which the lake basin is situated, as exemplified in the Great Lakes of North America. The lake brief refers to the five eras of lake basin management with different emphasis on planning: "Resource Development" in the late 18th through mid 19th century;" "Transition" in the late 19th century; "Federal Leadership" in the early 20th century; "River Basin" in the late 20th century; and the "new" era from the mid-1980s through today. It states, for example, there was unprecedented institution building taking place at the river basin level in the "River Basin" era, with emphasis on environmental protection and resource management (with associated structural interventions like construction of sewerage) resorting to a top-down,

Box 10.1. The Seven Principles of the World Lake Vision

Principle 1: A harmonious relationship between humans and nature is essential for the sustainability of lakes.

Principle 2: A lake drainage basin is the logical starting point for planning and management actions for sustainable lake use.

Principle 3: A long-term, proactive approach directed to preventing the causes of lake degradation is essential.

Principle 4: Policy development and decision making for lake management should be based on sound science and the best available information.

Principle 5: The management of lakes for their sustainable use requires the resolution of conflicts among competing users of lake resources, taking into account the needs of present and future generations and of nature.

Principle 6: Citizens and other stakeholders must participate meaningfully in identifying and resolving critical lake problems.

Principle 7: Good governance, based on fairness, transparency and empowerment of all stakeholders, is essential for sustainable lake use.

(http://www.ilec.or.jp/eg/wlv/WLV_Final.PDF)

command-and-control, government-dominated approach. A significant transition took place in the “new era,” which emphasized a bottom up, partnership-based, inclusive approach, including the development of grass-roots non-governmental organizations to empower communities and individuals—collectively having a profound impact on regional water resources management. As exemplified above, planning for management of lakes and their basins can also be viewed from the historical continuum of policy orientation with associated structural and non-structural intervention projects.

Strategic Plans and Incremental Planning

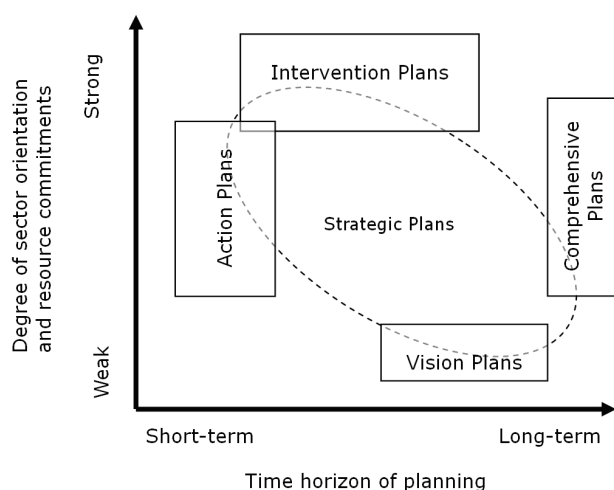
All of the above types of plans—vision, action, intervention, and comprehensive—may be “strategically” developed and implemented. The term “strategic” implies that the achievement target would be clear and the required resources would be committed according to some priority considerations. The implementation scheme has to be supported with proper assignment of responsibility, with policy, legal, and/or policy reforms and investments. The time frame of achievement may range from a relatively short period of a few years to a relatively long period of a few decades. As described in Chapters 4 and 8, development and implementation of a “Strategic Action Plan (SAP)” constitutes a core process of GEF programs, not only of lake basin management but also of other focal subject areas, particularly in combination with “Transboundary Diagnostic Analysis (TDA),” which is intended to identify areas of priority concern under the transboundary settings. Figure 10.2 is a conceptual diagram that relates, in terms of the degree of sector orientation and resource commitment vs. time horizon of planning, the action plans, vision plans, intervention plans, and comprehensive plans in relation to the strategic action plans.

As for non-GEF lake basins, the United States Environmental Protection Agency, for example, has spearheaded a strategic plan called the “Great Lake Strategy 2002” with other members of the U.S. Policy Committee Partners consisting

of major federal, state, and regional agencies responsible for the restoration of the Great lakes ecosystem. The plan was created for the new millennium to advance the restoration and protection of the lake basin ecosystem as a massive undertaking with priorities expressed under four major goals, with key objectives and actions, expressed under the headings of “chemical integrity,” “physical integrity,” “biological integrity,” and “working together.” (<http://www.epa.gov/solec/2002/index.html>)

As for GEF lake basins, how well the SAP approach has served to perform the intended catalytic function in bringing about needed improvements in lake basin management is not clear from the lake briefs prepared for the LBMI project. However, the combined use of SAP with TDA apparently has been instrumental for some lake basin management cases, not so much as a simple planning approach but as a vehicle for conducting multilateral dialogues on the broader transboundary subject areas of concern among the riparian nations that would have not been possible to pursue otherwise. For example, the Lake Tanganyika brief states, “One of the immediate objectives of the UNDP/GEF Lake Tanganyika Biodiversity was to formulate a SAP that establishes clear priorities endorsed at the highest levels of the partner governments. The SAP should identify priority transboundary concerns, as well as sectoral interventions needed to resolve the transboundary problems as well as institutional mechanisms for implementing elements of the SAP.” It also states, “A TDA was therefore one major step needed during the process of formulating the SAP.” As another example, the Lake Ohrid brief states, “Watershed Management Committees have been formed and have succeeded in creating comprehensive multi-stakeholder forums and in initiating pilot projects that have helped to develop a SAP for the Lake.” On the other hand, there are cases of SAP applications that would have been far more successful if preparatory activities had been satisfactorily pursued. The Lake Cocibolca brief states, for example, “Lack of reliable scientific data has been a major drawback and must be taken into account for any SAP to be devised,” implying that fulfillment of the necessary condition such as availability of scientific data greatly affects the utility of the approach.

Figure 10.2. Types of plans based on degree of sector orientation and time span of planning.



Building of the knowledge base on the state of the lake basin (as a part of TDA in the case of GEF approach, for example) and the attainment of social consensus to engage in strategic actions (as a part of SAP in the case of GEF approach, for example) are two important factors that affect planning. While these two characteristics form continuous the first runs from little understood lakes to ones where there is an extensive knowledge base about social needs, economic implications and biophysical processes; and the second runs from independent stakeholder group to societies where there is a high degree of social agreement—there are some distinguishable patterns of planning that relate to the combination of the states of these factors. Some examples of lake basin management situations under different

states of consensus-building and knowledge-base are presented in Box 10.2.

Integration Over Time of Individual Planning Efforts

While the strategic planning approach, supported by some knowledge generation exercise such as TDA in the case of GEF transboundary cases, could prove to be quite instrumental in the development and implementation of a basin management plan, the planning is a dynamic process involving time. Further, a lake management plan consists of various individual sector and local management interventions and initiatives rather than a self-contained comprehensive plan. Development of a management plan is only the initial step in systematically managing a lake basin. The plan has to be implemented through space and time with the involvement of a wide range of stakeholders.

As described in detail in Chapter 4, the sectoral orientation of government institutions, and for that matter that of any organizations including regional and international organizations, often leads to individual plans and projects (particularly resource development and conservation interventions) being implemented in fragmentary and disconnected ways. With budgetary and other resource mobilization constraints compounded by social and political considerations and processes, the temporal and spatial sequencing

of projects within the same sector may turn out to be quite problematic. While an integrated approach is desirable, achieving integration is a great challenge.

There are different ways of viewing how integration takes place over time and space. For one, individually and separately implemented intervention projects from different sectors may be brought together under an umbrella framework, so that the implicit project linkages and its integration benefits are explicit. For another, the interventions within the same sector may be implemented over time and space more or less independently and finally unified at some point in the planning period. Yet another case is for a single intervention project to grow and mature over a period by the broadening of the project coverage and integration of additional planning requirements that were lacking in the earlier phases. Box 10.3 presents some examples from the lake briefs of the above three cases of integration.

Box 10.2. Dealing with Uncertainties in Planning for Lake Basin Management

High consensus, good knowledge base: Many small-scale sectoral resource development projects with quantifiable objectives (fishery development, tourism) belong to this case. Because of the limited sectoral focus, the social agreement about lake basin management and the ability to use good quality knowledge to guide implementation, sectoral plans belonging to this category tend to be very successful. For example, a series of programs to reduce nutrient loads from point sources in both the United States and Canada received widespread public support and were based on a strong scientific knowledge base. These programs have been successful to the point where the majority of nutrients now enter the lake from diffuse sources, including internal sediment loads.

High consensus, poor knowledge base: The lake basins facing this situation require plans that would typically include a knowledge development component—such as an intensive monitoring program or a scientific or socio-economic research component—to reduce the uncertainties. These plans would also be developed under the precautionary principle; that is, management actions would be conservative, so that the chances of causing unforeseen problems would be minimized. Examples of lakes that fit into this category include Lakes Tonle Sap, Dianchi, and Issyk-Kul.

Low consensus, good knowledge base: Lake Nakuru in Kenya provides a good example. There, the number of stakeholder groups is much larger than other lakes in the region, but there has also been considerable biophysical research undertaken by Kenyan government authorities (with donor assistance, a local university, and NGOs) into the water quantity and quality problems of the lake and its catchment. The Lake Nakuru brief summarizes the situation as “It is now widely recognized that the constraints to lake basin management are mainly social, economic, and institutional.” The Kenyan Wildlife Service has developed an Ecosystem Integrated Management Plan for the Lake Nakuru National park surrounding the lake, and the Nakuru Municipal Council completed a Strategic Structural Plan for the town. However, there is no overall plan for the basin that sets out agreed sharing of the resources.

Low consensus, poor knowledge base. In the case of **Lake Chad**, the Lake Chad Basin Commission (established in 1964 by Chad, Nigeria, Cameroon, and Niger) has been unable to effectively manage the lake because some of the countries have pursued independent irrigation development. In addition, there is only a limited understanding of the combined effects of water withdrawals, climate variability, and climate change on the lake’s water level, so that there is no accepted knowledge base from which management decisions can be made. While management actions will be undertaken in these lakes, it is difficult to develop any coordinated plans in the face of limited knowledge and lack of social agreement. Typically, these actions will be confined to individual sectors, such as fisheries or tourism, and should ideally be based on a careful risk assessment of a particular management intervention. However, this seldom happens.

Three lessons can be drawn from the lake briefs about successful integration;

- (1) Integration should first take place where the pressures are greatest.
- (2) Integration should be phased over time.
- (3) Integration should be pursued by necessity rather than by design.

Integration should first take place where the pressures are greatest

For integrated lake basin management to be successful, there needs to be good governance coupled with the necessary enabling conditions. These include a political commitment to managing the lake basin in the long term for the benefit of all stakeholders, effective institutions, a sense of consensus amongst the stakeholders, and a good level

Box 10.3. Ways of Integrating Intervention Projects

Integration by Encompassing (Figure a)

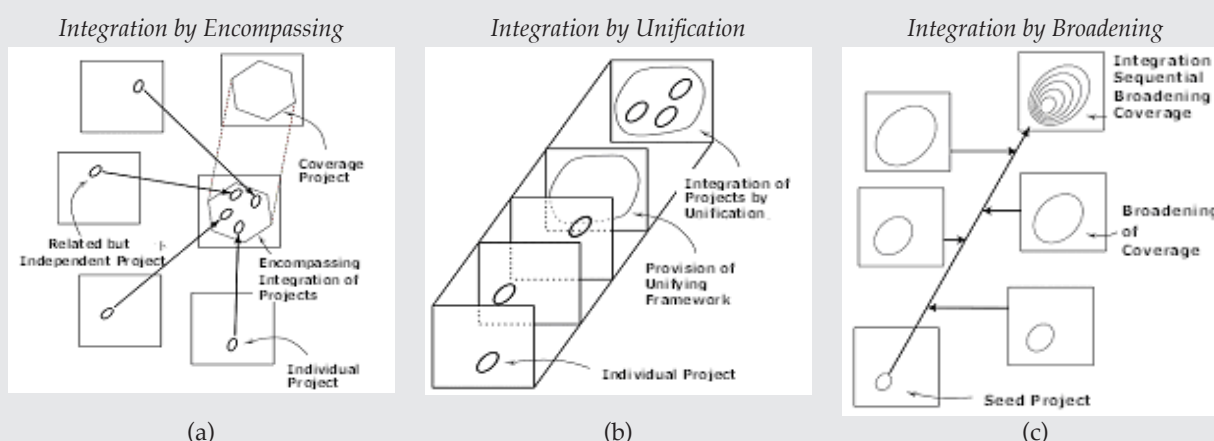
This type of integration occurs when an “encompassing” project or program is instituted to facilitate coordination of independently developed sectoral (including government and non-government sectors) programs and projects that are operating at the same time. This kind of integration is usually introduced when it becomes apparent that greater benefits can be gained by integrating multiple sector activities to a coherent and collaborative framework. Typically, this integration will include cross-sectoral coordination across different government Ministries, and even different countries for transboundary lakes. For example, the Lake Biwa Department of Lake Biwa and the Environment in Shiga Prefecture, Japan was established for the purpose of bringing together and integrating existing projects in the areas of forestry conservation, sewerage construction, environment, and watershed management to implement the “Lake Biwa Comprehensive Conservation Plan”.

Integration by Unification (Figure b)

The Zoning and Management Plan for Aquaculture (ZOMAP) in Laguna de Bay provides a typical example. The competition for Laguna de Bay’s aquatic resources has been fierce for decades, particularly during the 1970’s and 1980’s. It was due particularly to the introduction of fishpen culture technology during the mid 1970’s that immediately became a lucrative operation for the large-scale commercial operations. In 1980s, Laguna Lake Development Authority (LLDA) attempted to introduce various measures both to conserve the fishery resource as well as to support small-scale local fishermen, and specifically in 1983, a zoning plan of the entire lake surface was introduced for the first time. It was an early version of more refined ZOMAP to be introduced later, designed to rationalize the management and regulate the utilization of the fishery resources. The comprehensive Master Plan of zoning was approved in 1996. The Plan was later in 1999 placed under LLDA’s Lake Management Division. ZOMAP acted as a kind of unifying project, providing a basis for the new phase of sustainable fishery resource management for the lake, with clearer delineation of responsibilities and political commitments.

Integration by Broadening (Figure c)

In the case of Lake Constance, the fringing wetlands around the lake have been restored for biodiversity conservation over the past decades, with the extent of restored shoreline gradually expanding to provide for natural habitats. This is an example where the broadening has occurred over space. On the other hand, in Lake Biwa in the late 1970’s, it was the extent of legislative involvement in eutrophication management whose scope was broadened considerably from the initial “soap movement” which was a local movement by housewives. The movement led to enactment of a “eutrophication control ordinance,” which eventually culminated in the enactment of national legislation, “the Lake Law”, that allows for a range of conservation interventions by the national government in lakes throughout Japan. This broadening took place over several decades.



Three Forms of Integration.

of biophysical and socio-economic knowledge about the lake basin. Experience shows that moving too quickly to integrated lake basin management before these conditions are established does not work. (Lake Chad provides an example where the initial enthusiasm for a transboundary commission was not matched by long-term political and financial support). It is better to start small, by bringing together the management agencies and stakeholders where the issues are apparent and there is a developing social consensus that they need to be managed properly. This is often within a sector, such as fisheries, or with a problem such as pathogens from sewage where the pressures on the resources quickly becomes apparent. Success in correcting this problem builds confidence for tackling other problems. Examples of this incremental approach to integration are given in Box 10.4 for Lake Ohrid and Chilika Lake.

Integration should be phased over time

This lesson is a corollary of the previous one. It typically takes many years, even decades, for goals to be agreed by the stakeholders in single-sector issues, let alone multi-sectoral problems; for sufficient knowledge to be accumulated for effective management; for institutions to be established or coordinated; and for laws to be passed and rules developed. Thus, the approach of starting small and building on successes toward a more comprehensive lake management plan will take many years. All stakeholders need to be committed for the long-term for these plans to be successful. The Lake Naivasha Riparian Association has evolved over several decades from the earlier Lake Naivasha Riparian Owners Association (1929) to take on an increasingly wider responsibility. Originally formed just to manage the use

of the exposed lake bed by riparian owners, it now has a much wider role in environmental management of the lake and contributes to the lake's Management Implementation Committee, which is in the process of being gazetted under the Environmental Coordination and Management Act.

The externally funded assistance projects typically last for 5-6 years. This may seem inconsistent with the need for long-term management, but many of these projects include components to help develop the good governance and enabling conditions that are needed for long-term lake management. However, even this focus on establishing the conditions for long-term management needs to be maintained. As some lake briefs make clear (Lake Malawi), there are often no mechanisms established for sustaining this external assistance beyond the duration of the project.

Integration should be pursued by necessity rather than integration by design

Regardless of any of the above modes of integration, we should keep in mind that there will not be any perfectly integrated management plan. Naturally, a management plan that is subjected to only minimal integration may bring about a more desirable outcome than a plan that is subjected to highly complex and difficult integration. In the case of management of a system that is as complex as a lake basin system, in general, integration by necessity is likely to bear better fruit than integration by design, keeping in mind that over course of time that management can be adaptively improved by instituting a monitoring system with simple but useful indicators of achievement.

Box 10.4. Building on Initial Success

Lake Ohrid, Macedonia and Albania

An important commercial and cultural fish species, the Lake Ohrid trout, is threatened by overfishing, as well as by pollution, loss of breeding grounds, and introduced species. Both countries have agreed that the fisheries are in immediate danger and rapid management action is required. Scientific studies show that the fish in the lake are one single, linked population, and so they must be managed collectively, with similar requirements in both Macedonia and Albania. With assistance from bilateral and multilateral donors, government officials and fisheries experts in both countries have agreed to a unification of some of the fisheries regulations. For example, in 2001, both countries agree to the same allowable net size. While there are still significant differences in the organization of the fishing industries in the two countries, these early successes with fisheries management (coupled with the establishment of a non-executive management board for the lake, and agreements on treating the sewage from urban areas around the lake) provide a foundation for increasing cooperation in managing the lake.

Chilika Lake, India

Chilika Lake, on the east coast of India, is an estuarine lake system noted for its scenic beauty, its productive fisheries, its religious significance, and its importance as a resting place for migratory birds. However, due to diversion of inflowing rivers for irrigation, and increased silt loads from inflowing rivers, the lake exit has become silted up and fish catches have declined dramatically. A management authority was established for the lake in 1992 to coordinate and promote lake restoration and development across the operational agencies. A new entrance was dredged to the ocean in 2000 to provide more direct interchange between the lake and the ocean. The results were dramatic-salinity levels in the northern sector of the lake changed from 0.5-2.5 ppt to 0.1-36.00 ppt, and fish landings increased from 1600 mt before intervention to 11,877 mt in 2001-02. There were other benefits in crab catches and in reductions in aquatic weeds. The obvious success of this engineering intervention in the lake has strengthened the hand of the Chilika Development Authority in implementing other aspects of lake management, including non-structural measures.

Indicators of Achievement in Integrative Strategic Planning

A plan aiming at sustainable management of lake basins, once implemented, would realize some changes in the state of lake basin environments. Broadly, one would be interested in two kinds of resulting changes as achievement of the plan. The first is the change in the reduction in stress to the lake basin environments (output) and the second is the change in the state of the lake environment (outcome). Some of the typical stress reductions include a decrease in the area covered by the invasive species and substantial increase in the weed-free zone consequent upon desiltation operations (Chilika Lagoon); water abstraction; agrochemical and sewage pollution; destruction of riparian habitat (papyrus); over-fishing; and erosion / siltation (Lake Naivasha). Some of the environmental status indicators stressed in the lake briefs include, among many others, concentration of chemical oxygen demand (Lake Dianchi) and the distribution of water hyacinths (Lake Victoria). In pursuing a plan, the indicators of achievement of the output and of the outcome are not only useful but also essential in many cases. In GEF terms, they correspond respectively to the stress reduction indicators and the environmental state indicators. The degradation of environment and loss of resource values in a lake basin and the emergence of a scarcity situation are often slow and relatively unnoticed. For example, even if a great deal of effort is made in reducing the pollution load discharged into the lake, the actual improvement in water quality or the state of health of the aquatic environment, or the achieved outcome of the planning effort, may not be immediately clear. On the other hand, the reduction in the magnitude of pollution load is one of the major contributing factors toward improving the water quality or the state of aquatic environment. Though not readily improvable, the magnitude of the outcome, e.g., the improvement (or no improvement sometimes) in the quality of lake water, can be measured through appropriate monitoring. The magnitude of the output-for example, the amount of pollution load reduced-is measured using the datasets and information obtained from various sources.

For a plan to be consistently and continuously ready to aim at sustainable management of lake basins, it will have to fulfill one additional requirement. It is the process through which the enabling environment for planning will improve its functionality. In GEF terms, it is called the process indicators. For example, the control of eutrophication will not be possible if construction of a sewerage system alone is completed with financial support from external funding agencies. The need to install the nutrient removal capability apart (an additional funding requirement), the households and business operations will have to invest in connecting to the system. Unless there is a law stipulating the requirement for connection and the penalty for not doing so, and the enforcement system and provisions (e.g., manpower and administration cost), the constructed sewerage facility will be operating far under its capacity. The Lake Nakuru sewerage system is still undergoing this process almost

two decades after a rehabilitation project was undertaken in the mid-1980s. The planning objective of upgrading the sewerage facility may have been fulfilled, and that was the desired outcome of those responsible for the constructing of the system. The service provision to the city and the citizens and the reduction of nutrient discharge to the lake has to be monitored through the use of process indicators such as the number of household connections, the capacity improvement of the sewage sector of the municipality, and upgrading of the testing laboratory. These activities are continuing, with the process indicator values slowly improving.

As described above, the use of indicators is important in the pursuit of strategic planning for lake basin management, be it a vision, action, intervention, or comprehensive approach. The importance of the use of indicators is particularly stressed today in the implementation of projects involving the use of funds with specific term and duration, as in the case of those from the external funding agencies such as GEF. GEF has issued the operational guideline documents such as "Program Performance Indicators for GEF International Waters Programs" prepared by its Monitoring and Evaluation Unit. The status of application of the guidelines and the evaluation of usefulness of their application to the planning of lake basin management supported by GEF is preliminary, and little information is presented in the lake briefs. But the following are some of the useful observations that relate to the subject in a broader context of planning for lake basin management.

- (a) One of the important side benefits is that through the process of making the three sets of indicators truly useful, the key representatives from the concerned governments, agencies, NGOs, and research institutions involved in analyze the information and data have the opportunity to develop mutual trust and respect. Under the transboundary context, this is as important a benefit as the indicators themselves.
- (b) The specific terminology with clear definition of the stress reduction indicators, environmental status indicators and the process indicators used in the GEF framework to monitor the degree of accomplishment in planning is equally useful for non-GEF projects and programs. This may not have been anticipated at the time the framework was conceptualized by GEF.
- (c) The use of indicators of performance or achievement at the project level need to be properly carried over beyond the duration of the project itself-that is, to the program and the entire planning process-as implied in the discussion in the previous section. This is a subject that needs to be pursued further with the analysis of actual application results to be tested and the experience properly.

- (d) While there is little room for dispute on the importance of strategic planning and the use of performance/achievement indicators, the need to reduce the transaction costs of carrying out the work is quite important (Lakes Cocibolca and Titicaca, for example). Small but sustained investment in facilitating the collaborative program among the existing institutions is often much more cost effective than an intensive short-term exercise.

Adaptive Management and Monitoring of Progress

The management plan describes what actions should be taken and activities implemented. A comprehensive management plan would include necessary policy changes, new or revised standards and guidelines, new or revised regulations, new legislation, proposals for the introduction of new technology and practices, and plans for remodeling existing infrastructure and introducing new infrastructure. There is a wealth of such actions and activities that could be included in the plan, but in most cases, skilled human resources, time, and money are limited. Hence, the question is what should be the priorities and in what sequence should actions be taken and activities implemented.

Developing and implementing lake basin management programs with priority considerations alone, however, may not be sufficient for dealing with the highly complex and dynamic context of lake basin problems today—there are too many uncertainties, unknowns, and untested assumptions. The kind of management plan that lake basin management programs need to focus on in the future is quite unlike traditional, static master plans that are largely based on forecasts and predictions. For example, there are uncertainties about ecological processes and functions, about the impact of different patterns of resource use, and about political and social development and change in the future, and hence what values and conflicts might constitute driving forces. The driving forces may be what values and conflicts might constitute the planning decisions. The risk of wasting limited resources on actions and activities that do not bring major benefits in terms of the agreed targets is large in the face of these kinds of uncertainties. Lake basin

management planning should therefore have to reflect the character of adaptive management planning; that is, a process for developing management plans based on an explicit set of assumptions and hypothesis about the elements and components of a lake basin's natural and man-made system and how they function and interact, with a well-designed monitoring program. Particularly essential is the provision of an institutionalized feedback system that enables the planning team to assess these assumptions, improve its model of the lake basin system, assess progress toward the targets, and adapt and adjust the plan to reflect what has been learned from the expanding knowledge base. For scientific research, data gathering, and monitoring to be directly linked to management, the allocation of resources to research and knowledge development and the management priorities have to be closely but flexibly interlinked, with high reliance on the participation of stakeholders to establish goals and targets, to manage competing objectives, and to weigh options and tradeoffs.

Summary and Conclusion

It is often quite difficult to translate the conceptual goal of lake basin planning, i.e., sustainable use of lake resources into actual plans for implementation. There are several associated difficulties. The first pertains to limitations in information and knowledge that would be required to attain the maximum values. There is also a great deal of uncertainty associated with measurement and assessment of values and impacts. This is also compounded by the characteristics of lakes; that is, factors such as “long retention time,” “complex dynamics,” and “integrating nature” described in Chapter 2. The second relates to whether or not the accrued values could be shared equitably. Even if the overall values are maximized, developing principles of equity at the individual level is often complex and difficult. Development of an agreeable scheme during planning is often mired with difficulty. Knowledge limitations and the inherent uncertainties associated with valuation complicate the process. In cases where there are severe conflicts, resolution usually takes place during implementation of the plan rather than during its development. Finally, the overall plan of lake basin management consists of many component plans that by themselves do not maximize the use

Box 10.5. Ecosystem Approach in Planning

For a coordinated ecosystem approach encompassing multiple jurisdictions to be functional, some sort of a lake basin commission may be needed. To guide the ecosystem approach and to assess its success over time, goals and timelines with specific targets are required. The pitfalls of the ecosystem approach, i.e., that its scope may become too large and that unrealistic objectives may be set, need to be carefully taken into account in applying the concept (Lake Malawi). Also, a viable solution can only be found if the entire watershed ecosystem is taken into consideration by the management and a strong integration of science and management is incorporated in the project.

A lake basin management plan also has to be linked to the plans and programs developed with a broader scope of government operations. National policies and programs will, in turn, need to include specific components to echo lake management policy, and establishment of lake management policy will have to take into account existing policies and strategies of the riparian and catchment countries (Lake Victoria). To avoid contradiction between a sectoral plan vs. national development plan, an umbrella whole basin master plan is essential. It is also important to establish a lake basin commission for coordinated natural resource management (Lake Malawi, Lake Nakuru).

values of lake resources. That is, at each stage of resource development and conservation, there may be intervention plans of different scope and scale. One intervention would be followed by another. At each stage, there has to be a plan that may or may not be wholly integrated as part of the overall plan that allows for the maximum sustainable use of resources.

The forms of planning are reviewed, particularly with respect to the time horizon of planning versus the degree of sector orientation and resource commitment. Lake brief cases are associated with two important qualities that significantly affect how planning is conducted; that is, the uncertainties associated with societal consensus in planning and the degree of adequacy in the acquired knowledge on lake behavior and response to human interventions. Also discussed are three different ways of viewing integration over time of individual planning efforts, with the realization that planning is a continuous process of pursuits with the required adjustments. The measures in the degree of achievement in terms of the stress reduced (output), the status of environment (outcome), and the functioning of the planning process (adequacy of enabling environment) ought to be closely associated with strategic planning. While these indicators are of critical importance in properly pursuing planning in lake basin management, the effort needs to be made further for the usefulness of these indicators to be transcended to the broader scope of planning as a continuous and sustained process for integration of individual plans and programs of different kinds at different time periods.

Key Lessons

- Planning of lake basin management requires development and implementation of a comprehensive basin management plan with the necessary administrative measures integrated over the concerned sectors.
- Plans of different kind, i.e., vision, action, intervention and comprehensive plans, have different purposes, scopes, and implementation schemes, but they all require strategic approach under the resource and institutional constraints.
- Due considerations has to be paid about management of the particular lake basin, with regard to different combinations of the degree of societal consensus and the degree of uncertainties associated with the state of knowledge.
- The outcomes of individual planning efforts can be integrated over time, resorting to different patterns of integration proven successful in various lake basin management cases.
- Integration should first take place where the pressures are greatest, be phased over time, and be pursued by

necessity, where appropriate, rather than by design, and by building on initial success.

- Planning of lake basin management need to be continually assessed for its achievement and performance by using indicators of achievement with respect to stress reduction, environmental state, and the process of creating the enabling environment.
- The role of political institutions and politicians, as well as the changing socio-political climate, should be positively and appropriately taken into account.
- It should not be forgotten that the role of individual champions are reported in many cases to be quite instrumental.

Further Reading

1. [Juarez](#) documents how citizen participation in workshops assisted the planning process at Lake Chapala in Mexico.
2. [Connell](#) describes the role of water planning at the national level in Australia on the Murray-Darling Basin.
3. [Holdren](#) provides a concise planning framework that is commonly used at some of the smaller to mid-sized lakes in North America.
4. [Pokharel](#) discusses the need for a nationwide lake basin management plan in Nepal, including a detailed look at the Lake Phewa case.
5. [Abdullah](#) similarly looks at nationwide planning in Malaysia and draws some lessons for strategic planning in other counties.
6. [Villalobos](#) presents the experience from Chile on how planning and standard setting come together for lake basin management.