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Five Years after Rio

Innovations in Environmental Policy

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(Continued on the inside back cover)

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Five Years after Rio

Innovations in Environmental Policy

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Cover illustration by Kathy S. Rosen. The cover figure shows that an optimal level of pollution is reached when the damage from an additional unit of emission equals the cost of reducing emissions by one additional unit.

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Foreword

If development is to become sustainable, human behavior must change. Corporations, consumers, and public agencies all need to switch away from activities that degrade the environment and invest instead in activities that conserve ecosystems for the future. Sometimes such changes are motivated by moral concerns, but often incentives and consciousness raising are required. In the five years since the Rio Earth Summit, enlightened governments have been searching for more effective ways to encourage behavioral change while maintaining efficiency and freedom.

This study explores some of the innovative policies designed to change behavior toward more environmentally sustainable patterns. The presentation is focused around a policy matrix that identifies four sets of different policy instruments:

- Policies based on existing markets
- Policy instruments that involve creating new markets
- Regulations and quantitative restrictions
- Policies that seek to harness the power of public information and participation.

The most successful governments will use a combination of all four.

The framework we present here is still incomplete. Future updates of the policy matrix,

and the case studies underpinning it, will be available on the Internet. We intend to make this a "live" database of international experience on environmental and natural resource policy. The broader the base of approaches and case studies on which the matrix can draw, the more useful it will be to policymakers and practitioners everywhere. We are looking for partners in this endeavor, and I invite you not only to read what follows but also to consider what you could contribute from the experience in your country or organization. We can be reached at: environment@worldbank.org, Subject: Policy Matrix.

This study was conceived by Andrew Steer, Environment Department director, and executed under his leadership. The text was written by Kirk Hamilton, John Dixon, Jian Xie, and Arundhati Kunte of the department's Indicators and Environmental Valuation Unit. Editing and coordination were done by Tine Nielsen, Alicia Hetzner, Donna Allen, and Virginia Hitchcock. Desktop production was done by Isabel Alegre, Sriyani Cumine, Jim Cantrell, and Glenn McGrath. We wish to thank all those who contributed examples of new policies for this work and the Governments of Norway and Sweden for their generous support.

*Ismail Serageldin
Vice President
Environmentally Sustainable Development*

PART ONE

From Rhetoric to Action: Policies for Sustainable Development

CHAPTER 1

The Road from Rio

In June 1992 representatives of 178 nations met in Rio de Janeiro, Brazil to decide what actions were needed to promote environmentally and socially sustainable development. The Rio Earth Summit catalyzed government interest in translating broad policy goals into concrete action on the ground. Rio heightened awareness of global environmental threats, opened new pathways for communication between official and nonofficial organizations working towards a common end, and greatly increased public awareness of the issues at hand. Progress since Rio has not necessarily been smooth or easy, however, as policymakers have had to confront the sheer complexity of linking environment and development problems.

The commitment of leaders from around the world to achieving sustainable development was embodied in Agenda 21, the centerpiece agreement that emerged from the Earth Summit. The action programs and activities of Agenda 21 are organized under six themes—the quality of life, efficient use of natural resources, protection of the global commons, management of human settlements, waste management, and sustainable economic growth—and in most themes both environmental and developmental concerns are addressed.

The attempt to find synergies between environment and development comes out most clearly in strategies addressing the issues of poverty, consumption patterns, demographic pressures, land, freshwater, and forests. Poverty

alleviation, which forms the core of Agenda 21, is addressed in terms of improving both the access to natural resources and the management of the environmental resources base. The persistence of severe poverty in some parts of the world, together with a standard of living based on wasteful consumption in other parts, are both incompatible with achieving the sustainable use of the earth's resources.

A striking feature of the outcome of Rio was the fact that it was a consensus of national governments and not that of scientific and technical experts. Securing commitment to action at the level of heads of state is remarkable and critical, particularly when it comes to global environmental issues. The urgent need to manage global environmental resources, resources that are shared by every nation and every living creature, means that all nations must work in collaboration with one another. Although the diverse and complex contribution of human activity to global concerns such as climate change and depletion of the ozone layer are not fully understood, the potentially irreversible nature of changes in these life-sustaining biogeochemical processes led to the adoption of a precautionary approach.

This report is a stock-taking, five years after Rio, of what has been attempted worldwide by national governments and international institutions to foster the use of economic, regulatory, and institutional instruments to better manage the environment. The body of lessons

Box 1.1 Hallmarks of the "New Environmentalism"

The many approaches to environmentally sustainable development in the developing world have produced a range of lessons from experience. These lessons point to a "New Environmentalism" that offers a fresh perspective on the policies traditionally implemented in industrialized countries (Steer 1996). The new environmentalism is both more practical and more aware of the need to harmonize economic and environmental agendas. It takes a more balanced approach to policy change, one that recognizes the constraints that governments and societies face. Ultimately the new environmentalism promises to be more successful in helping countries address their serious environmental management challenges.

There are a number of defining characteristics of the new environmentalism that reflect these practical lessons from experience. These include the need to *set priorities carefully* and to *pursue cost effective solutions*. With scarce internal and diminishing external financial sources, it is important to be strategic in deciding which issues to address first. This approach also requires *seeking synergies* in policy reform that result in environmental improvements while producing other economic benefits—subsidy reform is the classic example of a triple dividend, where pressure on the environment is reduced, fiscal resources are freed for other uses, and economic efficiency increases as a result of reductions in price distortions.

The growing understanding of the costs of regulatory approaches has dictated an increased *use of market instruments where feasible*. Harnessing the market in environmental protection also sends the message that governments must *work with the private sector, not against it*. Above all, the recognition of the limitations of existing institutions emphasizes the need to *economize on scarce administrative and regulatory capacity*.

Participation is an important ingredient of effective policy development and implementation and the need to *involve citizens thoroughly* (including the private sector) is important in developing the political will to take effective action. By building and *investing in partnerships that work*, it is possible to create a sense of shared responsibility for better management, and gain acceptance of the added personal costs that may be required to obtain larger social gains. While technical "fixes" are often attractive, it bears repeating that *management is more important than technology*, and developing the institutional and human capacity for better environmental management will take time and investments. Finally, the new environmentalism has clearly learned that the single most important step towards an improved environment is to *incorporate the environment from the start*, not as an "add-on" at the end of project analysis or development of macroeconomic policies.

learned through this process can rightly be termed "the New Environmentalism" (see box 1.1 for summary characteristics).

The breadth and range of policy instruments for environmental and natural resource management can be overwhelming. A key part of this stock-taking exercise, therefore, is the construction of a policy matrix that organizes

policy approaches under the broad headings of *using markets, creating markets, regulations, and engaging the public*. This is backed up by Part Two, which presents brief case studies of many of the policy instruments highlighted in the matrix. The concluding section in Part One emphasizes the key characteristics of effective environmental policy.

From Policy Framework to Policy Action

The high rhetoric of Rio has been followed by an often painful silence as policymakers face the challenge of converting rhetoric to action. Not only do many countries lack a mature institutional base for environmental management, but the very act of addressing environmental problems and correcting distortions usually implies imposing a "tax" on someone—either a polluter who has been disposing of wastes into the environment without charge, or a forester or fisherman who exploits an existing natural resource without paying a stumpage fee or observing a quota on sustainable fish catch.

Environmental policy is at heart concerned with changing the incentives that individuals and institutions face. Governments have met this challenge in a variety of ways. In the past the commonest approach to changing environmental incentives was to directly regulate activities in the marketplace, but this has proven to be costly and complex. Using markets or creating them where they are lacking is a more recent innovation in environmental protection—this can take the form of eliminating distortions in market prices through subsidy reform, using taxes to increase prices to reflect social costs, or establishing new markets in which pollution permits or development rights may be traded. Finally, experience in many countries has shown that involving and informing the public can be a very effective and efficient way to protect the environment, whether through education on environmental issues, eco-labeling, publishing pollution emission data, or

building institutions that involve the public directly in resource management.

The twenty five years since Stockholm and the five years since Rio have witnessed major advances in terms of both national awareness of environmental issues and commitments to action. These commitments are manifest in a variety of ways, and take place at two levels. First, and here Rio really did play a catalytic role, there has been a welcome emphasis on the development of policy frameworks. These sustainable development strategies and action plans lay out the broad policy priorities for countries, a necessary first step if environment and natural resource policy is to be strategic. Second, there is a need to translate policy priorities into specific policy actions. Some of the valuable experience gained and innovative policies developed at this level will be explored below in the policy matrix.

The policy matrix attempts to categorize and summarize a great deal of useful experience with individual policy instruments. It provides an essential structure for the case studies on policy instruments presented in Part Two. The first step, though, before exploring specific policies, is to summarize recent experiences in the development of policy frameworks.

National Sustainable Development Strategies and Action Plans

Around 100 countries have now prepared national sustainable development strategies or

Box 2.1 The policy matrix: an outline

The policy matrix, presented here in outline and in more detailed "slices" on subsequent pages, organizes and categorizes what is by now a very rich and diverse set of national experiences in environmental management. The rows of the matrix are divided into two themes, *resource management* and *pollution control*, and these themes are then divided into sectors such as water resources, forests, air pollution, and solid waste. The columns of the matrix are divided into four broad classifications of policy instruments: *using markets*, *creating markets*, *using environmental regulations*, and *engaging the public*.

Each column of the policy matrix is further subdivided by type of instrument, as shown in the table below. *Using markets* is therefore broken down into individual instruments and approaches, such as subsidy reduction, environmental taxes, user fees, deposit-refund systems, and targeted subsidies. Within each cell of the detailed policy matrix, shown on the following pages, there is greater specificity still: under "user fees for natural resources" for instance, there is an entry for bioprospecting fees in Costa Rica and Madagascar—however, where countries or regions are names, these are selected examples and not comprehensive listings.

The idea for the policy matrix has many intellectual precursors, including Panayotou (1996) and

Warford and others (1997). As well as bringing some order to an often-fragmented subject area, the policy matrix is intended to become a tool for analysts concerned with the design of natural resource and environmental policy. Looking across a row of the Matrix, at forest resources for example, shows the wide range of instruments that have been applied to the management of this resource. Looking down a column, at tradable permits for instance, indicates the broad spectrum of resource and pollution issues to which this instrument has been applied. The matrix structure is also intended to stimulate thinking about how individual policies interact, increasing the scope for positive synergies and reducing the potential conflicts between policy instruments.

Many of the country case studies highlighted in the policy matrix are summarized in Part Two. The presentation of the Matrix which follows is necessarily a synopsis of a great deal of information, and the case studies in Part Two are only a selection from a larger, and growing, set of example applications of innovative policy approaches to environment and natural resource problems. Ultimately the policy matrix will become the front end to a "live" database on the World Wide Web, which will lead users to individual case studies and references to more complete information.

The policy matrix: policy instruments for sustainable development

<i>Themes</i>	<i>Policy instruments</i>			
	<i>Using markets</i>	<i>Creating markets</i>	<i>Using environmental regulations</i>	<i>Engaging the public</i>
<i>Resource management</i>	<ul style="list-style-type: none"> • Subsidy reduction 	<ul style="list-style-type: none"> • Property rights/ decentralization 	<ul style="list-style-type: none"> • Standards 	<ul style="list-style-type: none"> • Public participation
<i>and</i>	<ul style="list-style-type: none"> • Environmental taxes • User fees 	<ul style="list-style-type: none"> • Tradable permits/ rights • International offset systems 	<ul style="list-style-type: none"> • Bans • Permits and quotas 	<ul style="list-style-type: none"> • Information disclosure
<i>Pollution control</i>	<ul style="list-style-type: none"> • Deposit-refund systems • Targeted subsidies 			

National Environmental Action Plans (NEAPs) to help guide their thinking on environmental management (World Bank 1997a). Although these strategies are frequently effective in highlighting important environmental issues, they have sometimes been less successful in identifying

priorities for action and making explicit links to policy changes. The best NEAPs often use economic analysis to help identify priorities for environmental interventions based on assessments of the benefits and costs of different alternatives—recent examples include countries

as diverse as Costa Rica, Lebanon, and Moldova, all using economic analysis as one "filter" to help identify priorities for action.

The major lesson learned from the sustainable development strategy and NEAP processes is the fundamental importance of setting priorities, developing national ownership, and involving the public. *Setting priorities* either on an economic or an ecological basis is essential since financial and human resources are limited, and governments can only respond to a few needs at a time. In the Costa Rican NEAP for example five priority areas were identified out of more than a dozen areas initially targeted for action. *National ownership* is also central to creating the political climate for effective action and policy change. It often takes longer to develop ownership and *involve the public and relevant ministries*, but it has been found that without ownership and the associated participation, an action plan or strategy usually becomes a paper document that goes on the shelf and is ignored.

In many cases preparing a strategy paper or an action plan is the easiest part of the environmental management challenge. Creating the actual institutions that are needed to monitor compliance with policies or enforce measures is a slow, difficult process. Since most countries did not have existing agencies with environmental management responsibilities, the creation, staffing, funding, and empowerment of such agencies has taken a great deal of effort and political capital. Many different approaches have been used to institutionalize environmental management responsibility: in different countries this responsibility has been housed in a new ministry, as part of an existing ministry, or as a specialized agency under the executive branch of government. It is not yet clear whether there is a "best" answer to the appropriate institutional structure; it seems that the success or failure of each alternative is dependent on local conditions.

The Policy Matrix: New Approaches, Proven Winners

The preparation of national sustainable development strategies for the Earth Summit of 1992 gave new impetus to the evaluation of past environmental policies. A lot was learned about what is effective and what is not, which

approaches are efficient and which are practical. The new post Rio emphasis on reconciling environment and development, incorporating poverty and equity issues, and managing the global commons has built the momentum for policy innovations. Governments, including developing country governments, and the World Bank have been adopting the best of the proven approaches and fostering significant innovations.

Taking stock of the various policy instruments being used for sustainable development requires some organizing principles which are set out below in the policy matrix. The matrix distinguishes between policy approaches that are aimed at natural resource management as compared with pollution prevention and mitigation, and it organizes the approaches themselves into four broad categories depending on the principal emphasis of each policy instrument:

- Using markets
- Creating markets
- Using environmental regulations
- Engaging the public.

The policy matrix, outlined in box 2.1, places the expanding set of policies and instruments for sustainable development within a coherent structure. The four more detailed matrices, one for each policy approach, give a partial (but not exhaustive) listing of countries where given policies have been or are in the process of being implemented. To give the full flavor of the specific approaches, a selection of brief case studies is presented in Part Two of this study.

Using Markets

Among the most powerful policies for improved environmental management are those that use the market and price signals to make the appropriate allocation of resources. Environmental resources are typically underpriced in two important ways: many subsidies actually reduce the cost of overexploiting or polluting the environment, and market prices generally reflect only private costs, ignoring the damages inflicted on others by pollution emissions. Using markets therefore involves moving towards free market prices on the one hand and moving beyond free market prices on the other. As long as markets are reasonably free and competitive, harnessing

Table 2.1 The policy matrix: instruments and sample applications

By sector or theme		Using Markets							
		Subsidy reduction	Environmental taxes on			User fees for		Perform bonds/ deposit-refund	Targeted subsidies
			emissions	inputs	products	nat resources	services		
Resource management	Water resources	Reduction in water subsidy China, Hungary, Poland				Water resources taxes Brazil, Germany	<ul style="list-style-type: none"> Water pricing Chile, China, Colombia Watershed protection charges 		
	Fisheries			Fishing input taxes	Product taxes	Fisheries licenses Mauritania		Oil spill bonds U S	
	Land Management	<ul style="list-style-type: none"> Removal of land conversion subsidies Brazil Removal of the tax on undeveloped land France 				<ul style="list-style-type: none"> Property taxes Differential land use taxes/fees Germany 	Betterment charges Korea, Mexico		Subsidies for restoring natural cover Canada
	Forests	Reduction in land conversion subsidies and subsidized livestock credit Brazil, Central America			Forest product taxes Brazil, Colombia, Venezuela	Stumpage fees Brazil, Costa Rica, Honduras, Indonesia, Philippines, Malaysia	<ul style="list-style-type: none"> Park entrance fees Costa Rica Reforestation taxes Indonesia 	Reforestation deposit/performance bond Costa Rica, Indonesia, Malaysia	<ul style="list-style-type: none"> Subsidies for seedlings India Credit subsidies for reforestation Costa Rica
	Sustainable agriculture	Reduction in agriculture subsidies most developing countries							
	Biodiversity/protected area	Reduction in land conversion subsidies				Bioprospecting fees Costa Rica, Madagascar	<ul style="list-style-type: none"> Watershed protection charges Costa Rica, Indonesia Park entrance fees Costa Rica, Indonesia, Nepal 		Habitat protection subsidies
	Mineral resources		Fees on mine wastes and tailings Philippines				Mining royalties Algeria, Brazil, Brunei, Colombia, Ecuador, Malaysia, Namibia, Nigeria, Venezuela, and Canada, U S and other OECD		
Pollution control	Air pollution	Reduction in energy subsidies Transition economies, most developing countries	Emission taxes Egypt, Korea, China, Eastern Europe, Kazakhstan, OECD	<ul style="list-style-type: none"> Energy taxes OECD Differentiated gasoline prices Egypt, Mexico, Philippines, Turkey 	Environment-related product taxes Bangladesh, OECD	Royalties for fossil fuel extraction		Sulfur tax refund systems Sweden	Subsidies for industrial energy-saving Sweden
	Water pollution		Wastewater discharge fees Brazil, China, Eastern Europe, Korea, Mexico, OECD, Philippines				Sewage charges Brazil, Chile, China, Colombia, Indonesia, Malaysia, Mexico, Singapore, Thailand		Tax relief and subsidized credit for env investment Brazil, Chile, China, Colombia, Ecuador, India, Korea, Mexico, Philippines
	Solid waste		Waste disposal taxes Canada, France, U K, U S				User fees for waste management Ecuador, OECD, Thailand, Venezuela	Deposit-refund systems Bangladesh, Brazil, Chile, Colombia, Ecuador, Finland, Jamaica, Japan, Mexico, Norway, Philippines, Sweden, Taiwan (China), U S, Venezuela	Credit/subsidy policy Korea, Taiwan (China), Turkey, U K
	Hazardous waste/toxic chemicals	Reduction in agrochemical subsidies most developing countries	Disposal charges China, OECD, Thailand	Pesticide taxes OECD	Product taxes Denmark			Bond for waste treatment	Subsidies for phasing out pesticides Sweden

Table 2.1 The policy matrix (continued)

By sector or theme		Creating markets			Environmental regulations			Engaging the public	
		Property rights/ decentralization	Tradable permits/rights	International offset systems	Standards	Bans	Quotas	Information disclosure	Public participation
Resource management	Water resources	<ul style="list-style-type: none"> Water rights: Chile, US Decentralization of water supply management: Hungary 	Water markets: Australia, Chile, India, New Zealand, US	Water trading across borders	Water quality standards	Seasonal ban of certain types of water use: US	Water use quotas: Israel, US	Water efficiency labeling	Water user association: Argentina, Mexico, Turkey
	Fisheries	200-mile Exclusive Economic Zone (EEZ)	Tradable quotas/permits: New Zealand		Fishing standards	Fishing bans	Fishing quotas		
	Land management	Land title: Thailand	Transferable development rights: Puerto Rico, US	Tradable conservation credits	Land use standards/zoning: Brazil, China, Guatemala, Korea, OECD, Pakistan	Establishment of environmentally sensitive areas	Land subdivision		
	Forests	Land titling	Tradable reforestation credit	Tradable reforestation credits: Costa Rica, Panama, Russia	<ul style="list-style-type: none"> Logging regulations Zoning: Brazil 	Logging/log export bans: Costa Rica	Logging quotas: Malaysia	Eco-labeling: Nordic countries	
	Sustainable agriculture	<ul style="list-style-type: none"> Land ownership: Thailand Participatory irrigation management: Argentina, India, Mexico, Philippines, Sri Lanka, Tunisia 	Transferable development rights		Zoning: Brazil	Ban on use of pesticides: Indonesia, Latin America		Eco-labeling: many OECD countries	Community self-help groups: Kenya
	Biodiversity/protected area	Biodiversity patents and bio-prospecting rights: Costa Rica, Madagascar	International tradable conservation credits: Costa Rica, Mexico	Tradable conservation credits	Conservation zone: Brazil, China, Costa Rica	Establishment of national parks: Brazil, Costa Rica, Indonesia			NGO involvement: Philippines
	Mineral resources				Waste and tailings containment			Energy efficiency labeling: Australia	
Pollution control	Air pollution	<ul style="list-style-type: none"> Environmental liability Private energy production: Philippines 	<ul style="list-style-type: none"> Tradable emission permits: Chile, Czech Rep., Poland, Kazakhstan, US Auctionable permits for ODS: Mexico, Singapore 	Joint implementation carbon offsets: Argentina, Latin America, Norway, Poland, Russia, US	Air quality and emission standards: Brazil, China, India, Korea, OECD, Philippines, Singapore, Turkey	Ban on imports of ODS: China	<ul style="list-style-type: none"> Emission quotas: OECD Area licensing for vehicles: Singapore 	Public disclosure program: Chile, Indonesia	
	Water pollution	Environmental liability	Tradable wastewater discharge permits		Wastewater discharge standards: China, India, Indonesia, Korea, Malaysia, OECD, Philippines, Singapore		Industrial wastewater discharge quotas: Bahamas, China, Colombia, OECD	Public disclosure program: Bangladesh, Indonesia, Philippines	Community pressure: Korea
	Solid waste	Environmental liability		Tradable recycled contents	Landfill standards and landfill zoning			Industrial waste exchange program: Philippines	
	Hazardous waste/toxic chemicals	Environmental liability			Containment/treatment standards	<ul style="list-style-type: none"> Basel convention Ban on use of some pesticides: Indonesia 		Labeling	

market forces can be a powerful way to reduce the cost to the economy of achieving environmental goals.

Policies that use the market have two principal attractive features. First, although they may appear to be blunter than other, more targeted policy instruments, market-based approaches are often much easier to administer and implement. Administrative considerations are discussed in chapter 3.

Second, market-based approaches may have important fiscal consequences for governments, either from reducing costs to the treasury by reducing subsidies that harm the environment (for instance, subsidized prices for fossil fuels), or by raising revenues through user fees or environmental taxes. These sums may be considerable. For example, recent estimates are that environmentally damaging subsidies total over \$240 billion per year in developing countries and the transition economies (see box 2.2). Tapping even part of the potential savings from reducing subsidies could go a long way to meeting the need for new financial resources to help developing countries achieve environmentally sustainable development.

As seen in the policy matrix, there are several different categories of instruments that rely on using the market. As mentioned earlier, *subsidy reduction* is a classic and well-known example of policy reform: reductions in or elimination of subsidies normally results in reduced environmental impacts (from reduced use of the previously subsidized factor) and monetary savings to the Treasury. Recent successful examples of

subsidy removal include energy and water pricing reform in many countries, pesticide and fertilizer subsidy reductions in Bangladesh and Indonesia, and the removal of subsidies that had led to excessive land clearing in Brazil. Subsidy removal, however, is only the first step. Even if there is no subsidy and market prices reflect the full costs of production, there may be other external costs. *Environmental taxes* can then be used to reflect the additional costs to others (the economic externalities) that are created by the use of resources. The policy matrix presents examples of environmental taxes imposed on industrial emissions in China and the Netherlands, on inputs such as energy and water in many countries, and on final products. By sending the signal that the use of a resource imposes costs on others, environmental taxes serve as an incentive both to be more efficient in resource use (thereby decreasing total demand and reducing environmental damages), and generating revenues (see box 2.3 for an innovative use of environmental taxes in Sweden).

A third category of market-based approaches is *user fees*. This recognizes that many individuals receive important benefits from the use of the environment, but may pay very little or nothing for this right, often leading to poor levels of service or overuse of the resource. The introduction of user fees is one way to capture part of this benefit, improve levels of management and service, and share the benefits from exploiting natural resources. For example, stumpage fees for forestry activities are commonly being increased in order to capture part of the "economic rents" associated

Box 2.2 Estimates of major subsidies

As the table opposite shows, estimated subsidies to energy, roads, water, and agriculture in developing and transition economies total over \$240 billion per year in the 1990's. While this is a substantial improvement over the situation in the 1980's, these subsidies still lead to wasteful resource use, excessive damage to the environment, and a drain on the Treasury. Cutting these subsidies in half would free over \$100 billion of finance that could be used for sustainable development, simultaneously reducing the stress on the environment.

Source: Gandhi and others (1997).

Environmentally Damaging Subsidies mid-1990's (billions of U.S. dollars per year)

Sector or product	Developing and transition economies
Fossil fuels	48
Electricity	112
Road transport	16
Water	56
Agriculture	10
Total	242

Box 2.3 Sulfur taxes in Sweden

In Sweden the tax on the sulfur content of fuels is a good example of living within your administrative means. While the "best" instrument for reducing sulfur emissions is an emissions tax or tradable emission permits, both of these approaches are complex to administer—economic instruments like these may be efficient, but they do not substantially reduce the requirement for monitoring and enforcing of the policy. The alternative implemented in Sweden in 1990 is a hybrid: a substantial tax is levied on the sulfur content of fuels (more than \$4 per kilogram of sulfur), but this is rebated for large emitters who can prove how much sulfur emission they have abated (through flue gas desulfurization, for instance). For large emitters, therefore, the effect of the sulfur tax is precisely the same as an emissions tax; for everybody else the

tax on the sulfur content of fuels provides incentives to switch to low-sulfur fuels and to reduce energy use overall.

This tax on fuels is relatively simple to implement because it can be levied at the wholesale level. To date administrative costs have been less than 1 percent of revenue. For any country that has an excise regime for fuels, the sulfur content tax would be a straightforward addition to the existing administrative apparatus.

The Swedish sulfur tax has been extremely effective. The national target for sulfur emissions was met several years ahead of schedule, and the revenue from the tax was actually lower than projected, as a result of the extensive fuel switching and emission reductions that followed the introduction of the tax.

with forestry operations. Part Two contains a case study with relevant examples from countries as diverse as Brazil, Costa Rica, Indonesia, and the Philippines. The managers of parks and protected areas recognize the large private benefits individuals receive from visiting these areas and are beginning to capture part of this benefit via increased admission fees and user permits. Costa Rica with its volcanoes, beaches, and rainforests, and several of the East African countries with large safari businesses, are actively using user fees to generate additional government revenues and to provide for enhanced protected area management. User fees are also being increased for public provision of water and sanitation services, thereby allowing for an improved level of service and increased overall welfare.

Markets are also useful in the establishment of *performance bond* and *deposit-refund systems*. In both cases a financial bond or deposit is used to guarantee compliance with the desired outcome such as meeting environmental standards, replanting forests after harvest, or by correctly disposing of waste products, as in Japan and Taiwan (China). The existence of the deposit or bond helps ensure that the financial costs of noncompliance are sufficiently high that firms and individuals take the necessary steps to protect the environment.

A last category of policy instruments that rely on markets is *targeted subsidies*, where an explicit subsidy is offered to achieve a socially desirable outcome. Although these go against the general

trend of subsidy removal and the distancing of government from active involvement in the market, there are cases when such subsidies may be justified. For example, in the resources management area, targeted subsidies have been used to promote reforestation in Costa Rica. Targeted subsidies have promoted pollution control in Brazil, China, and India, industrial energy savings in Sweden, and the phase out of ozone depleting substances in many countries around the world. Global Environment Facility projects often take the form of targeted subsidies.

Creating Markets

Market creation is an important way to reduce one of the most persistent and pervasive dangers to sustainable development, the lack of markets for environmental resources and services. Defining property rights, privatizing and decentralizing, establishing tradable permits and rights, and creating international offsets are all examples of the innovations underway in market creation, as highlighted in the policy matrix.

Establishing property rights for land, water and logging concessions provides a fundamental incentive for better resource management. When squatters become owners and forest concessionaires have long-term contracts, there is a built-in incentive to exploit natural resources in a sustainable manner. Tropical deforestation and the decimation of the world's fisheries are stark reminders

of the sorts of perverse results created by unregulated open access to resources.

Privatization and *decentralization* can play an important role in moving many aspects of environmental management out of the state sector, which is often starved for capital, and into more commercial operations where there is a strong incentive both to generate current revenue and to make investments that will increase revenue in the future. Public sector water and sewage works are the classic examples of important environmental resource management institutions where fee collection is low, maintenance expenditure is insufficient, and investment is lacking. Private sector participation in infrastructure is not a panacea, but there is a growing list of success stories in which the correct balance of risk-sharing and performance standards has dramatically improved access, quality, and economic performance as well as environmental performance (see the case study from Côte d'Ivoire in Part Two).

Tradable permits and rights involve the explicit creation of a market in environmental resources, encouraging efficient use and fostering the recognition that these resources are scarce and valuable. Tradable pollution emission permits (as implemented for ozone-depleting substances in Singapore, for instance) are the best known examples of market creation, and the evidence is

that they are very effective as long as a number of important design issues are addressed. First, the permit must actually create a property right—if there is any doubt on this count then firms will not participate in the market. Second, the question of initial allocations of permits must be handled equitably. Finally, there must be no artificial obstructions to trading permits.

A variety of *international offset systems* extend the notion of a market for environmental resources across country boundaries, permitting firms and institutions to meet environmental objectives by purchasing abatement wherever on the globe it is cheapest. Box 2.4 highlights a particularly novel approach to carbon offsets that is being implemented in Costa Rica; similar efforts at "joint implementation" are developing in Belize, Bolivia, Honduras, Nicaragua, and Panama.

As the policy matrix shows, environmental policy instruments that create markets come in a variety of forms and have broad applicability across pollution and resource management issues. A wide range of industrial and developing countries are applying these instruments to deal with practical issues. While these approaches get the incentives right and encourage least-cost solutions to environmental problems, they can be costly to administer. Finding the right balance of monitoring, enforcing, and giving free play to market

Box 2.4 Certifiable and transferable greenhouse gas emissions offsets in Costa Rica

High transaction costs have been one of the traditional impediments to implementing international offset systems for carbon emissions. Many of the earliest examples of carbon offsets involved firms (typically electric utilities) having to identify individual plots of land in tropical countries on which a given amount of carbon could be absorbed and sequestered, and then signing agreements guaranteeing the sequestration through a long-term management regime with the owners of the land. These guarantees by the land owner then had to be certified as valid by the emitting country. Each of these steps increased the costs per unit of carbon sequestered.

Costa Rica launched a scheme of certifiable and transferable offsets in 1995, and signed an agreement with the U.S. government for their recognition that year. The Costa Rican government has acquired substantial areas of degraded pastureland and established management regimes that will ensure growth

of new forest on these lands, as well as sustainable maintenance of the resulting forest stock. The amount of carbon sequestration on these lands has been verified by the U.S. government, leading to transferable offset permits that are recognized in the United States. From the purchasing firm's point of view buying an offset is now almost as simple as buying stock in a securities market. Similar arrangements with the government of Norway have led to the sale of 200,000 certifiable and transferable offsets (in units of metric tons of carbon) for \$2 million.

Given the millions of hectares of marginal and degraded agricultural land in the developing world, there is great scope for afforestation schemes to become the cornerstone of a much expanded development and use of certifiable and transferable offsets in the future. This scheme by Costa Rica is an excellent example of a developing country providing leadership in addressing a problem of global importance.

forces is the challenge prospective users of these instruments must face.

Using Environmental Regulations

Regulations are the most common approach to environmental problems. But they should be used judiciously because of the large direct and indirect costs they impose. *Standards, bans, permits* and *quotas* are often favored by policymakers because they promise certainty of outcome—without costly monitoring and enforcement, however, this promise may not be realized.

Regulations are in some cases the only feasible instrument by which to achieve the aims of public policy. For example, controlling emissions of very hazardous substances will generally best be accomplished by outright bans. Similarly, land zoning regulations are the most effective means to ensure that residential areas are not downstream or downwind from polluting factories. Rules restricting certain activities on ecologically sensitive lands would be another example of a case in which regulatory approaches are essential.

Some approaches to regulating pollution are more efficient than others. One that is particularly inefficient is to stipulate abatement technologies—this tends to discourage innovations that have the potential to limit pollution emissions more cheaply. In other cases a mixture of approaches works best—in Malaysia, for example, a combination of standards and charges were effective in reducing water pollution from oil palm mills.

Where there are relatively few sources of a pollutant, regulation may be the most administratively feasible approach. So if a few electricity generating stations are the major source of an air pollutant like sulfur oxides, regulatory abatement standards will probably be cheaper and simpler to administer than pollution permit trading (in this case the market may be too thin) or pollution taxes. Box 2.5 examines the experience of banning ozone-depleting substances in China.

The final considerations in designing regulations are credibility and sanctions. If regulations are not enforced then there is little incentive for firms and individuals to obey them. If government environmental policies are not credible then they will not meet their goals. Regarding sanctions for noncompliance, it is often the case that environmental legislation stipulates penalties that are either too weak (a small fine, for instance, which firms will happily pay rather than having to install abatement equipment) or too strong (closing the offending plant, creating strong political pressure for it to be reopened). Penalties for noncompliance must be proportionate and fair.

Engaging the Public

The final set of environmental policy instruments are those that are a result of public involvement in improved environmental management. It has been commonly observed that governments rarely lead in the fight for an improved environment; more often political leaders respond to pub-

Box 2.5 Regulating ozone-depleting substances in China

Where there are relatively few producers of ozone-depleting substances (ODS) and the enforcement of regulations on imports is effective, phasing out these substances through regulatory approaches will be relatively efficient and effective. This approach is being taken in China, which has set the target of reducing ODS use to its 1991 level by 1996 (although rapid economic growth in the early 1990s is proving this an ambitious target), with subsequent targets set at a 50 percent reduction from this level by the year 2000 and complete phaseout by 2010.

These targets will be met through a series of regulations, pricing policies, and penalties. New

Source. World Bank (1995)

production facilities based on ODS in the halon and aerosol sectors have been banned since 1991. Importation of refrigerators and freezers using chlorofluorocarbons was banned in January 1995, along with the manufacture of auto air conditioning equipment based on chlorofluorocarbon-12. At the same time imports of non-chlorofluorocarbons using refrigerators, freezers, and compressors were granted preferential import duty treatment. It is estimated that the use of roughly 4500 tons of ODS had been eliminated through the implementation of these measures by mid-1996.

Box 2.6 Public participation in irrigation management in Mexico

In 1989 the Mexican government adopted a policy of participatory irrigation management. The main purpose of the policy was to transfer the management responsibilities of irrigation districts from the government to water user associations. In 1990 the first irrigation district was transferred to the users. By 1995 more than two-thirds of the country's 3.2 million hectare irrigation network (divided into eighty irrigation districts) had been transferred to 316 water user associations. After the transfer farmers had to face higher charges for irrigation water owing to the loss of government subsidies, but they gained management autonomy and ownership based

on a twenty-year concession. The average recovery rate of operation and maintenance costs increased from 57 percent in 1991 to close to 100 percent in areas with water user associations. Improvements have also been seen in water use efficiency, management staff productivity, and environmental benefits.

From the government side, the transfer freed up government resources and the responsibility of providing, maintaining, and repairing irrigation systems. This allowed the government to concentrate scarce financial and human resources in those sectors most in need of government intervention.

Source: World Bank (1996b).

lic demands for action to address environmental issues. Consequently, information disclosure, community pressure, and public participation are crucial in creating the political will to take effective action.

Two major sets of instruments have been identified. The first revolves around *information disclosure* and other means that allow consumers to make more informed choices and demand more environmentally friendly goods and services. Eco-labeling, whereby such products as tuna or tropical woods (as in Indonesia) are labeled to show that they were harvested in an environmentally safe manner, are increasingly common. Energy efficiency guides on major home appliances and automobiles are another practical form of information disclosure; in Australia, for example, energy efficiency labeling allows consumers to choose between less efficient (but possibly cheaper) appliances and those that may cost more initially, but have lower operating costs (and associated external benefits from reduced energy consumption). In fact, a number of countries allow public energy utilities to take tax credits for subsidizing consumer adoption of higher efficiency appliances or lighting fixtures. The disclosure of information about pollution emissions can also allow the public to monitor the performance of individual firms and their compliance (or the lack thereof) with environmental standards. This has been used in Japan and in several European countries for some time, and is being

introduced in Indonesia and the Philippines at the present time.

The other broad means of engaging the public in sustainable development is through *public participation*. One avenue to participation that has proven to be particularly effective is the requirement for public discussion of environmental assessments of major projects. This has raised public awareness of environmental problems and given whole communities an effective voice in deciding how important aspects of their environment will be affected by the development process. Participatory approaches have also been key to the successful management of environmental infrastructure. The well known examples of water user associations in countries as diverse as Argentina, Indonesia, Mexico (see box 2.6), and Turkey are examples of active and successful public participation in resource management.

Building effective public participation is not necessarily easy to achieve, however. It requires tools to help the poor to express themselves. It requires new partnerships between governments, NGOs (see, for example, the case study on NGO involvement in the operation of protected areas in the Philippines), trade unions and community groups. Participatory approaches require new ways to carry out pilot projects and new funding mechanisms. Above all, participation requires capacity-building in the nuts and bolts of community-based management. But the evidence to date is that investing in public participation can pay large dividends in effective environmental management.

Designing Effective Policies

Just as environmental problems are not the result of a single action at one point in time, solving these problems and building sustainable development will be a long, slow process that often involves making tradeoffs. As such, we are rarely in the world of the "first-best" solution but are more often in the more realistic world of the "second-best." This is not necessarily a problem—practical solutions often require balancing competing needs, and it is important not to let the perfect be the enemy of the good in implementing policy changes.

A useful aspect of the policy matrix is that it juxtaposes a wide range of policy instruments. As policymakers set their priorities and choose their preferred approaches, the policy matrix could also serve as a reminder that avoiding conflicts between instruments, and seeking complementarities, is an important part of the environmental management process.

The policy matrix illustrates many of the approaches that are being tried around the world. Applications of a given policy instrument to different sectors can be seen by scanning down a column; the range of approaches to one sectoral area can be seen by going across a row. Since most cells in the matrix list countries where an approach has been tried, it can quickly be seen that different countries have applied very different policy instruments to similar environmental management problems, in part reflecting differing constraints at the national level.

Nevertheless, in spite of the plethora of issues and approaches being tried, there are four strong

lessons that have emerged from this review of environmental policies—both proven winners and new approaches. These lessons are the importance of *achieving financial sustainability*, the practical aspects of *ensuring administrative sustainability*, the benefits of *building constituencies for change*, and the need for *achieving policy integration*.

Achieving Financial Sustainability

The most successful policy initiatives are those that generate financial resources, recognizing the constraints of limited external resources and fiscal restraint by governments. In spite of the rhetoric of Rio it is now clear that there will be little if any additional external resources to fund environmental improvements. Governments are also facing strict fiscal regimes with many competing demands and a desire to reduce, not increase, the role of government in the economy. These factors all place additional emphasis on the importance of devising policies that are financially sustainable.

Fortunately there are many examples of policies that do generate financial resources, either by removing environmentally damaging subsidies, imposing environmental taxes that help account for externalities, or charging users a fairer price for the benefits that they receive from the environment. Of course, when the management problem is one that involves global externalities, the Global Environment Facility (GEF) and other funds are available to offer limited financial support. These resources, however, are insufficient

to address all global problems, and are not available for the often more pressing national-level needs. Consequently, the financial sustainability of new policies is often the single most important dimension of creating effective change.

Ensuring Administrative Sustainability

Of equal importance in creating change is recognizing the many administrative constraints to implementing new policies or procedures. Since the environment is a relatively new concern, few countries have well-established environmental management bureaucracies. As a result the environmental management function is frequently housed in a new, often weak, ministry or unit. Technically trained staff, laboratory facilities, and other support are often scarce or nonexistent. Environmental change also often requires change on the part of other, well established and powerful ministries.

Consequently, policies that do not require elaborate and expensive administrative support have a better chance of success. Building capacity for improved environmental management is an important, but longer-term, process. The policies reviewed in this report highlight a number of innovative approaches to improved management, sometimes involving policies that are self-policing or that make minimal administrative demands. As with financing, a second-best but implementable policy is often preferred over the "ideal" but unrealistic first-best choice.

Building Constituencies for Change

Whenever policy change involves removing "rights" or taking away economic rents, those whose financial interests are negatively affected will fight back. Political will is therefore necessary to implement effective change and fight vested interests. This is true for the environment as for any other sector. In fact, the existence of pervasive externalities and rent capture in the environmental sector makes the political dimension even more important.

Informing the public about the costs of environmental degradation or pollution, and involving them as advocates for reform is facilitated by open exchange of information, and more open so-

cieties. Some of the most polluted places on earth were in parts of Eastern Europe and the former Soviet Union where environmental protests and debates were not tolerated. Without the combination of an informed and involved public and a committed government, the best laws and legislation are likely to have little impact.

Achieving Policy Integration

One of the lessons from Rio is that the environment and economic development are inextricably linked. Major progress has been made since Rio in understanding and measuring the links between macroeconomic policies and the environment.

While the policy matrix focuses on the wide range of policy instruments that are available to manage specific environmental resources and problems, countries need to recognize that decisions made in the macroeconomic domain will ultimately have an impact on these resources as well. Many of these effects will be positive: instability in an economy is generally destructive of the sorts of investments in resource management upon which sustainability depends, and the efficiencies inherent in reducing price distortions will often lead to increased efficiency of resource use. There are, however, clear instances where economic liberalization can exacerbate existing policy failures: for example, increased access to international markets can put pressure on natural resources where property rights and resource pricing regimes are inadequate, leading to excessive exploitation. To the extent that liberalization leads to growth in production and incomes, this may lead to new environmental problems in the form of pollution emissions. The bottom line, of course, is not for countries to resist macroeconomic reforms for environmental reasons, but rather to ensure that policy reforms of the sort highlighted in the policy matrix are established to work in conjunction with the process of economic liberalization.

It is equally important for economic policymakers to understand the extent to which resource and environmental conditions impinge upon macroeconomic performance. Bad resource policies can actually hurt long-run economic growth by dissipating the wealth inherent in natu-

ral resource stocks. And excessive pollution levels damage not only economic assets, such as buildings, crops and forests, but human health as well. Excess levels of pollution-linked illness result in lost productivity, and excess levels of mortality imply substantial welfare losses.

In sum, the lessons in the five years since Rio suggest optimism about the potential for effective, cost-efficient environmental reform, but tempered with the reality that additional financial resources are likely to be limited and that major

institutional issues need to be addressed. This report is a "work in progress," a first attempt to organize a disparate body of knowledge about the different and often very creative approaches that governments and organizations are taking to manage natural resources and the environment. The World Bank is committed to extending this work and making it widely available — it can most successfully do so with the assistance of its partners in governments and in the wider development community.

PART TWO

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Using Markets

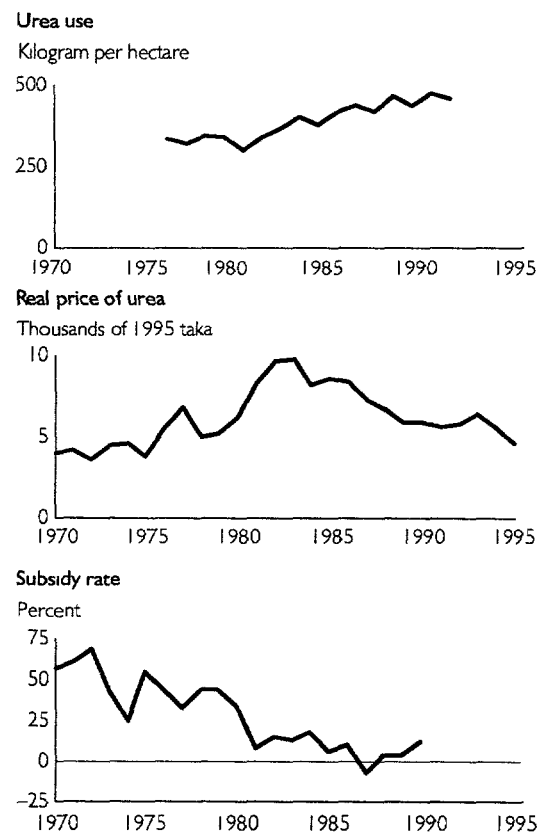
Bangladesh: Reducing Fertilizer Subsidies *Specific approach: subsidy reduction*

Until 1978 the Bangladesh government had a monopoly on fertilizer production, procurement, and distribution. Three basic types of subsidies existed in this period: a direct price subsidy when border prices exceeded government sales prices, an indirect production subsidy when ex-factory prices exceeded border prices, and an indirect distribution subsidy when distribution costs exceeded private sector costs.

Although these subsidies contributed to the promotion of fertilizer use, they imposed heavy financial burdens on the government. By the late 1970s, fertilizer subsidies accounted for 4 percent of the national budget (Mokarrum 1994). In 1978, for example, the total fertilizer subsidy was \$93 million (1995 dollars), with an average subsidy rate of 54 percent (Renfro 1992). The government's control of the fertilizer market also resulted in misallocation of resources and inefficient production and distribution. The government spending on fertilizer marketing and distribution rose by 240 percent in 1973–78 even though sales increased by only 90 percent (Mokarrum 1994). In addition, concern arose over environmental pollution resulting from fertilizer production and use, including the possible contamination of surface and drainage water and lake eutrophication.

In 1978 Bangladesh began experimenting with partial deregulation of urea sales. Retail

Figure 4.1 Effect of real prices on urea use in Bangladesh, 1970-95



Source: Mokarrum 1994; Renfro 1992

prices were deregulated completely in 1983. The savings resulting from the removal of fertilizer subsidies were estimated at US\$294 million in 1990–93: \$253 million from saving in fertilizer transportation and movement, \$33 million from

reductions in direct subsidies, and \$7 million from procurement through private sector imports (Mokarrum 1994). The savings represent more than 2 percent of total government revenue per year.

Despite the abolition of price control and the reduction in subsidies, real prices of urea have declined over time due to improved efficiency in distribution, increased domestic production, and

decreases in world urea prices in the mid-1980s. Declining prices, together with a substantial increase in the area planted to improved varieties, have resulted in a sustained increase in fertilizer use of 10 percent annually from 1970 to 1990 (see figure 4.1).

Source: Mokarrum (1994); Renfro (1992).

China: Subsidy Reform in the Coal Sector

Specific approach: subsidy reduction

Since the mid-1980s China has made remarkable progress in reducing energy subsidies. This is especially true in the coal sector, which contributes more than 70 percent of the country's energy production. Subsidy rates for coal have fallen from 61 percent in 1984 to 11 percent in 1995.

The World Bank (1997a) recently estimated that China's total economic subsidy for fossil fuels (based on the difference between domestic and world prices) fell from \$25 billion in 1990/91 to \$10 billion in 1995/96. It has also been reported that the budgetary subsidy from central government to cover the operating losses in state-owned coal mines decreased significantly (from \$750 million or 1.09 percent of total government expenditure in 1993 to \$240 million or 0.26 percent in 1995 (Wang 1996)). Simultaneously, the economic performance of coal mines improved, with estimated operating losses of state-owned mines dropping from \$1.4 billion in 1990 to \$0.23 billion in 1994 (Wang 1996).

These achievements have been made by removing coal price controls and by the developing of non-state-owned coal mines. Currently about 50 percent of production is carried out by these private mines (Wang 1996). About 80 percent of coal is now sold at international prices (Gray 1995).

Reform in the energy sector has reduced government spending and also, along with the structural adjustment and technological change, contributed to energy conservation and environmental protection. Energy intensity in China has fallen by about 30 percent since 1985. This implies that energy consumption (in oil equivalents) and carbon dioxide emissions are now respectively 0.3 billion metric tons less and 1.1 billion metric tons less than would have been the case if reform had not taken place.

Source: World Bank (1997a); Wang (1996); Gray (1995).

France: Removing Tax on Undeveloped Land
Specific approach: subsidy reduction

France has levied a tax on undeveloped land since the first half of the nineteenth century. Although the tax can be justified in terms of the optimum distribution of the factors of production and the revenue of local authorities, it has exacerbated several problems. Among these is ignorance of the environmental value of undeveloped lands. Under the tax system, non-intensive and less productive natural areas such as environmentally sensitive woodlands and wetlands are penalized.

Realizing the negative environmental implication of the tax on undeveloped land, the French government recently began to reform it so as to remove the incentive to destroy natural ecosystems. Three areas for reform were identified: (1) the overhaul of the system of exemptions to include environmental considerations, (2) a signifi-

cant reduction in the tax to be paid, and (3) general reform of the basis for the calculation of property value to better reflect local economic and ecological realities. Through the 1992 Finance Acts the government began to abolish certain exemptions and subsidies detrimental to the environment and set out to dismantle *departmental* and regional payments of the tax on undeveloped land in 1992. There has since been a significant reduction in the amount of these taxes imposed and therefore in the proceeds generated from the tax. With a reduction in the tax burden on undeveloped land, the economic incentive to convert less productive natural areas into productive lands has decreased.

Source: International Institute for Sustainable Development (1994).

Hungary: Decentralization and Subsidy Reduction in the Water Sector

Specific approach: subsidy reduction

The Hungarian government has phased out many subsidies from the state budget since beginning to move to a market economy in 1989. The percentage of total budgetary subsidy in total government expenditure dropped from 60 percent in 1993 to 42 percent in 1995 (IMF 1995). The subsidy reduction in the water sector is significant. The subsidy for irrigation was eliminated in 1990, equivalent to an annual saving of 2 million 1986 U.S. dollars, about 0.01 percent of government expenditure (OECD 1994). The subsidies from the state budget for public water supplies have been decreased from 100 percent prior to 1989 to 30 percent in the early 1990s (Bhatia, and others 1995).

The major steps taken by the Hungarian government to reduce the high state budgetary subsidy for water include decentralizing the responsibility of the central government for providing public water services and raising water

tariffs. The central government has legally transferred water supply facilities to local authorities, along with ownership of existing water assets. According to a World Bank-ODI joint study (Bhatia, Cestti, and Winpenny 1995), 28 out of 33 water utilities have become independent systems. The percentage of investment in the water sector from the state budget has fallen to less than one-third.

Water tariffs have been raised to the level based on a formula that includes the cost of inputs, depreciation, maintenance, and a markup of 1 to 2 percent. The combined tariff for water and sewerage now ranges from Ft 23 (\$0.31) per cubic meter in Budapest to Ft 107 (\$1.42) per cubic meter in Siofok. In the past three years, for example, the price of water in Budapest has increased tenfold.

Source. Bhatia, Cestti, and Winpenny (1995); OECD (1994b); IMF (1995).

Indonesia: Removing Pesticide Subsidies

Specific approach: subsidy reduction

Prior to 1986 the Indonesian government heavily subsidized pesticides in an attempt to boost agricultural production. The pesticide subsidy rate (the amount of the subsidy paid per unit of costs) was as high as 85 percent in the early 1980s (Pincus 1994). These heavy pesticide subsidies were a financial burden to the government: for example, in 1986 subsidies amounted to 179 million 1995 U.S. dollars (about 0.17 percent of GDP and 0.8 percent of the total government expenditure) and in the period of 1976–87 nearly \$1.5 billion 1995 U.S. dollars (World Bank data).

These huge subsidies resulted in excessive and inefficient use of pesticides and consequently caused economic loss and environmental damage. Domestic pesticide production soared from 6,000 tons in 1972 to 53,100 tons in 1985 (Indonesian National IPM Program, undated, and Pincus 1994). The country's total consumption of rice insecticides was about 20 percent of the world market in the mid 1980s (Kenmore 1991).

One of the well-known environmental problems related to the overuse of pesticides in the country is the outbreak of brown planthopper. When agricultural production was traditional and less intensified, with little use of pesticides, brown planthopper was not considered a pest; it was controlled by its natural enemies in rice fields. However, as the applications of insecticides increased, so did brown planthopper infestation. In 1976, the country's loss to an outbreak of brown planthopper was recorded as over one million tons of rice, enough to feed more than 2.5 million

people (Kenmore 1991). Research indicated that the overuse of rice insecticides, which kill the natural enemies of brown planthopper, together with the intensification of rice production, was directly responsible for the outbreak. In addition to the brown planthopper problem, pesticide pollution was a major cause for concern in Indonesia's densely populated village communities, particularly where water for drinking and bathing was in limited supply.

These problems led Indonesia to drastically modify its pesticide policies. In 1986 many pesticides on rice were banned and direct subsidies for pesticides were phased out in 1986–89. The policy shift not only saves more than \$100 million per year in government expenditure but also makes the country economically and environmentally better off. Pesticide production dropped to 22,100 metric tons in 1990 and meanwhile pesticide imports fell to a third of mid-1980s levels. Although no data exist to quantify the environmental impact of the subsidy elimination, the significant drop in pesticide use is thought to have alleviated damage to the environment—particularly to public health and to biological diversity. The reduction in pesticide use has been accomplished without adverse effects on rice production. Total milled rice production rose from 27 million metric tons in 1986 to 30 million metric tons in 1990 (see table 4.1).

Source: Kenmore (1991); Pincus (1994); Indonesian National IPM Program.

Table 4.1 Indonesia: pesticide subsidies, 1985–90

	1985	1986	1987	1988	1989	1990
Pesticide subsidy (1995 US\$ mill.)	141	179	134	85	2	0
Subsidy rate (percent)	85	75	45	40	0	0
Pesticide production (1000 m.t.)	53	46	58	48	29	22
Milled rice production (mill. m.t.)	26.5	26.8	27.3	28.3	29.4	30.3

Source Kenmore (1991)

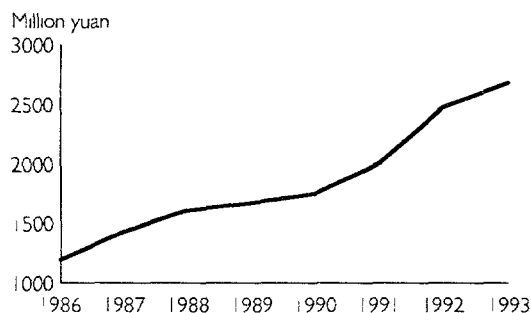
China: The Pollution Levy System

Specific approach: environmental taxes

China began to experiment with a levy on industrial pollution that exceeded emissions standards in cities in 1979. In the early 1980s a pollution levy system was officially incorporated into law and was gradually expanded to cover the entire country. Government revenues from the pollution levy have since increased rapidly, for example, from 1.2 billion yuan in 1986 to 2.7 billion yuan in 1993 (see figure 4.2). The pollution levy now provides about 15 percent of all capital expenditures for pollution control and is the principal source of funding for regulatory enforcement activities by local environmental protection bureaus.

According to the pollution levy system, twenty-nine pollutants in wastewater, thirteen pollutants in industrial waste gases, and all industrial solid waste, noise, and radioactive waste are subject to a fee. Prior to 1993 the Chinese pollution levy system imposed charges only for pollutants that exceeded emissions standards and then only for the one pollutant most in violation of the standard. To provide incentives for enterprises to further reduce the within-standard pollutant discharges into water, a fee charged on the total quantity of wastewater discharged was introduced in 1993. The collections of this within-standard fee now amount to over 10 percent of the collections of the over-standard fee.

Figure 4.2 Chinese government revenues from the pollution levy, 1986-93



Source: National Environment Protection Agency of China, various years

Although the pollution levy system provides revenue for funding pollution control activities, it has been criticized for its low charge rates and weak enforcement. The charges are below the marginal costs of pollution control in most cases and are not indexed for inflation. A survey of industries in thirteen cities by a government agency found about 120 million yuan in pollution levy underpayments in 1992 under weak enforcement. The pollution levy system still has the potential to increase government revenue.

Source: National EPA of China (Environment Yearbook Series); Xie and Florig (forthcoming).

Denmark: Environment-Related Product Taxes

Specific approach: environmental taxes

In Denmark the total environment-related tax revenue consisted of 7.3 percent of total government revenue and equaled 3.7 percent of GDP in 1993. In early 1994 the Danish government introduced several new pollution-related product taxes. Although so far the revenue from these new taxes constitutes less than 0.01 percent of total government revenue, they are increasingly important in generating revenues and correcting market failure as the following examples shows.

The retail sales of pesticides sold in containers less than 1 kilogram or 1 liter are taxed at 1/6 of the wholesale value including the tax but excluding the value-added tax (VAT). The tax on imports is 20 percent of the producer price. Pesticides sold in larger quantities are subject to a tax of 3 percent of the wholesale price excluding discounts and VAT. In 1993 there was a tax revenue of DKr 11 million from pesticide sales.

Rechargeable nickel-cadmium batteries are also subject to a tax. The rate is DKr 2 per single battery and DKr 8 per battery attached to a technical device or apparatus. The total revenue from the tax was DKr 7.8 million in 1993. The revenue is earmarked for covering the costs of collection for used rechargeable batteries.

An excise duty of DKr 30 per kilogram is levied on CFCs and Halons as well as products containing them. The tax revenue in 1993 was DKr 5.1 million.

There is an excise duty on ordinary light bulbs whereas energy-saving bulbs are exempt to encourage energy efficiency. Domestic plastic and paper cups, plates, and cutlery are taxed at a rate of one-third of the wholesale value including the tax rate but excluding VAT, and imports face an even higher rate of 50 percent.

Source: OECD (1995).

The Netherlands: Effluent Charges on Industrial Wastewater

Specific approach: environmental taxes

In an effort to reduce wastewater at industrial sources the Dutch government introduced a license system and effluent charges. For instance, the country's 1970 Pollution of Surface Waters Act requires that all nonlicensed discharges into surface waters be prohibited and that polluters must pay for their discharges. The charges are implemented and managed by water boards, self-governing bodies of surface water users responsible for water management. The rate of effluent charges has risen sharply since its introduction, for example, from FL 1.1 per population equivalent in 1969, to FL 27.9 in 1980, and to FL 55.1 in 1990.

The results of this set of policies are remarkable (see table 4.2 below). For example, the total amount of industrial wastewater discharge dropped by 73 percent between 1969 and 1990 while industrial production was booming during the same period. Meanwhile, a large amount of revenue has been raised through the charges. (FL 1.3 billion or about 0.5 percent of total government revenue in 1990). This revenue provided a substantial resource for financing the construction and operation of sewage treatment plants.

Source. Bressers (1995); Jansen (1991).

Table 4.2 The Netherlands: effluent charges on industrial wastewater

	1969	1975	1980	1985	1990
Total discharges on surface water (million PE)	45.5	33	28	25.8	23.6
Industrial discharges	33	19.7	13.7	11.3	8.8
Domestic discharges	12.5	13.3	14.3	14.5	14.8
Total effluent charges (million FL)	50	340	780	1080	1300
Average charge per PE (FL/PE)	1.10	10.30	27.86	41.86	55.08
Average charge per m ³ of wastewater (FL/m ³) (assuming 300g biological oxygen demand in 1m ³ of wastewater)	0.01	0.14	0.38	0.57	0.75
Average charge (dollars per m ³)	0.004	0.06	0.19	0.17	0.41

Note The unit on which effluent charges are levied is the "population equivalent" (PE), which is roughly equivalent to the water pollution emissions by one individual. One PE is equal to 60g biological oxygen demand per day.

The Philippines: Introduction of Wastewater Discharge Fees

Specific approach: environmental taxes

The Philippines has recently introduced a mix of new environmental policies to ensure that the rapid economic growth of the country is environmentally sustainable. These instruments complement the traditional command and control system by using market forces (environmental user fees), public disclosure of information (see the case study, "The Philippines: The EcoWatch Project," p. 47), and engagement of the public through community participation in environmental management.

After three years of preparation with support from the World Bank the Philippines started implementing its environmental user fee in January 1997 with the first batch of industries paying a fee based on their assessed pollution load. Under the system, activities that utilize environmental resources by discharging wastewater are required to pay a fee for every unit of pollution they discharge, hence the name environmental user fee. This is in addition to meeting the existing discharge standards specified in the regulations.

In principle the system is expected to cover all polluting activities from industrial, commercial, domestic, and agricultural sources in the country. The proposed user fees would eventually also cover all major pollutants from all media (land, air, and water). However, implementation of the system is gradual. During the first phase the program covers only one pollut-

ant (biological oxygen demand) and one medium (water), one geographic area (the lake water shed of Laguna de Bay under administration of the Laguna Lake Development Authority (LLDA) a government corporation), one group (industry) and within this group only major polluters in five industrial sectors representing nearly 90 percent of the total water pollution discharged in the lake. To start up the program the implementing agency LLDA invested some of its own resources in additional staff, equipment, and outreach programs. A critical element of this first phase is the consultation with industries, which had already started during the design phase.

The government will build on the experience of this first phase to mainstream the program throughout the country and across sectors and media. In particular, the Department of Environment and Natural Resources hopes to use the results in drafting the legislation required for applying user fees outside the LLDA area.

Revenues from the environmental user fee will be used for water quality management programs and to strengthen the existing monitoring and enforcement capability of the LLDA. Twenty percent of the revenues are being shared with local government units in the program area. To ensure a continuous funding of administrative costs, polluters pay a small flat fee in addition to the variable fee.

Source Official brief by Secretary V. Ramos, Department of Environment and Natural Resources, the Philippines.

United States: Ozone-Depleting Substance Tax

Specific approach: environmental taxes

The United States introduced a tax on the production of ozone-depleting substances (ODSs) in 1989 as a key component of its ozone protection policy. The tax rate, originally \$1.37 per pound, was increased to \$5.35 in 1995. It was also set to increase by \$0.45 per year. The tax was applied to eight chemicals in 1989 and then to twenty in 1990. To protect the competitiveness in the world market, border adjustments in the tax have been adopted.

The effect of the ozone-depleting substances tax has been very encouraging. Production of the most important ozone-depleting substances has fallen to less than half their pre-tax level. Between 1990 and 1992 production was consistently well below the caps set by the Montreal Protocol. For

the five chlorofluorocarbons (CFCs) originally covered by the agreement, for example, production never exceeded 65 percent of the allowable level and, as a percentage of the caps, it fell somewhat. Production of the same five CFCs has fallen faster than world production. This represents a dramatic reversal of the situation before the tax was introduced in 1990.

Besides its effect on reducing ozone-depleting substances, the tax has been a valuable source of revenue for the federal government. Annual revenues started at \$360 million in 1990, and rose steadily to more than \$1 billion in 1994.

Source: International Institute for Sustainable Development (1994).

Effects of Energy Taxes and Subsidies on the Economy and the Environment

Specific approach: taxes and subsidies

Some people worry about the negative impact of energy taxation on economic growth, but removing energy subsidies and taxing environmentally adverse energy use can be an economically and environmentally sound policy for a country.

Germany and Japan have heavily taxed energy for years. Their percentages of gasoline prices accounted for by taxes in 1995, for example, were 78 percent and 53 percent respectively (see table 4.3 below). The energy productivity (measured by GDP per kilogram of energy used) in Germany and Japan, however, is about ten times higher than in Russia and China where energy is still subsidized. Also, carbon dioxide emission intensity is much lower in Japan and Germany (0.30 and 0.49 metric tons per thousand U.S. dollars,

respectively) than in Russia and China (5.43 and 5.27 metric tons per thousand U.S. dollars, respectively).

Germany provides an example of a country where the link between economic growth and energy consumption growth can be broken by improving efficiency in the use of energy. In 1990–94 Germany achieved a 1.1 percent a year economic growth while its energy consumption dropped by 1.5 percent a year. Similar results can also be seen in China. From 1990 to 1994 the GDP of China grew annually by 12.9 percent, while the country's growth rate of energy consumption was only 4 percent a year.

Source: OECD (1996); World Bank (1996b); World Bank (1997a).

Table 4.3 Effects of energy taxes or subsidies: cross-country comparison

Country	Average tax (subsidy) rates (a)/ (1995) (%)	Per capita energy use (b)/ (1994) (kg)	GDP per kg of energy (1994) (\$/kg)	Carbon dioxide emissions per dollar of GDP (1992) (m.t./'000\$)	Average annual energy growth rate (1990-94) (%)	Average annual GDP growth rate (1990-94) (%)
China	(7)	647	0.7	5.27	4.0	12.9
Germany	78.4	4097	6.1	0.49	-1.5	1.1
Japan	52.8	3825	9.6	0.30	2.3	1.2
Russia	(20)	4038	0.6	5.43	-8.9	-10.6
U.S.	33.3	7905	3.2	0.82	1.8	2.5

a. For Germany, Japan, and the United States, average tax rates on regular unleaded gasoline; for China and Russia, average subsidy rates

b. Measured in oil equivalents

Costa Rica: Ecotourism and Conservation

Specific approach: user fees

Ecotourism is widely considered more ecologically and culturally sensitive and less likely to bring negative impacts than most other production sectors. In recent years it has been increasingly accepted as a clean revenue source and an effective tool for combining conservation and sustainable development. Costa Rica is one of the best known examples of ecotourism.

Costa Rica has developed a strategy for promoting ecotourism and linking protected areas into the larger context of regional development. More than 12 percent of the country is included in the parks and protected areas system. Tourism has been one of the fastest growing sectors in the economy, with an annual increase of 25 percent between 1991 and 1994. Tourism revenue has become the second largest source of foreign income (for example, \$506 million in 1993) in the country. It provides economic benefits to local peoples and local governments while also supporting nature conservation.

Even though ecotourism provides important economic benefits to the country, the parks themselves were often starved for funds and a very low entrance fee was set for residents and foreign visitors alike. In 1994, the new government decided to increase admission fees for foreign visitors, initially to \$15 per person, with residents paying about \$1. This policy of differentiated user fees allows a government to capture part of the observed willingness-to-pay by foreigners for

Costa Rica's unique natural resources. The higher fees sharply increased revenues but did result in a decrease in the numbers of park visitors. The entrance fees were later reduced as a result of protests from foreign visitors and the tourism industry and multi-park package admission tickets and differentiated pricing were introduced. The new pricing structure and increased revenues have allowed the government to begin to upgrade park facilities. The varying fee structure also helps even out use among the various parks to reduce crowding at the most popular parks. In addition, the regions are retaining a portion of the fees for use locally, rather than sending all the money to the nation's capital.

In addition to the national system of protected areas Costa Rica has encouraged the creation of private nature reserves and nature attractions, and the use of debt-for-nature swaps. The experience of Costa Rica shows that the creation of private reserves, such as the Monteverde Cloud Forest, can benefit both local residents and the broader cause of conservation. The development of ecotourism in Costa Rica has not only brought in substantial revenues but has also given Costa Rica an international reputation as a leader in sustainable development and the use of innovative management and financing mechanisms.

Source: Brandon (1996); Dixon (personal communication).

Pricing Forestry Resources Right: Selected Examples of User Fees and Taxes in Developing Countries

Specific approach: user fees

After many years of forestry resources underpricing that led to excessive exploitation and loss of government revenue, a number of forest-rich developing countries began to reform their forestry policies towards capturing more economic rent and setting incentives for protecting forestry resources. The following are just a few examples of this:

- *Stumpage taxes, reforestation deposits, and service fees in Costa Rica.* After revision of the country's forestry law in 1986 several changes in forestry taxes and charges have become effective. First, a 10 percent tax on stumpage value was set in 1986. Second, loggers are required to deposit 20 percent of stumpage value with government on guarantee that it will be refunded if trees are replanted. Third, loggers are charged for road maintenance and other services. The reform of the stumpage fee structure succeeded in raising forest revenues drastically, for example, an increase of 15 times in real terms between 1985 and 1989. Although the reforestation deposit is still lower than the replanting cost in many cases, reforestation has increased significantly since the forestry policy reform. The area reforested jumped from an average of 10 square kilometers a year between 1980 and 1985 to 230 square kilometers in 1990 (World Bank 1994; Peuker 1992).
- *Removal of land conversion subsidies and charges on forestry products in Brazil.* Since the 1980s the Brazilian government has gradually removed land conversion subsidies. The state of Minas Gerais levies a charge on all kinds of forestry products from logs and firewood to roots and seeds. The charge rate was originally set at 3 percent of the value of forestry products and was adjusted later based on an indexed rate varying according to the value of each forestry product (da Motta and Reis 1994). This change has resulted in a much higher tax on charcoal and firewood from native forest (major causes of deforestation) than on other forestry products. Furthermore, reductions of up to 50 percent of the tax due are granted if reforestation activity is sufficient to generate the forestry production equivalent to consumption levels. To some extent, the charge has been a successful incentive to reforestation.
- *Setting stumpage prices at auction in Honduras.* Prior to 1992 stumpage charges and timber prices were set by the government at a very low level. Despite the timber production of more than 9 million cubic meters per year in Honduras, the state forestry revenue was very low (only \$4.8 million, less than 1 percent of central government revenue, in 1994). Realizing that there was tremendous loss of economic rents and inefficiency in the forestry sector induced by government intervention, the Honduras government began to reform the pricing policy in 1992. A new policy that aims at raising timber prices to international levels by requiring the sale of timber at auction has been adopted. According to the experiment on a small portion of forest areas, the stumpage price rose from \$5 (30 lempiras) per cubic meter of timber in 1992 to \$11 (72 lempiras) in 1993, and to \$33 (280 lempiras) in 1994 (World Bank data). The policy is considered to have great potential for capturing a significant amount of economic rent.
- *Reform of stumpage prices in the Philippines.* Having a long history of low rent capture on its forestry resources, the Philippines government began to change its pricing policy in the early 1990s. In 1990, through Public Act No. 7161, the government raised the charge on each cubic meter of timber cut from a mere 1 percent to 25 percent of the market price. This policy change could result in a significant increase in rent capture from 11 percent to about 50 percent of economic rent. The total charge on logs harvested thus rose significantly from 92 million pesos (0.06 percent of government revenue) in 1989, to 460 million (0.26 percent) in 1990, and further to 806 million (0.37 percent) in 1991 (Department of Environment and Natural Resources, Philippines 1994).
- *A reforestation fee in Indonesia.* The Indonesian government began to impose a reforestation

fee in 1980 of \$4 per cubic meter on all timber-extraction activities. The fee was raised to \$7 per cubic meter in 1989, and then to \$10 in 1990. The current rate is about \$22 per cubic meter. Through the fee, a more than one billion dollar fund for forest restoration and conservation activities has been established (Sizer and Rice 1995).

- *Strengthening forestry taxation in Malaysia.* The Malaysian government recently took steps to recapture revenue loss due to transfer pricing. Transfer pricing was common in the country

enabling timber merchants to realize their profits in privately held offshore companies and reduce their Malaysian tax exposure. The government action has been reported to successfully reduce the problem to an acceptable level. Twenty timber companies were assessed for large back taxes—one owed as much as \$40 million (Sizer and Rice 1995).

Source: da Motta and Reis (1994); DENR (1992); DENR (1994); Peuker (1992); Sizer and Rice (1995); World Bank (1994).

Japan and Taiwan (China): Deposit-Refund Systems for Solid Waste Recycling

Specific approach: deposit-refund system

The basic idea of a deposit-refund system is to let those who generate waste be responsible for the costs and to provide incentives to encourage waste recovery and recycling. This system has been considered effective in encouraging the recycling of certain types of solid waste. The following are success stories from Japan and Taiwan (China).

Japan is one of the most successful countries in terms of recycling solid waste. For years the Japanese government has strongly supported recycling programs (there is a recycling law) and the concept of recycling has been well accepted by the public and industry. As of 1989/90, the country recycled 92 percent of beer bottles, 50 percent of waste paper, 43 percent of aluminum cans, 45 percent of steel cans (now 70 percent, according to *Sanpai Times*, 12 January 1996), and 48 percent of glass bottles. Besides government support and public attitudes in favor of recycling, deposit-refund systems have provided considerable incentives for recycling and contributed significantly to the achievement. Taking the recycle of beer bottles as an example, the system operates as follows: Beer makers levy a deposit fee on each 20-bottle case of beer. As of 1992 the fee was 300 yen, 100 of which is for the bottles and the other 200 for the container. The deposit is passed on from manufacturers to wholesale dealers and

then to retail shops and ultimately to consumers. The refund is made at each distribution stage when the used packages and bottles are collected. Local communities also collect a small portion of the used bottles and return them to the beer makers through bottle dealers. In addition, a number of local governments and consumer cooperatives have also organized deposit-refund schemes for beverage cans.

In 1989 Taiwan (China) established a deposit-refund system to recycle polyethylene terephthalate (PET), the plastic commonly used in soft drink bottles. There are 104 manufacturers of PET bottles in Taiwan (China) making some 260 million bottles each year. Under the system members of the industry have formed a foundation that administrates a joint recycling fund to cover costs of collection and recycling of the bottles. The fund is replenished from a deposit on the sale of each bottle. Those returning PET bottles to collection locations receive a refund of NT\$2.00, around US\$0.08 per bottle. There are 14,000 collection locations available (about one for every 1,600 persons). By delivering bottles to recycling plants the collectors receive NT\$0.50 (or US\$0.02) per bottle. By 1992 the PET recycling rate was 80 percent.

Source: O'Connor (1994); Pan (1994).

Creating Markets

Côte d'Ivoire: Experience with a Concession for Water Supply

Specific approach: property rights or decentralization

The watchword in private water supply in West Africa is an acronym, SODECI. The company began operating the Côte d'Ivoire capital's water system thirty years ago and now manages more than 300 piped water supply systems across the country. Its 300,000 individual connections, increasing by 5–6 percent a year, already reach some 70 percent of the nation's 4.5 million urban residents—2 million in Abidjan, and the rest in settlements of 5,000 to 400,000 people.

A high percentage of its urban customers are poor, users whom SODECI values as a matter of policy. To facilitate service to them, it forgoes direct hook-up charges on three out of four of its domestic connections. The policy works. SODECI has a 98 percent or better collection rate from its private (as opposed to government) customers and a profitable track record.

From its original concession to supply water in Abidjan, the company took on lease arrangements to produce and distribute water in other municipalities. Recently, in the course of a broader

service-sector reorganization, SODECI won a countrywide concession contract for water operations and investments. The grant is a tribute to its accomplishments. First, it has succeeded in providing service that comes close to industrial countries' standards. Second, the cost of SODECI water to consumers is no higher than in neighboring countries in similar economic conditions or in members of the CFA franc zone, where tariffs rarely cover capital and operation and maintenance costs, and service lags behind.

While 46 percent of its capital comes from SAUR, a French water company, and 2 percent from the Ivorian government, private Ivorian interests own a majority of SODECI's shares and collect the dividends those shares pay. Its bonds are one of the main items traded on Abidjan's financial market, and its performance as a private firm supplying a public service could well be a model elsewhere in West Africa and beyond.

Source: World Bank (1996c).

Phoenix, Arizona, United States: Privatization of Solid Waste Services

Specific approach: property rights or decentralization

In the late 1970s Phoenix had a sanitation workforce of approximately 480 personnel servicing a city of 700,000 people. The budget for this operation, inflated to today's dollars, would be about \$80 million annually. Today Phoenix has a population of more than a million people, yet the total sanitation workforce is 330 people, with an annual budget of \$43.3 million. These results were achieved by adopting a competitive privatization process.

In order to reduce its expenses on solid waste services, the city council asked the management of public works to privatize a portion of the collection service. Public works was allowed to participate in the bidding process. Through the

privatization process public works learned how to improve its service quality both from its participation in the bidding process and from solid waste services delivered by the private sector. After losing the first two rounds of bids, public services won the next three successive bids.

The competitive privatization approach has served Phoenix well. Regardless of whether the public or the private sector is responsible for delivering solid waste services, the privatization process has improved productivity, driven the implementation of leading-edge waste technology, and proven a winner in cost-savings.

Source: Donovan (1994).

Singapore: Auctionable Permits for the Consumption of Ozone-Depleting Substances

Specific approach: tradable permits

In Singapore, a sophisticated auction mechanism has been introduced in order to trade the permits for the consumption of ozone-depleting substances. Each quarter the national quotas of ozone-depleting substances are allocated between importers and users, half on the basis of historic consumption and half through auction. Importers and users must register to participate in a tender process conducted by sealed bid, in which each firm indicates the amount of ozone-depleting substances it would like to purchase and its offer price. Bids are then ranked by price and the lowest winning bid (that is, the one that clears the market) serves as the quota price for the full allotment of ozone-depleting substances, includ-

ing the 50 percent that was allocated on the basis of historic consumption.

There is a sufficiently large number of bidders to establish competitive conditions, as indicated by the rapid increase in quota price during the first few rounds of bidding—before firms had made a serious effort at conservation and substitution. Compared to traditional command and control measures such as fixed quotas and prices, the auction approach is efficient, in terms of the costs at both individual and society levels, and easy to implement. The auction also allows the government to capture a sizable portion of the quota rents, which can then be used to subsidize recycling services and encourage alternative technologies.

Source: Markandya and Shibli (1995).

Joint Implementation and Its Application in the Americas

Specific approach: international offset systems

Stemming from the UN Framework Convention on Climate Change adopted during the 1992 Earth Summit in Rio, "joint implementation" (JI), also called "activities implemented jointly" (AIJ), is a new cost-effective approach to reduce emissions of greenhouse gases. It is defined as international arrangements through which an entity of one country partially meets its commitment to reduce greenhouse gas emission levels by undertaking cost effective emissions mitigating projects in another country. In particular, JI provides a developed country with an opportunity to implement greenhouse gas emissions reduction activities in a developing country at a lower cost than could be achieved by the first country solely within its own borders. From a JI investor's standpoint, JI means cost effective emissions mitigation options, a sound investment potential, and an opportunity to explore investments abroad. From the host country's standpoint, JI is an environmentally sound mechanism to attract foreign capital, which is otherwise unavailable, and obtain modern, clean, efficient technologies.

Since the Rio conference, the United States has been actively engaged in initiating and implementing JI projects. In October 1993 the United States announced the U.S. Initiative on Joint Implementation (USIJI), a voluntary pilot pro-

gram encouraging organizations in the United States and other countries to implement projects that reduce, avoid, or sequester greenhouse gas emissions. A number of Latin American countries have also shown strong interest in supporting the JI concept. Costa Rica has established a national JI program. Several other Latin American countries, notably Belize, Bolivia, Guatemala, El Salvador, Honduras, Mexico, Nicaragua, and Panama, are exploring ways to create national programs and policies.

To date USIJI has approved 22 JI projects, 17 of which are in Latin American countries (8 in Costa Rica, 3 in Honduras, 2 in Belize, and one each in Bolivia, Mexico, Nicaragua, and Panama). These projects are mainly in two sectors: land use and energy. They apply a variety of technologies and practices, including energy efficiency improvements; wind, geothermal, hydroelectric, and solar energy; coal to natural gas fuel switching; methane gas capture; and forest preservation and reforestation. For example, the forest restoration project in Costa Rica will sequester five million metric tons of carbon by restoring 58,500 hectares of abandoned or marginal pasture to primary dry and wet forest.

Source: U.S. Initiative on Joint Implementation (1996).

Using Environmental Regulations

Malaysia: Experience in Effluent Control in the Palm Oil Industry *Specific approach: standards and charges*

The Malaysian experience in effluent control in the palm oil industry demonstrates that a set of well-designed environmental policies can be very effective in controlling industrial pollution in a developing country.

The Malaysian government's effort to reduce the effluent from the palm oil industry has been implemented through a licensing system, which mainly consists of effluent standards and effluent charges. Progressively stringent effluent standards were stated in a government environmental quality regulation and were implemented in four stages. Specifically, after being given one year to install treatment facilities, palm oil mills were required to reduce their wastewater discharges, taking biological oxygen demand (BOD) concentration as the key parameter, from 25,000 mg/l un-

treated effluent to 5,000 mg/l in 1978/79, to 500 mg/l by 1981, and to 100 mg/l by 1984 onward.

In addition to the standards effluent charges are levied on the biological oxygen demand load discharged. Palm oil mills were given one year (1978) of paying a low fee for the biological oxygen demand load exceeding a standard of 5000 mg/l in recognition of the initial difficulties the industry would face. A much stricter biological oxygen demand standard (100 mg/l in 1984 onward) and hence higher effluent charges were imposed after that. The charges are MR100 (US\$40) per ton for biological oxygen demand loads above the standard and MR10 per ton for biological oxygen demand loads equal to or less than the standard. Meanwhile, polluters were required to pay a nonrefundable MR100 annual license-process-

Table 6.1 Malaysia: experience in effluent control in the palm oil industry

	1978	1979	1980	1981	1982	1984	1989
Biological oxygen demand standards (mg/l)	5,000	2,000	1,000	500	250	100	100
No. of mills	131	140	147	157	167	186	254
Crude palm oil production (1,000 tons)	1,786	2,188	2,573	2,822	3,511	3,715	6,057
Biological oxygen demand generated (tons/day)	563	690	850	1,000	1,100	1,640	1,693
Biological oxygen demand load discharged (tons/day)	563	222	130	58	35	4	5
% reduction in biological oxygen demand load generated	0	67.8	84.7	94.2	96.8	99.8	99.7

ing fee. The mills that succeeded in developing technologies to reduce biological oxygen demand were rewarded by being charged at a lower rate.

The results of policy implementation are very encouraging. The palm oil industry has made steady progress towards meeting the target of 100 mg/l biological oxygen demand. A progressive reduction in the total biological oxygen demand load discharged was recorded (see table 6.1). For example, between 1978 and 1989 despite a 93 per-

cent increase in the number of palm oil mills and a jump of crude palm oil production from 1.8 million tons to 6.1 million tons, the daily biological oxygen demand load released to public water bodies fell steadily from 563 tons a day in 1978, to 58 tons in 1981, and to only 5 tons in 1989. Studies also show that these policies did not result in loss of competitiveness for the palm oil industry.

Source: Markandya and Shibli (1995).

Israel: Quotas and Charges for Irrigation Water Use

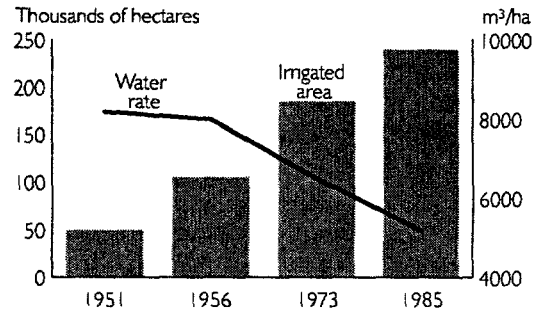
Specific approach: quotas and charges

Compared with other water-scarce countries in the world, Israel has achieved remarkable results in the efficient use of irrigation water. Israel's policies to improve water efficiency consist mainly of annual allocations of water and water charges.

Irrigation water is allocated based on an annual quota. The quota is fixed and licensed based on the area cultivated, the crop mix, and water requirements of each crop. There are norms and maximum quantities of water allowed for different crops, as determined by field estimates. The allocation system provides an incentive for water efficiency since farmers must sustain their farms on the allocated volume and any wasteful practices may cause farmers to reduce their irrigated area or pay penalties for overconsumption.

Charges for irrigation water are based on a progressive block rate structure. In July 1990, for example, water charges were as follows: 80 percent of allocated volume was charged at \$0.125 per cubic meter, the remaining 20 percent was charged at \$0.20 per cubic meter, and consumption above the allocated limit was charged at \$0.26 per cubic meter. Seasonal pricing is also practiced. During peak months, a 40 percent premium is charged because the energy required per unit

Figure 6.1 Irrigated area and water application rate in Israel, selected years 1951 to 1985



Source: Bhatia, Cestti, and Winpenny 1995.

of water supplied increased due to greater hydraulic losses in overloaded pipelines.

The results from water quota and charge policies have been a steady decline in the average water application rate per hectare and a notable increase in irrigation efficiency. Between 1951 and 1985 the water application rate fell from 8,200 m³ per hectare to 5,200 m³ per hectare, a 36 percent reduction (see figure 6.1). Irrigation water use in this period increased by 200 percent, whereas the area under irrigation increased by 380 percent.

Source: Bhatia, Cestti, and Winpenny (1995).

Engaging the Public

Australia: Eco-Labeling and Energy Saving *Specific approach: information disclosure*

In order to improve the energy efficiency of household appliances, a number of countries have adopted the energy efficiency labeling scheme as an environmental policy instrument. The experience of energy labeling in New South Wales, Australian presents a success story.

The Australian energy efficiency labels are carefully designed to clearly present information. Specifically, the labels contain information on energy consumption in two ways. First, a figure is used to digitally indicate the specific energy consumption according to standard tests. Second, a familiar, easily intelligible star rating system is adopted. As for hotels, the more stars there are on a label the better the appliance is in terms of energy efficiency.

Although its effect on improving energy use intensity is indirect, the labeling scheme works effectively. It provides manufacturers (retailers) with incentives to produce (sell) less energy – intensive products. For example, within one year of the introduction of the labeling scheme, the energy efficiency of refrigerators in showrooms increased by about 15 percent, mainly due to changes in the composition of refrigerators being offered. One Australian producer of refrigerators has introduced between 15 and 20 new, energy-efficient models since labeling began in the late 1980s. An improvement in energy efficiency has also been observed in the markets of dish washers and air conditioners.

Source: Kraemer (1995).

Indonesia: Public Disclosure Program

Specific approach: information disclosure

Most developing countries are hampered in their pursuit of sustainable development by lack of information, institutional capacity, and funding. In these countries sophisticated instruments such as taxes, charges, and tradable permits often cannot work well. Therefore, there is a need for appropriate, innovative, and cost-effective environmental policies and programs. Indonesia's public disclosure program is an example of this.

Faced with acute pollution problems, shortage of environmental protection funding, and weak enforcement of regulations, the Indonesian government has experimented with a program for rating and publicly disclosing the environmental performance of Indonesian factories. The aim of the program is to have a low-cost but effective means of putting public pressure on factories and providing incentives for factories to adopt cleaner technologies. The pressure, through public disclosure, on factories with poor environmental performance is applied by the government, the community, and the market.

With the help of the World Bank the Program for Pollution Control, Evaluation, and Rating (called PROPER) was introduced to the public in June 1995. Based on the government's evaluation of its environmental performance a plant is assigned a color rating (gold, green, blue, red, and black) by PROPER. A blue rating is given to factories that are in compliance with national regulatory standards, gold is reserved for world-class performers, and black for factories that have made no attempt to control pollution and are causing serious damage. Green and red are in between.

In the pilot phase of PROPER, 187 plants were rated. 115 of these plants were rated as red and 6 as black. Red and black plants were privately notified and given until December 1995 to improve their performance. Preliminary results show that PROPER has a positive impact on factories' environmental performance. By December 1995 — the time of full disclosure — the number of black plants had been reduced from 6 to 3, and the number of red plants from 115 to 108.

Source: Afsah, Laplante, and Wheeler (1996).

The Philippines: The EcoWatch Project

Specific approach: information disclosure

Eco-labeling is increasingly used as an effective instrument to make production and consumption patterns more environmentally sound. The Nordic countries, for example, have used eco-labeling (the Nordic Swan) since 1989 for their industrial products. Australia also adopted an energy efficiency star rating system in the late 1980s (see *Australia: Eco-labeling and Energy Saving*). The results of these eco-labeling programs are very encouraging. Since the Rio conference, eco-labeling has taken place in the developing world. The recent development of the EcoWatch project in the Philippines represents this trend.

On December 7, 1996, President Ramos, witnessed by the Department of Environment and Natural Resource and the Laguna Lake Development Authority, signed a memorandum of agreement with twenty three industry associations (representing some 2,000 companies) formally launching an eco-labeling campaign, the industrial EcoWatch Project. The project is designed to provide a strong incentive to industries to comply with environmental regulations and to reward those industries whose environmental performance exceeds standard requirements.

The project specifically allows the government to set up an environmental grading system to categorize the environmental performance of these firms using a five-color (gold, blue, green, brown, and black) labeling system. A black label will be used for firms with no pollution control or causing serious damages to the environment, blue for firms that meet all environmental standards and required procedures (such as self-reporting of pollution data), and gold for firms that meet environmental standards for three years

straight and conduct at least two environmental programs such as waste reduction and recycling projects.

The rating results will be announced in the media (newspapers, television, and radio) in an attempt to provide firms with a strong incentive to improve their environmental performance.

So far broad guidelines for the color coding methodology have been established. A list of 259 priority wastewater dischargers have been identified and about 100 have been rated for the first EcoWatch announcement scheduled for late March 1997. A critical step in the design of the project was to include the industry representatives in the elaboration of the program from the beginning with the result that the private sector, through the signing of the EcoWatch project agreement, committed to support the implementation of the project and its mainstreaming throughout the country. An additional five provinces are scheduled to introduce EcoWatch during the next year.

The EcoWatch Project is supported by a Pollution Management Information System, which is being developed with World Bank assistance. The system will also support the environmental user fee program (see *Philippines: Introduction of wastewater discharge fees*), which is being implemented concurrently, thereby reaping the benefit from the synergy between various instruments of the country's new environmental policy mix.

Source: The University of the Philippines and Engineering Research and Development Foundation, Inc. (1996); Areas (1996).

Kenya: Community-Managed Water Utilities

Specific approach: public participation

The communities of Murugi-Mugumango and Ngorika in Kenya stand out as examples of successful community-owned water utilities run along commercial lines. Both utilities started out as small, self-help water groups in the mid 1970s and evolved into sophisticated water societies with more than 1,000 members each. The monthly revenues for the Murugi-Mugumango Water Society are approximately Ksh 35,000–40,000, sufficient to cover their monthly expenditures of Ksh 30,000–35,000. While the Ngorika Water Society is smaller and less well established than Murugi-Mugumango, its monthly revenues of Ksh 8,000–10,000 are also sufficient to cover monthly expenditures (Ksh 7,000–8,000). In addition, both communities have consistently expanded the systems and operations over time, building offices, employing staff, and widening distribution.

Two factors contribute to the success of these communities' operations. First, both water societies received timely management training from nongovernmental organizations (NGOs) and technical assistance (for construction design and supervision) from the Ministry of Water Development. Second, these organizations worked with the societies to develop a commercial framework (based on paying for water) and a full set of rules, bylaws, and guidelines. Members defined the objectives of society and delineated the rights and responsibilities of each member of the water cooperative and the penalties for noncompliance.

These member-created rules foster ownership and responsibility to the water system. For example, both water societies require that each member contribute a certain amount of labor as partial payment of fees. Cash payment in lieu of labor is actively discouraged by financially penalizing those who pay in cash. In Ngorika an individual would need to pay Ksh 100 in cash to satisfy a day of labor valued at Ksh 25.

Other penalties play a role in keeping the systems commercially viable. Both communities have stringent rules regarding nonpayment of fees or illegal connection to the water system. In Ngorika a member who bypasses a meter may be expelled from the society for life, be forced to pay a large fine, or have to plead her or his case before the general members to be reconnected. Nonmembers are taken to court. Ngorika has had no cases of illegal connection since the society's development, as compared with the earlier illegal connection rate of 20 percent.

Both water societies use disconnection as the penalty for nonpayment of fees, but they try to be flexible on this issue. They will accept partial payments on outstanding balances, and they refrain from disconnecting if a member explains his or her difficulties before defaulting. Reconnection fees are high, which discourages members from taking advantage of leniency.

Both water societies are flourishing. In 1985, when Technoserve's (an NGO) management assistance contract with Murugi-Mugumango ended, the water society had Ksh 500,000 in the bank and about 20 km of main and distribution pipeline with more than fifty individual connections. Since then 60 km of main piping have been laid and 1,160 members have obtained metered connections to the system. The society has built an office complex, employs 18 permanent staff, and has total liquid and property assets of almost Ksh 800,000. Ngorika is a younger organization, but in 1990 it had almost 60 km of main and distribution pipe, as well as 36 km of connecting pipe. It had 320 individual connections serving 456 people before the society's formation in 1988.

Source: Narayan (1995).

The Philippines: Nongovernmental Organization Participation in Conservation of Protected Areas

Specific approach: public participation

In 1994 the Philippines received a \$20.8 million grant from Global Environmental Facility (GEF) to conduct a seven-year project to conserve the nation's biodiversity heritage. Recognizing that national government alone cannot protect biodiversity, the project was initially designed to form partnerships between the public and private sectors by integrating the assistance of nongovernmental organizations (NGOs) into the management of protected areas (PA) at national and local levels

Recommended by the government, a consortium of national environmental NGOs and numerous other community-based NGOs, the NGO for Integrated Protected Areas, Inc. (NIPA), has been designated to be the recipient of a \$17 million GEF grant (that is, 81 percent of the total) for its role in PA management. The key roles of the NIPA include recruiting and coordinating local NGO support activities, providing technical assistance, monitoring implementation, and assisting in the establishment and implementation of a livelihood fund that will be used to support village socioeconomic projects and employment activities to reduce pressures on the protected areas.

This arrangement is being implemented at 10 priority protected areas of the national integrated

protected area system (a total of 1.25 million ha. of land, wetland, and water areas). Protected Area management boards (consisting of local governments, NGOs, and indigenous people representatives) have been established for nine of these ten areas. Meanwhile, NIPA has recruited local NGOs to assist with field activities, community organizing, and strengthening of protected area management boards. Progress in these areas is positive, and there is increased community awareness at the reserve level of the need for conservation and sustainable development activities.

NGO participation, however, is not a panacea for all previous administrative problems in protected area management. The preliminary results of the project implementation have shown similar problems to those that plague government. Multiple layers of administration and management have hindered effective project management and contributed to delays in decisionmaking. There is reluctance for NIPA to prioritize activities and to make decisions, particularly those that may jeopardize relationships with the local NGOs.

Source: Global Environment Facility (1994); The World Bank (1997b).

Senegal: Creating Incentives for Farmer Participation

Specific approach: public participation

Early efforts in Senegal to transfer irrigation system management to farmers by establishing village units showed little success because of unclear plans, timetables, and provisions for transfer, and because of the failure to provide control or incentives for the farmers.

Recognizing these problems the 1990 Bank-assisted Irrigation IV Project required total transfer of operation and maintenance to farmers as a precondition for financing rehabilitation works. Getting farmers to agree to take over these systems required considerable negotiation, particularly because they perceived existing irrigation fees as too high, let alone the additional costs and responsibilities of covering full operations and maintenance expenses.

Increasing the control of farmers over irrigation services was the key factor that convinced them to agree to assume responsibility for system management and cost recovery. Farmers demanded the right to hire their own staff, choosing agency operators only if they had performed well, and even then reducing their salaries from the full civil service package. Following the transfer of ownership of rehabilitated operating systems with their infrastructure to farmers, agency staff

would be allowed to enter the schemes only with farmers' permission. To improve farmers' management capacity, manuals were prepared for each system; and training in basic literacy as well as technical and financial skills for organizational leaders was incorporated. Farmers were willing to pay at least part of the training costs.

Although the long-term sustainability of the project is difficult to assess at this stage, the accomplishments to date are impressive. Before the transfer, assessed fees covered only 17 to 21 percent of maintenance and replacement costs, and less than a quarter of these were actually collected. As a result, maintenance suffered, electricity often was not paid for, and system reliability was very poor. After the transfer, farmers paid fees four times as high, covering full operation and maintenance costs and a replacement fund for capital. The benefit to the farmers was greatly improved irrigation reliability. Moreover, because they were able to monitor the pump operators and had an incentive to save on energy costs, electricity requirements were reduced by half. Savings to the government included huge reductions in agency staff costs as farmers took over functions.

Source: Meinzen-Dick, Reidinger, and Manzardo (1995).

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