

Chapter 5

Identifying Effective Policies: Incentives and Regulations

Changing negative behaviors and reinforcing positive ones is the heart of lake basin management and perhaps the most difficult area. Some key questions dealt with in this chapter on policies include:

- How can behaviors be changed or reinforced?
- What specific policy responses are used at lakes around the world?
- What is the appropriate mix of policies?
- What are the key lessons for lake basin managers?

Introduction

Policy-making is an art, not a science, and changing specific policies for improved lake basin management is part of a multi-step process. After identifying the parameters of the lake basin's physical system, and the roles of the various stakeholders within the system, the decision maker (actually, "decision making process" is a more accurate term but "decision maker" is used here for convenience) considers what is happening at present, what alternatives are feasible, and the overall objectives of improved management. These are the "goals" of improved lake basin management and the objectives toward which new, specific policies are put in place.

Changing policies is an integral part of introducing effective solutions and making a difference in a lake basin. Policies can be considered at several different levels. The broader policy framework includes many dimensions—general goals for lake basin management, the supporting legal framework and institutional arrangements (both formal and informal), and the state of scientific knowledge. In addition, policies (or policy responses) are needed to address specific issues and change behavior. These policy tools often take the form of economic signals or incentives, as well as rules and regulations, and are designed to create specific outcomes. This latter set of policies are the focus of this chapter. People-centered policies, those that rely on public information and involvement, are equally important and are discussed in Chapter 6 on Participation.

In some cases (the easy ones) the needed improvements are largely engineering investments, and the main problem is in securing financial resources (money!). Engineering and infrastructure solutions are discussed in Chapter 7 and Financing is discussed in Chapter 9. However, in most cases, improved management usually means improved management of people and their actions, and the introduction of policies to change their behavior.

As discussed earlier, in almost all cases the users of lake resources (the stakeholders) are doing what they feel is best for them *given the prices, policies and institutions that they face*. Accordingly, any change in the patterns of resource use (whether it is a change in agricultural practices in the upper watershed or fishing in the lake, for example) will require someone doing something different, and *taking an action that they would not normally take*. In fact, since we assume that all individuals are already "doing the best that they can" any change in their behavior must be induced. Consequently, various policy tools are used to "change the rules of the game." This is the role of new policies or institutions—to make changes in the signals that lake resource users perceive and react to, and thereby improving the use of the lake and its resources.

The process of changing policies is never easy. As seen in most of the lake briefs, there are almost always winners and losers, and there are usually additional investment costs associated with what is being proposed. Different interest groups may require quite different policies, and in some cases where lake basin management is a regional or international responsibility, this further complicates the process of designing and implementing new policies. Hence effective policy change requires planning, political commitment, and the financial and economic resources to implement change.

A Not-so-simple Example

The 28 case studies provide many useful examples of this challenge. In the case of Laguna de Bay, for example, the government's management approach has been flexible and has evolved over time as the management authorities have had to both respond to new challenges (e.g. expansion of fish pen operations and shoreline industrial development)

as well as search for new sources of funding. See Box 5.1 for a discussion of this process, and how the Laguna Lake Development Authority has tried a variety of different policy approaches to address the lake's problems. As explained in Box 5.1, the LLDA has shown the wisdom of trying to make a difference and fine-tuning policies as experience was gained. This view is summarized in their informal motto of "Ready-Fire-Aim"!

Identifying Potential Policy Responses

As mentioned earlier, policies can be thought of at many different levels, including changing institutions or legal frameworks, or taking legislative action. As used here, however, *policy response refers to a narrower set of discrete actions taken by governments or other management organizations in reaction to some problem and to produce some desired outcome, often by changing some price signal or setting certain standards*

or norms. These types of policies can also be thought of as a combination of economic signals and incentives (market-based policies) and rules and regulations (command-and-control policies).

In effect, this definition of policy making is an example of the "Monday morning rule"-whereby the decision maker, after attending a workshop and thinking about lake basin management challenges in the context of the analysis and approaches presented in this report, has to decide what can be done differently when he or she returns to the office on Monday morning. Therefore the focus is on discrete, often modest changes that can begin to make a difference (while not denying that broader, longer term social and institutional change are also an important part of the search for more sustainable lake basin management). Incremental changes are often the first step to effective lake basin management by making all stakeholders part of the management

Box 5.1. Laguna de Bay and LLDA-an evolving policy response

When the Laguna Lake Development Authority (LLDA) was set up in 1966 to help manage Laguna de Bay and its water quality problems, the approach used was a fairly traditional Command and Control (plus capital investments) approach. Initially funded by an annual allocation of one million pesos from the National Government, over time the LLDA has become much more self-financed through a combination of regulatory fees and fines, laboratory services, and resource user fees (aquaculture and water abstraction). As the LLDA gained experience, it broadened its mandate and set of activities to take a more proactive approach in managing the lake as an economic as well as an ecological asset.

A particular area of interest has been the development and management of the fish pen/ aquaculture industry, and the conflicts with traditional fishing populations and issues of changes in water quality. Programs were developed to both support fish pen development as well as alternative income generating programs for lakeshore communities. Conflicts among competing uses of the lake's resources grew: for example, the area covered by fish ponds increased from less than 40 hectares in the 1970s to more than 30,000 hectares in 1983, reducing the area available for open fishing and impeding lake navigation. Different government ministries sometimes worked at cross-purposes within the lake.

The LLDA has also evolved in its response and more recently has tried to blend economic instruments (that either use or create markets) with command and control policies. Implementation of the Environmental User Fee System (EUFS) began in 1997 and combined a fixed fee and a variable fee to attack the problem of water pollution from lakeshore industries and communities. The fixed fee component is based on volume of discharge and covers administrative costs. The variable fee is based on whether discharges are above or below the BOD standard of 50 mg/l. Implementation began slowly and focused on a small set of industrial polluters (who were, however, responsible for up to 90% of the total organic load being discharged into the lake). The EUFS was gradually expanded to cover other firms, residential areas and commercial establishments.

The EUFS use of fixed and variable fees helps to correct a problem commonly encountered with discharge standard based fees-the later encourage dilution of discharges (to meet the standard) while the fixed fees will tax the increase in quantity of wastewater released. The LLDA still has CAC functions like registering all units that discharge into the lake, and monitoring and enforcement are always issues.

In another innovative approach a fish pen fee (basically a licensing fee) was set whereby monies are collected from the fish pen operators and then shared between the lakeshore communities (more if they have fish pens in their area) and the LLDA for general operating expenses. The fee is currently about US\$120 per hectare per year, and up to 35% of the money collected goes to lakeshore communities and the balance to LLDA.

The LLDA is an excellent example of a lake basin management authority that began life as a government mandated (and funded) regulatory agency and has evolved into a much more market-responsive agency willing to try different policy approaches to address evolving problems. In fact, the LLDA applies all four approaches in varying degrees.

LLDA's willingness to innovate is seen in the interactions with fish pen operators-clearly a high value operation (and consequently one that has a substantial ability to pay) but also an industry that contributes to environmental problems in the lake. Competition for lake resources between the fish pen operators and traditional lakeshore communities is an on-going concern and one that the LLDA has tried to address with a number of different policies including fish pen regulation and creation of new economic activities on the shore. The willing to try new approaches attitude of the LLDA is well summarized in their philosophy of "Ready-Fire-Aim". They are willing to start with actions and are happy to fine tune later. Put another way, in the world of policy formulation it is important that we "don't let the perfect [policy] be the enemy of the good."

process and getting their “buy-in” into the process. Modest first steps towards control of industrial pollution in Lake Dianchi in China, for example, laid the foundation for more major interventions over time.

Although each lake or basin being analyzed will probably require a very specific set of policies to address its own concerns, there are some more general lessons that provide useful guidance, both on the types of policies most likely to be effective, and the appropriate mix of policies to be used.

Decision makers can draw upon an expanding literature on effective policies to manage environmental problems. Although many of the policies were developed for other ecosystems, the principles are very transferable to many of the problems encountered in lake basin management. In a broad review of environmental management policies, four broad categories of policies were identified (see *Five Years after Rio: innovations in environmental policy*, World Bank, 1997). These categories are the following:

- Policies that engage the public (public awareness, voluntary groups, the mass media, others)
- Command and control type policies (rules and regulations)
- Policies that use existing markets (and often use price signals)
- Policies that create markets (and often create price signals).

These categories cover the entire range of policy tools being used at present and represent quite different ways of attacking similar problems. The only other intervention commonly used in lake basin management is a technological response such as physical investment in capital works like advanced sewage treatment, dredging and the use of biological agents to control weed growth. These technical responses are an important part of the management package but are not “policies” in the sense used here—they are discussed in Chapter 6. Furthermore, the first category listed above—policies that engage the public—is really a different type of initiative and is appropriately discussed in the following chapter on the role of public participation in lake basin management. Each of these remaining three broad classes of policies is now discussed.

Rules and Regulations-Command and Control Policies

The first broad category of policy tools or instruments commonly employed by governments is the use of regulations and standards. These are often referred to as command and control (CAC) policies. Whether it is a restriction on the use of a certain type of fishing gear, or the setting of an allowable pollution load for industrial or residential

effluent, command and control policies are popular with governments because they can specify the desired outcome. Environmental management in the West started with a CAC approach, and this helped to create the “policing” mentality about many resource management agencies. Users often felt that governments were there to oversee and police them, rather than work together for improved environmental and economic sustainability. There was an additional attractive feature about CAC type policies. Governments can state that they have strict standards in place and therefore feel like they are “doing something” about the problem—even if nothing is being enforced! The former Soviet Union was a classic example where everything was “controlled” by norms or standards, and almost none of the standards were actually enforced.

For some goals, in some social settings, command and control policies can be a very efficient and effective way to make a difference. For example, to reduce water pollutants in a lake specifying allowable boat engine types (two stroke or four stroke engines, for example) or fuels that may be used may be quite effective in reducing water pollutants. Similarly, banning certain pesticides can quickly help reduce water pollution from agricultural return flows. The Lake Biwa example mentioned earlier used regulations to control phosphate pollution in the lake. Many developed countries relied heavily on CAC policies in the past, and they were effective in achieving environmental goals. Command and control policies work best when the number of people affected is not too large, and when there is a social acceptance of government-set standards. If “social capital” is weak and enforcement is lax, command and control policies are unlikely to be effective,

A mixture of CAC policies is often used. To help manage fish stocks in a lake, specifying fishing boat size or imposing gear restrictions will have a direct impact on fish catch. Other CAC policies for fishery management include

- specifying “closed seasons” when certain species may not be caught,
- assigning allowable catch amounts per species or per period of time, or
- designating fishing zones for different categories of fishermen or different fisheries.

Note that command and control policies are NOT economic policies—they usually do not ask what are the benefits or costs of any policy (or, more importantly, what the net benefits are), they merely specify the desired outcome. As a result, CAC policies can be very inefficient ways to reach many goals. (In this case, “inefficient” means that the chosen policy may be effective in reaching a goal, but at a much higher cost than other policies.) The economic inefficiency occurs since CAC policies do not leave much room for negotiation or trades—everyone is expected to follow the

same standard. Experience with air pollution reduction in the United States has shown that when polluters have the ability to “trade” pollution reductions, those firms that are more efficient in doing so can often “sell” extra reductions to older or less efficient firms. The net result of this market-based approach is that total pollution reduction targets are met but at a considerably lower cost than if each firm had to meet a given target (a traditional command and control approach). When the US wanted to reduce atmospheric sulfur emissions, for example, a tradable quotas approach was used and allowed the overall target to be met at half the cost originally estimated to achieve the same reduction. Of course, to implement such an approach requires setting an overall target for pollution reduction and allocating initial firm-level reduction goals before trading begins.

Finally, command and control policies are often costly to administer and implement. The more finely tuned the CAC policy, the larger the administrative burden in enforcing the policy. In addition, if the policies are aimed at large numbers of individuals (rather than just a handful of individuals) monitoring and enforcement may be impossible. A good example is the difference in enforcing fishery regulations for thousands of artisanal or near-shore fishermen or for a handful of larger operators. In this case neither group may be easy to manage with CAC policies—monitoring or policing a large number of relatively weak artisanal fishermen may be just as ineffective as trying to impose restrictions on a small number of often wealthy or influential large fishing operators. The challenges in Lake Victoria in managing the different groups of competing fishermen illustrate this point.

Another illustration of the challenge is to try and affect agricultural chemical use by farmers in the upper lake basin. A CAC approach would specify what chemicals are permitted or how they may be applied—and could be almost impossible to enforce and monitor. A “blunter” approach is to combine the use of some CAC policies (e.g. ban the import and sale of the most damaging chemicals) with certain market-based policies such as correctly pricing agricultural inputs (removing subsidies) so that there is an incentive to use the input carefully and not over-apply. This happened with fertilizer in Indonesia. In the past, heavily subsidized fertilizer was over-used in rice production, much of the fertilizer was wasted and entered water return flows, and this created serious downstream environmental impacts. The government then raised fertilizer prices (a market based policy) largely because the Treasury could no longer afford to pay the subsidy. The net result was a sharp decrease in fertilizer use (and the pollution of water that was an associated by-product of excessive fertilizer use in the past) but no decrease in rice production. Farmers just started to use fertilizer, now a more expensive and hence “valuable” input, more carefully!

In summary, command and control approaches are more likely to succeed when the following requirements are met:

- the number of individuals or units to be managed are small or there are easily monitored points e.g. landing beaches or sites for fish catch
- the institutional structure to monitor and enforce sanctions exists and is effective
- there is a reasonable level of “social capital,” and individuals and society have respect for government and institutions
- there is a sense of “shared responsibility” for management of the lake basin and its resources

This is a rather demanding set of requirements and helps explain why in many countries command and control has been only minimally effective in promoting improved lake basin management (while still allowing governments to give the impression of having set many standards and having taken action).

In other cases, policies send signals or create incentives/disincentives to change behavior. These policies are generally referred to as “market-based incentives” and either use existing markets or create new markets. Just as with command and control policies the market-based policies usually require monitoring and institutions to help enforce them.

Policies that Use Existing Markets

Markets and market prices are very powerful senders of signals—a higher price for a food or fish product will cause farmers or fishermen to increase production, a higher price for fuel or inputs will decrease incomes and may cause a shift in technology. Even subsistence farmers and fishermen are affected by market price signals, although the impact may be quite indirect and lagged in time. The policies that use prices to send signals are the most important category of what economists refer to as “market-based incentives” or MBIs.

Economists accordingly place a lot of emphasis on “getting the prices right” and the power of the market (and prices) to change behavior. There are several reasons for this:

- Market signals (prices) affect most people and normally do not require direct government intervention once the price has been set
- Market signals affect both those who are in the market and those who are only marginally involved
- People respond to market signals (prices)
- Market signals (prices) can change quite quickly and hence are a fairly responsive policy tool (think of the impacts in changes in the price of fuel or water)

- Market signals can be used to both reward good behavior (e.g. a subsidy for use of environmentally friendly equipment), or to punish undesirable behavior (e.g. a tax to discourage over use of a scarce resource or to discourage polluters)
- Changes in market prices is a classic way to “internalize environmental externalities”, and thus encourage more efficient resource use. A higher price for pesticides, for example, helps the price reflect the costs of pesticide pollution of water, and also encourages farmers to use less pesticide and use it more carefully.

Having said this, it is usually not a simple political process to introduce these changes. Since the well-being (welfare) of people is being affected, there will always be pressures to resist changes by those who will lose something due to changes in prices. This is natural-no one wants to pay more for anything (e.g. water for drinking or irrigation, fishing permits, waste water discharge permits) even if they agree that the current price is too low-and has some subsidy built into it. The people who receive free or subsidized services (or free access to certain lake resources) almost always feel that the lower price is the “correct” price and will fight efforts to raise the price. Whether they are successful or not in preventing efforts to increase prices (or restrict use) often depends on their political power. In addition, when those affected are low-income fishermen or farmers, there are important distributional issues about any new burden-can they afford the new costs (even if the costs are fully justified)? Are there other groups receiving subsidies who could (and should) pay more, and maybe provide a cross-subsidy to lower income resource users? For example, the Lake Naivasha case raises interesting questions about who benefits from the uses of the lake waters (flower growers, fishermen, traditional pastoralists), and who should shoulder what portion of the costs of improved management.

The one exception where some users *may* be willing to accept an increase in a charge or price for a previously free or under priced resource is where the user group sees that some action or investment is needed or else they will *all* lose in the future. This form of “enlightened self-interest” is unfortunately less common than one would like, but examples do exist. In Asia for example, both the fish pen operators in Laguna de Bay and the pulp industry in Lake Toba have accepted a new fee/charge in hopes of assuring the longer-term financial (and ecological) sustainability of the lake resource and their industry.

Policies that Create Markets

Sometimes *markets are poorly developed or lacking*-this is usually due to poorly defined property rights or where past use was limited and did not put pressure on the sustainability of the resource. In a fishery, for example, if the previous levels of catch were below the MSY-maximum sustainable yield-there was no need to regulate or control the

catch-there were enough fish for all users. However, with population growth or introduction of new technologies (such as bigger boats or more effective fishing gear) this situation often changes. Users begin to compete with one another and the resource begins to degrade.

In these cases it may be possible to create a new market and then reap the benefits of market-based policy tools. For example, if the lake fishing industry is an open-access resource (e.g. anyone with a boat can catch fish) it may be possible to *assign property rights* (or catch quotas) to lakeshore communities. The fish have then become an economic commodity and the entitlement holders (those individuals or groups with the property rights or the catch quotas) now own an “economic asset” and have increased interest in and options for managing the fish resource. The newly enfranchised owners of the fish resource may chose to harvest their allotment, sell their quota to another group, or wait until later to harvest their share. This is not unlike what happens when grazing lands or forest lands are changed from communal open-access resources to resources that have identifiable property rights.

Note that communal resource management can work in some settings (usually where there are smaller, more homogenous groups), but the history of open access fisheries is full of examples where over fishing resulted in serious degradation of the fish resource. Some of the issues of communal management of resources are discussed in Chapters 2 and 5.

Another type of policy that creates a market is where there is *a new or expanding use*. In many case, for example, sport fishing in lakes has been traditionally unregulated and untaxed. The introduction of “user fees”-a license fee, a per catch charge, a daily admission fee-are all ways that a market can be created. Once the market is created the policy instruments or tools that are used are the same as those found under the third category (Policies that Use Existing Markets).

A final example of “market creation” is found in many international lakes or lakes that are designated as Ramsar sites. In these cases the lake basin and its resources have been recognized as having international benefits and international “stakeholders” in their management. This recognition is often accompanied by additional funding to help pay for management and the production of these trans-national benefits. The GEF has been actively funding management of international waters (including lakes) and many bilateral agencies and NGOs help pay for management in specific lakes that yield important biodiversity or other environmental benefits.

The Policy Mix

Policy-making is a creative process and successful policy-making is almost always a combination of several different policy instruments or tools. The institutional framework for implementing new policies is equally crucial. It is not possible (nor desirable) to be prescriptive with respect to which policy is best for each problem. Since policies are designed to affect people and their behavior, what works in one situation may not necessarily work in another. Successful policy implementation depends on many factors-socio-cultural factors, institutional dimensions, the extent of market development and public confidence in the “system” and various aspects of what economists call “social capital” (See Box 4.2).

Policies have to be tested and proved in the field and it is difficult to predict in advance whether or not a policy will be completely successful. The case studies provide many examples where well-intentioned policies were ineffective, or where policies successfully used in one setting failed in another.

For example, the common problem of over fishing can be addressed by any number of different policies. Although what is likely to work in any particular lake will depend on the situation in that lake, a set of potential policies that could be considered to control over fishing include the following:

- Auctioning of pre-determined catch quotas (using a market), or
- Assignment of new catch quotas that can then be bought and sold (creating a market), or
- Restrictions on the types of fishing gear allowed, fishing effort, or allowable catch (command and control approaches), or
- Public information campaigns to encourage fishermen to limit or restrict their catch (public information/involvement).

Obviously the selection of an appropriate policy, or mix of policies, is likely to vary site-specific. See Box 4.3 for an

example from Lake Dianchi or using a mix of policies to address water pollution. Even when command and control approaches are chosen to address a problem, public information and consultation may be essential in gaining acceptance of (and compliance with) the new policies. Since policies basically are designed to change human behavior, we must never lose sight of the importance of properly consulting on and explaining the new policies if they are to be successfully introduced. Those societies that have gained recognition as being “environmentally friendly”-Costa Rica is one example-have been able to do this largely through public education and participation, and obtaining political support at the highest levels of government. Otherwise improved environmental management will always be everyone’s second (or third) priority.

Lessons of Past Experience: Increasing the chances for successful policy implementation

Given such a flexible approach to policy making (selecting one policy from this category and another from another category)-and the many possible ways to achieve any given objective-what suggestions can be made for effective policy design? Based on considerable worldwide experience with implementing environmental-management policies, five broad lessons have been learned about what is likely to make a successful policy package. Again, one cannot be prescriptive but successful interventions in many environmental management areas indicate that successful (e.g. effective) programs often share these characteristics:

Build “political will”. Without the support of the general public and the political establishment it is usually impossible to implement effective management. Whether this is done by grass-root level efforts, or a carefully developed public information campaigns, the creation of interest in and commitment to improved lake basin management is an essential component of improved management. Often referred to as “political will”, this merely means that governments and management authorities are committed to take actions and enforce changed policies.

Governments rarely lead with respect to improved environmental management-they usually follow demands from the public. Once the general public is committed to change, it is a powerful incentive for governments and management

Box 4.2. Social Capital

Social capital is the sum of the beneficial ways that different members of a society interact with one another. It is often the missing ingredient in creating a successful policy intervention. Societies with higher levels of social capital have greater possibilities of reaching co-operative solutions, and using self-discipline to enforce required changes. Social capital is not the same as economic wealth-some poor societies can have a large amount of social capital (especially if the population is fairly homogenous). One characteristic of societies with large amounts of social capital is a “shared vision”- the Costa Rican public’s view of the role and importance of the environment is one excellent example. The lack of social capital, in contrast, is often marked with distrust, cynicism, and failure to find co-operative solutions. Unfortunately, in many of the world’s lakes (especially those with very mixed, ethnically diverse populations and sharp competition for available resources) social capital is scarce and this makes implementation of new policies very challenging.

authorities to take actions and enforce changed policies. Accordingly, the role of an informed and involved public is essential in creating the “enabling framework” for improved lake basin management. Active citizen involvement has helped create political will to take action in lakes as diverse as Biwa, Sevan, Constance or the Great Lakes.

Achieve financial sustainability. Successful programs usually generate some or all of the revenues needed for their management. Fortunately a number of potential policies have the attractive feature of helping reach an environmental or economic objective while also generating resources (e.g. money!) that can be used to pay for management. Examples include the use of “user fees” or other use-based charges. For example, expanding lake-based recreation and the implementation of a user fee can help put management on a self-financing basis. Some of these approaches are discussed in Chapter 9 on financing.

As mentioned earlier, there are serious sustainability questions about management programs that are entirely dependent on either outside funds or the use of subsidies. If local financial support (e.g. income) is not developed, when the external source of funding ends, so may the management program. There are too many examples of lake basin management initiatives or research programs that lasted only as long as the external funding. External resources should therefore play more of a catalytic role rather than an implementing role. A number of the case studies illustrate this point.

Ensure administrative sustainability. Linked to the financial issue is the administrative and institutional requirement needed to implement any new set of policies.

Effective policies have to fit within the institutional capabilities that exist, or the new policies have to provide sufficient resources to develop and strengthen institutions. Command and control policies (e.g. regulations) may be particularly demanding with respect to institutions - both for monitoring and imposing any needed sanctions. Again, experience around the world illustrates the difficulty in building institutions that are effective and sustainable and this is increasingly difficult when the scale of the institutional responsibility increase. Localized institutions may be easier to set up and maintain than regional, or international institutions.

Build effective constituencies for change. In addition to the broader issue of building “political will” for change, managing lake basin resources usually means managing various groups of people, often with quite different interests. As pointed out by Carpenter and Cottingham “the fundamental problem of lake restoration is an economic mismatch: those who cause the problem do not benefit sufficiently from the remediation.” Therefore, building a sense of “community” and ownership among the various “stakeholders” is essential if new policies are to be implemented. A strict enforcement-only approach (basically a command and control approach) is unlikely to be successful, especially in the longer term. Lake basin management, since it often involves large numbers of users, many of whom are poor or “marginalized” members of society, is especially challenging. This point is well illustrated by many of the case studies.

Actively work towards policy integration. Policy integration means that different policies in different sectors of the economy need to work together to obtain the desired

Box 4.3. Lake Dianchi, China-A mix of policies to improve lake water quality

Water pollution was a major problem in Lake Dianchi in China. Although Kunming, the capital, obtained its primary water supply from the Song Hua Ba reservoir, Dianchi was an important water source for Kunming in dry years as well as serving industry and agriculture. Pollution came from sewage, industrial effluents, irrigation return flow and storm run-off. The municipal government responded with a combination of policies-strengthen administration and enforcement of laws and regulations, and new investments totaling more than 2.1 billion yuan (about \$250 million). The investments were supported in part by a World Bank loan. Large engineering investments were made in sewers and water treatment facilities, and industrial polluters began to meet discharge standards.

Still, numerous old industries remained important sources of pollution. A pollution levy system had previously been introduced into China and was being applied in the basin along with the discharge standards under which industries were charged a penalty if their discharges exceeded the discharge standards. The charges provided an incentive for industries to take steps to control their pollution. They were assisted in making pollution reducing investments by government loans and grants, funded in part by the revenues collected from the pollution levies, as well as from additional government funds for environmental protection. This “carrot and stick” approach, combining discharge standards, pollution charges, and loans for pollution-reducing investments, has been used in many locations to help encourage industries to reduce their pollution.

In Dianchi progress has been reported in reducing pollution in the lake. Compared with 1995, by the year 2000 industrial wastewater discharged was reduced by 60%, COD was reduced by 80%, and soot, dust and SO₂ were all significantly reduced. These benefits, largely due to capital investments and management improvements, have been supported by an active program of citizen’s involvement and public dissemination of water quality information. In order to help repay loans for the capital improvements and their operation and maintenance, the city also began to charge user fees via water charges, and fees for wastewater treatment and domestic solid waste disposal. The management challenge remains since Kunming is growing rapidly and is the economic hub of the province. Still the example of management of Lake Dianchi illustrates the application of a number of different policy tools to work together towards the longer-term goal of improved lake water quality.

objectives. While this is a simple statement to make, actually practicing it requires that analysts, planner and decision makers explicitly consider the external impacts of their more narrow sectoral policies. For example, attempts to improve lake water quality are hurt when agricultural development policies designed to increase grain production provide subsidized fertilizer or agricultural chemicals in the upper watershed, thereby promoting increased chemical use and increased grain production (a good thing) but resulting in increased chemical inflows into the lake and reduced water quality (a bad thing).

The focus on the role of technology and information in these training materials (see Chapter 7 and 8) helps inform this debate. Policy integration is never easy since it requires different parts of government or the management structure to change what they would normally do. Although the higher objective is “improved lake basin management”, the direct implication at the sectoral level may be to decrease output (c.f. the agriculture example given above).

In addition, if policy integration within a country is difficult, the problems are compounded when the lake is an international lake and lake basin management must incorporate more than one country and many different government entities. The Great Lakes Commission of the United States and Canada illustrates the slow, but quite successful, evolution of an international management regime. The numerous difficulties in implementing improved management in Lake Victoria, in contrast, illustrate the remaining challenges.

Further Reading

1. [Santos-Borja1](#) discusses how an innovative policy to reforest parts of the Laguna de Bay basin is being used to generate “carbon credits” to raise money on the international market.
2. [Santos-Borja2](#) provides an in-depth discussion of the successful implementation of an Environmental User Fee System to control organic pollution to Laguna de Bay, Philippines.
3. [Ballatore](#) uses a simple example to discuss the theory behind many of the policy instruments covered here, with a focus on command-and-control regulation versus economic instruments.
4. [Skinner](#) shows the important role that Indigenous Peoples play in the policy making process, using the case of Lake Atitlan, Guatemala.
5. [Tapas](#) examines some of the policies used to manage relatively small lakes in Bangladesh called haors, baors, and beels.