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Market Based Instruments for Environmental Policymaking in Latin America and the Caribbean: Lessons from Eleven Countries

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Foreword

One of the greatest challenges facing developing countries is to enhance growth while finding the most cost-effective way to reduce negative environmental impacts.

The traditional and most direct approach to environmental management is to impose restrictions, guidelines, penalties, and fees. But this “command-and-control” (CAC) method can be difficult and expensive to implement, monitor, and enforce, especially in countries with weak institutional capacity.

Experience has shown that market-based instruments (MBIs), which broadly speaking provide economic incentives to modify behavior, may be a more effective way to achieve many environmental goals. Though not necessarily less expensive than CAC instruments, MBIs often yield better results by harnessing the powerful cost-benefit motivations of businesses and individuals.

This study of MBIs, focusing on 11 countries in Latin America and the Caribbean, is a work in progress. It is part of a wider effort to disseminate knowledge, share experience, and facilitate the development and use of MBIs throughout the region.

The investigation’s results far exceeded expectations. The authors found that a wide range of MBIs already have been developed and applied in the region, and that most of them represent genuine attempts to adapt the instruments to each country’s individual economic, social, and cultural characteristics. Very interesting MBI cases were reported and a clear picture was drawn of the current status of MBI enforcement and the problems these instruments face.

Gradualism and flexibility emerged as fundamental issues in successful implementation of MBIs. Also, information-

building and information-sharing were identified as key factors that promote intra- and intergovernmental integration and public participation, thereby helping to remove legal and political barriers and merge institutional strengths.

Future work will look more closely at valuing the quantitative costs and benefits of various types of MBIs in different economic, administrative, and political contexts. This will provide clearer guidance on which MBIs are most appropriate for specific conditions and policy objectives.

With support from the Economic Development Institute (EDI), the World Bank has held three regional workshops (in 1995, 1997, and 1998) as part of its broader initiative on MBIs in Latin America and the Caribbean, and will continue to sponsor in-country workshops in the future. In addition, an internet seminar was organized that focused on fostering greater regional cooperation and coordination on environmental issues and MBIs, and providing further knowledge on institutional structure, MBIs, and efficient resource management.

The purpose of this multifaceted dissemination strategy (of which this study is one element) is to:

- STIMULATE ideas on how MBIs can be further introduced into environmental policymaking;
- LEARN cross-sectoral, country-specific approaches to cost-effective pollution control and voluntary compliance;
- IDENTIFY specific cost-effective programs and interventions that engage the community, businesses, and government agencies in improving environmental quality.

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Preparation of the report relied extensively on a series of background and related papers initiated in early 1995, as well as on helpful consultations and insights that were received from two workshops, one in 1995 in Miami, Florida with the authors of the country studies, and another in Buenos Aires, Argentina in 1997 supported by EDI (Economic Development Institute of the World Bank) involving World Bank staff, government officials, and representatives from the private sector, academia, and nongovernmental organizations (NGOs). The names of the participants and the list of background and related papers are provided in the Bibliographical Note; an appendix of Background Paper Summaries is also included.

Good planning and design made the July 1997 seminar in Argentina focused and productive:

- The seminar brought together a highly qualified group of participants with experience in using economic instruments and working on Bank projects. This fostered a rich dialogue between Bank staff, partner institutions, and other participants within the context of a shared community of practice.
- Participants were able to provide examples of good (and not so good) practices derived from actual experience. This permitted a smooth transition between modules and purposeful interaction with other practitioners—all from Latin America.
- The seminar focused on the desire expressed by Latin American countries engaged in institu-

tional, regulatory, and market reforms to attain a better understanding of the linkages between institutional structure and cost-effective pollution control.

The major outcomes of the seminar were:

- Recognition that use of economic instruments is at the top of the environmental management agenda in Latin America because of the limited performance of command-and-control measures and the need to generate earmarked revenue.
- A clear understanding of the current status of enforcement problems in selected Latin American and Caribbean countries. Most of the cases of economic instruments that were discussed provided good examples of tailoring incentives to fit the particular economic and cultural characteristics of each country.
- An understanding that economic instruments are tools to solve problems and not an end in themselves. For example, Chile's air pollutant trading experience was discussed as an instrument to solve metropolitan air pollution problems and not as a study of Chile's policies. Others who had experience with similar air pollution problems then contributed their views within this context. Consensus was also reached on seeing economic instruments not as replacing command-and-control approaches but rather as complementing direct regulation.
- Confirmation that the Bank, through its economic and sector work and environmental technical assistance projects, should take a leadership position in promoting economic instruments for environmental policymaking in the region.
- Broadened understanding of issues concerning the use of economic instruments, particularly by sharing participants' experiences as well as comparing them with the use of such instruments in the OECD countries and Asia. The seminar also permitted the participants to update country case studies, and new examples were presented for Colombia and Ecuador.

Abstract

This paper summarizes a series of country studies addressing the use of market-based instruments (MBIs) and command-and-control (CAC) measures for environmental management in Latin America and the Caribbean. MBIs can be an important means for introducing added efficiency to existing CAC mechanisms. However, the scope of MBIs must match countries' institutional capacity to implement them. MBI approaches that introduce *gradual and flexible reforms* are therefore more likely to succeed within the current regional context of ongoing institutional changes. Revenue collection is often a key function of

MBIs, but this in itself does not lead to successful environmental management. These revenues must be *channeled to local authorities* so that they can build the institutional capacity required to effectively implement MBIs. Finally, international donor agencies are prone to recommend OECD solutions without considering local institutional conditions, and the flow of information regarding MBIs has mostly been from "North" to "South." This study seeks to share experiences, successes, and difficulties in the use of MBIs by countries throughout the region, and to promote a beneficial "South-South" dialogue on these issues.

Abbreviations and Acronyms

BOD	Biological oxygen demand
CAC	Command and control
CAR	Regional autonomous corporation (Colombia)
CNA	National Water Commission (Mexico)
CO	Carbon monoxide
CO ₂	Carbon dioxide
CONAM	National Environmental Council (Peru)
CONAMA	National Environmental Council (Chile)
DMA	Municipal Environment Directorate (Ecuador)
DSW	Domestic solid waste
EA	Environmental assessment
ECORAE	Ecuadoran Institute for Eco-Development in the Amazon Region
*EEC	European Economic Community
EIA	Environmental impact assessment
GDP	Gross domestic product
IBAMA	Brazilian Institute of the Environment and Renewable Natural Resources
IBDF	Brazilian Institute for Forest Development
INDECOPI	National Institute for Defence of Competition and Intellectual Property (Peru)
*INE	(Mexico)
ISO	International Standards Organization
ISW	Industrial solid waste
MARNR	Ministry of Environment and Natural Resources (Venezuela)
MBI	Market-based instrument
MBR	Market-based reform
MCMZ	Mexico City Metropolitan Zone
MinAmbiente	Ministry of Environment (Colombia)
MMA	Ministry of Environment and Legal Amazonia (Brazil)
NAFTA	North American Free Trade Agreement
NGO	Nongovernmental organization
NEP	National Environmental Policy Law 6938 (Brazil)
NO _x	Nitrogen oxide
NRCA	Natural Resources Conservation Authority (Jamaica)
NWC	National Water Commission (Jamaica)
OECD	Organization for Economic Cooperation and Development
OMN	Official Mexican Norm
*PM-10	Fine particulate matter (diameter of 10 microns or less)
*PROFEPA	(Mexico)
PROMAR	Project for Wastewater Management and Coastal Pollution Control (Peru)
SEDAPAL	Lima Water Company (Peru)
SEMA	Special Secretariat for the Environment (Brazil)
SISNAMA	National Environmental Management System (Brazil)
SO ₂	Sulfur dioxide
SUDEPE	Superintendent of Fisheries Development (Brazil)
TSP	Total suspended particles
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNIDO	United Nations Industrial Development Organization
USEPA	United States Environmental Protection Agency

Summary

In general, environmental policies try to reduce environmental degradation at the lowest possible social cost. A key means for achieving this is to somehow align private costs with social costs in such a way that “externalities” become part of decisionmaking. Market-based instruments (MBIs) are receiving increased attention in many countries as a way to improve environmental quality.

MBI approaches span a wide range of potential mechanisms, and the literature lists literally hundreds of individual instruments. At one extreme, they include fines or sanctions that are linked to traditional command-and-control (CAC) regulations. At the other extreme, they include laissez-faire approaches that depend on consumer advocacy or private litigation to provide incentives for improving environmental management. Between these extremes are the more familiar tax-and-subsidy approaches as well as less commonly used mechanisms that rely on traded property rights. All of these approaches, in their own fashion, attempt to internalize environmental costs.

Market-Based Instruments Are Gaining Wider Application	
	Barbados Bolivia Brazil Chile Colombia Ecuador Jamaica Mexico Peru Trinidad and Tobago Venezuela
Credit Subsidies	● ● ● ● ●
Tax/Tariff Relief	● ● ● ● ● ● ●
Deposit-Refund Schemes	● ● ● ● ● ● ● ● ● ● ●
Waste Fee and Levies	● ● ● ● ● ● ● ● ● ● ●
Forestry Taxation	● ● ● ● ●
Pollution Charges	● ● ● ● ● ● ● ● ● ● ●
Earmarked Renewable Resource Taxes	● ● ● ● ● ● ● ● ● ● ●
Earmarked Conventional Tax Levy	● ● ● ● ● ● ● ● ● ● ●
Tradable Permits	○ ● ● ● ● ● ● ● ● ● ● ●
Eco-Labeling	● ● ● ● ● ● ● ● ● ● ●
Liability Instruments	● ● ● ● ● ● ● ● ● ● ●

● In Place
○ Being Introduced

There is by no means a single standardized definition of an MBI. The definition used in this study builds on the commonly held understanding that an MBI must, foremost, attempt to align private costs with social costs to reduce negative environmental externalities. The particular strength of an MBI then depends on the degree of *flexibility* that a polluter has in achieving a given environmental target. A “weak” MBI essentially dictates through regulation the type of process that must be used; failure to comply results in economic sanctions. A “strong” MBI would allow market forces to determine the best way to meet a given standard or goal. Flexibility is operationalized by equating it to the level of decentralization that occurs in transferring social (or state) decisions to the private (individual) level. A strong MBI thus decentralizes decisionmaking to a degree that the polluter or resource user has a maximum amount of flexibility to select the production or consumption option that minimizes the social cost of achieving a particular level of environmental quality.

A commonly held belief is that strong MBIs are more economically efficient and environmentally effective than weak MBI or CAC approaches. The theoretical literature shows that by providing incentives to control pollution or other environmental damages, MBIs have lower private compliance costs and can provide much-needed revenue for local government coffers. These factors have been largely responsible for the early enthusiasm for using MBIs. In practice, however, many countries are finding that administrative costs associated with MBIs may actually be higher. Monitoring requirements and other enforcement activities characteristic of CAC measures still are necessary for MBIs, but additional administration efforts may also be required to cope with the design and institutional changes arising from MBI application. Recognition of this extra institutional burden is one of the main subjects of this study.

The main purpose of this work is to investigate the use of MBIs in the Latin American and Caribbean context. The investigation covers a panel of 11 countries (Barbados, Bolivia, Brazil, Chile, Colombia, Ecuador, Jamaica, Mexico, Peru, Trinidad and Tobago, and Venezuela) and a cross-section of issues (water supply and abstraction, water quality, air quality, energy, solid and liquid waste management, toxic substances, noise, and agriculture) within an urban setting.

Key Findings: Existing Market-Based Instruments

The review revealed some general conclusions that applied to the sample of study countries as a whole.

There has been substantial experimentation with MBIs in Latin America and the Caribbean. MBIs across a wide range of mechanisms have been developed and applied in all of the countries investigated.

The primary historical role of MBIs in the region is to raise revenue. The major impetus behind using many of the MBIs in Latin America and the Caribbean has been to raise revenue. Other potential objectives—such as reduction of environmental impacts or improving the cost-effectiveness of regulations—have been under-emphasized or not attained.

Public awareness is low and uncertainty is high. Weak participation among stakeholders, largely inherited from authoritarian regimes of past decades, poses a real constraint to the rapid implementation of complex MBI mechanisms.

Exploding a Myth: MBI or CAC?

A common assumption regarding MBIs is that they form a ready substitute for outdated or inefficient CAC regulatory procedures. This substitution opportunity is not shared in Latin America and the Caribbean. For a number of reasons, the implementation of MBIs will not provide a quick panacea for the problems often associated with CAC procedures; MBIs also require strong institutions, adequate legislation, and effective monitoring and enforcement. Although there is definite scope for careful and timely implementation of certain MBIs, significant constraints will persist in three areas.

Institutional constraints to MBI implementation remain pervasive. Most of the countries surveyed had existing legislation that established environmental institutions and that provided for the use of economic incentives in environmental management. On paper, therefore, everything is in place to use MBIs. In reality, however, institutional weaknesses—such as underfunding, inexperience, unclear jurisdiction, or lack of political will—limit the effective implementation of MBIs.

Administrative intensity of MBIs remains high. Monitoring requirements, legal design requirements, public consultation needs, and enforcement or collection needs of MBIs are not always noticeably different from strict CAC approaches. MBIs are therefore not a substitute for weak institutions or for CAC; some regulatory elements are inevitably required, and a strong institutional base is a prerequisite to MBI implementation.

Market-based reforms (MBRs) may hinder or help MBI implementation. Macroeconomic reforms such as

trade liberalization, public sector commercialization, and fiscal reform are key features of recent experience in Latin America and the Caribbean. In some cases, these MBRs provide an economic environment that is conducive to implementing MBIs; this is most often the case where removal of subsidies more closely aligns private costs with social costs. In other instances, however, MBIs may be inconsistent with ongoing reforms; deregulation often strikes down regulations that are necessary for MBIs to operate, and public sector reforms may limit the amount of institutional strengthening that is required for MBIs to operate effectively. In either event, failure to take into account the linkages between MBIs and MBRs inevitably undermines MBI implementation.

Specific Design Issues and Opportunities

The review also provided insights into five specific design areas.

Distribution, poverty, and tax incidence. The social dimensions of MBIs—as expressed through their potentially regressive nature or repercussions—is a significant concern in the region, which has one of the highest levels of inequality in the world.

Perverse incentives. Some of the MBIs reviewed had demonstrably perverse effects. For example, while the intent of a water pollution charge may be to reduce pollution, it may increase pollution if it is based on effluent concentrations.

Tradable permits. There are opportunities for introducing tradable permits in Latin America and the Caribbean; a major constraint to their implementation is finding an equitable initial allocation and trading regime that is consistent with local market reform processes.

Earmarking. Specifically earmarking revenues from MBIs to explicit environmental objectives is gaining increased favor in the region. The programs are most successful where (a) taxes or incentives are linked to existing collection mechanisms, and (b) amounts are made available to decentralized authorities for environmental programming or for institutional strengthening.

Advocacy. Consumer advocacy through voluntary measures and public pressure (at times linked to formal or voluntary liability instruments) plays a potentially critical role as an MBI in Latin American and Caribbean countries. To a large degree, these mechanisms are interpreted as substitutes for historically weak institutional capacity.

Future Focus

Because the countries and issues reviewed were not a complete cross-section of all Latin America and the Caribbean, the conclusions drawn in this study are largely indicative rather than definitive prescriptions. The MBI experience does, however, point to some important areas for future work.

First, in some areas MBIs can be an important means, if not the only one, for introducing some added efficiency to existing CAC mechanisms. The scope of the MBIs must, however, match the institutional capacity to implement them. To this extent, MBI approaches that introduce *gradual and flexible reforms*

are more likely to be consistent with ongoing institutional changes.

Second, while the revenue collection task of MBIs has been highlighted, there still is a strong need to *channel revenues to local authorities* to assist in building institutional capacity.

Finally, international donor agencies are most prone to recommend OECD solutions with little regard to institutional issues; to date, most of the information flow regarding MBIs has been of a “North-South” variety. An important opportunity has been missed to share environmental management experiences among countries in the region. Increased *information sharing* in a “South-South” dialog will benefit all parties.

Resumen

En general, las políticas ambientales intentan reducir la degradación ambiental al costo social más bajo posible. Un medio clave para lograr ésto es, de algún modo, alinear los costos privados con los costos sociales de tal forma que las “externalidades” lleguen a ser parte integral de la toma de decisiones. En muchos países los instrumentos de mercado están recibiendo una creciente atención con el fin de mejorar la calidad ambiental.

Las aproximaciones basadas en instrumentos de mercado comprenden una amplia gama de mecanismos potenciales, y la literatura lista centenares de instrumentos particulares. En un de extremo, ellos incluyen multas o sanciones que se vinculan con las regulaciones tradicionales de “comando y control” (CAC). En otro extremo, ellos incluyen enfoques basados en el “laissez-faire” que requieren la participación activa del consumidor o el litigio privado como formas de incentivos para mejorar la gestión ambiental. Entre estos dos extremos, es posible encontrar aproximaciones más familiares basadas en “impuestos y subsidios” así como los mecanismos

menos familiares basados en derechos de propiedad comerciables. Todas estas aproximaciones, en su propio estilo, intentan internalizar los costos ambientales.

No hay una definición standard particular de un instrumento de mercado. La definición usada en este estudio se construye sobre el entendimiento usualmente sostenido de que un instrumento de mercado debe, primero, intentar equiparar o alinear los costos privados con los costos sociales para reducir las externalidades. La “fortaleza” particular de un instrumento de mercado entonces depende del grado de *flexibilidad* que un contaminador tiene para lograr una meta ambiental determinada. Un instrumento de mercado “débil” esencialmente dicta mediante la regulación que tipo de proceso debe usarse; el fracaso en el cumplimiento de la norma o regulación resulta en sanciones económicas. Un instrumento de mercado “sólido” permitiría que las fuerzas del mercado determinen la mejor manera de cumplir con una meta o norma determinada. La “flexibilidad” es operacionalizada si se ve como equivalente al nivel de descentralización que ocurre al transferir las decisiones sociales (o públicas) al nivel privado (o individual). Así, un instrumento de “mercado sólido” descentraliza la toma de decisiones al extremo en que el contaminador o el usuario del recurso tiene un grado máximo de flexibilidad para seleccionar la opción de consumo o producción que minimiza el costo social de lograr un nivel particular de calidad ambiental.

Una creencia usualmente sostenida es que los instrumentos de “mercado sólidos” son económicamente más eficientes y ambientalmente más efectivos que los instrumentos de “mercado débiles” y que las aproximaciones de comando y control. La literatura teórica muestra que, al proveer incentivos para controlar la contaminación u otros daños ambientales, los instrumentos de mercado han abaratado los costos privados de cumplimiento y pueden proveer gran parte de las rentas necesitadas en las arcas de los gobiernos locales. Estos factores han sido largamente responsables del entusiasmo inicial por usar instrumentos de mercado. En la práctica, sin embargo, muchos países están encontrando que los costos administrativos asociados con los instrumentos de mercado pueden ser altos. Los requerimientos de monitoreo y las demás actividades para asegurar que las leyes son observadas son similares a aquellos requerimientos asociados con los instrumentos de comando y control. Asimismo, pueden requerirse esfuerzos adicionales de administración para

Los instrumentos de mercado están experimentando una mayor aplicación en América Latina

	Barbados	Bolivia	Brasil	Chile	Colombia	Ecuador	Jamaica	México	Peru	Trinidad y Tobago	Venezuela
Subsidios crediticios	●	●	●	●	●	●	●	●			
Exoneración tributaria/arancelaria	●	●	●	●	●	●	●	●			●
Esquemas de depósito-devolución	●	●	●	●	●	●	●	●	●	●	●
Cobros e impuestos por desechos	●	●	●	●	●	●	●	●	●	●	●
Impuestos forestales		●	●		●						●
Cargos por contaminación			●		●		○	●			
Impuestos a la explotación de recursos naturales renovables cuya recaudación es para un fin específico			●		●	●					
Recaudación convencional de impuestos para un fin específico			●		●			●			
Permisos comerciables		○		●					○		
Etiquetado ecológico (“verde”)	●	●	●	●	●	●	●	●			
Instrumentos de responsabilidad	●				●						●

● En aplicación
○ Bajo introducción

abordar el diseño y los cambios institucionales surgidos a partir de la aplicación del instrumento de mercado. El reconocimiento de esta carga institucional adicional es uno de los temas principales de este estudio.

El propósito principal de este trabajo es investigar el uso de instrumentos de mercado en el contexto de América Latina y el Caribe. La investigación cubre un grupo de once países (Barbados, Bolivia, Brasil, Chile, Colombia, Ecuador, Jamaica, México, Perú, Trinidad y Tobago, y Venezuela) y temas transectoriales (abastecimiento y extracción ilegal de agua, calidad de agua, calidad de aire, energía, gestión de desechos sólidos y líquidos, sustancias tóxicas, ruido, y agricultura) dentro del ámbito urbano.

Hallazgos claves: instrumentos de mercado existentes

La revisión reveló algunas conclusiones generales que se aplicaron a la muestra de países estudiados como un todo.

Ha habido una experimentación considerable con instrumentos de mercado en América Latina. En todos los países investigados se han desarrollado y aplicado instrumentos de mercado a través de una gama amplia de mecanismos.

El papel histórico principal de los instrumentos de mercado en América Latina es generar rentas. En América Latina el impulso principal detrás del uso de muchos de los instrumentos de mercado ha sido generar rentas. Otros objetivos potenciales —tales como la reducción de los impactos ambientales o la mejora en el costo-efectividad de las regulaciones— han sido pobremente enfatizados o no se han logrado.

La conciencia pública es baja y la incertidumbre es alta. La débil participación entre los sectores de la sociedad involucrados, mayormente heredada de regímenes autoritarios de décadas pasadas, pone una limitación real a la rápida implementación de instrumentos de mercado complejos.

Refutando un mito: ¿instrumentos de mercado o comando y control?

Un supuesto común con respecto a los instrumentos de mercado es que ellos constituyen un sustituto para los procedimientos regulatorios de comando y control obsoletos o ineficientes. Esta oportunidad de sustitución no es compartida en América Latina. Debido a un número de razones, la implementación de instrumentos de mercado no proporcionará una rápida panacea para los problemas frecuentemente asociados con los procedimientos de comando y control; los instrumentos de mercado también requieren instituciones fuertes,

legislación adecuada, y un efectivo monitoreo y verificación del cumplimiento de la ley. Aunque hay un alcance definido para la implementación cuidadosa y oportuna de ciertos instrumentos de mercado, sin embargo, persistirán limitaciones importantes en tres áreas.

Existen restricciones institucionales generalizadas a la implementación de instrumentos de mercado. La mayoría de los países estudiados tiene una legislación existente que establece instituciones ambientales y contempla el uso de incentivos económicos en la gestión ambiental. En el papel, por lo tanto, todo está listo para usar instrumentos de mercado. En la realidad, sin embargo, las debilidades institucionales —tales como déficit presupuestal, inexperiencia, jurisdicción o competencias poco claras, o la falta de voluntad política— limitan la implementación efectiva de instrumentos de mercado.

La intensidad administrativa de los instrumentos de mercado es alta. Los requerimientos de monitoreo, los requerimientos de diseño legal, las necesidades de consulta pública, y las necesidades de recaudación o verificación del cumplimiento de la ley asociadas con la implementación de instrumentos de mercado no siempre son marcadamente diferentes de requerimientos y necesidades de las aproximaciones estrictas de comando y control. Por lo tanto, los instrumentos de mercado no son un sustituto para instituciones débiles o para instrumentos de comando y control; inevitablemente se requiere de algunos elementos regulatorios; y una base institucional fuerte es un prerequisite para la implementación de instrumentos de mercado.

Las reformas basadas en el mercado pueden estorbar o apoyar la implementación de instrumentos de mercado. Las reformas macroeconómicas tales como la liberalización del comercio, la comercialización del sector público, y la reforma fiscal son características importantes de la reciente experiencia latinoamericana. En algunos casos, estas reformas del mercado proporcionan un ambiente económico que es apropiado para implementar instrumentos de mercado; este es frecuentemente el caso donde la eliminación de subsidios hace que los costos privados estén mas cercanos a los costos sociales. En otros casos, sin embargo, los instrumentos de mercado pueden ser inconsistentes con reformas en marcha; la desregulación frecuentemente relaja las regulaciones necesarias para que operen los instrumentos de mercado, y las reformas del sector público pueden limitar el grado de fortalecimiento institucional requerido para que los instrumentos de mercado operen efectivamente. En cualquier caso, la falla en considerar los vínculos entre instrumentos de mercado y reformas de mercado inevitablemente socava la implementación de instrumentos de mercado.

Asuntos relativos al diseño específico de instrumentos de mercado y oportunidades existentes

La revisión también proporcionó conocimientos en cinco áreas específicas relativas al diseño.

Distribución, pobreza e incidencia tributaria. Las dimensiones sociales de los instrumentos de mercado — expresadas a través de su naturaleza o incidencia potencialmente regresiva— es una preocupación importante en América Latina, región que tiene uno de los niveles más altos de desigualdad en el mundo.

Incentivos perversos. Algunos de los instrumentos de mercado revisados de hecho tuvieron efectos perversos. Por ejemplo, mientras la intención de un cargo por contaminación de agua puede ser reducir la contaminación, sin embargo, también puede aumentar la contaminación si dicho cargo está basado en las concentraciones del efluente.

Permisos comerciables. Hay oportunidades para introducir permisos comerciables en América Latina; una limitación importante para su implementación es encontrar una asignación inicial equitativa y un régimen de intercambio (de los permisos) que es consistente con los procesos locales de reforma del mercado.

Destino específico de los fondos recaudados. El destinar las rentas provenientes de los instrumentos de mercado específicamente para objetivos ambientales explícitos está ganando fuerza en América Latina. Los programas son más exitosos cuando (a) los impuestos o incentivos están vinculados a los mecanismos de recolección existentes, y (b) los montos son puestos a disposición de las autoridades descentralizadas para programas ambientales o para el fortalecimiento institucional.

Defensa del consumidor. La defensa hecha por el consumidor mediante medidas voluntarias y la presión pública (a veces vinculada a instrumentos de responsabilidad voluntaria o formal) juega un papel potencialmente crítico como un instrumento de mercado

en los países de América Latina. En un mayor grado, estos mecanismos son interpretados como sustitutos para la capacidad institucional históricamente débil.

Enfasis futuro

Debido a que el grupo de países y los temas revisados no representaron una sección transversal completa al no cubrir todo América Latina y el Caribe, las conclusiones alcanzadas en este estudio son mayormente sugerencias y no tanto prescripciones definitivas. La experiencia con instrumentos de mercado, sin embargo, apunta a algunas áreas importantes para un futuro trabajo.

Primero, en algunas áreas los instrumentos de mercado pueden ser un medio importante, si no el único, para introducir alguna eficiencia adicional a los instrumentos de comando y control existentes. El alcance de los instrumentos de mercado debe, sin embargo, equipararse con la capacidad institucional para implementarlos. En este sentido, las aproximaciones basadas en instrumentos de mercado que introducen *reformas graduales y flexibles* probablemente serán más consistentes con los cambios institucionales en marcha.

Segundo, mientras la tarea de recaudación de rentas de la aplicación de instrumentos de mercado ha sido resaltada, todavía existe una fuerte necesidad de canalizar las rentas a las autoridades locales para ayudarlas a construir la capacidad institucional requerida.

Finalmente, las agencias donantes internacionales mayormente están dispuestas a recomendar las soluciones de la Organización para la Cooperación y el Desarrollo Económico (OCDE) con poca consideración a los asuntos institucionales. A la fecha gran parte del flujo de información con respecto a instrumentos de mercado ha sido del tipo “norte-sur”. Se ha perdido una oportunidad importante para compartir experiencias de gestión ambiental entre los países latinoamericanos. Un mayor intercambio de información en un diálogo “sur-sur” beneficiará a todas las partes.

1. Introduction

Background

In 1989 the Organisation for Economic Co-operation and Development (OECD) identified more than 100 different types of market-based instruments (MBIs) at a time when such environmental management policies were first being considered in many countries (OECD 1989). Examples of these included packaging taxes, effluent taxes and charges, capital or operating subsidies, tradable permits, deposit-refund schemes, performance bonds, liability instruments, and many others. Early OECD experiences showed that relying on MBIs can (a) decrease compliance costs by industry, (b) decrease administrative burdens on the public sector, (c) improve environmental conditions in urban air quality and urban water quality, (d) decrease emissions and effluents of toxic and nontoxic wastes, (e) improve human health conditions, which in turn improves economic productivity and decreases health care costs, and (f) contribute to institutional sustainability by supporting cost-effective public sector institutions that cooperate with the private sector and nongovernmental organizations.

More recent reviews by the OECD indicate that many of these are also gaining favor in developing countries (OECD 1991). The use of MBIs has also been endorsed within the 1992 Rio Declaration on Environment and Development as an important component of sustainable development (Box 1.1).

But there is increasing evidence that, as with command-and-control (CAC) procedures, MBIs are facing constraints—even in industrial countries—by limited institutional capacity to oversee them (OECD 1994a, 1994b; Scott and others 1995). Many countries are therefore taking a closer look at how MBIs might be applied.

The purpose of this work is to review the practical application of MBIs in the context of Latin America and the Caribbean. A panel was selected of 11 countries—Barbados, Bolivia, Brazil, Chile, Colombia, Ecuador, Jamaica, Mexico, Peru, Trinidad and Tobago, and Venezuela—in which to investigate the current use of MBIs in the region and to determine whether there are particular opportunities or constraints in their implementation. The study provides input to various countries' planning processes and provides a mechanism

Box 1.1 The Road from Rio

Solutions to environmental problems require improved management of the developmental process, with a greater emphasis on internalizing environmental costs. Policymakers face the challenge of identifying policies and strategies that make it in everyone's economic interest to utilize environmentally sound products and services. Market-based systems of incentives and disincentives that motivate economic behavior are emerging as powerful, cost-effective methods of achieving environmental goals.

The internalization of environmental costs in sustainable development, and the role of economic instruments in this process, has become well-entrenched in documents emerging from the Earth Summit in 1992:

“National authorities should endeavor to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.”

—*Principle 16, Rio Declaration, United Nations, 1992*

“Governments are encouraged to apply economic and regulatory instruments . . . to support the principle that generators of waste pay for their disposal.”

—*Chapter 21, Agenda 21, United Nations, 1992*

“Countries are encouraged to develop fiscal and policy incentives and other measures to encourage environmentally sustainable imports and local products with low waste or degradable waste content.”

—*Programme of Action on the Sustainable Development of Small Island Developing States, United Nations, 1994*

for information sharing within the countries of Latin America and the Caribbean.

In each country, two or three “high-priority areas” were selected. These were selected from a list that included issues such as water supply and abstraction, water quality, energy, air quality, solid and liquid waste management (including toxic substances), noise, and urban agriculture. Because there were limits to the number of countries selected and the number of issues addressed, many of the conclusions and recommendations drawn in this work should be regarded as indicative rather than definitive and prescriptive.

The Urban Challenge

About 50 percent of the world’s population lives in urban centers, and in most parts of the world this proportion is increasing as people are attracted to the opportunities and services offered by such centers. But urbanization has, in both industrial and developing countries, often created a concomitant rise in congestion, crime, urban poverty, and environmental degradation that has stymied the best efforts of city planners. Responses to this environmental and social degradation have been mixed. A small number of cities are starting to come to grips with the full extent of the challenge of addressing these myriad urban problems. Others attempt to address the problems through low-cost, piecemeal solutions: for example, Jakarta city administrators recently announced a ban on highly polluting (but highly popular) motorized three-wheelers to reduce congestion and pollution. Many jurisdictions simply ignore the problems.

The decline in quality of life in some cities has led some to argue that the process of urbanization should itself be discouraged. At one extreme this may even imply a complete *laissez-faire* approach that allows urban quality to decline to the extent that people are eventually forced out by economic necessity; this occurred, for example, in Lagos and some other cities where urbanization declined for a brief period as the urban poor moved to rural areas to escape urban poverty. But for the most part the pressures that lead to urbanization are expected to persist well into the next century, and the well-being of countries and economies will depend on the existence of vibrant urban centers. The challenge is thus not to prevent urbanization, but to manage it in a way that is consistent with the sustainable development goals of the country as a whole.

Many studies have been done of how best to manage urban problems (Davey 1993; Kingsley and others 1994; McGranahan and Songore 1994; Leitmann 1995). Such studies generally concur that:

- *Urban poverty and environmental degradation are strongly linked.* The poor pay more for environmental services, have poorer access, and often live in the most hazardous areas.
- *Spatial location provides important opportunities and constraints to sound management.* Concentration of industries can facilitate cost-effective pollution control, while a highly dispersed informal sector can be mostly unmanageable.¹
- *High-income cities have different problems from low-income cities.* All cities are plagued by surface water pollution and inadequate solid waste management. Basic sanitation tends to be a common problem for low-income cities, whereas hazardous waste management and ambient air pollution control are typical high-priority problems for high-income cities.
- *Environmental management is complex and institutions are usually not synchronized.* Overlapping jurisdictions and lack of accountability will often undermine management efforts.
- *Urban problems often have impacts that reach far beyond urban areas.* Cities draw in resources and dispose of wastes in surrounding areas, degrading environmental quality in these and “peri-urban” and rural zones.

These observations are simply a synopsis of the growing realization that achieving “urban sustainability” will require concurrent management of economic, environmental, social, and institutional change. To be implemented successfully, MBIs also must conform to goals within each of these dimensions.

In Latin America, the need for an urban focus becomes clear, however, because of the health benefits that could be derived from cleaning up pollution in urban areas (Table 1.1). The estimates clearly show that (a) urban pollution problems are a relevant priority in environmental management, (b) the higher health costs due to water pollution indicate that sanitation is still the main environmental priority, and (c) air pollution problems cannot be neglected.

A central focus of all of the country studies was therefore to investigate the use of MBIs within an *urban* context. But in many cases the review of MBIs also showed that they were being applied in areas dealing

1. Recent work suggests, however, that the relative size and extent of the informal sector shrinks with higher income levels (World Bank 1995e, p. 35); this implies that interventions for environmental management of some components of this sector may be of lower priority.

Table 1.1 Cost of Health Impacts Associated with Urban Pollution in Latin America

Country	Area Covered by Estimate	Annual Cost of Health Impacts (US\$ million)	
		Water Pollution	Air Pollution
Brazil	Nationwide	130–389	—
	São Paulo, Rio de Janeiro, and Cubatão	—	2.4–3.5
Chile	Santiago	96–149	100
Colombia	Bogota	16.9	4.9–15.6
Ecuador	Pichincha, Guayas, and El Oro	133	—
	Quito	—	57
Mexico	Nationwide	3,600	—
	Mexico City	—	1,077
Peru	Nationwide	500–1,000	—

— Not available.

Note: Similar methods were used in calculating the costs for different countries and cities. The estimates are based on foregone output caused by cases of morbidity and mortality plus respective hospital costs. Each country study reflects local conditions corresponding to (a) regional coverage consistent with data availability, (b) dose-response functions to correlate pollution level to health impacts, (c) diseases according to highest incidence, (d) rates of discount reflecting local productivity, and (e) local income levels for foregone output.

Source: Estimates by Serôa da Motta and Mendes 1995a, 1995b, 1996.

with mining, petroleum, or renewable resource development.

Outline

The general project methodology is to use a case study approach that highlights the major trends and developments in managing urban environmental quality. Within high-priority areas, this helps identify potential regulatory and market-based mechanisms (for example, pricing interventions) that are socially, environmentally, and economically beneficial (these are often referred to as “win-win-win” strategies.)

The specific scope of the work is to compare—in the urban sector—different environmental management methods, focusing on options that use some form of MBI, and where possible comparing these options to highly centralized regulatory approaches. One concern is that in Latin America and the Caribbean, as in many developing countries, the institutional capacity to implement a wider range of management techniques is a major constraint to implementing environmentally effective and economically efficient reform. The study therefore address this concern by analyzing the institutional requirements in light of institutional capacity constraints.

A key audience for this work are the practitioners involved in institutional design, as well as decisionmakers working within such institutions in Latin America and the Caribbean.

In all of the case studies some common themes have been pursued, and a consistent methodology was applied to analyze conditions.² This paper summarizes and interprets the findings as follows:

- Chapter 2, *Regulations, Market-Based Instruments, Macropolicies*, provides a general framework for investigating the use of MBIs in the Latin American and Caribbean context. MBIs are defined and a classification of the different approaches is provided. The issue of linking MBIs to general market-based reforms (MBRs) through the macroeconomic policy regime is also introduced here.
- Chapter 3, *Institutional Frameworks in Latin America and the Caribbean*, describes the legislative and institutional setting in the study countries. Major lessons are drawn within a context of promoting “institutional sustainability.” The key theme of this chapter is that various institutional constraints will continue to plague implementation of environmental management whether it is in the form of a CAC or strong MBI approach.
- Chapter 4, *Market-Based Instruments in Latin America and the Caribbean*, describes the current experience with MBIs in the study countries. It

2. Executive summaries of the country studies are appended to this report. The full studies are available from the country study authors or from the project task manager, Richard M. Huber (LCSES).

demonstrates the relatively wide experimentation with MBIs, and their focus as a revenue-generating device. It also reveals the importance of strong institutions and consistent MBRs in making implementation of MBIs successful.

- Chapter 5, *Additional Issues in Design of Market-Based Instruments*, addresses selected MBI design issues that often arise in the theoretical literature and that have additional interesting dimensions in the Latin American and Caribbean context. In par-

ticular, this chapter summarizes findings about the (a) social issues relating to distribution, poverty, and tax incidence, (b) prevalence of “perverse incentives,” (c) role of tradable permits, (d) role of earmarking, and (e) role of legal redress through advocacy.

- Chapter 6 provides concluding remarks relating to the main lessons extracted from the country studies.

2. Regulations, Market-Based Instruments, and Macropolicies

This chapter provides a general framework for investigating the use of MBIs in Latin America and the Caribbean. MBIs are defined and a classification of the different approaches is provided. The issue of linking MBIs to general market-based reforms (MBRs) through the macroeconomic policy regime is also introduced here.

Regulations and Market-Based Instruments—A Framework

There are a number of general economic principles that form the background philosophy for an economically and environmentally sustainable strategy. The two most often enunciated include the polluter-pays and precautionary principles. The polluter-pays (or user-pays) principle assigns rights that allow internalization of costs that would not normally be incurred by the polluter or user (externalities). The precautionary principle provides a mechanism for dealing with the uncertainty of impacts (Perrings 1991; O’Riordan and Cameron 1995).

A number of mechanisms have been developed and used to promote these principles (Asian Development Bank 1990a, 1990b, 1990c; Tietenberg 1990; Eröcal 1991; Kreimer and others 1993; Bates and others 1994). At one extreme they include fines or sanctions that are linked to traditional command-and-control (CAC) regulations. At the other extreme they include laissez-faire approaches that require consumer advocacy or private litigation to act as incentives for improving environmental management. In between we find more familiar tax-and-subsidy approaches as well as the less familiar mechanisms relying on traded property rights. All of these approaches, in their own fashion, attempt to internalize environmental costs.

There is by no means a single standardized definition of an MBI. The definition used in this study builds on the commonly held understanding that an MBI must, foremost, attempt to align private costs with social costs to reduce externalities (Panayotou 1995). Within this definition, the particular strength of an MBI then depends on the degree of *flexibility* that a polluter has in achieving a given environmental target. A very “weak”

MBI essentially dictates through regulation the type of process that must be used; failure to comply results in economic sanctions. A very “strong” MBI would allow market forces to determine the best way to meet a given standard or goal.

Flexibility is operationalized by equating it to the level of decentralization that occurs in transferring social (or state) decisions to the private (individual) level. A strong MBI decentralizes decisionmaking to a degree that the polluter or resource user has a maximum amount of flexibility to select the production or consumption option that minimizes the social cost of achieving a particular level of environmental quality;

profit- or utility-maximizing behavior in this case also generates a “lowest social cost” outcome. This study thus focuses on the *cost-effectiveness* of *reducing externalities* in defining an MBI. This interpretation provides scope both for internalizing the costs or benefits of any externality while allowing the freedom of choice that will per-

mit users to select an appropriate technology for optimizing environmental quality.

Table 2.1 illustrates the broad spectrum of instruments that might be available, all of which implicitly or explicitly have some incentive effect. These fall across a continuum ranging from very strict command approaches to decentralized approaches that rely more on market or legal mechanisms. Even traditional CAC regulations, with heavy fines, create a presumed incentive effect because the polluter would be compelled to comply with the regulations to avoid the sanctions.

Goals of Market-Based Instruments

In principle, therefore, there are a wide range of methods available for attempting to regulate or manage urban environmental quality. Each of these intend to address a variety of goals.

One goal associated with decentralized decision-making relates to *cost-effectiveness*. The asymmetry of information, for example, often implies that private firms are more likely than governments to identify the most cost-effective means for achieving a given level of

“A STRONG MARKET-BASED INSTRUMENT decentralizes decisionmaking to a degree that the polluter or resource user has a maximum amount of flexibility to select the production or consumption option that minimizes the social cost of achieving a particular level of environmental quality.”

– Study Definition

Raising revenue is a dominant focus of MBIs in OECD countries

Box 2.1 OECD Environmental Taxation in the 1980s

The role of environmental taxes has been growing both politically and economically. In the 1980s it was foreseen by many observers that reduced government intervention could lead to a more prominent role for economic instruments, particularly taxes, providing incentives to change polluter behavior.

When MBIs were proposed, they were often regarded as a potential substitute for command-and-control approaches. Moreover, they were frequently touted as having strong incentive effects that could, if properly estimated, be harnessed to achieve a socially optimal level of pollution abatement or environmental degradation. Experience within the OECD, however, shows that neither of these presumed roles of MBIs have been widely applied:

“[OECD surveys indicate that] the role of charges has been extended, although their revenue raising capabilities have remained the dominant function. . . . Although an increasing number of charge schemes show incentive purposes, not much evidence exists that such instruments will replace direct regulation as part of the process towards reducing government intervention.”

Source: OECD 1994b, 1995.

pollution control (Box 2.2). This forms the basis for the common theoretical result that—if one focuses entirely on private costs—strong forms of MBIs are more cost-effective than their weaker counterparts or than CAC approaches (Tietenberg 1992).

Another fundamental goal of most environmental regulatory systems is to *decrease externalities*. Externalities exist where the agent making the production or consumption decision does not bear all of the costs or benefits of this decision. Externalities abound in environmental issues. Pollution disposed of into a waterway may be a low-cost solution to waste disposal for the polluter, but firms and individuals downstream may suffer consequences through higher costs from lost fishery production, higher water treatment costs, lower amenity values (for recreation), or loss of critical drinking water supplies. Most economic incentive structures attempt to transfer some of this cost back to the individual responsible for the decision. A similar situation could exist with environmentally beneficial decisions; a firm that cleans polluted intake water and then discharges clean water after using it in its internal process would, in fact, be creating a positive externality, and in such cases it could be argued that it is optimal to provide subsidies to such a firm in direct proportion to the value of this external benefit.

A third goal that many policymakers have when designing an appropriate economic incentive system is *revenue generation*. There are, however, practical trade-offs to consider between revenue generation and incentive effects. In principle it would be possible to levy a very high charge that effectively discourages all polluting activity. Abatement levels would be very high in such a case, but no revenue would be generated. Similarly, very low charges would generate little revenue and generate little abatement because there is no incentive for firms to reduce pollution. Typically, the abatement–revenue function is an “inverted

U” in which revenue is maximized at some intermediate level of abatement (Box 2.3). A policy decision must be made relating to how much additional revenue (beyond the maximum) a government is willing to give up to generate higher levels of abatement. The answer to this policy question should be related to the marginal benefits of pollution abatement, but in fact it typically is more a function of government budgetary realities that regard such taxes as a convenient means for underwriting environmental management efforts.

Finally, policymakers are continually faced with high levels of scientific *uncertainty* in designing regulatory systems; one goal of intervention is to address uncertainty. This has caused some analysts (Lonergan, Ruitenbeek, and Dearden 1994) to recommend the use of surcharges to

Box 2.2 Firms' Compliance Costs: MBIs versus CAC

A study undertaken for the industrial sector in the state of São Paulo reveals that the use of a presumptive tax for organic matter—to achieve a certain level of total abatement in the state's main river basin—may reduce by 70 percent the total private abatement costs incurred by the sector when compared with a traditional command-and-control approach. The private cost savings, estimated as an annual value of approximately US\$6 million, are paid by firms as taxation for their residual pollution. That tax revenue may be small when compared to other fiscal revenue sources, but it is a source of public revenue that can be used either for other purposes (such as education or health care) or for environmental expenditures.

Source: Serôa da Motta and Mendes 1996.

deal with some of the uncertainties of resource use in a complex system.

Examples of Market-Based Instruments

Within the MBI definition, there are a number of different approaches that might be construed as incentive

Table 2.1 Classification of Policy Instruments Based on Decentralization and Flexibility in Individual Decisionmaking

<-----Minimum Flexibility----->		<----- Moderate Flexibility ----->		<----- Maximum Flexibility ----->	
<--- Maximum Government Involvement --->			<--- Increased Private Initiative --->		
<-Control-Oriented->		<-----Market-Oriented----->		<-Litigation-Oriented->	
<i>Regulations and Sanctions</i>	<i>Charges, Taxes, and Fees</i>	<i>Market Creation</i>	<i>Final Demand Intervention</i>	<i>Liability Legislation</i>	
General Examples					
<u>Standards:</u> Government restricts nature and amount of pollution or resource use for individual polluters or resource users. Compliance is monitored and sanctions imposed (fines, closure, jail terms) for noncompliance.	<u>Effluent or User Charges:</u> Government charges fee to individual polluters or resource users based on amount of pollution or resource use and nature of receiving medium. Fee is high enough to create incentive to reduce impacts.	<u>Tradable Permits:</u> Government establishes a system of tradable permits for pollution or resource use, auctions or distributes permits, and monitors compliance. Polluters or resource users trade permits at unregulated market prices.	<u>Performance Rating:</u> Government supports a labeling or performance rating program that requires disclosure of environmental information on the final end-use product. Performance based on adoption of ISO 14000 voluntary guidelines (for example, zero discharge of pollutants, mitigation plans submitted, pollution prevention technology adopted, reuse policies and recycling of wastes). Eco-labels are attached to “environmentally friendly” products.	<u>Strict Liability Legislation:</u> The polluter or resource user is required by law to pay any damages to those affected. Damaged parties collect settlements through litigation and the court system.	
Specific Examples of Urban Applications					
<ul style="list-style-type: none"> • Pollution standards • Licensing of economic activities • Land use restrictions • Construction impact regulations for roads, pipelines, ports, or communications grids • Environmental guidelines for urban road alignments • Fines for spills from port or land-based storage facilities • Bans applied to materials deemed unacceptable for solid waste collection services • Water use quotas 	<ul style="list-style-type: none"> • Noncompliance pollution charges • Greening of conventional taxes • Royalties and financial compensation for natural resources exploitation • Performance bonds posted for construction standards • Taxes affecting intermodal transport choices • Taxes to encourage reuse or recycling of problem materials (for example, tire taxes and battery taxes) • Source-based effluent charges to reduce downstream water treating requirements • Tipping fees on solid wastes • User charges for water 	<ul style="list-style-type: none"> • Market-based expropriation for construction, including “environmental values” • Property rights attached to resources potentially impacted by urban development (forests, lands, fisheries) • Deposit-refund systems for solid and hazardous wastes • Tradable permits for water abstraction rights, and water and air pollution emissions 	<ul style="list-style-type: none"> • Consumer product labeling (eco-labels) relating to problem materials (for example, phosphates in detergents) • Education regarding recycling and reuse • Disclosure legislation requiring manufacturers to publish solid, liquid, and toxic waste generation • Blacklist of polluters 	<ul style="list-style-type: none"> • Damages compensation • Liability on neglecting firm’s managers and environmental authorities • Long-term performance bonds posted for potential or uncertain hazards from infrastructure construction • “Zero net impact” requirements for road alignments, pipelines or utility rights of way, and water crossings 	

systems.

Public Sector Monopoly

Traditional models of public sector monopoly have argued that an “environmentally friendly” public firm, which looks after all production levels, can be designed such that all of its production decisions are optimal, including those relating to environmental costs and benefits. In theory, no specific MBIs would be required in such a case. In practice, however, analysts typically find that public firms are the least accountable and have little internal incentive to meet even their own environmental standards and guidelines (Serôa da Motta 1991).

Strict Legal Sanctions

Environmental laws in most countries provide—in theory—for severe penalties in the event that prescribed regulations are not followed. In practice, however, such penalties are often not enforced because of a wide variety of constraints, and they must be implemented in conjunction with less adversarial procedures to be effective. These problems have been addressed through various mechanisms. In Trinidad and Tobago, for example, the use of an Environmental Tribunal, coupled with a focus on consensus building and voluntary (incentive-based) structures has the advantage that it avoids an adversarial system wherever possible. Also, a require-

Environmentally effective MBIs may generate very little revenue

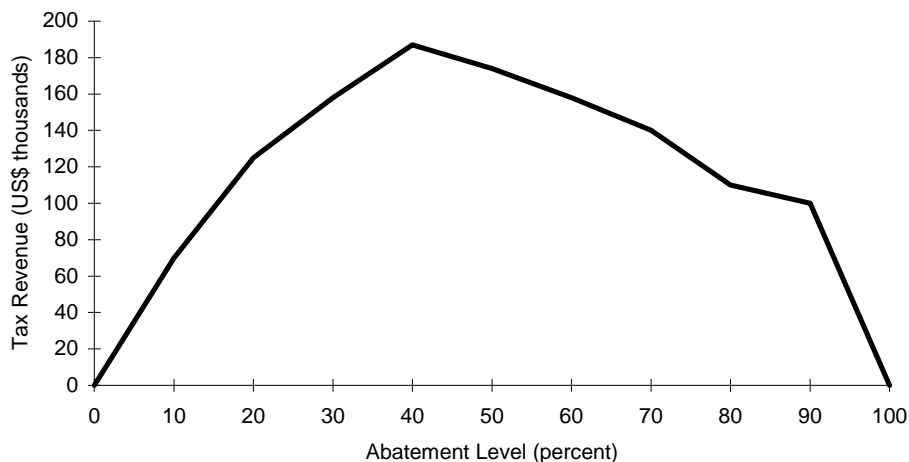
Box 2.3 Revenues versus Incentives: An Example of the Trade-offs

One means of raising incremental revenue can be through an incentive-based tax, such as a presumptive tax, that is based on presumed levels of pollution from specific polluters. To explore the potential contribution of such a charge, an estimate was made of annual revenues if applied to light and medium industry in Guyana. Generic “cost versus abatement” models were used for typical industrial structures, and were applied to industries in Guyana.

Low taxes generate few revenues and little abatement. High taxes can achieve higher levels of abatement, but they do not necessarily generate a large degree of revenue; the higher tax levels create an incentive to cut back on pollution and thus also will not generate much net revenue. As shown below, the maximum (assuming 100 percent collection efficiency) that might be collected through such a tax on the entire Guyanese manufacturing industry is approximately US\$187,000 annually. The resultant annual revenues arising from a presumptive tax, at different levels of abatement, are shown below.

It is notable that in Latin America and the Caribbean, as in many OECD countries, revenue generation is often a central goal of MBIs. MBIs are generally not used to generate a “social optimum,” which may be defined as that level of abatement at which marginal social costs equal marginal social benefits. On the accompanying diagram, such an optimum would require the estimation of costs and benefits at each level of abatement: such an exercise is typically beyond the institutional capacity of many government environmental agencies.

Pollution Abatement versus Tax Revenue from MBIs in Guyana



Source: Estimates by Ruitenbeek (1995).

ment for self-monitoring in Trinidad and Tobago decreases administrative costs substantially.

Regulations, Fines, and Penalties

Centralized control-oriented approaches relying extensively on regulatory guidelines, permits, or licenses have traditionally been the preferred mechanisms for controlling environmental impacts in urban areas (Box 2.4). Although it is technically simple to impose regulations with specific fines for noncompliance, the problems associated with implementing them and achieving compliance are for many developing countries insurmountable.

First, “regulatory drag” can occur when the regulatory approval system, because it is overburdened, unnecessarily holds up critically important investments, and in so doing acts as a drag on economic development prospects. Second, the capacity to implement regulations is often limited because of inadequate human resources, or inadequate supportive infrastructure such as environmental information or monitoring networks. Third, local financing constraints arise because authority

for environmental regulations is often delegated to lower (local) levels of government without adequate sources of financing for implementing and monitoring the regulations. Fourth, conflicting standards often prevail where individual ministries or departments have been responsible for setting environmental regulations within their own departments; lack of coordination often leads to conflicting or overlapping regulations. This is often most pronounced for water-related issues because of the numerous stakeholders involved in water use. Finally, conflict of interest within government programs exists where government agencies are themselves the implementing or investing authority; self-regulation becomes problematic under such circumstances and seldom are there built-in incentives to ensure compliance. This is especially a problem with common infrastructure facilities (such as roads and ports), which typically are a government mandate.

User Charges and Taxes (or Subsidies)

Some of the greatest opportunities for improved environmental management include those arising from appropriate market-oriented instruments. The application

Box 2.4 Air and Water Quality Regulations in Mexico

The most significant example of increasing environmental problems is in the Mexico City Metropolitan Zone (MCMZ), which harbors more than 30,000 polluting companies. Three million vehicles circulate daily and 20 million people reside there. The high incidence of atmospheric pollution, as well as the greater water demand for residential and industrial use, put the well-being of a large number of people in danger. Increased incidence of pulmonary disease and gastroenteritis is occurring.

The environmental problems in Mexico City are not restricted to the valley because 30 percent of the water used comes from places more than 100 kilometers away. In other cases, the discharges of wastewater are deposited in agricultural lands causing water quality deterioration.

In addition to the high levels of atmospheric pollution and water demand in the MCMZ, the border area with the United States presents a widespread problem of toxic and hazardous substances. This area has rapid industrial and population growth from assembly factories.

To date, the Mexican authorities have faced the problems of environmental deterioration by imposing laws and operational norms. The environmental administration in Mexico is based legally in the country’s constitution and detailed in the General Environmental Protection Law of 1988. There are also several related laws and regulations, the most important being the water law and the regulations on hazardous wastes.

The main instruments derived from the Mexican laws are the Official Mexican Norms (OMNs); these give specific guidelines for the quality of natural and environmental resources. There are 33 water OMNs that set specific standards for wastewater discharge and establish limits for pollutant emissions in each industrial sector. There are 18 OMNs for atmospheric contamination: 5 for monitoring, 5 for stationary sources, and 8 for mobile sources. Norms have also been published for solid wastes, hazardous materials, and use of natural resources. Authorities require environmental impact studies and operating licenses for different activities.

Besides the OMNs, there are selected measures to control air pollution in Mexico City. The most important is the “Don’t Drive Today” program that prohibits circulation of 20 percent of vehicles in the MCMZ on a revolving basis. Verification of vehicular emissions is required at least once per year. Catalytic converters have been required since 1991.

Source: Belausteguigoitia, et al. (1995).

of these mechanisms typically has a number of goals. First, incentive effects which provide economic reasons for polluters or resource users to lower their impacts are reflected in user charges for typical infrastructure services such as sanitation and water provision. Incentives can also be used to affect intermodal choices: environmental taxes on fuels can discourage private automobile use, and concomitantly reduce demand for complementary public goods such as roads. Second, market-oriented approaches can be used as a recurrent revenue base; this is especially important where local institutions are expected to be financially autonomous, or are themselves required to fund selected regulatory functions.

An important variant of the user charge is a “presumptive tax.” The basis of the tax is an effluent charge that is sensitive to a *presumed* level of pollution. A firm is compelled to pay the tax, and no specific monitoring is conducted. If the firm wishes to reduce its tax burden, it must conduct monitoring at its own expense (but still subject to regulatory audit) to demonstrate that its actual pollution loads are less than the presumed loads.

Subsidies can also be used as an economic incentive for environmental management. Subsidies on environmentally appropriate behavior are analytically identical to taxes on inappropriate behavior. Such subsidies have been especially common in developing countries for the importation of pollution control technologies or for credit subsidies where the credit is used for environmental investments.

Market Creation (Permits and Deposit-Refund)

At a more complex level, market-oriented approaches can include some form of market creation. The most complex system involves tradable permits where user/polluter rights are assigned, according to a desirable total level of use or pollution, and compliance is achieved by trade. One potential advantage of such systems is that they may reduce bureaucracy and government participation in the process. Such decentralization of decisionmaking is particularly important in high growth economies where regulatory drag might otherwise be a problem.

Another potentially important type of market creation involves reform of property rights to confer some form of property right (either individual or joint) in areas of great environmental sensitivity; this requires that any entity undertaking infrastructure development (roads or other rights-of-way) in such areas negotiate compensation with a well-defined landowner.

Deposit-refund systems are also based on a market created to buy back sources of solid wastes. These have been used extensively to promote recycling. Such schemes are also appropriate for difficult problems such as toxic and hazardous waste management.

Market Creation (Eco-labeling, Disclosure Requirements, or Environmental Awareness)

A last form of market-oriented incentive involves intervention in final demand through educating or informing consumers. Eco-labeling that attempts to promote environmentally sound production and packaging is a relatively passive form of intervention; it decentralizes decisionmaking to the final consumer. A more aggressive form involves promulgating disclosure requirements; firms are required to publish precisely what they pollute. There are no sanctions attached to such disclosure but consumers are then given the choice of how to deal with the products of particular firms. Another example of education and awareness building, targeted to industries, is the UNIDO waste minimization program that assists in identifying appropriate technologies for specific plant and industry types. The programs typically improve energy and material efficiency for plants, while at the same time reducing waste generation. All such interventions can effectively reduce urban infrastructure requirements, improve environmental quality, and have important spin-offs in other social sectors. Their major disadvantage is that they typically require some form of subsidy.

Liability Legislation

Litigation-oriented approaches to environmental management require only that legislation be in place that confers relatively straightforward rights and obligations to resource users.³ These approaches form a legal umbrella for court cases, which then consider the nature and extent of environmental damages on a case-by-case basis. Most of these approaches are relatively new, and have seen very limited application in developing countries (quite often because legal systems are themselves weak in such countries). Even in industrial countries they are hampered by the analytical difficulties of establishing cause and effect, or of ascribing blame or negligence.

There are, however, two potentially useful applications of this approach in an urban setting. First, requirements for operators to post long-term “performance bonds” have often been used for mining projects, which may require some reclamation at an unspecified future date; similar performance bonds can be applied to road construction, pipeline construction,

3. One close (though nonlitigative) variant of this is a Coasian world, where polluters and affected people reach solutions for externalities by trading rights with strictly zero liability rule. Such a system has also been advocated as a strict *laissez-faire* nonregulatory approach, where government acts only to reduce transaction costs or to act as a neutral arbiter in the event of rights disputes.

or other urban infrastructure potentially affecting water resources or soil erosion. In principle, such performance requirements could even be applied to government agencies, although in such cases funds need to be held in trust by an independent trustee and some effective incentive must exist for these agencies to limit environmental disruption and recover the bond. Second, “zero net impact” legislation has been applied in a number of jurisdictions: its intent is to ensure that, if some unavoidable environmental disruption is caused in one area, a compensating investment is undertaken elsewhere. For example, if a road or bridge disrupts a river course and affects water availability, an investment is required that restores water to those affected.

One significant objection to using litigation-oriented mechanisms is neither environmental nor economic: it is social. Because such systems assume that all have equal access to the courts, the mechanisms often discriminate against the poor and others with limited access to legal recourse.

Lessons and Implications

In each of the above cases there is usually both an incentive element as well as a control element. Simply stated, there is no getting around the classic “carrot and stick.” Experience with these types of mechanisms around the world has shown that they have different advantages and disadvantages, and that depending on the goals of the government, some mechanisms are better than others. The following general conclusions can be drawn from this experience:

- Systems based solely on control-oriented approaches impose high private costs and often are not enforceable given existing institutional capacity.
- Litigation-oriented approaches require the development of a strong legal system to which all members of society have equal access.
- Market-oriented instruments allow polluters and resource users to find their own best mix of controls or responses, and therefore result in lower private costs than other approaches.
- Local authorities and strong institutional support play an important role in the success of market-oriented mechanisms.

Macroeconomic Policy Linkages

Market-Based Reforms and the Environment

For many reasons, increasing attention is being paid to the linkages between macroeconomic policies and environmental quality. First, within foreign aid programs,

there has been a fundamental shift occurring from direct investments to policy-oriented programs such as structural adjustment or other MBRs. Second, environmental degradation has been extensive in some regions of the world where much of the policy-oriented programs have been targeted (Convery 1995). Finally, good evaluation practice dictates that the environmental impacts of macroeconomic policies be considered just as we traditionally considered the environmental impacts of projects.

The primary purpose of this section is therefore to show that macroeconomic policies—or “economywide policies” as described by Munasinghe and Cruz (1995)—can offset the impacts of other more targeted interventions such as MBIs, if they are not adequately considered. Some key lessons from the literature are summarized; a major message is that linkages between MBRs and environmental quality exist, but that—with the exception of certain types of macroeconomic price subsidies—the direction of such impacts is typically highly irregular or uncertain.

Monetary Policy

There is an extensive debate over whether policies linked to interest rates and credit have had a positive or negative direct impact on environmental quality (Munasinghe and Cruz 1995). On a theoretical level, interest rates are simply the price of capital, hence the issue—to a degree—translates into whether capital investment is itself environmentally beneficial, and whether monetary policy itself contributes to higher or lower interest rates. For example, at an economywide level, lower interest rates would encourage investment in many types of schemes, from highly polluting industrial investments to beneficial national park projects. But even at a micro-project level, the availability of low-cost credit does not necessarily have positive impacts. In some cases, credit has been used to buy inputs (such as chain saws) that facilitate clearing of land at the extensive margin (which may contribute to deforestation) while in other cases it might be used to purchase inputs that promote intensification and investments in soil conservation (Lutz and others 1994). In brief, it is generally impossible to generalize whether the direct environmental impacts of monetary policies are fundamentally good or bad for environmental quality.

The issue is further complicated if one considers indirect impacts after various input substitution effects occur. One important role of monetary policy reform is to eliminate interest rate subsidies; this will generally increase labor intensity as real interest rates rise. For some processes, the direct consequences of lower capital intensity (and higher labor intensity) may involve an environmental improvement, as noted above. In other cases the indirect consequences of higher la-

bor intensity may, in fact, reduce environmental quality (Table 2.2). This is particularly true with waste recovery systems. Adding more labor is generally not a technologically appropriate means for recovering wastes from already labor-intensive industries such as textiles, metalplating, and metalworking. These are among the most polluting industries in the world and are among the most difficult to regulate because individual operations are often small-scale activities. Increased capital intensity in such industries, through some form of mechanization, provides scope for improved waste recovery and reduced pollution levels. Many of UNIDO's programs of waste management are based precisely on such substitution away from labor and towards capital. In short, it is again not possible to generalize whether increases in real interest rates will cause indirect substitution effects that represent net gains or net losses in environmental quality.

Trade Policy

The primary environment and trade issues have included discussions about "pollution havens" that establish permissive investment regimes to attract foreign investment (Folke and others 1994). Most of the empirical literature suggests, however, that such generalizations are again

not valid. The extent of environmental subsidies is typically insufficient (compared to the costs of other inputs) to induce major shifts in industrial location (Low 1992). Trade policies more typically encourage lower polluting industries (Box 2.5), and current international trade protocols (such as NAFTA) tend to encourage environmentally responsible production policies in countries of origin, many of which are developing countries. In addition, local subsidies that decrease import tariffs for environmental technologies—such as those in Barbados—can have a positive environmental impact.

Fiscal Policy

The environmental impacts of *general* fiscal policy, which includes primarily the personal and corporate income tax regimes, are also coming under greater scrutiny (Doern 1990; Dewees 1992). These policies are primarily of concern where they inadvertently distort investment decisions in a manner that penalizes environmental quality. In some cases, general fiscal policy can be used to encourage environmentally appropriate investments, such as through the provision of fast capital depreciation rates for pollution abatement equipment.

Table 2.2 Main Environmental Linkages of the Major Current Economywide Policies in Latin America and the Caribbean

Policy	Positive Linkages	Negative Linkages
Removing subsidies may be more effective than introducing MBIs		
Public price controls	Induces efficiency into the management of resources	Creates barriers to including environmental costs in the price of the product
Box 2.6 Subsidies, Emission Charges, and Institutions: Lessons from Russia	Public price controls induce efficiency into the management of resources	Creates barriers to including environmental costs in the price of the product
Public deficits and subsidies	Public deficits and subsidies results in larger emission reductions than MBIs introduced in the form of fees and taxes. The reasons for this are closely linked to the responsiveness of firms to changes in subsidy patterns, and to the ongoing need for adequate institutional capacity to implement a fee and tax system.	Public deficits and subsidies results in larger emission reductions than MBIs introduced in the form of fees and taxes. The reasons for this are closely linked to the responsiveness of firms to changes in subsidy patterns, and to the ongoing need for adequate institutional capacity to implement a fee and tax system.
Privatization	Privatization creates opportunity to introduce efficiency, eliminate subsidies, and correct environmental liabilities in the private sector. Privatization is a common practice in the private sector, and local authorities determine the collection of charges. A common practice is to waive fees on the amount enterprises invest in pollution control or to exempt payment by those polluters experiencing financial difficulties. Collection rates are thus low, and many cases appear to contradict the legislation.	Privatization reduces the scope, in the short-run, to impose environmental costs on private firms
Trade Liberalization	Trade liberalization shows that firms and end-users will have more responsibility to reduce emissions. Over the period of 1995 to 2010, energy use and greenhouse gas emissions are projected to decrease by about 15 percent as a result of removing all prereform (1990) energy subsidies. Introducing fees or taxes, even at the maximum level politically feasible, would have a similar effect on emissions as would simply eliminating energy subsidies.	Trade liberalization shows that firms and end-users will have more responsibility to reduce emissions. Over the period of 1995 to 2010, energy use and greenhouse gas emissions are projected to decrease by about 15 percent as a result of removing all prereform (1990) energy subsidies. Introducing fees or taxes, even at the maximum level politically feasible, would have a similar effect on emissions as would simply eliminating energy subsidies.
Fiscal Reforms	Fiscal reforms would reduce these emissions only 7 percent and 2 percent respectively	Fiscal reforms would reduce these emissions only 7 percent and 2 percent respectively

The role of *sectoral* fiscal policy has received the greatest attention because of the potential distortions it has on sectoral investment decisions, and because these policies are already generally strongly targeted to encourage selected types of activities (Pearce and others 1989). Most of the original concerns—relating to unsustainable forestry and agriculture practices—focused on sectoral fiscal policies such as stumpage fees on timber, chemical fertilizer subsidies, or pesticide subsidies. More recent urban sector management has been more commonly concerned with water charges and fuel pricing regimes (including electricity) that typically discourage sound resource use and encourage pollution.

Reform of input price subsidies within sectoral fiscal

processes. Recent work in Russia, for example, illustrates further that removing such subsidies can have greater positive environmental impacts than imposing pollution taxes.

Market-Based Reforms in Latin America and the Caribbean

Most recent work concludes that, with a few selected exceptions related to price subsidies inherent in sectoral fiscal policies, it is not possible to generalize whether macroeconomic policies have positive or negative impacts on the environment (Rock and O’Keefe 1994; Munasinghe and Cruz 1995). This implies that, operationally, most interventions will need to be based on case-specific work to determine the precise magnitude and direction of linkages.

Box 2.5 Macropolicy Linkages and Environmental Quality in Mexico

Studies of the impact of economywide policies on environmental quality in Mexico show that it is not possible to draw a priori conclusions that such impacts are inherently negative or positive:

- Foreign trade policies did not contribute to increased industrial pollution. Such policies generally favored less polluting consumer-goods industries. Most increases in pollution were attributable to structural shifts such as increased public investment in petrochemical and agrochemical industries.
- Fuel and electricity subsidies amounted to implicit subsidies of 4 to 7 percent of GDP from 1980 to 1985. This contributed to increased energy intensity, industrial pollution, and poor air quality in Mexico City.

Source: Based on Munasinghe and Cruz (1995), and Eskeland and Jimenez (1991).

policy is, generally, the one type of MBR that does produce positive environmental benefits. In many cases around the world it has been shown that environmental conditions improve as a result of removing pesticide subsidies, fertilizer subsidies, energy price subsidies, or subsidies of material inputs used in favored industrial

In the case of Latin America and the Caribbean, the background studies showed that macroeconomic linkages are important and can generate positive as well as negative impacts on the environment, on environmental institutions, or on the potential success of MBIs (Table 2.2).

3. Institutional Frameworks in Latin America and the Caribbean

This chapter describes the legislative and institutional setting in the study countries that will form, as here denominated, the environmental management sector. Major lessons are drawn within a context of promoting “institutional sustainability.” A key theme of this chapter is that various institutional factors will continue to constrain the implementation of any form of environmental management, regardless of whether it takes the form of a CAC or MBI approach.

Institutional Sustainability in Theory

Although the history of environmental institutions is quite complex and varies substantially between countries, a number of trends are detectable. The first phase of most institutions relied heavily on strong regulatory instruments—such as regulations, standards, or environmental impact assessments—as a basis for preventing environmental damage. Also, initially “environment” was often treated as a stand-alone sector, in isolation from other activities; a single institution was therefore often regarded as adequate for dealing with environmental issues. But as these institutions became more developed, their mandates often expanded and the meaning of “environment” also became more broadly defined. In this second phase, environmental issues became institutionalized—in some form—within *multiple* public sector ministries or departments. This often resulted in substantial duplication of effort and uncertainty in jurisdiction. A final phase has therefore involved a form of “rationalization” that spelled out clear environmental policy objectives (Rodgers 1991) and concomitant institutional reforms that involved more than one institution in the entire management process.

The need for the rationalization was driven, foremost, by the observation that existing structures were not always effective or sustainable. In many countries, environmental assessment processes produced unacceptable barriers to economic development with little noticeable improvement in environmental quality (resulting in regulatory drag). In others, regulations and standards were so stiff that they were virtually unenforce-

able. In many countries, administrative jurisdiction over certain areas continues to be open to interpretation. Finally, the high cost of enforcement and regulation often placed unacceptable burdens on state coffers. In all of these cases the institutions that were meant to promote environmental sustainability were, themselves, not sustainable. The goal of rationalization and reform has, in essence, been to reestablish institutions that are themselves sustainable (Box 3.1).

The means of achieving sustainable institutions vary, but the following trends are notable:

- *Smaller institutions.* A smaller institution is often more sustainable when it relies on existing institutions to carry out required environmental management functions. This results in lower incremental costs, while also allowing the agency to identify and concentrate on selected high priority environmental problems.

- *Decentralization of authority.* Decentralization to regional, state, provincial, or municipal governments streamlines central operations while transferring some of the financial responsibility to local authorities (which are often more amenable to financing local initiatives rather than seeing local taxes go to a central agency).

- *Focus on spatial planning.*

In lieu of sectoral management (forestry, mining, agriculture, etc.), many institutions are most effective at providing a coordinating role with a spatial basis. This has resulted in the proliferation of watershed management authorities, coastal zone management institutions, and other such spatial planning organizations. The result has often been greater effectiveness because environmental issues also typically extend across sectoral boundaries.

- *Reliance on nonregulatory mechanisms.* Nonregulatory instruments are becoming more common as a means for improving compliance without adding to public administrative costs. These mechanisms include a wide range of instruments, from effluent charges to enhanced public education programs to dispute resolution mechanisms.

“LEGISLATION is really not the critical factor in environmental improvements. Legislation cannot guarantee that the intent of the legislator will be implemented in practice. The major problems result from the difficulty of establishing control and enforcement mechanisms to apply the legal provisions.”

—United Nations Environmental Programme, 1976.

- *Reliance on technology transfer.* Trade and information-sharing agreements with foreign firms provide opportunities for the transfer of environmentally appropriate technologies to developing countries. Environmental institutions can provide a low-cost service through facilitating information exchange, and through providing a central focal point for the distribution of contact information.

Institutional Development in Latin America and the Caribbean

Many of the countries in the panel have been proceeding through a similar rationalization process. But the cross-section suggests that the full movement to a completely streamlined environmental management sector in each country is far from complete.

Legislative Basis

As would be expected, while the legal frameworks are based on international parameters, they have been tailored according to each country's pattern of resource exploitation and degradation. For example, countries with a larger industrial base—such as Mexico and Brazil—have been more prone to address industrial issues as a priority. Peru and Chile, by contrast, have focused on mining and fisheries while Caribbean states have concentrated on environmental impacts associated with tourism activities. In Bolivia, where social concerns and poverty often dominate the national agenda, public participation mechanisms play a dominant role.

But in spite of local nuances, environmental policies in Latin America today can be regarded as highly sophisticated by international standards and there are

numerous common elements in the panel. Most of the countries rely on an umbrella environmental law and have already established executive environmental agencies. Countries such as Colombia, Peru, and Venezuela have environmental targets entrenched within their national development plans; these plans also include references to economic instruments.

In addition, and particularly in South America, the new constitutions promulgated during the recent democratization period present specific chapters and amendments on environmental issues regarding conservation goals, use of natural resources, and liability measures.

Codified legislation is basically very similar across the panel. The various laws and acts typically provide guidelines for environmental management by establishing guiding principles, goals, and instruments for environmental policies. Based on the laws, enabling regulations, norms, and procedures are defined by the environmental agencies. The proposed instruments are mainly command-oriented ones. Standards and sanctions, licensing permits, zoning guidelines, environmental impact assessment (EIA) requirements and liability actions are found in most cases with only slight design differences. They are longer established and more numerous in Mexico and Brazil, perhaps due to a higher degree of industrialization and urbanization.

The main regulated areas are also very similar. Conservation norms, such as preservation areas and clearing restrictions, have generally been in place for a long time; in some instances they were first proposed more than 60 years ago. The exploitation of natural resources, such as fisheries, mining, and forestry, are usually highly regulated through zoning and licensing schemes. Also, water use is an area of traditionally intense regulation throughout the panel.

Box 3.1 Institutional Sustainability

The concept of “institutional sustainability” is a recent addition within the sustainable development philosophy (Brinkerhoff and Goldsmith 1992). It essentially underlines the idea that for environmentally, economically, and socially sustainable development to be achieved, institutions that promote these goals must themselves be sustainable. Lessons from a number of places around the world have shown that where institutions are themselves unstable or not adequately endowed, the broader mandates of economic development, environmental protection, and social well-being can not be realized. The concept of institutional sustainability is therefore an underlying goal of many modern-day environmental agencies and management policies.

Experience has shown that the chances of achieving long-term institutional sustainability increase if three conditions are met. First, there should be *flexibility* in institutional structures and mandates to deal with changing circumstances; this is best achieved by relying as far as possible on existing capacity and mechanisms. Second, mechanisms should be available that provide for *adequate financing* of these institutions; this is best achieved through making the institutions cost-effective and through providing them with some form of long-term self-financing. Third, initial development should focus on areas where early successes are likely to occur; this is achieved through *phasing development* of institutional capacity and through outlining high-priority targets for intervention.

Pollution issues have been introduced more recently. Due to the rapid industrialization and urbanization of many of these countries from the 1970s onward, pollution from wastewater discharges and air emissions was immediately fit into the 1974 Stockholm Conference's environmental management pattern; this resulted in the promulgation of standards, sanctions, EIA requirements, and licensing procedures that were heavily targeted to the industrial sector. Mobile sources of air pollution currently are a high priority because of the growing car fleet and unsolved public transport problems.

The most recent legislative development concerns solid waste collection and treatment from households and commercial activities. Sanitation, traditionally targeted within the public investment arena, now has been introduced into the environmental agenda at the highest priority level as water supplies and aquatic habitats are being seriously threatened and as health costs increase.

Institutional Basis

Institutional fragility remains a well-recognized key barrier to successful governmental management in the region. The case of environment, rather than an exception, can be seen as a typical example since environmental management demands strong governmental integration, public participation, and budgetary needs. Although the institutional rationalization process has progressed to accommodate both intersectoral and decentralized authorities, many of the institutions are still very weak.

Some type of specific environmental sector within the government is found in all countries in the panel (Table 3.1). Federal management today is concentrated at the ministerial level or in national councils (as in Chile and Peru). Environment secretariats and executive

agencies are also in place at regional levels. Although most countries have created executive agencies, overlapping mandates among related sectoral agencies are a common feature in the panel. General roles and responsibilities might include diverse functions such as implementation of economic incentives, preparation of environmental assessments, delegation to local authorities, or initiation of public participation processes (Table 3.2).

Intersectoral Authorities. In some countries—such as Brazil, Chile, and Peru—regulations are discussed by cross-sectoral councils, on which different governmental and private sector agencies have representatives. In Peru the environmental sector has only recently been organized to address urban sector pollution issues. But the degree of integration among the various agents, within all of these countries, is very low.

Sanitation and water companies are usually controlled by states and municipalities whereas solid waste collection is run mainly by municipalities. Energy matters are typically regulated within energy agencies without effective participation of the environmental agencies. Usually green (forestry, fishery, and fauna/flora protection) and pollution issues are empowered to distinct agencies within the environmental sector and sometimes, as is the case of Peru and Barbados, within distinct renewable resource subsectors. Such arrangements have led to multiple instances of conflicting jurisdiction with existing agencies, and to inconsistent norms and sanctions.

In general, integration between the environmental sector and other governmental sectors is very weak. Because of this, environmentally harmful sectoral incentives are often designed with the exclusion of input from

Table 3.1 Environmental Management Sectors in Selected Latin America and Caribbean Countries

<i>Country</i>	<i>National Environmental Law</i>	<i>Ministry of Environment</i>	<i>Environment Chapter in Constitution</i>	<i>Executive Environmental Agency</i>
Barbados		4 in process		
Bolivia	4 1992/95	4 1992		4
Brazil	4 1981	4 1991	4	4
Chile	4 1994	4 1994*	4	4
Colombia	4 1993	4 1993	4	4
Ecuador	4 1996	4 1996		
Jamaica	4 1991			4
Mexico	4 1988	4 1994	4	4
Peru	4 1990	4 1995*		
Trinidad and Tobago	4 1995			4
Venezuela	4 1976	4 1976	4	4

* National Commission.

Table 3.2 Roles and Responsibilities of Selected Environmental Institutions in Latin America and the Caribbean

<i>Country</i>	<i>Market-Based Incentives Mentioned in the Legislation</i>	<i>Approach to Environmental Assessment</i>	<i>Decentralized Role</i>	<i>Mechanisms for Public Participation</i>
Barbados	Economic instruments permitted	Planning agencies	No	Not defined
Bolivia	Economic instruments permitted	Specifies self-assessment for existing activities; requires EA on all new activities with five-year compliance deadline	Water and forestry decentralized; municipalities have major responsibility for local conditions	Extensive; permits public review and public civil actions in all environmental issues
Brazil	Allows contributions from users of environmental resources	Operating licenses issued based on EA requirements	State agencies maintain major responsibility	EA reports and licensing require public input
Chile	Advocates polluter-pays principle	Relevant law not yet implemented	No	Present in law
Colombia	Economic instruments for user-pays and polluting industry	Required before licenses and permits are issued	Implementation and enforcement through the regional and urban agencies	Consultation required under the constitution and Law 99
Ecuador	No	Sectoral responsibilities in different ministries	Municipalities of major cities are beginning to take increased responsibility	As required in specific sectoral laws, such as the mining law
Jamaica	No	Planning agencies	No	Not defined
Mexico	No	INE sets national standards and norms; PROFEPA enforces	Some in Mexico City Metropolitan Zone and in the border area with the United States	Not defined
Peru	No	General criteria for EA to be established	No	Local and regional government coordination
Trinidad and Tobago	Incentive programs or mechanisms that encourage the use of effective environmental systems	To be defined	No	Environmental clearance certificate requires public comment
Venezuela	No	Three permits required for land use, resource exploitation, and pollution control and mitigation	In process	Not defined

the environmental sector.

Decentralized Authorities. Since the 1970s countries like Brazil, Colombia, Venezuela, and Mexico have had a decentralized management structure where regional agencies are responsible for applying federal norms and for introducing appropriate regional adjustments. However, weak integration between federal and regional levels is often identified as a serious institutional problem.

Regional decentralization is mostly to the state level and in some cases to the municipality level in cities that have a very high proportion of the national population (such as Quito, Santiago, and Bogota).

Competence and Uncertainty

Human Resource Constraints

Relationships within and among legislatures in Latin American countries are characterized by a tendency to overlegislate. Parliamentary participation on executive

bills is usually passive by ignorance and reactive by lobby interests. Parliamentary initiatives on environmental legislation are often passed without the active involvement of the relevant agency. The failure to establish channels of expertise within these legislatures has hampered possibilities for designing or promulgating easily enforceable laws.

These intra- and intergovernmental integration issues reflect the degree of institutional capacity in the region. The environmental sector in these countries has been facing serious budgetary problems. Even in cases where earmarked resources are available, the amount reaching the sector is usually reduced by accounting devices within the governmental financing bureaucracy.

Because of public and political pressure, services required from the environmental sector are growing fast. However, budget allocation has not followed this same pattern. Even if investments in laboratories, monitoring networks, and other equipment are made available from external sources (earmarked revenue, international agency loans, foreign aid, and NGO funds), environ-

mental agencies still lack appropriate human resources to make efficient use of them. Because of the low level of public servant remuneration—imposed throughout the region because of the need for macroeconomic stabilization policies—the public sector in general has difficulty keeping qualified workers and cannot rely on expertise available in the private sector.

Goals, norms, and instruments are therefore set higher than the current managerial, monitoring, and enforcement capabilities of environmental agencies.

Finally, environmental public awareness has increased in urban areas where certain environmental costs have already affected the majority of the population. But the costs of protection are not yet fully grasped by the population as a whole. In areas where the environmentally regulated activity is the main source of income, political barriers are reinforced by public opposition.

Uncertainty

Environmental legislation in the region is generally considered to contain the same types of advanced norms and procedures implemented in richer countries. But lack of systematic and qualified monitoring—and consequent lack of reliable inventories, databases, and indicators—detracts from the effective enforcement of reliable standards. For example, failure to compile data and indicators has made zoning and permit instruments completely ineffective. Lack of staff and expertise to analyze EIAs and auditing reports turn such monitoring exercises into costly procedures with very ineffective results in terms of environmental improvement. This lack of enforcement creates uncertainty within the investment community and tends to perpetuate noncompliance.

Political constraints often impede the use of strong sanctions for noncompliance, particularly in sensitive economic sectors. The threat of job losses in small cities

or in declining regions—arising from the enforcement of sanctions—represents a very powerful reason for the public to accept governments' otherwise arbitrary relaxation of sanctions. Frequently, this results in the overruling of penalties and defaults or the postponement of abatement and preservation measures established in official agreements.

Finally, when enforcement does succeed, the court system—historically clogged with other claims—imposes its own delays in prosecution.

Political Barriers and Market-Based Reforms

The above difficulties faced by environmental management in Latin America and the Caribbean can only be overcome by addressing certain political barriers.

As noted earlier, environmental management faces the effects, in terms of budget constraints, resulting from the general crisis affecting the public sector in the region. Consequently, structural adjustment policies remain part of the development agenda in the region.

Macroeconomic stabilization plans attempt to limit public expenditure and eliminate sources of price escalation. Consequently, environmental policies that seek to internalize environmental costs (either through CAC or MBIs) within the economic system are not easily accepted politically, even if they have economically and environmentally beneficial consequences (Box 3.2).

Further, the need to find short-term incentives for rapid growth tends to create opposition to any environmental regulation that restricts investment. Although new capital stock normally includes cleaner technologies, bureaucratic procedures often impose delay costs through regulatory drag. Even though the production system as a whole may not be heavily affected by stricter environmental enforcement, some sectors and some firms may be hit hard because of their historical investment patterns. For example, environmental problems may be intractable where old capital investments

Box 3.2 Conflicting Market-Based Instruments and Political Priorities in Argentina

In 1980, Argentina attempted to introduce an industrial effluent discharge fee. The tariff included a fee for discharges within the maximum allowable level and a much higher penalty for discharges above the maximum allowable threshold. There were provisions for increasing the fee levels gradually over a 10-year period. The aim was to eventually set the fees at a level equivalent to abatement costs.

In practice the fees were never widely applied and the system was modified in 1989 to lower the fees and revise the penalties. Environmental groups sued the government on the grounds that the fee system amounted to a license to pollute beyond legal limits. The court declared the decree introducing the fees to be unconstitutional, and the issue remains unresolved in legal terms to this day. It appears that the court regarded the fee as exceeding the powers of the national government to levy taxes because it concluded that the fees could not be justified as a payment for service.

Source: von Amsberg 1995.

included inefficient and dirty technologies and where environmental conversion costs are very high.

In short, both MBI and CAC procedures face similar difficulties: even if such procedures appear to be environmentally and economically beneficial, they may be politically unacceptable if they appear to be inconsistent with other political priorities and MBRs.

Summary

Countries within the panel have undergone substantial environmental reforms over the past decades, both in terms of their legislation and their institutions. On paper, it would appear that everything should be in place to enable improved environmental management. In reality,

however, a number of persistent constraints continue to hamper effective management. Foremost, institutions themselves are still weak and lack an adequate degree of participation among stakeholders: new norms and standards often conflict with existing conventions or with current structural adjustment efforts.

The major implications this has for continued development of either CAC regimes or MBI regimes are that: (a) institutional strengthening, in particular through human resource development and through financial support to local agencies, is a high priority in all Latin American and Caribbean countries; and (b) the implementation of either MBI or CAC regimes must take into account existing political priorities and MBRs.

4. Market-Based Instruments in Latin America and the Caribbean

This chapter describes the current experience with MBIs in the study countries. As previously discussed, environmental management in these 11 countries has historically been based on CAC instruments. However, the study survey presents a number of market-oriented experiences already in place in the region. The survey demonstrates the relatively wide experimentation with MBIs, and the focus on using them as a revenue-generating device. It also reveals the need for strong institutions to implement MBIs. Since additional detail is provided in the Background Paper Summaries for each country study, this chapter highlights some of the more commonly used instruments; tradable permits (which have seen only limited application) are discussed in the following chapter because of their added complexity.

Credit and Tax Incentives

Most of the countries in the panel offer subsidized credit and taxation relief for environment-related investments, as shown in Table 4.1. They cover abatement investments or clean technology adoption in the industrial sector in Brazil, Mexico, and Colombia, the tourism sector in Barbados, reforestation activities in Chile and Colombia, mercury emission control in artisanal mining in Ecuador, cleaner energy uses in the Caribbean, Ecuador, and Brazil (solar, wind, and gas/hydroelectricity sources, respectively) and chlorofluorocarbon (CFC) phaseout in Colombia, Chile, and Brazil.⁴ Only in Bolivia and Peru, where environmental management is very recent, is no experience reported, although the new legislation has generated some initiatives.

Subsidies for abatement investments have, however, been of limited impact since environmental enforcement has not been effective enough to increase firms' demand for these expenditures. Moreover, it is reported that firms are using these incentives inadequately because of the lack of proper fiscal and environmental follow-up procedures to monitor their investments.

4. Other countries in the region have also used such incentives. In St. Lucia, a solar water heater subsidy is credited with increased sales of such units. In Argentina, a 1995 tax exemption has induced widespread adoption of compressed natural gas (CNG) vehicles as a more environmentally benign substitute for diesel or gasoline vehicles.

Subsidies for resource inputs, however, have been successful MBIs in dynamic markets. Reforestation subsidies have been an important factor for forestry sector expansion in Chile (reforestation of 1.7 million hectares in 20 years), whereas energy subsidies have succeeded in Barbados and Ecuador to foster energy substitution.

Cost-Recovery Tariffs

Pricing of water supply, sanitation, solid waste collection, and energy can play an important role in pollution control and resource use. Moreover, a full cost-recovery approach is essential for service expansion and it allows for cross-subsidies to low-income groups.

Sewage

In Brazil, industrial sewage tariffs based on the content of organic-matter and suspended solids have been in place since 1983 in the states of São Paulo and Rio de

Janeiro. In the case of the Greater São Paulo Region, the sanitation company has included only 95 big firms in the new tariff scheme because of monitoring diffi-

Table 4.1 Credit and Tax Incentives

<i>Country</i>	<i>Credit Subsidies</i>	<i>Taxation and Tariff Relief</i>
Barbados	To defray costs of environmental technologies in the tourism sector	Income tax rebate for water conservation and solar energy use in the tourism sector
Brazil	For abatement investments in the industrial sector	Income and value-added tax rebates for adoption of clean technology
Chile		For forestry activities
Colombia	For abatement investments in the industrial sector	Income and value-added tax rebates for abatement investments
Ecuador	For investments on mercury recovery in artisanal mining	For investments on mercury recovery in artisanal mining
Jamaica		For abatement investments in free zones
Mexico	For abatement investments in the industrial sector	
Venezuela		For abatement investments in the industrial sector

culties. Even with this small spatial coverage, revenue raised represented more than 11 percent of total industrial sewage revenue in 1993. It has been reported that the new tariff on pollution content has induced pollution control through improved internal management procedures, substitution of raw materials, and conservation.

Sanitation

In the case of Guayaquil in Ecuador, a concession was let to an independent Canadian firm. A fee on solid waste collection is applied as a 10 percent surcharge on electricity bills. Although it may not induce rationalization of waste generation, the collection costs for such a scheme are low and effective.

Bolivia and Venezuela have recently attempted to introduce waste-volume and landfill-tipping fees, and Jamaica and Barbados are about to introduce similar systems. Mexico and Chile are also contemplating the possibility of adopting these instruments for households and firms. The Venezuelan case confirms, however, that these instruments require strong institutional capacity to monitor waste volumes in households and firms and to restrict illegal dumping.

Energy

The removal of energy subsidies has also followed a revenue perspective due to macroeconomic constraints. Although in some cases it has incidentally induced substitution with cleaner fuels, pricing-control policies have restrained important changes in relative prices as in the case of gasoline in Venezuela. A successful example of energy pricing for environmental purposes was in Jamaica, where lowering the kerosene price induced substitution for charcoal consumption.

Summary

Although water supply, sanitation (sewage collection and treatment), and electricity tariffs have been increased in real terms across the region, only Chile and Colombia are already fully adopting a long-run marginal cost approach. Private participation in the sector, already envisaged in some countries, may speed up the adoption of this tariff policy.

It must be noted, however, that experiences in cost-recovery approaches, even in private participation schemes, have not fully incorporated environmental costs since private costs are the main concern and environmental costs are only borne when they are imposed through regulatory or other means. However, cost-recovery pricing for these services can be regarded as a first step toward charging the right price for pollution and natural resources. In most cases, adoption of cost-

recovery approaches can be carried out with relatively low legal and institutional barriers.

Deposit-Refund Systems

Voluntary deposit-refund systems for consumers are reasonably well developed in the countries of the panel (Table 4.2). Moreover, informal collection of paper, plastic, and other recyclable materials is an important occupation for unskilled workers.

Voluntary deposit-refund systems for returnable glass bottles are traditionally adopted in most countries due to the predominance of the beverage and beer packaging system. Refund payments for aluminum cans, due to the high value-added from recycling and the expanding use of such containers, are now increasing considerably in Brazil and Venezuela.

Recycling of ferrous materials, paper, and to a lesser extent plastic, are a well-established business in the region. Wholesalers collect material from firms and informal collectors and then sell the material to recycling companies. Collection is undertaken mostly at the curbside level and at dumping sites. Cooperatives of collectors—supported through municipal programs—are now common in the major Brazilian cities; this has improved health conditions and collection efficiency.

Table 4.2 MBIs and Solid Waste Management

<i>Country</i>	<i>Deposit-Refund System</i>	<i>Solid Waste Levy and Tipping Fees</i>
Barbados	Voluntary for glass beverage containers on consumers	Tipping fees under introduction
Bolivia	Voluntary for glass, paper, and plastics	Collection fees based on weight
Brazil	Voluntary for glass and aluminum beverage containers on consumers	Flat fees
Chile	Voluntary for glass and plastic beverage containers on consumers	Flat fees; tipping fees under discussion
Colombia	Voluntary for glass beverage containers on consumers	Electricity surcharge
Ecuador	Voluntary for glass beverage containers on consumers	Flat fees paid by municipality
Jamaica	Voluntary for glass beverage containers on consumers	Flat fees
Mexico	Voluntary for glass beverage containers on consumers and compulsory on car batteries at wholesale level	Flat fees; levy and tipping fees for hazardous waste under discussion
Venezuela	Voluntary for glass beverage containers on consumers	Flat fees

The introduction of voluntary deposit-refund systems for consumers in the region can be seen as a good MBI opportunity with fairly low legal, institutional, and political barriers. In fact, such initiatives can count on private participation and public support. Compulsory systems for firms and consumers, however, will certainly be more difficult because of legal and political barriers, and also because the need for monitoring capacity may be an important constraint. One of the few cases of mandatory schemes is found in Mexico. Car batteries are now under a compulsory deposit-refund scheme through which a new battery can only be sold with the return of an old one. Results of this program have not yet been evaluated.

Resource Use Charges

Table 4.3 presents a summary of several types of user charges implemented in the region. In Brazil, Colombia, and Venezuela, a forestry tax is charged for wood consumption when the harvesting is not compensated by equivalent reforestation activity. These taxes are usually set at very low levels and with very weak enforcement, particularly in frontier regions where monitoring is very difficult. Also, royalties paid out of natural resource exploitation are already in place in Brazil, Colombia, Ecuador, and Venezuela with relative success.

In Brazil and Colombia these royalties, created in the 1990s, are a small proportion (between 4 and 6 percent) of gross revenue in hydroelectricity, mineral, and oil production. In reality, these royalties are earmarked revenue sources for municipalities where exploitation takes place; some funds are also earmarked for regulatory and environmental agencies. In the case of Colombia, the use of royalty funds for preservation purposes is

more strictly earmarked than it is in Brazil. Therefore, the Brazilian experience has been one of using the royalty revenue as a supplementary budgetary source for general revenue purposes.

Royalties in Ecuador and Venezuela are strictly based on oil revenue. In Ecuador the royalty is a form of tax levy on oil passing through the pipeline from the Ecuadorian Amazon; the levy is earmarked to the Ecuadorian Institute for Eco-Development in the Amazon Region (ECORAE) formed in 1992. Royalty resources in Venezuela, by contrast, finance the federal general budget.

As can be seen, royalties may turn into an important source of revenue for environmental agencies and may also be a powerful tool for natural resource rationalization. While revenue aims can be achieved through a small share of the exploitation value, the appropriate royalty level on environmental grounds may require a more complex technical analysis. In some instances, such as with ECORAE, the actual incentive effects for rationalizing oil or energy use may in fact be minuscule, but as with OECD experience, the allocation of such revenues to institutional strengthening in the environmental sector justifies their classification as a “weak” MBI. Collection costs are low and will not depend much on institutional capacity and sophisticated legislation. Political constraints may arise in countries where the private sector is dominant in the taxed sectors and where the sector faces strong international competition.

Water Charges

The most active MBI pricing initiatives are water charges (Table 4.3). These charges can be part of a national charge scheme already in place, as in Mexico and Colombia, or

Table 4.3 User Charges in Latin America and the Caribbean

<i>Country</i>	<i>Forestry Taxation</i>	<i>Charges on Natural Resource Exploitation</i>	<i>Water Charges for Use and Pollution</i>
Brazil	On forestry activities without adequate reforestation	Over mineral and hydroelectricity production to compensate municipalities where exploitation takes place	Sewage tariffs based on pollution contents are in place in some states. Full water charges based on river basin authority already approved in some states and under discussion at the federal level
Colombia	On forestry activities without adequate reforestation	Over mineral and hydroelectricity production to compensate municipalities where exploitation takes place	Charges based on cost-recovery partially implemented and replaced by charges reflecting full environmental costs
Ecuador		On oil to finance environmental research and an institute for environmental management	
Jamaica			Under discussion
Mexico			Wastewater discharge at national level partially implemented and under revision
Venezuela	On forestry activities without adequate reforestation		

in the context of a river basin authority, as is the case of the Brazilian legislation under consideration by congress.

Mexico

Pollution charges in Mexico have been in place since 1991, but they have revealed enormous enforcement problems. The Mexican water legislation allows the National Water Commission (CNA) to apply the polluter-pays principle on water discharges from municipalities and industrial plants exceeding determined standards for organic matter and suspended solids. For volume discharges below 3,000 cubic meters, a simplified approach is adopted based on volume rather than pollution content.

Lack of enforcement has substantially reduced the revenue raised. Although revenue has increased from N\$17.4 million to N\$52.4 million since implementation of the law, this still represents only a minor percentage of potential revenue. Poor monitoring and opposition from polluters are the main reasons for enforcement failures.

The national scope of the water system has required monitoring resources that are beyond the current financial capacity of the CNA. Lack of private and public participation, along with the general lack of reliable information or careful analyses of expected impacts, has motivated polluters' opposition on grounds of competitiveness and distributive considerations.

The current revision of this legislation on water charges is aimed at removing these political barriers by enhancing participation, information, and institutional capacity. A more participatory and realistic approach may create an excellent opportunity for Mexico to implement an effective system of economic incentives for

water management, while also providing financial resources to develop institutional capacity.

Colombia

In Colombia, water charges for effluent discharges and water use have been applied since 1974 by the regional environmental agencies. The very few applications of these charges were implemented with a cost-recovery approach attempting to cover the operating costs of monitoring systems. It should be noted that the relevant legislation also contemplates uses of other renewable resources, such as air, fisheries, and forests. The fishing and forest charges were poorly implemented, as in the case of water, whereas air pollution charges were never applied.

Failure to expand coverage and introduce pollution and usage criteria in determining charge levels was because of reasons similar to those in the Mexican case: lack of appropriate design of the instrument, lack of information about impacts, incompatibility with the available monitoring system, and inadequate planning of its coverage. These factors have resulted in fierce public and political opposition and have undermined political support.

Only US\$116,000 were collected from a potential tariff revenue of US\$90 million. Interestingly, in the few cases where these constraints were overcome, it is reported that successful application of the charges induced changes in water use patterns as well as reductions in consumption and pollution.

In 1993 new environmental legislation (Law 99/93) was passed in Colombia in which pollution charges are clearly specified based on the criteria of

Can a Pigouvian optimum be achieved?

Box 4.1 Colombia's Proposed Environmental Tax: Practical Difficulties of Implementation

Title VII of Colombia's new Environment Law 99/93 states that the environment ministry (MinAmbiente) or the regional autonomous corporations (CARs) will establish a system of tariffs to be levied on the effluents and emissions of polluting industries. The tariffs were to be based on the following factors and requirements:

- For each of the factors that are included in the establishment of a tariff amount, MinAmbiente or the CARs will define quantifiable variables that will permit the measurement of environmental damage.
- Each factor and its variables should have a coefficient that permits the weighting of damage together with the factors and variables considered.
- The coefficients should be calculated based on resource availability and scarcity, diversity of the regions, pollution assimilation capacity, the contaminating or polluting agents, the socioeconomic variables of the population affected, and the opportunity cost of the resources.
- The factors, variables, and coefficients thus determined and measured would be integrated into mathematical formulas that permit the calculation and determination of the corresponding tariffs.

MinAmbiente set out to assess the costs of pollution treatment as a way of establishing the tariffs to be levied within this context. However, ultimately this environmental tax system was discarded because 90 percent of the CARs declared that the technical requirements were too rigorous for them to implement.

full environmental costs (Box 4.1). That is, the charge level must be defined according to the value of environmental services and the cost of environmental damages. In fact, the new criteria attempt to bring charge levels to optimum levels in the Pigouvian sense measured by economic welfare losses.

This new legislation eliminates the cost-recovery limitations of charges, which now may be set on a tax levy basis. However, now the constraints discussed previously are even more severe. The new rules demand a sophisticated institutional capacity since the new charge determination is complex and bound to vary significantly with activity and spatial factors. In addition to this technical constraint, the administration of these new charges can be extremely costly. The resulting higher uncertainty in economic and social impacts is, consequently, generating strong opposition among polluters and users.

Aware that the complexity of some proposed MBIs is exceeding domestic institutional capacity, the Colombian environmental agency is attempting to streamline current legislation and regulations; charge levels are to be determined in stages where rates are gradually estimated and implemented. Moreover, attention has been paid to a careful analysis of economic and social impacts for future negotiations with polluters and users. The necessary adjustments for the existing institutional capacity vis-à-vis the charge system are also being considered.

Once more, as in the Mexican case, these charges may be an excellent opportunity to promote effective water management in the country and to generate the financial resources required to overcome budgetary constraints. However, a strong enforcement capability is needed to secure these financial resources.

Brazil

The Brazilian experience on river basin management dates from 1978 when river basin committees were formed in some of the most problematic basins to carry out studies and suggest actions to rationalize water use.

These committees, composed of users, polluters, and government agencies, have no normative power and financing autonomy. That is, they do not have a legal basis to impose sanctions and charges. Therefore, most of the relevant committees' proposals were not put into practice and members' engagement was very weak.

The growing degradation of the Brazilian rivers led several initiatives within the environmental and energy sectors to develop new legislation on water resource management. The 1988 Constitution has finally introduced requirements at the federal and state levels that would provide basin authorities with normative and financing mandates. Since that time several projects based on river basin authorities have been discussed,

and a new version has been under discussion in the federal congress for three years. All projects introduce water charges that are based on use and pollution content, and that cover a wide range of activities.

The main disputes arising from these bills are related to (a) jurisdictional overlaps between various levels of government and the agencies located in specific river basins, (b) whether criteria for applying water charges should be based on cost-recovery or the cost of damages, and (c) whether allocation of charge revenue should be in terms of general funding or basin-specific budgets. Politicians are reluctant to create one independent jurisdiction that conflicts with existing state and municipal jurisdictions, and users are concerned with avoiding new forms of taxation and bureaucratic procedures. Environmental agencies are confused about how to reconcile current standards with fines for noncompliance and legal penalties. It is also argued that the country lacks the institutional capacity to deal with such innovative management at the national level without creating additional bureaucratic barriers and wasteful agencies. That seems to be a plausible argument since the institutionally fragile environment ministry has so far failed to find ways of clarifying and addressing these constraints.

In the most developed states, where environmental agencies are more active, such legislation has already been passed or is about to be approved. Nevertheless the political constraints faced by the federal bill are now impeding implementation. In these cases, while water charge revenues are seen as a catalyst among mayors seeking funds to carry on sanitation programs, their distribution criteria and resulting institutional arrangements make consensus difficult. Users are often absent from official discussions but are very active behind the scenes.

Therefore, the Brazilian experience on water charges has been very ineffective because discussions have not been participatory among stakeholders. In order to overcome this, the state and federal levels are considering the introduction of experimental river basin charges on a pilot basis, subject to agreement and consensus among users. It is also agreed that such fees should initially be set at a level to cover administrative and monitoring costs, and then gradually move to levels where use and pollution patterns could be induced to change. Based on this experience, regulations would subsequently be modified to reconcile competing interests.

Conventional Taxation

Colombia

A percentage of property taxes in Colombia are retained by municipalities to pay for expenditures by the regional environmental agencies. Under the proposed reform of the fiscal system, there will be a greater

Conventional taxation can be an effective mechanism.

Box 4.2 Brazil's Green Value-Added Tax

Revenue from the state valued-added tax (ICMS) is distributed among municipalities according to origin, generation, and population criteria. Since 1992, three Brazilian states—São Paulo, Rio de Janeiro, and Paraná—have introduced environmental revenue distribution criteria based on the size of area subject to land use restrictions (watershed and conservation protection). The main aim was to create a budgetary supplement to compensate municipalities where land use restrictions, which benefited society as a whole, might impose barriers to local economic development. An advantage of the scheme is that it did not require a new fiscal instrument. Moreover, it is expected that additional financial resources can also promote implementation of sustainable activities.

Introduction of the environmental criteria was carried out with a careful political approach involving mayors and representatives in the state congress. Because total tax revenue did not change and therefore the new criteria reduced the share of other municipalities, political resistance was acknowledged. Studies were undertaken to estimate budgetary impacts on municipalities where gains and losses were expected. As a first step it was agreed that a very small share of total revenue (between 0.2 and 3.0 percent) would be devoted to these criteria. Nevertheless, legislation allows for periodic revisions to the criteria, indicators, and shares based on the results. These revisions have in fact occurred in São Paulo and Paraná, where the system has already been in place for about three years. Major changes announced so far are restricted to redesigning indicators where monitoring difficulties have been encountered.

reliance on municipal taxes to finance environmental management. The driving force behind this approach has been decentralization and the lower transaction costs of these fiscal devices.

Brazil

Another interesting use of conventional taxation for natural resource preservation is Brazil's "green value-added tax" (Box 4.2). The tax is an example of a low-cost instrument where political barriers were overcome and where current legislation was used.

Mexico

A tax representing a very small percentage of the gasoline price—one cent per liter—was introduced to finance the installation of safety measures in gasoline station storage tanks to reduce fuel evaporation. The low transaction costs of this earmarked fiscal source, which is easy to collect and fund, has allowed that program to be successfully implemented.

The current CAC approach, based on car emission standards and maintenance monitoring, has not achieved the desired improvement in air quality. Therefore, a gasoline price increase was considered as a potential instrument (Eskeland 1994). But the surcharge on gasoline prices to reduce car use, and consequently, emissions in Mexico City, has been facing strong opposition. To induce changes in car use patterns (characterized by low demand elasticity for gasoline) would require much higher surcharges, which would certainly provoke strong public reaction.

Increased taxation on old cars was adopted for revenue reasons, but if the level is increased and is differentiated by vehicle performance, it may offer incentives for fleet renewal and promote antipollution and fuel con-

sumption improvements. Although such tax differentials can be easily implemented, most of the countries in the region actually differentiate taxes in favor of older cars because of equity issues.

Strong opposition to gasoline price increases is a typical case of misinformation and lack of participatory discussion. Gasoline price increases have a marginal effect on general price levels. With the earmarking of surcharge revenue to public transportation investments, passenger car owners could change their transport patterns and low-income groups, relying on mass transport, would enjoy an improved transport system with better safety and environmental standards, and a reduced trip time.⁵

Final Demand Instruments

Export firms in the region are increasingly introducing environmental management procedures to enhance their international competitiveness, particularly to comply with standards and norms in regional markets, such as EEC and NAFTA. Certification based on International Standards Organization (ISO) series has been a key factor to improve these companies' export performance. In Brazil, Chile, and Mexico eco-labeling has been the subject of discussions between governmental agencies and the private sector.

For Brazilian exporting firms, ISO 14000 environmental certification, as with the ISO 9000 quality series,

5. Estimates predict that similar gasoline surcharges for the city of São Paulo in Brazil, which also faces serious air quality problems, would generate annual revenue of US\$500 million and allow expansion of the subway system by 20 percent a year (Serôa da Motta and Mendes 1996).

has become an unavoidable commitment. Brazil's participation in the respective ISO meetings has been very active. In addition, mainly within the domestic market, joint efforts with environmental agencies and other normative bodies have been made to define criteria and norms for eco-labeling

In Ecuador a successful program was carried out by Quito's municipal government in an industrial district, El Inca, to identify cost-effective pollution prevention measures. While not motivated by environmental consciousness, the cost saving in energy, materials, and waste management have been great enough to encourage firms to join the program.

Summary

MBI applications currently represent a major initiative in environmental management in Latin America and the Caribbean. The potential efficiency gains from MBIs have been recognized, but the driving force towards MBI implementation has been, as in OECD countries, the goal of raising revenue. Therefore, the misplaced

conflict between MBI and CAC instruments does not seem to appear in the region's experiences.

The current budgetary constraints faced by the environmental management sector turn MBIs into an attractive option for collecting the necessary funds to improve CAC application. It is very clear that MBI initiatives are sought as complementary actions to CAC. The imposition of standards, licensing, zoning and permits still continues, and in fact MBIs provide innovative and flexible ways to enforce them.

The administrative demands of MBIs remain high. The monitoring requirements, legal design requirements, public consultation needs, and enforcement or collection systems related to MBIs are not always noticeably different from strict CAC approaches. MBIs are therefore not a substitute for weak institutions or for CAC; some regulatory elements are inevitably required and a strong institutional base is a prerequisite to MBI implementation. MBIs are thus a complementary tool to CAC procedures.

The main challenge in these initiatives is to design MBIs that can be successfully applied within the context of the same institutional and political barriers that are constraining the CAC approach.

5. Additional Issues in Design of Market-Based Instruments

From an operational perspective, MBIs should be designed with a number of key points in mind to ensure urban sustainability. In general, they should incorporate the following elements:

- The mechanism should reflect the polluter-pays principle to ensure that externalities are reduced. This can be achieved by setting charges or taxes at levels high enough to induce polluters and users to reduce their total level of degradation.
- The complementarity between regulations and incentives must be reflected in the design of all systems; incentive charges, for example, may still be complemented with some baseline standard that must not be breached under any circumstances.
- Revenue generation should be designed in a manner that allows some of the revenue to flow to local authorities to provide an incentive and a means for local empowerment.

This chapter addresses additional MBI design issues arising from the above points and relating to (a) social issues of distribution, poverty, and taxes, (b) prevalence of perverse incentives, (c) role of tradable permits, (d) role of earmarking, and (e) role of legal redress through advocacy.

Distribution, Poverty, and Tax Implications

The dramatic level of poverty and income inequality in the region creates serious barriers to undertaking stricter environmental practices when distributive effects are unknown. Remarkably, the reviews in the 11 countries provided very few examples of how various MBIs would impact different income groups. Opposition to many MBIs, as well as to CAC procedures, is based on alleged regressive impacts. This shows that there is, in fact, an interest in the distributive impacts of various policies and that the social dimensions of MBIs—as expressed through their potentially regressive nature or repercussions—is a significant concern in Latin America and the Caribbean. It is notable that Bolivia, one of the poorest countries in the region, is actively pursuing a policy that supports the progressive use of environmental charges (Box 5.1).

This reinforces, however, the need to undertake more work on the relative impacts of different mechanisms. Flexible instruments with efficiency and distributive gains have to be sought as politically viable options to the current procedures. Moreover, information about

Box 5.1 Progressive Environmental Taxation In Bolivia

Bolivia is the poorest country in South America and the third poorest in the Western Hemisphere. Close to one-third of the population is functionally illiterate, half of urban households and more than 90 percent of rural ones have unsatisfied basic needs. The infant mortality rate is high even by Latin American standards (75 per 1,000 live births). Diarrhea and acute respiratory diseases are the main sources of infant mortality, 32 percent and 19 percent of all deaths, respectively. The maternal mortality rate is also very high, at 390 per 100,000 live births.

Limited access to safe drinking water and adequate sewage systems are—in addition to malnutrition—the primary causes of the country's high morbidity and mortality rates (both urban and rural). These problems, in turn, are the result of historically very low levels of public investment in basic sanitation infrastructure (water and sewage systems, collectively known in Bolivia as *saneamiento básico*). Only 25 percent of rural households and 75 percent of urban ones have access to drinking water. Less than 1 percent of rural households and only 36 percent of urban ones have in-house sewage systems. Over the past few years public investment in basic sanitation has been less than 1 percent of GDP, equivalent to less than 6 percent of total public investment.

Because of this “poverty” focus, MBIs implemented in Bolivia must be progressive in nature to ensure that they do not unduly exacerbate the problems. For example, in 1994 the municipality of La Paz introduced a combination of polluter-pays and progressive-subsidy principles to solid waste disposal. Also, changes in the structure of water user fees are being implemented to increase the allocative efficiency of water use, to encourage private investments in infrastructure, and to allow for progressive subsidies.

Source: Escobar and Muñoz 1996.

the effect of impacts from different mechanisms must be made broadly available to all stakeholders; this will permit decisions and compromises to be made in an atmosphere of informed choice as opposed to an atmosphere of uninformed opinion.

Perverse Incentives

Perverse incentives refer to a class of MBIs that, while intended to improve environmental quality, in fact work in the opposite direction. Presence of such incentives indicates poor design or inappropriate application of an MBI. The fact that two types of perverse incentives were relatively common in the panel of countries studied indicates that experience in developing appropriate MBIs is still limited.

First, proposed or existing effluent charge schemes in some of the countries were still based on pollutant concentrations as opposed to pollutant volumes or loads. The effect of using concentrations as an indicator of pollution is that it creates an incentive for firms to dilute the pollution through, for example, abstracting more water and then depositing a larger gross volume of diluted waste into water bodies. Taxes or charges based on pollutant concentrations may, in fact, have the perverse effect of reducing water conservation, increasing industrial costs of treatment, and increasing pollutant damages.

Second, although tax differentials on equipment can be easily implemented, most of the countries in the region apply differentiated taxes so that there is an incentive to keep older vehicles on the road for longer periods of time. Given the poor condition of these vehicles, these tax treatments have the perverse effect of increasing fuel consumption, pollution, and maintenance costs; the alleged “social equity” impacts of such schemes are, moreover, typically specious.

Role of Tradable Permits

The use of tradable permits is currently under strong consideration in countries such as Chile, Peru, and Mexico.

Water Use

Tradable permits for water rights are in place only in Chile and are still under discussion in Peru. In Chile, individual tradable fishery quotas are also being implemented, but information is too scarce to analyze the experience.

The Chilean experience with tradable water permits dates to the 1920s. A general legal basis was, however, set in the 1951 water code that allows the state to give water concessions to private parties according to water use priorities. Water transfers were allowed provided that use remained the same. In 1969, during the agrarian

reforms, water became state property and trade concessions were prohibited.

The new 1981 water code reintroduced permanent water rights, which were completely separated from land rights and could be freely traded for consumptive and nonconsumptive uses. Conditional use was abolished and simultaneous requests were arbitrated through bidding.

Today there are approximately 300,000 water users in Chile. However, only 35-50 percent of them have legal title. Users are organized in private associations controlled by the General Directorate of Water (DGA), within the Ministry of Public Works, which is responsible for water rights regulation, approval of hydraulic works, and technical reports of conflict resolution. Irrigation has a specific national commission—composed of public and private institutions—to plan, evaluate, and approve public investments in the sector. These investments are coordinated by the Directorate of Irrigation and are executed by private companies.

A revision to this tradable permit system is under discussion in congress to avoid speculation and promote trade, address pollution problems, and enhance management capacity in planning and monitoring. A complementary system of tradable water emission permits is also under discussion.

Transaction records in 1992 showed that trade tends to be more intense near the Santiago area because of scarcity. In that year, only 3 percent of total water flow was traded in the area, with an estimated value of US\$366,000. Moreover, 94 percent of total transactions occurred between farmers and therefore did not involve changes in beneficial use. Trade between urban users and farmers did not exceed 3 percent of total trade transactions.

This low rate of transactions may reflect either a failure of the system or a close to optimal allocation of initial rights. Such an evaluation requires further research. It is, however, reported that trade has avoided political disputes and reduced investment expenditures.

In Chile, tradable water rights have been politically acceptable and enforceable because of the country's long tradition in water property rights. Even water rights that are not legally registered are respected and traded.

The lesson from this is clear: assurance and acceptance of property rights are particularly important for trading (or even taxing) water rights. Controversial equity issues are bound to arise for this essential natural resource and countries with no similar tradition should first legalize existing titles for property rights and define criteria for new allocations. The water permits already in place in many countries may provide an initial endowment.

In addition, fees for permits may be considered as a recurrent source of funding for management and monitoring activities.

Air Pollution

In 1991 Mexico passed legislation for tradable air pollution permits for stationary sources, and the system is currently under design. But again, most of the experience relating to air pollution trading occurs in Chile.

A successful road-auctioning system for bus transportation licenses has been implemented in Santiago to address pollution from traffic congestion. It is a clear example of introducing an economic incentive within an existing licensing system, thus benefiting from lower transaction costs, a fairly high level of revenue generation, and few legal and institutional barriers.

However, the Chilean system for air pollution permits has not been fully implemented. The system is to be applied in the Santiago area, where air pollution problems are very serious. Existing pollution sources are required either to comply with standards or to offset excess emissions by trade. Initial allocations were based on 1992 emission levels (a “grandfathering” system), while new sources are required to offset all emissions.

Offset trading started within the Chilean system in 1995 with very few cases, mostly intrafirm. However, it is recognized that compliance with emission standards—the CAC part of the system—has improved and has yielded beneficial results in terms of air pollutant concentrations in the Santiago area.

Although institutional capacity was a major con-

straint to implementing this system (Box 5.2), it is worth noting that the assignment of air pollution property rights was generally accepted by polluters. In fact, because of the free-market environment of the Chilean economy, the system’s political acceptance was high and private companies were active in discussing standards and criteria.

These lessons can now be of extreme importance in the case of Mexico, where a similar system is being pursued in the Mexico City Metropolitan Area. In Mexico, a significant change will be required in the environmental legislation to incorporate tradable permits. Therefore, it is important to explicitly support the free-market principles embodied in tradable permits and to promote polluter participation at the beginning of the design process.

Policy Synopsis

There are numerous opportunities for introducing tradable permits in Latin America and the Caribbean; the major constraint to their implementation will be finding an equitable initial allocation and trading regime that is consistent with local market-reform processes. Their potential to generate revenue is substantial if initial allocation is done by auction and if fees are charged annually for holding both exercised and unexercised permits.

Earmarking

Although earmarking of revenues is normally avoided in public finance, there are certain theoretical conditions

Box 5.2 Air Pollution Permit Trading in Chile

Decree 04/1992 introduced an implicit emissions trading system for fixed-source particulate emissions in the Santiago area. The system was based on emissions as reported in March 1992. Implementation of the Chilean trading system is under the control of the Program for Fixed-Source Air Pollution Control (PROCEFF) within the National Environment Council (CONAMA). PROCEFF’s initially limited institutional capacity delayed system implementation; private laboratories working with PROCEFF had been corrupted and some technical problems in measurements were also responsible for constant delays in enforcement.

Currently, PROCEFF has gained additional resources and is training personnel in private laboratories, certifying the equipment and defining adequate technical procedures. Legislative reforms are also in the works to overcome the problems encountered so far. The major problems are related to:

- *Distribution of allotments.* The initial allocation of emissions was not well defined. Companies were claiming larger emissions for the March 1992 baseline date than had been previously reported. The possibility of increasing the allocations retroactively thus reduced incentives for trading emission rights.
- *Legal basis.* The original law was considered insufficient to withstand legal challenges. The new draft law attempts to overcome this problem by defining emission permits as property rights rather than “transferable administrative permits” as in Decree 04/1992.
- *Uncertainty.* Given legal uncertainties, polluters did not believe that many of the provisions would be effectively enforced.

Source: Ríos 1995; von Amsberg 1995.

under which it can be justified. These circumstances usually arise when (a) transactions and administrative costs are very high, (b) revenues are related to the explicit provision of a service for a fee, or (c) political pressures for accountability generate effective collection of revenues. In this last case, people may only agree to pay a specific tax if they are satisfied that it is going to a program or cause they support. Governments around the world are discovering that many of these conditions exist within sectors related to environmental management.

Specifically earmarking revenues from MBIs to explicit environmental objectives is thus gaining increased favor in the region. In Brazil and Ecuador, earmarked resource taxes are used to support environmental institutions. In Mexico, incremental gas taxes were used to finance the reduction of fuel evaporation from local service stations. In most countries in the region, utility fees and tariffs are becoming more closely aligned with the cost of providing basic environmental services, and these revenues are increasingly being retained by the bodies that are responsible for financing those services.

To date, experience in Latin America and the Caribbean has demonstrated that earmarking programs are most successful where (a) taxes or incentives are linked to existing collection mechanisms, and (b) revenues are made available to decentralized authorities for environmental programming or for institutional strengthening. At a political level, earmarking is gaining support because it is found that such a "cost-recovery approach" may make it easier to build consensus, remove barriers, and guarantee budget resources to finance environmental institutions.

Legal Redress and Advocacy

A number of examples illustrate the use of voluntary measures and reliance on consumer advocacy to achieve environmental management goals in Latin American and Caribbean countries.

Trinidad and Tobago

The 1995 Environmental Management Act in Trinidad and Tobago provides for the use of MBIs in environ-

mental regulatory efforts. While few are yet in place, this focus has largely been a response to the difficulties encountered with enforcing strict CAC measures. The court system in the country is heavily backlogged, and enforcement and regulation is constrained by inadequate financial resources.

Although there is no legislation in place to mandate corporate liability for environmental damages, in 1990 PetroTrin established a voluntary policy of full compensation for environmental damages. The move was prompted by a number of uncontained well blowouts through the 1980s that damaged local homes, flooded farmers' fields with oil, and caused a significant public outcry in response to health damages when the company gave no assistance in relocating people to avoid the potentially lethal effects of the spills. After the voluntary policy was implemented, two notable trends happened: (a) blowout prevention devices on wells improved, making spills and leakage less frequent, and (b) when a spill did occur, it was easier to contain the impacts and any damages were readily compensated. An incident in the early 1990s, for example, required rapid evacuation of about 1,000 residents from a village when a blowout occurred; affected people were compensated for damaged land and inconvenience, and farms were restored at company expense.

Colombia

One very innovative liability instrument, devised in 1992, involves enhancing consumer actions by providing an economic incentive. Anyone pursuing an environmental liability judicial action is entitled to receive a fee equivalent to 10-15 percent of the total compensation. It is reported that since 1992 the number of actions has significantly increased.

Policy Synopsis

Consumer advocacy through voluntary measures and public pressure (at times linked to formal or voluntary liability instruments) in these cases plays a potentially critical role as an MBI in Latin American and Caribbean countries. To a large degree, these mechanisms are interpreted as substitutes for historically weak institutional capacity.

6. Concluding Remarks

While the countries examined in this paper encompass most of the region, and the examples include most major issues related to market-based instruments, it is not a comprehensive study in either regard. The observations and recommendations are meant to provide policymakers with a regional context and agenda for future efforts that can be adapted to each country's needs, rather than a detailed plan of action.

The most important general lesson is that conventional wisdom about instruments for environmental management must change, and this change must include a more coherent approach toward the use of economic incentives that recognizes and addresses issues of institutional fragility in the region. Within this overall context we make a number of major observations and conclusions about the current state of MBIs in the region:

- MBIs can improve environmental management, but they still impose high administrative demands and are not a “quick fix” to replace CAC measures.
- Limited institutional capacity is pervasive and creates constraints in implementing effective MBIs in light of their high administrative demands.
- Despite these constraints there has been substantial experimentation with MBIs.
- Historically, the primary motive for implementing MBIs has been to raise revenue.
- Budgets for environmental management are limited, and in many cases resources are poorly targeted or do not effectively advance policy goals.
- While environmental consciousness is increasing, public awareness of environmental management measures is still low, and environmental rules are plagued by uncertainty and lack of confidence.
- Although genuine attempts are made to adapt MBIs to local circumstances, information flow still is predominantly “North-South,” while intraregional cooperation is weak.
- Under the right circumstances, MBIs can enhance environmental management and equity, rationalize markets, reduce social costs, and increase institutional revenues.

Public management in Latin America and the Caribbean historically has been very bureaucratic, sensitive to political interference, and ineffective at enforcement. Policy implementation often has been poorly targeted, particularly in social policies. In the past, economic regula-

Ten Commandments for MBIs

REALISM. Be modest. Do not try to implement policies and instruments beyond the institutional means available.

GRADUALISM. National or regional policies can be gradually implemented by pilot projects or experimental programs. The establishment of plausible and enforceable norms, standards, and guidelines is an important starting point.

LEGAL FLEXIBILITY. Legislation must allow low-cost revisions.

INSTITUTIONAL INTEGRATION. Intra- and intergovernmental integration must be pursued to overcome barriers and to merge institutional strengths. Government economic agencies must be included, as well as parliamentary representation.

LEADERSHIP. The environmental management sector must lead the decisionmaking process by identifying stakeholders, barriers, and channels to consensus building.

PARTICIPATION. Public participation is a key issue. Participation by stakeholders must be planned and based on information building and sharing. Avoid stalemate issues that may paralyze the process. Equity issues must be properly identified, evaluated, and addressed.

MARKET RELIANCE. The growing reliance on markets must be incorporated into environmental policy and MBI design. Avoid high transaction and collection costs. Do not outpace implementation and acceptance of market adjustments.

REVENUE GENERATION. Many MBIs can generate earmarked revenue. Although correct pricing of environmental goods and services is one aim of MBIs, a cost-recovery approach may be a more effective way to build consensus, remove barriers, and guarantee financing.

HUMAN RESOURCE DEVELOPMENT. Human resources in the environmental field are scarce and remuneration of public employees is low. Restructure human resource profiles to make the most of limited budgets. Be small and rely on external expertise, concessions, and research centers. Be executive strong to keep external input effective and coherent.

CONTINENTALISM. Do not reject OECD experiences and recommendations, but increase ties to regional agencies where economic and cultural contexts may be more familiar.

tion was strongly dominated by command-and-control measures, usually applied within an authoritarian political system. More recently, social inequality, economic stagnation, macroeconomic destabilization, and weak international competitiveness have led countries to adopt—albeit haltingly in some cases—liberalization policies committed to free markets and trade.

This new economic scenario, along with other favorable political factors, has helped put MBIs high on the agenda of the environmental management sector in the region. Already countries have begun implementing economic instruments such as royalties, user charges, tradable permits, and green taxes. In many cases the MBIs are designed to complement rather than replace existing CAC measures (such as standards, licensing, zoning regulations, and permits) and to enhance CAC enforcement. However a major impetus behind many MBI measures has been to generate revenues earmarked for environmental management rather than to directly achieve goals such as reducing environmental impacts or improving the cost-effectiveness of regulations.

Reducing excessive regulation and high public expenditures has become the cornerstone of governmental reform, and is fully supported by society as a whole. But the important issues of redefining and better targeting regulations and public expenditures—which can both improve cost-effectiveness and help avoid unnecessarily jeopardizing critical policy goals—has largely been ignored.

In the environmental management sector, budget cuts often have been made in an ad hoc manner rather than with careful consideration of policy goals and effectiveness. In addition, not only have macroeconomic stabilization programs constrained overall public expenditures, but urgent social needs such as health and education have received higher priority than environmental management.

At the same time that environmental budgets are strained, environmental consciousness has increased due to democratization, international initiatives, and the pressures of rapid industrialization and urbanization. As institutions are expected to do more—often with less resources and increased bureaucratic costs—there is a higher risk of enforcement failures that will discredit policies, legislation, norms, and institutions. This creates lower confidence and greater uncertainty in environmental rules and enforcement. This uncertainty is perhaps the most serious criticism voiced both by the business sector and by people directly affected by environmental problems.

Under these circumstances, wide experimentation with economic incentives can be a risky burden for the environmental management sector since MBIs are not a simple substitute for CAC measures, and do not remove the need for strong institutions. In some cases MBIs potentially increase technical and financial demands. There-

fore gradual and flexible reforms may be the best approach as institutions evolve and strengthen.

This does not mean MBIs should be avoided, but rather that they require capable institutions, adequate legislation and financing, and effective monitoring and enforcement to succeed. Under these conditions, MBIs can overcome many institutional barriers and have important advantages over CAC measures. MBIs can introduce economic rationale into policy implementation thereby reducing social costs. They can make markets more efficient, improve equity outcomes, and if necessary they can generate revenues to strengthen institutions both at the national and local level.

However, MBIs are not a one-size-fits-all proposition. It is important to tailor such instruments to local conditions and needs. In this regard there are positive tendencies in Latin America and the Caribbean, but also considerable room for improvement. International agencies and donors still are prone to recommend OECD solutions with little regard to local institutional issues, and there has predominantly been a North-South exchange of information. While regional institutions have made genuine attempts to adapt MBIs to each country's economic and cultural characteristics rather than merely transplanting OECD solutions, Latin American and Caribbean countries could go much further in fostering intraregional cooperation and information exchange to benefit from one another's experiences, successes, and failures in environmental management.

This study only makes a start at filling this gap in information exchange. Further initiatives must be launched, and the countries of the region must take a lead in this process.

However, weak public participation inherited from earlier authoritarian regimes, general public sector crisis, and social inequalities are very difficult barriers to overcome, and they pose a real constraint to rapid implementation of complex MBI mechanisms. Sound and enforceable policies remain elusive.

To operationalize the use of MBIs more effectively within this fragile institutional context requires more than simply an ad hoc approach. This study recommends that the following steps be followed when considering the adoption or reform of environmental management policies:

- 1) Clearly identify the environmental problems that the policy reforms are meant to address, and set clear goals and objectives.
- 2) Take stock of instruments already in place, including an assessment of their flexibility and the degree to which they help internalize environmental costs.
- 3) Analyze existing legal boundaries and their compatibility with MBIs, and consider the feasibility of reforms that would create a more favorable legal environment.

- 4) Analyze relevant market forces, economic agents, and the rationality of economic incentives, paying particular attention to the role of market-based reforms outside the environmental management sector.
- 5) Identify environmental damages whose costs are not internalized, and their relation to various economic and domestic activities (for example, pollutant emissions and transportation, land degradation and natural resource exploitation, water pollution and sewerage).
- 6) Quantify if possible the social benefits (environmental improvement, social control, cost reduction, fiscal revenue) and costs (tax erosion, smaller consumer surplus, inflation) of various reforms.
- 7) Investigate the feasibility of introducing specific MBIs in terms of their impact on private costs, institutional costs, marginal cost of revenue generation, and legal changes.
- 8) Recommend policy, institutional, or legislative actions (such as decentralization and legislation based on the polluter-pays principle).

Appendix: Background Paper Summaries

Bolivia

Bolivia is a very large, sparsely populated, and poor country in the center of South America. It covers 1.1 million square kilometers, has 6.9 inhabitants per square kilometer, and a per capita income of US\$760 a year. Geographically, the country is divided into three different regions: the altiplano, the inter-Andean valleys (some arid, some humid), and the eastern lowlands. These climatic regions cover 20 percent, 20 percent, and 60 percent of Bolivia's territory, respectively, but some two-thirds of the population live in the highland regions of the country (altiplano and valleys). Just over half of Bolivia is covered with forests (mostly humid, but some semiarid). Hydrologically, the country is divided into three major water basins: the Amazonian to the northeast, the Pilcomayo which feeds Río de la Plata to the southeast, and the Lake Titicaca–Lake Poopó closed basin in the west.⁶

Bolivia is the poorest country in South America and the third poorest in the Western Hemisphere, after Haiti and Honduras. Close to one-third of the population is functionally illiterate, half of urban households and more than 90 percent of rural ones have unsatisfied basic needs (UBN), such as limited access to safe drinking water, sewerage, basic education, and health services. The infant mortality rate is high even by Latin American standards (75 per 1,000 live births). Diarrhea and acute respiratory diseases are the main sources of infant mortality (32 percent and 19 percent, respectively). The maternal mortality rate is also very high, at 390 per 100,000 live births.

Environmental issues in Bolivia can be classified under two broad categories: those involving long-term management of natural resources, and those directly affecting the daily livelihoods of significant portions of the urban population. There are three priorities in the first category: (a) improving water quality, (b) managing rain forests, and (c) resolving land tenure conflicts, including those of national parks and indigenous peoples' claims.

The issue of sustainable management of natural resources is very important in Bolivia, but it falls outside the scope of this document. The country just adopted a new forestry law, is considering a new law for modernizing the administrative framework of rural lands, and may consider a new water law in the near future. All these have important environmental implications because they re-

fine property rights, establish new conflict resolution mechanisms, and set new rules for the use of natural resources. However, these legal changes have broader implications that go beyond the issue of improving environmental quality. Furthermore, there is very little information available that can be used to evaluate the environmental implications of these policy changes.

This paper focuses only on the narrower category of urban environmental quality issues. It is argued that widespread poverty is the main cause of the environmental quality problems affecting the majority of Bolivians. In particular, limited access to safe drinking water and adequate sewage systems are—in addition to malnutrition—the primary causes of the country's high morbidity and mortality rates (both urban and rural). These problems, in turn, are the result of historically very low levels of public investment in basic sanitation infrastructure (water and sewage systems, collectively known in Bolivia as *saneamiento básico*).

Only 24.9 percent of rural households and 74.8 percent of urban ones have access to safe drinking water. Less than 1 percent of rural households and only 36.2 percent of urban ones have in-house sewage systems. Over the past few years, public investment in basic sanitation has been less than 1 percent of GDP, equivalent to less than 6 percent of total public investment.

With the implementation of the bold "Popular Participation" and "Administrative Decentralization" reforms over the past two years, Bolivia has taken major steps that will significantly increase the level of local (department and municipal) public investments in basic sanitation and other key infrastructure projects. At the same time, the country has adopted quite strict environmental standards, equal or similar to those set for water and air quality by the U.S. Environmental Protection Agency (USEPA).

This paper argues that significant improvements in environmental quality and living standards for the majority of Bolivians will come primarily as a result of higher rates of public investment in basic sanitation infrastructure. On the other hand, effective enforcement of the strict environmental standards recently adopted will at best have a marginal effect on the living standards of the poor. It is doubtful that Bolivia's public sector has the institutional capacity to enforce the new environmental standards and it is questionable whether the country as a whole can afford the cost of adopting such strict standards, since doing so involves sacrificing some income growth.

6. The Bolivia section is extracted from Escobar and Muñoz 1996.

The main instrument of environmental policy as it relates to urban living standards is the environmental law passed in June 1992, and its six regulatory decrees issued in December 1995. The law and its decrees introduced over 350 pages of strict standards and regulations that rely primarily in command-and-control (CAC) mechanisms for enforcing environmental quality. Although the law allows for the possibility of using market-based instruments (MBIs), all the work that the Ministry of Sustainable Development and the Environment has done to date in order to implement the law has been in CAC mechanisms.

This law mandates that all existing public and private projects, programs, or activities (with some exceptions) prepare an "environmental manifesto," a self-evaluation of their present environmental conditions. The law also stipulates that all future projects, programs, or activities must have an environmental impact assessment (EIA). Both of these must be approved according to the environmental quality standards set forth by the regulatory decrees; firms will have five years to make the necessary technical adjustments in their practices to abide by the new standards. These stipulate, for example, that the maximum permissible limit for carbon monoxide (CO) in the air is an average of 10 micrograms per cubic meter in an 8-hour period, or 40 micrograms per cubic meter in a 1-hour period, which are exactly the same standards that were in effect in 1989 in the United States (Portney 1990). With regard to water quality, the law stipulates a maximum permissible limit of 60 milligrams per liter for total suspended solids discharged, and 80 milligrams per liter for BOD5.

There are no official estimates on the costs and benefits (private or social) involved in rigorously applying the standards and regulations included in the law and its decrees. However, it is clear that implementing the law will have very high transaction costs to be paid by both the public and private sectors. The government at the central, department, and municipal levels is already facing significant constraints in implementing the law, primarily due to lack of qualified personnel and appropriate training of public officials. At the same time, demand for qualified technicians to fill out environmental manifestos and EIAs is already inducing many professionals from the public and private sectors to establish consulting firms for this purpose. Both of these phenomena are drawing scarce professionals away from other productive activities.

Government-sponsored MBIs have only started to emerge in Bolivia (Table A1). For example, in 1994 the municipality of La Paz introduced a combination of "polluter-pays" and "progressive-subsidy" principles for solid waste disposal. Households now pay a waste disposal fee based on the amount of electricity they consume. Since most households have electricity meters and there is a

strong positive correlation between electricity consumption and income levels, this mechanism has allowed private waste-collecting firms (one large company and several microenterprises) to operate more efficiently.

In addition, there are a couple of examples of market-based allocation mechanisms in paper and glass recycling. However, these operate completely as a result of spontaneous market signals and have received little or no attention from the government. It is expected that these will gradually grow as the country develops. There is significant potential for introducing MBIs in water use in urban areas as the institutional and financing mechanisms of water utilities change in the near future.

The highest priority area on environmental quality in Bolivia's urban areas is facilitating access to safe drinking water. Improvements in this area have significant environmental benefits, since it will directly address one of the main causes of morbidity and mortality in urban areas, especially among the poor. There are two major challenges in this regard: (a) to significantly increase the level of investment in infrastructure, and (b) to change the structure of user fees.

Higher investment rates in infrastructure are essential in order to increase the number of households with access to drinking water (especially in Beni and Pando, where distribution networks are deficient or nonexistent, and in the country's four largest cities, where the population is growing rapidly) and to improve its quality (in particular in cities such as Oruro and Potosí). Bolivia is considering two mechanisms in order to meet this challenge: (a) empowering municipal governments through increased autonomy, taxing powers, and net transfers, and (b) privatizing (or "capitalizing") municipal water companies and cooperatives.

Changes in the structure of user fees for water are important to increase the allocative efficiency of water use, to allow for progressive subsidies, and to encourage private investments in infrastructure. The country is making the necessary legal changes to facilitate the capitalization of municipal water and sewage companies and cooperatives.

A second high-priority area for Bolivia is to introduce certain key principles based on markets and civil society participation to environmental management, and to reconsider some of the standards and regulations introduced by the environmental law and its regulatory decrees. Specifically, it is recommended to (a) use cost-benefit analysis tools in environmental policymaking, (b) apply regularly the principle of marginal cost pricing for public utilities, with a progressive subsidy when appropriate, (c) establish clear property rights for water and land resources, (d) promote the involvement of civil groups in environmental management, (e) strengthen market-based instruments that are easy to apply, (f) reconsider some air and water quality standards, and (g) simplify the require-

ments and procedures for environmental impact evaluations mandated by the environmental law.

Brazil

Table A1 Environmental Policy Instruments in Bolivia

<i>Regulations and Sanctions</i>	<i>Charges, Tariffs, and Taxes</i>	<i>Market Creation</i>	<i>Final Demand Intervention</i>	<i>Liability Legislation</i>
Forestry and Biodiversity				
Forestry law and environmental law: <ul style="list-style-type: none"> Classify forestry land Management plans are required License to clear is required Sanctions for forest crimes or offenses Fines 	<ul style="list-style-type: none"> License for forest extraction (US\$1 per hectare per year) License to clear 	<ul style="list-style-type: none"> Concessions over fiscal land are competitive (there are some limitations), tradable, and last 40 years 	<ul style="list-style-type: none"> Certification is required for products under CITES Convention Eco-labels 	<ul style="list-style-type: none"> Public reporting or accusation is possible for environmental offenses or crimes Civil and criminal litigation is possible for environmental damage
Soil, Erosion, Salinity				
Soil management plan and environmental law: <ul style="list-style-type: none"> Land classification Land use zoning 	<ul style="list-style-type: none"> Permission to use, according to zoning, is required The use of toxic substances is prohibited 			<ul style="list-style-type: none"> Public reporting or accusation is possible for environmental offenses or crimes Civil and criminal litigation is possible for environmental damage
Water Pollution				
Environmental law and other sectoral regulations: <ul style="list-style-type: none"> Water quality standards Discharge prohibition for some toxic substances Environmental impact assessment Noncompliance fines equal to 0.3 percent of the asset's value 		<ul style="list-style-type: none"> There are rural markets for water rights, nevertheless they do not have proper legal recognition nor institutional endorsement 		<ul style="list-style-type: none"> Public reporting or accusation is possible for environmental offenses or crimes Civil and criminal litigation is possible for environmental damage
Drinking Water and Sewage System				
Environmental law and municipal regulations: <ul style="list-style-type: none"> Water quality standards Discharge prohibition for some toxic substances Fines for disposal of human waste in unauthorized places 	Tariffs for drinking water and sewage system are determined by income, type of consumer, and quantity consumed (in La Paz and Cochabamba). <ul style="list-style-type: none"> US\$0.20 per cubic meter of drinking water in La Paz US\$0.40 per cubic meter of drinking water in Cochabamba US\$0.09 to US\$0.24 per cubic meter for the sewage system 		<ul style="list-style-type: none"> There is an increasing demand for bottled drinking water 	<ul style="list-style-type: none"> Public reporting or accusation is possible for environmental offenses or crimes Civil and criminal litigation is possible for environmental damage
Solid Waste				
Environmental law and municipal regulations: <ul style="list-style-type: none"> Distinction between solid waste and hazardous waste Prohibition on dumping waste in unauthorized places Fines for dumping waste in unauthorized places 	For La Paz and Cochabamba there is a charge of <ul style="list-style-type: none"> US\$30 per ton for industrial waste US\$1 to US\$3 per month for domestic waste per home In other cities the waste collecting companies cannot charge for the service 	<ul style="list-style-type: none"> In La Paz the municipal company had contracted one big company (80 percent of waste removal) and nine small enterprises Spontaneous recycling of paper, glass, and plastic 		<ul style="list-style-type: none"> Public reporting or accusation is possible for environmental offenses or crimes Civil and criminal litigation is possible for environmental damage
Air and Others				
<ul style="list-style-type: none"> Air quality standards Prohibition on dumping toxic substances Environmental impact assessment Noncompliance fines equal to 0.3 percent of the asset's value Municipal zoning for different uses 				<ul style="list-style-type: none"> Public reporting or accusation is possible for environmental offenses or crimes Civil and criminal litigation is possible for environmental damage

This summary discusses first the performance of environmental management in Brazil and its approach of

using command-and-control instruments. The Brazilian experience of existing economic incentives is described next. Lessons and recommendations regarding potential future economic incentives are presented in the last parts of the text.⁷

Brazilian Environmental Management Sector

During the 1970s, the country started facing severe urban environmental problems because of rapid industrialization and the mechanization of agriculture. These changes took place when environmental issues regained international importance at the 1972 Stockholm Conference of the United Nations on Environment.

The design and coordination of environmental and natural resource policies in Brazil reacted promptly to new domestic and international environmental realities with the creation, in 1973, of the Special Secretariat for the Environment (SEMA) within the Ministry of Internal Affairs. Legal consolidation occurred in 1981 through National Environmental Policy (NEP) Law 6938, which defines the objectives, priorities, guidelines, instruments, and duties of environmental policies.

The formulation and coordination of the NEP is assigned to the National Environmental Management System (SISNAMA), which comprises: a government council formed by representatives from all ministries; an advisory council (CONAMA—National Council for the Environment) formed by representatives of the states, unions, NGOs, and experts; the Ministry of Environment and Legal Amazonia (MMA), which chairs CONAMA; an executive agency (IBAMA—the Brazilian Institute of the Environment and Renewable Natural Resources) linked to MMA; other public agencies concerned with environmental matters; and state and municipal environmental agencies. The resources to carry out the NEP are financed through the National Environmental Fund (FNMA) under MMA administration.

Like many government structures in Brazil, SISNAMA falls administratively between the national and departmental systems. States and municipalities have seats in CONAMA and play an important role. Moreover, they often have specific environmental laws and very active environmental protection agencies (EPAs) that share with the federal government the assessment and evaluation of many environmental issues.

SISNAMA only started operation in 1984 when CONAMA established its rules. The first radical change occurred in 1988 when the creation of IBAMA integrated all federal executive agencies. At the upper levels of the system, however, there are still some constraints that prevent the executive council from performing its functions of intervening in the national

planning process and of standardizing governmental actions in environmental matters and other related issues.

IBAMA, created as the executive agency of SEMA, brought together the authority, resources, and responsibilities of the Brazilian Institute for Forest Development (IBDF), the Superintendent of Fisheries Development (SUDEPE), and the Superintendent of Rubber (SUDHEVEA). In 1991 SEMA received full institutional and budgetary autonomy and ministerial status as a secretariat directly linked to the Office of the President. Finally, in 1994, it became the MMA.

In broad terms, the distribution of responsibilities among the different government levels for implementing the NEP is made informally, as described below. IBAMA, in addition to the duties related to budgetary and policy control issues—like license concession, standards setting, monitoring, and coordination—is mainly responsible for renewable natural resource issues, and in particular the Amazon ecosystem. State agencies are responsible for water pollution issues. Municipal agencies are responsible for drainage, solid waste, and noise and air pollution issues.

Command-and-Control Instruments

Environmental management in Brazil is largely based on command-and-control instruments as stated in the NEP law. These instruments can be classified as follows:

- Environmental standards
- Land uses based on zoning and conservation units
- Licenses based on environmental impact assessment studies
- Sanctions such as fines, compensation for damages, and closures.

The 1988 Federal Constitution reinforces conservation of certain ecosystems (for example, Amazonian forest) that are considered national patrimony, and that therefore require specific legislation for their exploitation. The new constitution also created the National Integrated System of Water Resources Management.

Another constitutional novelty is that there is liability placed on firms for environmental damages under which firms' managers can be prosecuted. It also considers damages to fauna and flora as crimes without bail; any person can prosecute environmental violators and governmental agencies failing to enforce the law.

These liability actions have, however, very limited results. The recurrent overcrowding of the Brazilian judicial system tends to delay court decisions. Moreover, governmental agencies are not always able, or are sometimes unwilling, to cooperate when damage estimates are needed or when information must be obtained and cleared.

7. This section is extracted from Serôa da Motta 1996b.

Implementation Problems

Command-and-control approaches adopted by EPAs are facing two types of problems:

- Weak inter- and intragovernmental integration
- Financial and human resources constraints.

The federal environmental agency—IBAMA—is supposed to act only in interstate cases or in very specific situations where natural sites are under federal domain such as tropical forests. Pollution issues are by law almost entirely under state enforcement, and state agencies often introduce stricter standards and sanctions than those defined at the federal level.

Some state EPAs (for example FEEMA in Rio de Janeiro and CETESB in São Paulo), created in the 1970s, have been chiefly concerned with pollution issues such as water and air quality. Forestry, fishing, and land use are often under the responsibility of other state agencies. As for water supply, water capture licensing and sewage services as well as waste collection and treatment are offered either by state or by municipal companies. Such arrangements have failed to generate integrated approaches to environmental planning at state levels.

The federal EPA, however, legally covers all aspects of environment protection. The creation of IBAMA was a result of that intention, merging existing federal agencies such as SEMA, SUDEPE, and IBDF. IBAMA, however, has not succeeded in playing the role of federal EPA. With the present outcry over deforestation, IBAMA has devoted much of its efforts to forestry resource management.

Federal support and supervision activities on pollution control have consequently shown a very poor performance. In the case of state EPAs, performance varies according to each state, and differences are to some extent related to the state level of economic growth.

Furthermore, some EPAs, as in the case of Rio de Janeiro and Minas Gerais, have been badly affected by the economic recession of the 1980s when political will did not favor environmental issues. After the ensuing budget cuts, the recent concern on environmental matters has not been sufficient to overcome budget problems. By contrast, the situation is worsening because of the increasing demand on environmental protection services.

External funds are becoming essential to EPAs, although they are not always fully effective because national counterpart funding often fails to be delivered because of tight public expenditure control. Fines from sanctions in many states are earmarked for EPAs but

they do not amount to a significant part of the total budgets. Moreover, fines can be contested in court and payments delayed, which make them an unpredictable source of revenue. Although still small in budget terms, license fees generate larger revenues on a constant basis for state EPAs. Environmental charges may provide large sources of revenues, but they are not fully reverted to environmental purposes.

Apart from lack of resources, EPAs have no freedom to set their own salary levels according to functional needs; they are always restricted to governmental general salary plans. External funds are not allowed to finance salary expenditures. Such constraints can be regarded as a central cause of the current institutional disarray.

That financial weakness has also been a barrier for inter- and intragovernmental integration since financial resource transfers became a key issue. The lack of integration, consequently, has weakened environmental planning, which does not give enough room to introduce the environmental dimension in macroeconomic and sectoral policies and programs.

Identification of High-Priority Areas

Water pollution in Brazil is mainly due to domestic effluents, agricultural runoff, and industrial discharges.

Almost 50 percent of domestic sewage is collected by the general system. However, treatment levels do not exceed 15 percent. Investments needed to offer adequate sanitation services would take almost 1 percent of the country's annual GDP.

In 1988 the abatement levels in the industrial sector were 73 percent for organic matter and 52 percent for inorganic matter. To reach higher rates of abatement with the best available technologies, the industrial sector would have to spend around 2 percent of its annual GDP.

Indicators for agricultural runoff are not available but they may represent more than 40 percent of potential organic emissions in watersheds in Brazil.

Mortality cases due to intestinal infections related to waterborne diseases are concentrated in children younger than one year old. Health costs associated with these diseases may vary from US\$130 million to US\$389 million.

Air pollution levels are very high in the major Brazilian cities of São Paulo and Rio de Janeiro, and in industrial cities such as Cubatão. Estimates of health costs in these three cities are between US\$2.4 million and US\$3.5 million.

Solid waste collection reaches almost 90 percent of the urban population, although adequate sanitary landfills are rarely available.

Table A2 Charging for Natural Resource Use in Brazil

<i>Instruments</i>	<i>Current Status</i>	<i>Annual Revenue^a</i> <i>(millions of US\$)</i>	<i>Purpose</i>
Industrial Sewage Tariff Based on Pollution Content			
São Paulo state	Partially implemented since 1981	13	For cost recovery of sewage treatment stations
Rio de Janeiro state	Implemented since 1986 and ceased in 1994	3	
Financial Compensation due to Natural Resource Exploitation			
Hydroelectric generation	Fully implemented since 1991	315	To compensate municipalities and states where production takes place and also the environmental regulation agencies
Oil production		97	
Mineral production (except oil)		41	
Fiscal Compensation for Preservation Areas (Water Supply and Ecosystem Areas)			
São Paulo state	Implemented in 1994	19 ^b	To compensate municipalities for land-use restrictions based on environmental reasons
Paraná state	Implemented since 1992	53	
Rio de Janeiro state	Under discussion in the state legislature	55 ^b	
Deforestation Taxes			
Federal Forest Deposit Fund paid by users who do not carry out reforestation activities	Implemented since 1973	7	To finance public reforestation projects
Forest tax in Minas Gerais paid by users of forest products	Partially implemented since 1968 and fully revised and implemented in 1994	12	To finance governmental activities on forest policy

a. Estimated revenue for 1993, except where noted.

b. Anticipated annual revenue (instrument not in effect in 1993).

Use of Economic Incentives

The use of market-based instruments (MBIs) in Brazilian environmental policies is restricted to a few areas where they have played limited roles. The important experiences already in place are in natural resource exploitation, wood consumption, and industrial water sewage.

Water, sanitation, solid waste, and energy tariffs do not include any environmental costs. The tariffs have also failed to apply the long-term marginal cost approach, although the current public deficit crisis is forcing them to apply more realistic tariff levels.

Voluntary deposit-refund schemes are traditional practices for glass and aluminum containers.

In Table A2, an overview of the existing MBI experiences is presented.

These MBIs were used with revenue raising objectives with practically no concern for the incentive effects. The lack of incentive purposes implies that charges or taxes are not determined on the basis of net marginal costs or on spatial differences in assimilative capacity. Therefore, they do not stimulate efficiency in the use of natural resources.

Although they will not be addressed here because they are still under very recent discussion, there exist some important initiatives in environmental auditing and eco-labeling; the Brazilian export-oriented sector is also playing an active role in the definition of ISO 14000.

Environmental auditing, however, is becoming mandatory in certain states and there is a similar bill in the National Congress for discussion. These auditing

procedures may be overcome by the voluntary initiatives of ISO 14000 and eco-labeling.

Lessons and Recommendations

Up to now, the use of MBIs in environmental policies in Brazil was made with the sole objective of raising revenues. This limited role—acknowledged even in the industrial countries—should not be taken as a problem, in particular if revenues are used to finance public investments and government programs related to environmental management. Indeed, it can be seen as a necessary step forward in the development of adequate enforcement capability.

Table A2 shows estimates of annual revenue from all environmental charges already in place in Brazil to be approximately US\$541 million in 1993. Thus, the total amount of annual environmental charges will represent approximately 0.1 percent of 1993 GDP. The main problem, therefore, is how to earmark these revenues for environmental purposes.

Gradually, however, environmental policies will have to be concerned with the use of MBIs as incentive mechanisms. In Brazil, only timid attempts have been made in this direction and the results were far from successful. The reasons are, on the one hand, lack of adequate technical, legal, and administrative capability in the design of MBIs, and on the other hand, strong resistance demonstrated by economic agents.

The recommendations derived then are to (a) assure the objective of revenue generation for the creation of adequate enforcement capacity, (b) internalize environmental objectives in sectoral policies, (c) reconcile the

use of CAC and MBI, and (d) undertake research to evaluate MBI uses and constraints.

Potential Economic Incentives

There still exists a very important federal initiative on water charges within a context of river basin authorities; the legal framework under discussion in the National Congress is facing problems related to overlapping boundary jurisdictions and criteria for charge level and revenue distribution. Several states are also passing similar bills. In São Paulo state, for example, the law is already approved but similar problems are now impeding its implementation.

Another area of intense discussion within the environmental management sector is the introduction of gasoline and alcohol fuel taxes in cities where air pollution problems are severe. Tax reform under discussion in the congress has been seen as an opportunity to introduce this new tax which, in the city of São Paulo alone, could generate US\$500 million for public transport purposes. But negative public reaction to this taxation may reduce chances that such legislation will be sent to congress.

The introduction of tipping fees in landfills is another area of interest in large urban areas in São Paulo and Rio de Janeiro. Fiscal incentives for the recycling sector are also under discussion.

Caribbean

In contrast to the other countries and papers in this series, the case study relating to the Caribbean⁸ is approached from a somewhat different angle to reflect the following “stylized facts” about Caribbean island states:

- *Small-island vulnerabilities and institutional opportunities are conceptually different from those in larger riparian countries.* Extensive research over the past few decades has illustrated that economic, environmental, and social vulnerabilities make small-island communities more susceptible to external shocks. Also, however, the smaller size can be an advantage in pursuing low-cost interventions with low institutional overheads.
- *The “urban challenge” in small-island states does not stop at the city’s edge.* Although the connections between urban and rural activities are often less than clear even in large countries, the distinction becomes even more problematic in small-island states with relatively small populations.

As a consequence of these conditions, some of the MBI prescriptions in this study differ markedly from those in other studies.

The paper concentrates on the island of Barbados and provides comparative analyses with other Caribbean countries, in particular with Trinidad and Tobago and with Jamaica. The issues in Barbados generally include the following as key priorities: (a) coastal zone degradation, (b) inadequate land disposal of solid waste, (c) uncontrolled management of toxic and agricultural chemicals, (d) marine pollution, (e) destruction of natural forests, (f) lack of environmentally sound planning; (g) fragmentation of institutional responsibility, and (h) lack of environmental awareness.

To some degree, the priorities of Barbados are also reflected in the major investment projects currently being undertaken in the country. These include: (a) west coast sewage project, (b) south coast sewage project, (c) solid waste management plan, (d) coastal zone management plan and coastal conservation project, (e) coastal conservation institutional strengthening, and (f) agricultural diversification.

Legislation and MBIs in Barbados

The current legislation concerning environmental management in Barbados can be characterized as incomplete and fragmented with a high degree of overlap and duplication. Wastewater standards have not been legislated and World Health Organization (WHO) standards are currently being used for major environmental pollutants. Penalties are often inadequate and differ between acts which are designed to regulate similar offenses. The regulation of similar offenses by several different acts is in itself an area of overlap which creates confusion in terms of determining which provisions should prevail. The legislation is weakened by the incomplete nature of the enactment, the division of responsibility between several ministries, and insufficient enforcement capabilities. Also, a number of legislative gaps exist. For example, the legislation which is designed to protect coastal ecosystems is focused mainly on the prevention of overexploitation and makes little or no reference to the potential toxicity of contaminants.

MBIs in Barbados

Direct Regulation. Regulation of the tourism sector is primarily administered through the planning process. For example, a condition attached to building permits requires new hotels, as well as old hotels undergoing major refurbishing, to adopt facilities for pretreating wastewater before it enters septic tanks. Given that there are no wastewater standards in Barbados, a BOD standard based on the WHO guidelines is being used to set minimum discharge standards.

8. This section is extracted from Ruitenbeek and Sawyer 1995.

Duty and Tariff Relief for Importation of Environmental Equipment for Hotels. Incentives for the importation of duty-free goods are outlined in the Hotel Aids Act for new establishments, and in a refurbishing program for existing hotels that are expanding their operations. For existing hotels, applications for the importation of duty-free goods are made to the Permanent Secretary of the Ministry of Finance. Duty-free goods in both of these programs include environmental technologies.

Fiscal Incentives for Hotels. The hotel industry currently receives a number of fiscal incentives through direct or indirect subsidies. These include (a) assistance with project financing, (b) tax holidays of up to 10 years, (c) relief from multiple taxation, (d) leasing of property, (e) marketing support, and (f) training and support organizations. Also, some smaller hotels have had their outstanding water bills waived by the Barbados Water Authority.

Building Regulations and Rebate. Recent demand-management proposals include both CAC and MBI approaches. For example, all new commercial buildings over 1,000 square feet and all new residences with a roof area or living space in excess of 3,000 square feet will be required to construct rainwater storage facilities. This regulation is being complemented by a rebate of Bds\$1 per gallon of installed tank capacity up to a maximum of one-quarter of the roof space. Although existing commercial and residential units are not required to install holding tanks, they do qualify for the rebate. Enforcement is scheduled to begin in January 1996.

Building Regulations and Tax Incentives. New commercial and government buildings will be required to install watersaving taps and, where applicable, showers. This will be enforced through the Town and Country Planning Regulations. Retrofitting of existing commercial buildings and residences will be encouraged by allowing claims on corporate and personal tax for the amount of the watersaving device. All regular showerheads and taps should be phased out within five years. Enforcement is scheduled to begin in January 1996.

Water and Sewer Charges. Those connected to the Bridgetown sewer and water supply system are charged a quarterly fee by the Barbados Water Authority. This includes water and sewer charges, where sewer charges are calculated on a ratio with water use. Those outside of the Bridgetown project do not pay for disposal services. Once the west coast and south coast sewer projects are operational, sewer charges will be instituted. Some 44,000 water users (approximately 33 percent of

all users) have meters, with another 30,000 planned under the south coast sewer project. Water is priced according to a subsidized scheme with domestic charges equal to one-third of total supply costs and industrial users priced at two-thirds of total cost.

Regulation of Water Charges—Water Permits for Agriculture. Agricultural water permits are required for agricultural plots above a certain size. To avoid obtaining the permit and having to pay a usage charge, farmers report their holdings in smaller parcels. This results in many farmers using water for irrigation free of charge. Also, a significant amount of peri-urban agriculture is conducted on the island. Based on the size and number of plots on urban properties, water usage could be quite high for this use. But for the most part, calculation of water usage and therefore water bills for urban properties is based on a coefficient that includes the number of bathroom fixtures and bedrooms; the more toilets in the residence, the more the household is charged. Given the lack of metering, and the number and size of urban agricultural plots, in many cases water use will be underestimated and billing will be too low.

Pricing and Subsidization of Waste Collection. Approximately 85 percent of households are on scheduled pickups by the sanitation service. Disposal services are provided free of charge and not according to the marginal cost of supply. Many hotels, enjoying tax holidays, are therefore receiving a free service, although some do pay transportation costs to private sector collection services. The main subsidies result from government subventions channeled to the Sanitation Services Authority (SSA). Between 1991 and 1994, the SSA received subventions totaling Bds\$78.5 million (US\$39.25 million). Waste collection and disposal accounts for 4 percent of 1995-96 government expenditures.

Deposit-Refund System. When glass bottles were the dominant drink containers, manufacturers enjoyed a 95 percent return rate for reusable bottles. This high rate was facilitated by a deposit-refund system. With the introduction and subsequent domination of plastics in the bottling industry, the original deposit-refund system was canceled. Another deposit-refund system was instituted in 1985. This program was in direct response to increased foreign competition from regional beverages and was not intended to reduce waste streams destined for landfills. In fact, until recently all of the returned plastic ended up in the landfill. The program has facilitated a 30 percent return rate for polyethylene terephthalate (PET) bottles. The major weakness of this program has been the lack of incentives to facilitate packaging and preparation of PET bottles for recycling.

New Tipping Fee and Environmental Levy. A new tipping fee is included in the 1995-96 budget. A fee of Bds\$40 per ton is proposed in addition to item-specific fees for bulky wastes. The importation of bulky waste will be subject to an environmental levy. Domestically produced bulky wastes will be subject to an increased consumption tax. The new tipping fee and the environmental levy are anticipated to generate annual revenue of Bds\$2 million and are a direct response to anticipated government cost increases associated with a new landfill. Recycling businesses will also be granted fiscal concessions but specific proposals are not available at this time.

Summary of New MBI Opportunities

By Caribbean standards, Barbados is quite far advanced in its application of MBIs. Its historical focus on subsidies has also recently moved the next step toward an orientation based on charge systems. These charge systems, however, are not likely to be adequate to cover a large share of all recurrent costs (under the polluter-pays principle) while also providing a buffer for environmental emergencies (under the precautionary principle). Two opportunities do, however, stand out as being of potential applicability in the Barbados context.

Liability Approaches. The basic principle behind liability approaches to environmental management requires only that legislation be in place that confers relatively straightforward rights and obligations to resource users. These approaches form a legal umbrella for court cases, which then consider the nature and extent of environmental damages on a case-by-case basis. These approaches are relatively new, and have seen very limited application in developing countries because legal systems are themselves weak in such countries. There are, however, opportunities for voluntary liability mechanisms that do not suffer the same problems as their formal counterparts; such informal systems have operated successfully in Trinidad and Tobago to control damages from oil development.

In the Barbados context, a voluntary liability system would be most relevant to the hotel sector. The basic requirements are that (a) there is a relatively well established sector, (b) the sector and individual members of the sector have a public image to maintain to assure the continued success of the sector, and (c) the potential impacts are monitored by an independent body. The hotel sector in Barbados, which effects coral reefs and local marine uses, and has a stable presence, suits these conditions well. Under a voluntary damages scheme, individual hotels would in effect post performance bonds with an industry association that would in turn monitor environmental impacts and draw down on the bonds in the event of damages being

assessed. The role of NGOs would be an important contribution to the successful implementation of such a program.

Market Creation. Market creation may be an option for tradable permits for water allocation between hotels in Barbados. The major constraint to implementing such a system is that water meters are not in place for all hotels. Tradable permits require that water use data be available on demand, and without accurate metering or a viable equivalent it would be difficult for an administrative office to track water use and compare this rate to the permitted allowance. Without metering for all participants, it would be difficult to enforce and monitor the program. If this can be overcome, however, then a number of conditions exist which support the use of tradable water permits for the hotel sector.

First, the hotel sector is a major user of water and generator of water pollution. Conservation incentives are not in place, other than the planned tax deduction for watersaving devices. Opportunities therefore exist for a program which promotes water conservation for this sector.

Second, the hotel sector can be characterized as mature, with very few new entrants into the market. Most construction activity involves expanding and refurbishing existing hotels. It can be concluded that the hotel sector has a relatively stable demand for water. Stable demand presents an opportunity for tradable permits given that a maximum level of water consumption for the sector can be established based on historical use and demand. New entrants into the market, or existing operations expanding capacity, must secure water supply within the established cap. The relatively stable demand for water by the hotel sector means there is less pressure to increase the cap. To reduce demand, the cap is ratcheted down over time, or not expanded to keep pace with moderately increased demand.

Finally, given the level of water use by the hotel sector and the required conservation measures that Barbados faces, political and popular support for the program could be forthcoming. This would be contingent on some sort of policy analysis that showed that the policy would not overly burden or constrain the industry. But, given the concern over water supply on the island, political support could be forthcoming for tradable water permits for the hotel sector.

Institutional Requirements

The trend in Barbados is toward consolidation of environmental management functions within a single body to minimize jurisdictional overlaps, to streamline operations, and to provide the ability to deal with environmental problems on a broader ecosystem basis. All of these moves are consistent with the ideas of institutional sustainability relating to cost minimization, priority set-

ting, and flexibility. The two most significant constraints to implementing MBIs at a more substantial level, however, are (a) current lack of self-financing mechanisms, and (b) lack of specialized training.

Self-Financing. Most of the current structures still are subsidy based, and even those with a tax or fee element are introducing rebates for social reasons or to prevent distortions to economic production. As a result, there are few self-financing mechanisms in place. Moreover, the scale of industry is unlikely to be sufficiently large to provide an incremental tax base that can be earmarked for environmental institutions. The primary focus of any MBI effort must therefore be to use low-cost systems that promote self-monitoring.

Training. The design of MBI systems is constrained by a lack of technical expertise to design and implement appropriate structures. While some countries are pursuing this through grant assistance from foreign donors, Barbados has not yet made any such moves at this stage. Training requirements in the area of environmental economic analysis and in decisionmaking based on environmental economic information are therefore a prerequisite for effectively implementing most MBI structures.

Conclusions

In Barbados, the conclusions relating to the use of MBIs are similar to experience elsewhere in the world. In particular, however, the examples from Barbados support the general conclusions that:

- Systems based solely on control-oriented approaches often are not enforceable given existing institutional capacity.
- Market-oriented instruments are relatively simple to design, and allow regulators to target high-priority areas, polluters, and resource users first.
- Local authorities play an important role in the success of market-oriented mechanisms.

Also, from an operational perspective, MBIs should be designed with a number of key points in mind to ensure sustainability. The successful MBIs in Barbados incorporate the following elements:

- The mechanisms reflect the polluter-pays principle to ensure that externalities are reduced.
- Revenue generation is designed in a manner that allows some of the revenue to flow to local-level authorities to provide an incentive and a means for local empowerment.

But some of the MBI conclusions in this study differ markedly from those in other studies because of the small-island context.

Subsidies versus Charges. Most of the MBI approaches used to-date focus on providing incentives through subsidies rather than taxing or charging for damages. Even where damage charges are assessed, a subsidy element in the form of a rebate is often introduced that makes the overall intervention revenue-neutral, even though it does provide an effective incentive. The role of revenue-neutral systems in small-island states is seen as an effective means for avoiding distortions that may effect the fragile competitive position of many of these economies. As such, self-financing mechanisms for many such economies are not possible.

Role of Voluntary Self-Monitoring. The lack of implementation capacity has consistently undermined collection efficiency, regulatory monitoring, and enforcement of those charges and regulations that do exist. Even the simplest forms of monitoring, those involving metering, have traditionally seen poor performance. As a consequence, even the simplest CAC procedures are likely to be ineffective unless incentives are put in place that induce self-monitoring. From this perspective, market creation mechanisms and voluntary systems of damage compensation that take advantage of social (peer group) pressures are likely to see broader success rates in a small-island context than they would in a larger country.

Liability Instruments. Liability instruments are an appropriate mechanism that take advantage of the flexibility inherent in small-island institutions. They have few administrative overheads and create fewer burdens in a small-island context than they would in a larger country where other institutional imperatives might conflict with those of the particular liability instrument.

Ecosystem Orientation. Institutional boundaries in Barbados are being oriented toward ecosystem boundaries, which is appropriate to a systems analysis and implementation approach. In part, this is dictated by the lower implementation capacity available, but it also reflects a need to coordinate ecosystem-based problems that overlap districts or cross over between urban and rural boundaries.

Nonurban Targets. The distinction between urban and rural interventions should not be regarded as a constraint to effective MBI implementation. The analysis of macroeconomic policies, and of selected sectoral policies, illustrates that all of the sectors and areas are strongly linked either biophysically or through socioeconomic factors such as migration. The most effective means for preventing urban decay may therefore be through interventions in rural sectors.

Policy Synopsis

The policy prescriptions can be summarized as follows: (a) historically, effective MBIs in small-island states typically are subsidy oriented to avoid distorting local comparative or absolute advantages, (b) *any* form of CAC structure is likely to be unenforceable unless self-monitoring structures are in place, (c) complete decentralization using liability instruments is readily implemented within capacity-constrained, small-island institutional structures, (d) institutional frameworks relying on ecosystem boundaries will be more successful than those relying on administrative boundaries, and in many cases the most realistic ecosystem unit will include the island as a whole, and (e) the most effective MBIs for tackling urban problems may, in fact, be those outside of the urban areas.

Chile

Chile's Economic Policy

In the mid-1970s, Chile began a major reform process of its economy characterized by a strong reliance on the market and a trade liberalization policy.⁹ Relative price distortions were eliminated in a significant way. Government intervention in productive activities was strongly reduced through major privatization of state enterprises during the 1980s, and a strong and stable system of private property rights was achieved. Growth rates in the Chilean economy have averaged 8 percent during the 1986-94 period. Exports rely mainly on natural resources and have grown at an average rate of 6.7 percent during the past 15 years, reaching US\$11.645 billion in 1994.

With respect to sectoral policies, few distortions exist. In the case of agriculture, price bands for wheat, sugar, and oil seeds were implemented for income stabilization purposes. The forestry sector has benefited from an afforestation subsidy since 1974, which partially explains the 1.7 million hectares of exotic species planted during the past 20 years; these constitute the basis of the forest exporting activities. Mining (particularly copper mining) is one of the main economic activities in Chile, contributing 8 percent of GDP and 45 percent of total exports in 1994. CODELCO, a state-owned firm, contributes 52 percent of copper exports. There is strong participation of foreign investment in this sector.

Environmental Quality in Urban Areas

Santiago is by far the largest urban area of Chile. Its population of approximately 4.5 million represents 40 percent of the total population of Chile. Two other important but smaller urban areas are Valparaiso and Concepcion, which although presenting important environ-

mental problems such as industrial pollution, were excluded from the analysis because of information limitations that are not present in the Santiago area where problems have been better addressed and analyzed.

Domestic Solid Wastes. It is estimated that 2.5 million tons of domestic wastes are generated in urban areas in Chile. Approximately 80 percent of these wastes are adequately collected and disposed at sanitary landfills, while the remaining 20 percent is less controlled. The Santiago area generates approximately 60 percent of the wastes and houses 40 percent of the population. The disposal options for Santiago are landfills. At least two major problems exist with waste disposal in Santiago. First, existing landfills are at full capacity, and second, there are many illegal dumping sites that do not comply with minimal sanitary regulations. New landfills will be constructed north and south of Santiago to solve the disposal problem, but they have been strongly opposed by the neighboring communities because of the external costs. These costs include depreciation of property values and potential health and sanitary risks.

Industrial Solid Wastes (ISWs). Information on the quantity and quality of industrial wastes at the national level is limited. Recent estimates based on the system initiated in 1993 of declaring and tracking ISWs, indicate that for the Santiago area alone the generation of ISWs is approximately 70,000 tons per month, which equals 840,000 tons per year. Part of the ISWs are disposed through the municipal collection system, but they are mainly disposed of by private firms that deliver the wastes to landfills. Information about the generation and disposal of toxic wastes is very limited. Indirect estimates suggest that 133,000 tons are generated in Chile per year.

Water Pollution. Chile has higher morbidity rates for typhus and hepatitis than other countries in Latin America. In the case of typhus, for example, the morbidity rate in 1990 reached 52.7 per 100,000 inhabitants in Chile, compared with an average of 20.5 for Latin America. This seems contradictory given Chile's high coverage rates for drinking water and sewerage systems, which for 1992 were estimated at 97.6 percent and 84.8 percent respectively. The reason for this sanitary problem is the lack of adequate treatment of domestic and industrial effluents, which causes water pollution and results in widespread use of polluted water for vegetable irrigation. Historically, morbidity rates for typhus in the Santiago area have been higher than in the rest of the country.

Air Pollution. Santiago's air pollution is one of the most evident environmental problems in the country. One of the major consequences is the threat to health from fine

9. This section is extracted from Ríos 1995.

particulate matter (PM-10) which can cause premature death and respiratory diseases such as pneumonia. According to a World Bank study “the population of Santiago is routinely exposed to concentration levels that violate air quality standards for total suspended particles (TSP), PM-10 and carbon monoxide in winter and ozone (O₃) in summer.” Several initiatives have been taken to control air pollution in Santiago, but with the exception of TSP, the quality indexes for most pollutants do not show major improvement. A factor to be kept in mind though is that Santiago’s population and economic activity continue to grow.

Chile’s Environmental Policy

Even though part of Chile’s environmental law was passed by the beginning of the century, implementation and enforcement began less than 10 years ago. Most of the existing laws correspond to isolated efforts made by individual government institutions. In March 1994 the General Environmental Law was passed, which establishes guiding principles and goals for Chilean environmental policy. Since then efforts have continued to be made to define water and air pollution control policies and to implement a system of environmental impact assessments (EIA), among others.

The 1994 law defines six guiding principles that are to be followed when designing environmental policies and regulations: polluter-pays, prevention, gradualism, citizen participation, liability for environmental damages, and efficiency. It is interesting to note that economic concepts such as having polluters internalize the economic costs of polluting activities (polluter-pays), aiming for economic efficiency through flexible and cost-effective policies (efficiency), and favoring reparation and compensation for victims of environmental damage (liability for environmental damages) are stated explicitly in the Chilean environmental law.

The implementation and coordination of environmental policy and regulation in Chile, according to the 1994 law, is the responsibility of the government environmental agency CONAMA (Comisión Nacional del Medio Ambiente). The existence of multiple government agencies involved in environmental management, as well as lack of coordination in the past, has generated a regulatory framework which is characterized by overlapping institutional responsibilities and lack of consistency. Currently, most environmental regulations consist of command-and-control instruments, such as emission standards and technological requirements. In general, Chile’s economic policy relies heavily on the market and on private property rights. From this perspective less resistance should be expected if implementing MBIs for environmental protection.

Air Pollution. Air pollution control relies primarily on non-MBIs. National air quality standards have been established by the ministry of health for each of the important pollutants, representing goals that every policy should aim at but that are not legally binding. Mobile sources contribute significantly to PM-10, NO_x, and CO emissions; major regulatory initiatives include mandatory retirement of old buses, introduction of vehicle emission standards (which in practice makes the use of three-way catalytic converters mandatory), and limits on the operation of vehicles without catalytic converters based on license plate numbers. Fixed sources pollute mainly with SO₂ and PM-10 (industrial processes), and TSP (street dust and open lands). Regulations for fixed sources include a ban on the use of wood-burning fireplaces during the entire year, emission standards, and decontamination plans for some fixed sources in Santiago.

Some MBIs are being used for air pollution control, for example, auctioning of road routes for urban buses in Santiago, and a system of tradable permits for PM-10 emissions from industrial sources in Santiago to be phased in during 1997. Since 1994, any new emission source requires compensation from an existing source. In addition, an initiative for road pricing of private cars in downtown Santiago is being discussed by the congress.

Water Pollution. Because of the generalized practice of discharging polluted waters from sewage systems and industries without previous treatment, water pollution is a major problem in the whole country. Facilities for wastewater treatment are uncommon in most areas. Investment in interception and deviation facilities are under way in the Santiago and Valparaiso areas. These investment plans are the responsibility of the corresponding sanitary companies which are autonomous state companies. It is important to mention that charges for the provision of drinking water and sewage collection services are based on marginal cost pricing and full cost recovery including a 7 percent return on the invested capital.

Existing regulations consist mainly of non-MBIs. Ambient water quality standards exist depending on the use of water. Several bans on the discharge of polluted waters into rivers and other aquatic bodies used as a source for irrigation and/or drinking water are in place. Their enforcement though is weak. Provisional regulation by the Superintendent of Sanitary Services establishes effluent standards for industrial sources independently from the type of watercourse receiving the effluent. As with most environmental laws in Chile, several pieces of legislation on water pollution control do exist, but do not represent a coordinated framework. CONAMA is currently revising a draft proposal for the control of water pollution which includes effluent standards and

sanctions for noncompliance as well as an MBI consisting of a system of tradable emission permits

Solid Wastes. According to Chilean regulations, municipalities are responsible for the adequate collection and disposal of solid wastes, and the ministry of health is in charge of enforcing compliance with technical norms for the management and operation of landfills. Since the early 1980s, municipalities have had the option of subcontracting the collection and transportation of solid wastes with private companies. Part of this cost is recovered from households through a flat fee, the collection of which is a municipal responsibility. The construction of landfills is subject to the approval of the corresponding health services agency; for new landfills an EIA needs to be approved in order to obtain the construction authorization. Recycling of paper, cardboard, and glass occurs spontaneously and is an interesting business in Chile. A voluntary deposit-refund system that is in place for plastic soft drink containers was an initiative of the bottling companies.

With respect to industrial and toxic wastes, the regulatory framework is very vague and weak. Municipalities are responsible for “waste” disposal, but it is not clear if industrial and toxic wastes are included or not. On the other hand, according to the sanitary code, health services agencies are responsible for the approval of projects that generate industrial or mining wastes requiring adequate disposal. In 1993 a system for declaring and tracking industrial wastes was implemented in Santiago to generate information and create an inventory of industrial wastes. This will serve as the basis for adequate regulations. The regulation for toxic and hazardous wastes is incomplete, but the laws needed to fill this void are currently under preparation.

Other Areas. Other MBIs that have been implemented in Chile include:

- The 1981 water code, which established a system of tradable water rights for water allocation among different users. Water rights are completely separated from the land and traded freely in the market.
- The 1974 afforestation law, which includes an afforestation subsidy, an income tax exemption, and management plans. This law supported the development of plantation forestry in Chile.
- The 1991 fisheries law, which basically includes non-MBIs such as management plans, seasonal restrictions, global quotas, and control on the number and size of the fleet. Individual tradable quotas are used for new and in-recovery fisheries.
- The 1992 Chilean country program to protect the ozone layer in accordance with the Montreal Protocol. This includes, among other compo-

nents, an product ozone seal to allow for consumer discrimination among products and a monetary subsidy for technological reconversion.

High-Priority Areas

The following two high-priority areas were selected on the basis of gross estimates of environmental benefits and costs as well as their priority in the government’s agenda.

Management of Domestic Solid Wastes (DSWs). A rough estimate is that the private costs of DSW management in the Santiago area are at least US\$30 million, and are expected to grow by least at 7-8 percent per year. Landfills are the only available option for urban disposal. Their location is a very controversial issue because of the negative externalities they cause. A reduction in the generation of DSWs seems economically desirable in the Santiago area, which may not be the case for other areas with higher carrying capacity. Given the varied nature of the economic issues related to DSWs, a combination of MBIs should be analyzed in more detail (“one instrument for each goal”):

- *Implementation of differentiated fees* by volume or weight for waste collection and disposal to provide incentives to reduce waste generation and to recycle and/or reuse certain wastes. This is an application of the polluter-pays principle. It would require gathering information at the household level and improving control of illegal dumping. Administrative costs should be compared with the benefits of correcting the existing price distortion generated by flat fees.
- *Creation of compensation mechanisms* to internalize social and environmental costs borne by municipalities housing landfills, which are implicitly subsidizing all other municipalities (and the corresponding community) using these landfills. A direct mechanism is to have all other municipalities pay an extra charge for disposing their wastes at the landfill, which would result in higher fees at the household level.
- *Environmental insurance* for possible damage claims resulting from unexpected environmental impacts caused by landfills. Even though, according to current legislation, landfills are subject to EIAs to assure that no major impacts on health and environment exist, long-term damages can occur. If the cost of such an insurance is included in the disposal cost charged to other municipalities, part of the environmental costs will be internalized by all users.

- *Provision of accurate information* on the degree of recyclability or cost of disposal of a given product would allow consumers to discriminate among products. If the consumer population has a positive willingness to pay for recyclable goods, but no reliable information is available (as is the case in Chile), it will not translate into higher prices and/or consumption choices.
- *Monetary incentives to encourage more recycling.* Even though recycling occurs on a spontaneous basis in Chile, and there is significant economic activity in recovery of paper, cardboard, plastic, and glass, household involvement is still minimal. Specialized private recycling firms obtain recycled materials from separators or “cartoneros” that collect at the curbside level before municipal collection, and industrial plants that sell their wastes directly.

Abatement of Domestic Water Pollution. Total annual benefits of wastewater treatment have been estimated at between US\$24 million and US\$77 million. This includes savings in health costs by preventing typhus caused by contaminated water in the Santiago area, avoiding agricultural export losses from possible health-related trade restrictions in the event of a cholera outbreak, a lower incidence of cholera, expanded farm output, and reduced consumer costs. Estimates for the cost of reducing water pollution in the Santiago area, basically by building a network of wastewater interception and treatment facilities to meet Chilean water quality standards for unrestricted irrigation, are estimated at US\$78 million per year. The decision made by EMOS, the sanitary company for the Santiago area, to invest massively in treatment plans to cover the entire area, does not seem economically sound. Other alternatives to be analyzed are the following:

- *Incrementalism for investment plans.* The goal of unrestricted irrigation seems too ambitious given the current benefits of treatment plans; a lower standard for certain areas at least should be considered. A more gradual approach seems more advisable, especially considering that willingness to pay for environmental goods increases with higher income and environmental education. Some supplementary actions to minimize the risks of a cholera outbreak can include chlorinating of irrigation channels and public education.
- *Agricultural zoning.* There is an important difference between the cost of using clean water (underground or treated effluent) versus unclean water for the production of vegetables in the Santiago area. Different zones in Santiago have different water supply sources, thus implying

that there might be an efficient solution if a policy of agricultural zoning is implemented.

- *Certification mechanisms.* The existence of reliable information on some specific environmental characteristics of goods such as use of clean water for irrigation might allow for the creation of a market for “clean vegetables.” Consumer demand for safe products would develop in this market if adequate and reliable information were available. Currently this market is being eroded by lack of consumer confidence. This type of certification might be a cost-effective instrument.
- *Privatization of sanitary companies.* In light of the major investment plans in water treatment adopted by EMOS (and the lack of resources) as well as the serious management failures evidenced in recent months by some of these companies, privatization seems a reasonable option, particularly given the existence of a well-constituted supervisory authority, the Superintendent of Sanitary Services.

Colombia

The objective of this paper is to provide a practical study of the use of economic instruments for environmental management purposes in Colombia.¹⁰ The paper focuses on two high-priority areas for environmental policy: control and reduction of water pollution in urban areas arising from industrial sources, and control of air pollution from fixed and mobile sources.

Environmental Management and Law 99/1993

Prior to the passage of Law 99 in 1993, environmental management in Colombia was characterized by severely limited success in controlling environmental and natural resource degradation, mainly due to the following factors:

- Environmental management was scattered over a multitude of institutions, which made design and application of environmental policy difficult, and made the environmental sector politically weak. As a result, there was a failure to introduce environmental concerns into sectoral and economic policies in general.
- In many cases environmental regulation was a responsibility of sectoral ministries. For example, management of the basic natural resources of the country was the responsibility of the ministry of agriculture, which also was required to promote agricultural production and productiv-

10. This section is extracted from Ramirez and Cubillos 1995.

ity, resulting in a higher degradation rate for forests and natural resources.

- Together with the scattering of authority for environmental management, the definition of policies was too centralized and there was little involvement of local communities.
- Budgetary constraints, which were reflected in personnel and technical limitations (low salaries and technical skills).
- Excessive political influences in environmental management. As a result, employment of managers and skilled labor was very unstable. It was also common to relax enforcement when environmental regulation was in conflict with political interests.
- There was practically no presence of environmental authorities in the cities. Environmental management in Colombia was historically related to rural areas, especially the more developed rural areas, while poorer areas like Amazonia or the Pacific Coast were not under the control of environmental authorities.

With the 1991 Constitution and Law 99/1993, environmental management was completely reorganized: the Ministry of the Environment was created together with 16 more regional EPAs (for a total of 34) and 4 urban EPAs in the most important cities. In addition, five environmental research centers were established. Law 99 also defined new sources of income for the environmental sector, new incentives and economic instruments for environmental management, and new possibilities for public involvement.

MBI Experiences before Law 99/1993

The use of economic instruments in environmental legislation has a longer tradition in Colombia than in many Latin American countries. In 1974 resource use charges and taxes to offset recurrent expenses were introduced for the first time. In 1982 charges were introduced for atmospheric emissions resulting from commercial activities, and in 1984 they were extended to wastewater discharge as well.

In spite of this, the effective use of economic instruments as a way to achieve restoration and conservation of resources has been almost nonexistent:

- Although such instruments were envisioned in the legislation some of them were never applied, such as the charges for air pollutant emissions, which were not implemented because the ministry of health never drafted the necessary regulations.
- Although during the past 20 years the Regional Autonomous Corporations (CARs)—regional EPAs—have applied compensation charges for wastewater discharges and for the use of water

and forests, those charges were not systematically billed except in a few cases: US\$116,000 was collected from a potential of US\$90 million! The forest and fishing use charges have not been successful either.

- In the few cases where retributive tariffs were put into effect, they were implemented on the basis of the operating costs of a water quality monitoring program rather than as part of a resource restoration plan.
- The charges have been too low to induce a more rational use by resource users.
- In general, failure to apply pollution and user charges has been related to design problems, technical and institutional weaknesses in the environmental management sector, and lack of political will together with pressure from the private sector to not apply such charges.

Nevertheless, there are two elements that should be underlined from the Colombian experience with water pollution and user charges.

First, it is an experience of more than 20 years that serves as a basis for refining these instruments and their application. Second, there are some specific experiences that suggest the potential of this instrument for environmental management: for example, a regional EPA had to increase water use charges threefold in 1990, and by 70 percent in 1993 due to a drop in water supplies. As a result, consumption of water was reduced by 50 percent. In another example (quoted by environmental economist Guillermo Rudas), the threat of applying a water pollution tax to the largest iron and steel plant in the country (the tax was never effectively applied because of legal disputes) was enough to induce the plant to control pollution to avoid the charges it calculated it would have had to pay every year if the tax were implemented.

Current and Potential Use of MBIs in Colombia

Law 99/1993 covers, as one of its most important goals, the use of economic instruments as an essential tool for environmental policy “to encourage natural resource users to comply with environmental standards, to modify their consumption patterns and to induce the adoption of processes and consumption of goods produced through clean technologies.” Here we summarize some of the key issues related to experience in the use of MBIs and their potential application in Colombia, emphasizing in each case the advantages and disadvantages.

Market-Based Reforms. Colombia has two characteristics that help to promote the use of MBIs in environmental policy: first, the economy has been one of the most stable in Latin America over the past 30 years; second, a trade

liberalization process was started in 1991 together with a set of market-based reforms in the labor and financial markets, health and social security, infrastructure and public services, and other sectors.

The liberalization process can help to increase competitiveness, as well as lessen environmental impacts. The renewal of a good part of capital stock may have resulted in adoption of cutting-edge technologies with lower environmental impacts in several manufacturing sectors. The efficiency changes induced by the liberalization process can also help to lower generation of wastes, and thereby decrease emissions per unit of production.

A key issue is to evaluate the possibilities of using economic instruments to stimulate the adoption of less polluting technologies. This is one of the current priorities in the definition of environmental policy in Colombia.

On the other hand, there are some problems for the use of MBIs in environmental policy (specifically for environmental taxation at the national level) arising from current macroeconomic issues: (a) existence of a growing fiscal deficit, and (b) tendency toward the simplification of tax structure and administration of fewer taxes. In this respect, environmental taxation is complex and discriminatory, taking into account differences in pollutants, resources, and assimilative capacities.

Recently there was a tax reform that included some environmental proposals like incentives for importing capital goods for pollution control purposes, incentives for conservation of natural forests, and elimination of the value-added tax for income associated with the Montreal Protocol. A more relevant reform for environmental purposes could be the regional tax reform (at the municipality level) that is currently under preparation. Initial results from a study for the ministry of environment suggest that it is at a local level (regions and municipalities) where fiscal and other economic instruments for environmental purposes might have more relevance and applicability.

Institutional Basis and Administrative Capability. With the recent creation of the ministry of environment and several related environmental agencies, institutional capability of environmental management has improved significantly in Colombia. Some of the achievements related with this reform are:

- Establishment of the ministry of environment as the head of environmental management in Colombia, with increasing political power and influence.
- Creation and consolidation of regional environmental authorities in charge of environmental management in their respective regions.

- Decentralization of environmental management with more presence of regional concerns and local involvement in the definition and implementation of environmental policies.

At the same time, capability and efficiency of environmental management in the future will depend on two main efforts: (a) increasing the technical capability of the environmental management sector, and (b) improving environmental information and related databases, mainly in urban areas. Different studies on environmental problems have emphasized lack of information as one of the most important restrictions affecting the capability of environmental authorities to effectively regulate use of natural and environmental resources and to control pollution. Currently, there is a study under way with the objective of designing a system of urban environmental indicators and to propose a data generation strategy in the medium and long run that can serve as a basis for defining priorities and strategies for environmental policies.

Economic Instruments: Pollution Taxes. Law 99/1993 and the National Development Plan emphasize the priority given to the use of economic instruments, and especially the use of retributive and compensatory pollution charges or taxes.

The concept of a retributive tax refers to the compensation that should be paid in exchange for using the environment for the provision of a service, such as serving as a dump for refuse generated by both the commercial and residential sectors. The retributive charge refers to the compensation required to guarantee the quality of a resource.

The way in which the new legislation defines these charges is innovative. While traditionally they have been used to permit coverage of the administrative costs of the maintenance and control of resources, the new concept is that the tax must reflect the social cost caused by the pollution. In this cost, the negative impact generated by activities (whether productive or not) on the welfare of the community is a balance between the internalization of the cost of the externality and the benefits arising from its control. Theoretically, the result must be an optimum reduction in welfare losses.

The task of implementing a tax is not easy. Proposals vary from the extreme position of applying the charges according to the exact terms of the law, to a tax based on the costs of treatment or on the actions taken by contaminants to rehabilitate the affected resource. In addition, in this scheme it is not necessary to focus on the revenues generated by the tariffs, but rather to focus on a tax that promotes a change in the mode of production that leads to an improvement in the environment or a reduction in contamination. The scheme would work by trial and error,

seeking an adequate level for the tariff; this is expected, for example, to correspond to about 6 percent of profits in the tannery and wood industries. This figure suggests that the inflationary impact of the taxes would be low.

Nor does it seem probable that industrial growth would decelerate as a result of these taxes. To the contrary, it will promote efficiency and growth in productivity in the use of resources.

Finally, the resources collected from the tariffs are beneficial from an environmental management perspective. Some of the regulations have introduced mechanisms for income generation for the environmental sector. That is the case for watersheds, where part of the environmental costs derived from such activity are internalized. Likewise, 30 percent of the Royalties Fund, which is financed by the exploitation of nonrenewable natural resources and their exports, goes to preservation and to fund priority environmental restoration work in regions where such resource exploitation takes place. This constitutes a compensation for the environmental deterioration associated with such resource exploitation.

The importance of these income-generating instruments for the environmental sector is indisputable. These resources will represent around 500 billion pesos during 1994-98. Colombia is the only Latin American country where the environment sector has such income-generating systems, which are stable and easy to collect. In contrast, some other instruments such as pollution charges imply serious technical and administrative complications, as analyzed further on. It is not yet possible to assess the impact of these financial mechanisms on environmental preservation and improvement. Undoubtedly, their success will depend in good part on the efficiency of environmental expenditures.

Legal Mechanisms. Another potentially powerful tool for environmental change and protection is the set of legal mechanisms that originated in the constitutional reform of 1991, such as the "Citizens' Rights Action" (Acción de Tutela), the "Compliance Action," and the "People's Action." The last of these mechanisms has the character of an economic instrument since anyone who files a People's Action has the right to compensation of between 10 and 15 percent of the total value of the work necessary to correct the environmental damage caused. The effectiveness of these instruments has been proven in a short time: in three years there have been almost 300 "tutelas" (Citizens' Rights Actions) related to environmental disputes.

Ecuador

Experience with Command-and-Control Regulatory Approaches

Ecuador has had adequate legislation and institutions to encourage proper environmental stewardship.¹¹ The problem has been lack of political will, overlapping institutional mandates, limited capacity, and meager budgets to implement the laws. As a result, until very recently, there were no examples whereby the *polluter-pays principles* were enacted or whereby an industrial concern was fined or charged for illegal effluent discharge. Quito presents the most optimistic view whereby industrial plants have been requested to do environmental audits, and the municipality is beefing up the environmental unit to better monitor emissions and effluents.

Experience with Market-Based Incentive Approaches

Ecuador is investigating appropriate instruments for environmental policymaking. In the government of Ecuador's *Proposal for Political Environmental Strategies*, the precursor to the *National Environmental Action Plan*, the use of market-based incentives and correction of perverse macroeconomic distortions is mentioned frequently. In addition, in the *Agenda for Development 1993-1996* of the present administration, an important agenda item is (a) to evaluate the problem of solid waste and industrial effluent and (b) to apply as a first priority market incentives and as a second priority regulatory fines.

There are examples in Ecuador where economic instruments have been utilized, the most recent of which is the Quito Effluent Charge (Mark Kenber, personal communication with author).

The Quito Effluent Charge

As part of the reform of Municipal Ordinance 2910 for the Prevention and Control of Fixed Source Pollution, the Municipal Environment Directorate (DMA), in collaboration with Fundación Natura, Ecuador's most prominent NGO, has designed a pollution charge system to control industrial organic effluents and combustion emissions. The system is similar for both types of discharge so the description here concentrates on liquid organic wastes.

Originally all firms had to remove 80 percent of the combined organic content (combined content = $[2\text{BOD} + \text{ChOD}]/3 + \text{suspended solids}$) from their liquid waste stream, which was assumed to guarantee at least 2 milligrams per liter of dissolved oxygen in the two rivers. The new mechanism is a hybrid between the establishment of a norm and a pure effluent charge, based on

11. This section is extracted from Huber 1995.

national water quality regulations that establish eight different water quality standards depending on the use to which the resource is to be devoted.

The DMA will set the discharge norm at the level required to guarantee in the short-run the least strict of the water quality standards in the city's two rivers. At present this is around 56 kilograms of combined organic discharge per firm per day. Firms whose emissions are below this level pay no charge, while those whose emissions exceed the norm pay a per-unit charge equivalent to the cost of municipal treatment (US\$0.36 per kilogram). In time, and in keeping with a predetermined and published schedule, the discharge norm will be made gradually stricter, so that the quantity of emissions exempt from payment of the charge will correspondingly be reduced. Each reduction will correspond to a new level of water quality. After a period of 8 to 10 years the discharge norm will be at a level which assures an ambient water quality such that the rivers can be used downstream for irrigation, cattle, and drinking after primary treatment.

On the basis of firms' biannual discharge reports, the combined organic discharge is computed and the six-month charge (the total discharge for the period less the value of the norm multiplied by 125 days, all multiplied by US\$0.36) is calculated, based on the assumption that a firm's discharge levels will not be reduced (or increased) during the period. If a firm subsequently introduces some new form of reducing its effluents, it can apply for a reevaluation by the DMA, and if its claim is corroborated, the new lower charge level will be applied from the date of the application.

Other Direct Incentives

Regarding direct incentives, price instruments in effect in Ecuador are stumpage fees for forest exploitation, deposit-refund schemes for bottled products (beer and mineral water), and effluent charges on industrial waste. Recently, in Quito, fines on mobile air pollution sources (cars, trucks, and buses) have been introduced that are higher than the cost of fixing the problem through adoption of appropriate technology or a tune-up. Here is a clear example of where the positive marginal costs of reducing emissions are outweighed by the marginal benefits. This is the implicit economic rationale for Municipal Ordinance 3120, which went into effect on January 2, 1995 and which targets large vehicles. Owners of vehicles with exhausts that do not meet the norm set forth in the ordinance are subject to a fine equal to five minimum monthly salaries. Currently, that fine is worth US\$160. In addition, violators face a 375,000 sucre fine (equal to US\$155 at current exchange rates) and must post a *garantía* of 1,125,000 sucres (US\$465), which is approximately *double* the cost of making the repairs

needed to bring an engine up to standard. Nearly US\$100,000 in fines were collected in January 1995.

By 1995, tariffs on private automobiles had fallen from 200 percent to 40 percent and duties on private buses and heavy trucks amounted to just 10 percent. There are no tariffs on vehicles imported from Colombia or Venezuela or on buses used for public transportation. Between 1988 and 1993, the number of vehicles in the country rose by 5.8 percent per annum, reaching a total of 450,000. This tariff structure is designed to keep public transportation costs low, and may be considered not only a subsidy for the poor, but also an incentive for the public to take public transport, thereby diminishing air pollution and traffic congestion. Air pollution in the central historical district (where buses, cars, and trucks discharge 2,511 tons of combined emissions annually) is affecting tourism revenues. Named by UNESCO as a cultural World Heritage Site, tourism revenue in an historic center is certainly affected by poor air quality.

Possibly the most appropriate case for the introduction of a market-based incentive would be to encourage industry to phase out leaded fuel. However, this is an expensive proposition. A major investment would be required to produce unleaded gasoline at the Esmeraldas refinery. To be specific, US\$490 million (in 1991 dollars) would have to be invested to retrofit the refinery to produce unleaded fuel.

There are examples in which private industry has identified cost-effective pollution prevention measures. This approach, which involves assessments of the use of energy and chemicals to identify waste prevention opportunities, has been applied successfully by Quito's municipal government in a pilot program carried out in an industrial district, El Inca. Pollution prevention was implemented in Guayaquil by a company that manufactures nonferrous metal products and ceramics. During the last two years, it has invested approximately US\$1.5 million to upgrade burners, replace pumps, recover salable by-products from tile cuttings, and switch to chemical additives that are environmentally preferable according to the U.S. vendor. These innovations, which reduced energy consumption as well as the volume and toxicity of process wastewater, had nothing to do with environmental regulations, subsidies, or tax breaks. The reengineering and yield enhancement was not motivated by environmental consciousness, but rather to improve the firm's competitiveness in a marketplace that is moving toward free trade. For this company and many others in Ecuador, the need to avoid waste of energy, water, chemicals, and other inputs is blurring the distinction between technological change aimed at reducing pollution, and innovation aimed at containing costs.

Indirect price instruments do not exist. However, subsidies on agricultural inputs (pesticides and fertiliz-

ers), fuel oil, and gasoline (with the exception of diesel) have been phased out. Air pollution improved over the last two decades because of substitution of cleaner fuels such as natural gas and hydroelectricity for dirtier ones such as wood, charcoal, and coal. The substitution reached the poor because of fuel and electricity subsidies that peaked at 7 percent of GDP in 1980. However, while energy subsidies might have diminished pollution by stimulating a switch to cleaner forms of energy, they simultaneously affected air quality for the worse by encouraging energy-intensive industry and the use of motor vehicles.

Industry had enjoyed large energy (fuel and electricity) subsidies since the early 1970s and reacted to an end to these subsidies with protests and lobbying. Likewise, subsectors that use water intensively, including pulp and paper, textiles, and chemicals, have complained about diminished water subsidies. Positive environmental benefits have arisen from the end of subsidies because industry has reacted to higher prices by trying to conserve energy and water. For example, tanning and textile enterprises are much more interested than they used to be in the recovery and reuse of process waters.

No examples of quantity-based or technology economic instruments for environmental policymaking such as tradable emission permits were found. One interesting solution to a recurrent problem of cost recovery in solid waste is the 10 percent surcharge on electricity that pays for solid waste management. This solution to cost recovery has been highly successful because electricity has the highest incidence of payment. Nonpayment is met with electricity cutoff and illegal hookups are quickly found and disconnected.

Regarding solid waste management, in Guayaquil, Ecuador's largest city, trash collection has been contracted out with some success. The municipality of Guayaquil asked for bids to haul garbage from the city to a landfill. The contract was awarded to a Canadian firm that is paid US\$9 per ton (the lowest bidding price by more than half) for garbage delivered to the state-of-the-art sanitary landfill. While they may lose money in the residential pickup areas, they are making money on the larger scale industrial pickup sites. Original estimates were that they would be delivering 1,200 tons per day when in fact they have been delivering 1,600 tons per day. The contract is up for review and renewal every five years, guaranteeing that they will serve the residential neighborhoods well. This represents an interesting incentive because the private-sector solid waste management company is paid by the ton to deliver garbage, thereby encouraging them to pick it up. Whereas in other cities solid waste management is of poor quality and imposes a net cost, in Guayaquil the municipality may turn a profit, because deliveries multiplied by the

US\$9 fee are *less than revenues from the 12 percent surcharge on electricity bills that finances solid waste collection and street cleaning.*

One environmental institution, the Ecuadoran Institute for Eco-development in the Amazon Region (ECORAE), is funded by revenues from a tax levy on oil. ECORAE, formed in 1992, is responsible for the sustainable development of the Amazon region and is funded through a levy on petroleum that passes through the pipeline that brings oil from the Ecuadoran Amazon to the refinery in Esmeraldas, on the coast.

Subsidy for Conversion to Retort Amalgamation to Minimize Mercury Loss in Artisanal Mining Processes
Finally, an MBI was utilized to promote the use of retorts to reduce mercury loss in the amalgamation process of artisanal gold mining. While not heavily taxing mercury at its point of entry (that would have been somewhat ineffective because mercury results in less than 1 percent of total costs to the artisanal gold miner) an incentive is being offered to reduce the costs of the retort to the gold miner. This is an example of subsidizing the cost of appropriate technology for environmental and health benefits. The cost of a retort is about equivalent to 1.5 grams of gold, but will provide a 5-10 percent improvement of capturing gold in the amalgamation process.

Jamaica

This study is a preliminary survey of existing approaches to urban environmental problems and associated resource management.¹² It pays particular attention to the extent to which market-based instruments are used and could be used to improve environmental protection. Three areas regarded as high priority are selected for detailed consideration: solid waste management; urban water quality including coastal, surface, and groundwater; and urban water resources.

Jamaica has been giving creditable attention to environmental management. Standards are being set and regulations are being put in place. In addition to command-and-control measures, market-based instruments are being considered. Where some of these concern traditional measures such as user charges for public utilities, there is increasing recognition of the need to move from subsidized and free services to cost recovery and market pricing systems, which use marginal social cost principles.

Jamaica is fortunate in that the need for a wide array of policies including market-based instruments is

12. This section is extracted, with permission, from Persaud, Wright, and Benfield 1995.

more widely appreciated than in many other developing countries.

The most cogent reason why a wider array of policy instruments needs to be considered is that although increasing attention is given to environmental policies, their existing state is far from what is required for sustainable development. And the consequences are dire, leading to the poor state of services in areas such as waste management and water supply, and serious environmental degradation, poor air and water quality, careless handling of toxic materials, poor management of water resources, and intolerable risks and consequences to health.

While present economic circumstances are not propitious for moving quickly to the adoption of full cost recovery in areas such as waste management and water supply, appreciation of its need is increasing and in some areas great progress is possible in improving the framework of policies and in beginning to move in the right direction. In some areas, affording change is difficult, but without change, degradation would reach intolerable levels—in some cases it has already reached such levels.

Water Quality

The poor state of coastal and groundwater in Jamaica can be largely attributed to major inadequacies in sewer systems, the run-down state of treatment facilities for liquid waste from sewers and industrial waste pipes, poor garbage disposal practices, high chemical use in export agriculture, and illegal waste disposal by cruise ships. The most notable example of the severity of Jamaica's urban water pollution problem is the degradation of water quality and ecosystem health in Kingston Harbour. About 12 million tons of untreated sewage flow into the harbor daily.

The 1992 survey of the harbor showed that the ambient BOD value in the harbor ranged from a low of 1.2 milligrams per liter, to an extreme of 102 milligrams per liter, with the highest value greatly exceeding the BOD standard of 20 milligrams per liter for sewage effluent levels. Fecal coliform levels have exceeded maximum allowable levels in some samples. There are high levels of lead and zinc. High levels of pesticides and metals were found in fish. Species diversity and the numbers of benthic organism living within the harbor decreased significantly. The natural ecosystems, especially pelagic fisheries and shrimp populations, were degraded. This meant lost income to the marine fisheries industry; increased costs in order to utilize fisheries resources also greatly affect recreational and tourist activities. The threat to the valuable tourist industry is real because of the high pollution levels in some coastal waters.

In the Kingston Metropolitan Area about 30 to 35 percent of the population receives sewage collection and treatment. But of the 26 sewage treatment plants, 23 are scarcely functioning.

Groundwater provides about 80 percent of the National Water Commission's supply of potable water. However, wells are having to be abandoned because of high nitrate levels and this could increase dependence on surface water which is costly to procure and distribute. There is a large reliance on septic tanks for sewage disposal but because of the limestone formations, wells sometimes become contaminated. Both underground and surface water could benefit from a more controlled use of agricultural chemicals.

An urgent need is the improvement of sewage treatment and a great extension of the sewered population. There has been a significant response to this need. The facilities at Montego Bay and Kingston are being extended.

Further advances in the work of the Natural Resources Conservation Authority (NRCA), the umbrella institution with the leading role for the preservation of the quality of the Jamaican environment, could do much to arrest the degradation of water quality and the environment in general. The NRCA has an appropriate level of autonomy and independence and it can reduce its dependence on government subvention. Very little monitoring is done on air and water quality and on the handling of harmful wastes. The NRCA has the power to set compulsory requirements for users of toxic substances and harmful emissions, implement pollution taxes, and license and monitor emission standards. It has begun to set standards, but even in command-and-control measures it has a long way to go. In relation to economic instruments, the NRCA appreciates their need but it has scarcely begun to move in this direction.

Solid Waste

The solid waste situation can also be considered critical, especially in relation to the location of existing sites, poor organization and management of disposal services, and the lack of proper monitoring by regulatory agencies. Approximately 2,726 tons per day of domestic solid waste and 562 tons per day of industrial solid waste are disposed of at the 25 official dump sites in Jamaica. Only two of these sites have available cover material and only one operates in a manner similar to that of a landfill. No leachate flow diversion provision is found at any of the sites, nor are any lined to prevent groundwater contamination.

The dangerous nature of some of the waste disposal at these sites poses risks to both humans and livestock which frequent the dumps. They are a breeding ground for vermin and pose serious risks for the spread of disease. In some dumps, such as the Riverton City site, scavenging is a major economic activity practiced by members of the surrounding community. The free access that scavengers have to the dump also poses a threat

to the wider public, since disposed food items sometimes find their way back onto the market where unsuspecting persons may purchase them. In addition, the persistent fires at the Riverton, Lakes Pen, and Six Mile dumps are believed to be responsible for the high incidence of upper respiratory tract infections recorded for the Kingston Metropolitan Area.

Due to the porous geological substrata over which most of the dumps are situated, leachate from decomposing material finds its way into groundwater and surface water sources. Medical wastes are carelessly handled and indiscriminately disposed in municipal dumps. The amounts of toxic waste generated by local industries are unknown, but about 300,000 tons of hazardous material were imported into Jamaica in recent years.

While a survey of pollution in 1992 found that levels of total suspended solids were below Jamaica's standard, in three sites in urban areas—Montego Bay, Harbour View, and Half Way Tree in Kingston—samples indicate levels of 260, 139, and 158 micrograms per cubic meter respectively, when the maximum allowable level in Jamaica is 150 micrograms per cubic meter. Lead contamination is a serious problem—sampling has shown elevated blood levels, especially among children, and there have been cases of blood poisoning.

It is important that the waste management program in Jamaica seek to incorporate the informal groups whose livelihood is bound up with the recovery, recycling, or reuse of materials from the dumps. This would result in the employment of the otherwise unemployed, laying the base for the development of a recycling industry.

The study recommends the introduction of domestic waste disposal charges and landfill tipping fees in ways that would be broadly related to the amount of waste generated and take into account ability to pay. Success in imposing disposal charges and landfill tipping fees would depend on adequate policing against illegal dumping. Deposit-refund schemes have begun to be adopted, but integral to the extension of such schemes is the expansion of recycling. The deposit-refund system should be more widely used to facilitate recycling. Incentives might be needed to encourage recycling activities. Disposal facilities need to be greatly improved. Sites should be better chosen and regulations against illegal dumping need much stronger enforcement. Litter laws need to be strengthened and enforced.

Water Supply

The National Water Commission (NWC) has the overall responsibility of providing and distributing water in Jamaica. Financial constraints, poor management practices, and inefficient water collection and distribution systems have limited the Commission's ability to effectively provide a satisfactory service.

In addition to the above problems, water shortages in urban areas are caused by uneven rainfall and frequent droughts, lack of conservation practices generally, and the degradation of watershed areas. Jamaica is particularly susceptible to watershed degradation because approximately 80 percent of the land surface is hilly. Of the 33 watersheds on the island, 19 are badly eroded. The main causes of watershed degradation and resulting shortages in water supply have been infrastructure development and deforestation arising from agricultural intrusion and charcoal production.

The NWC currently has a volume-based pricing structure in order to allow for full recovery of operating costs and to encourage greater efficiency in use, but a significant number of households are not metered and water is provided free in some areas through public stand pipes. The NWC also applies a rate differential between households and firms, with firms paying a higher price. This has not encouraged economy in the use of water, especially among domestic water consumers. Even at the subsidized rates, price adjustment to cover inflation is sometimes slow.

To address the problem of diminishing water resources, the study recommends the introduction of:

- Quantity-based water charges
- A quantity-based charge by the Underground Water Authority for water extraction from underground sources
- A utility regulatory board for water which would control monopoly pricing but also help to ensure efficiency in treatment and distribution
- Improved monitoring of water quality
- Greater enforcement of watershed protection regulations
- Improved access to land, by easing the pressure on hillside farming.

Conclusion

Market-based instruments can greatly help to provide more efficient, less costly, and more effective environmental policies. But they also require institutional strengthening. In the process of their introduction, and to achieve sound environmental management generally, the ability of the NRCA to carry out its functions must be strengthened. A determined effort on the part of policymakers is needed to make the legislation work. It is not enough to have the legal and institutional mechanisms in place without the capacity for monitoring and enforcement. Pollution taxes should on the whole play an increasingly significant part in fiscal policy, but market-based instruments can be adopted on a wider basis.

Mexico

The objective of this study is to contribute to discussion of the potential use of economic instruments in environmental management in Mexico.¹³ Although application of these tools has been limited, their potential is certainly wide. The high-priority areas chosen are contamination of air and water, and disposal of solid and toxic waste.

While few practical cases exist where economic instruments have been implemented in Mexico, the debate on their possible application has gained strength. What has accelerated the discussion of economic instruments in Mexico? Three factors are worth mentioning. First, there has been an increase in the number and intensity of environmental problems, along with their consequent risks for the population. Second, ineffectiveness of other policies has been a contributing factor. Third, there is a necessity to look for solutions in economically adverse situations, where the resources dedicated to the environment are scarce.

The most significant example of increasing environmental problems is in the Mexico City Metropolitan Zone (MCMZ), which harbors more than 30,000 polluting companies. Three million vehicles circulate daily and 20 million people reside there. The high incidence of atmospheric pollution, as well as the greater water demand for residential and industrial use, put the well-being of a large number of people in danger. Increased incidence of pulmonary and gastroenteritis are occurring.

The environmental problems in Mexico City are not restricted to the valley because 30 percent of the water used comes from places more than 100 kilometers away. In other cases, discharges of wastewater are deposited in agricultural lands, causing water quality deterioration.

In addition to the high levels of atmospheric pollution and water demand in the MCMZ, the border area with the United States presents a widespread problem of toxic and hazardous substances. This area has rapid industrial and population growth from assembly factories.

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To date, the Mexican authorities have faced the problems of environmental deterioration by imposing laws and operational norms. The environmental administration in Mexico is based legally in the constitution and detailed in the General Environmental Protection Law of 1988. At the same time there are several related laws and regulations, the most important being the water law and the hazardous wastes regulations. Regarding general policies, it is worth highlighting the National Program of Environmental Protection 1990-94, as well as the subsequent sectoral plans.

Table A3 summarizes the main instruments used for environmental improvement in Mexico.

The main instruments derived from the Mexican laws are the Official Mexican Norms (OMNs); these give specific guidelines for the quality of natural and environmental resources. There are 33 water OMNs that set specific standards for wastewater discharges and establish limits for pollutant emissions in each industrial sector. There are 18 OMNs for atmospheric contamination: 5 for monitoring, 5 for stationary sources, and 8 for mobile sources. Norms for solid wastes have also been published, as have norms for hazardous goods and use of natural resources. In general, the authorities require environmental impact studies and operating licenses for different economic activities.

Besides the OMNs, there are control measures, especially in the case of air pollution in Mexico City. The most important is the "Don't Drive Today" program that restricts circulation of 20 percent of the vehicles of the MCMZ on a revolving basis. Verification of vehicular emissions is required at least once per year. Catalytic converters have been required since 1991.

In addition to the water OMNs, the National Environmental Commission (CNA) demands that the industrial sector treat its effluent. At the same time, the CNA has substantial resources for the installation of treatment plants and the development of hydraulic infrastructure.

The establishment of hazardous wastes norms has

Table A3 Main Instruments Used for Environmental Improvement in Mexico

	<i>Air</i>	<i>Hazardous Wastes</i>	<i>Water</i>
Command-and-Control Instruments			
Regulations and Sanctions	<ul style="list-style-type: none"> • 18 norms • "Don't Drive Today" program • Vehicular emission verification • Improvement in the quality of gasolines 	<ul style="list-style-type: none"> • 7 norms 	<ul style="list-style-type: none"> • 33 norms
Economic Instruments			
Charges, Taxes, and Permits	<ul style="list-style-type: none"> • Gasoline tax • Environmental tax 		<ul style="list-style-type: none"> • Rights for discharge of wastewater • System of prices and introduction of electronic meters

13. This section is translated from the book by Belusteguioitia, Cordero, and Guadarrama 1995.

been supplemented with other actions such as inventories, identification of disposal sites, and classification of wastes. Nevertheless, the results of these initiatives have not been encouraging. Environmental deterioration continues, and Mexican authorities are forced to look for alternative solutions to environmental problems. Three MBIs are under discussion: a market for tradable permits for SO₂ mitigation, rights for wastewater discharges, and a gasoline tax in the MCMZ.

Tradable Permits

Norm 085 was approved in 1994 and establishes maximum atmospheric emission levels for carbon monoxide, nitrogen oxides, sulfur dioxide, sulfuric acid rain, and suspended particulates. It also sets requirements and operating conditions for using combustibles in stationary sources.

Within this norm, local “bubbles” have been created that allow the trading of SO₂ emission permits for stationary sources. The intent is to maintain the levels of pollution inside the established limits. It is hoped that the markets will begin operation by 1997.

Markets that operate in the designated bubbles will be designed during the period between approval and enforcement of the norms. The bubbles, in turn, are specified based on the seriousness of the local emissions problem. One of these bubbles integrates the Federal District and the municipalities.

To implement a system of tradable permits, however, it is necessary to modify the General Environmental Protection Law so that it incorporates concepts such as “bubble pollution.” Once the legal framework is modified, a market of tradable permits will be created.

The detailed design of the MBIs is under discussion. The participating companies will comply with the norms once measurements are made, either for current emissions or emissions allotted under the permits. Also, to assure compliance, it will be necessary to determine a series of applicable sanctions. These should be severe enough that the company opts for satisfying the environmental norm instead of simply paying the corresponding sanctions.

Gasoline Tax

The tax was designed as a mechanism for the Department of the Federal District to use to finance gas station remodeling in order to reduce and recover vapor emissions. The tax has been in operation since January 1995.

Because the price elasticity of gasoline varies between -0.4 and -0.8, the imposition of a tax that represents 0.5 percent of the fuel price will have marginal impacts on consumption. However, in terms of collection, the tax represents an important source of financing for environmental projects. In the Federal District the amount collected could reach US\$20,000

per day, given a consumption of about 13 million liters in 1993.

One of the advantages of this tax is the low transaction cost, since collection occurs directly through the purchase of gasoline. The amount collected is given to the Secretary of Finance, but the redistribution mechanism is automatic. While the tax has many advantages as an instrument of environmental management, some problems exist. First, the law did not contemplate the possibility that a local authority could implement a gasoline tax. Second, a tax is never easy for society to accept; it was necessary to earmark the revenues for gas station conversion. Finally, there is a belief that an increment in energy prices in turn raises the prices of other products, causing inflation. This last point has been studied by Weihmann for the case of Mexico; the study indicated that less than 10 percent of total costs were energy related.

The tax in Mexico City lacks the dynamic incentives characteristic of a long-term solution. The amounts collected are independent of consumption or type of vehicle, and do not influence marginal consumption decisions. Also, the percentage of tax within that total price is very low; it is very likely that consumers do not realize that a tax exists.

Another problem is that the earmarking of the tax is not permanent. Although the revenues are currently allocated to gas station conversion, there has been no announcement about future investment targets (after two years) once the conversion program is complete.

The tax therefore still is not a clearly defined long-term instrument. This hinders the decisions of individuals to make technological substitutions that improve energy efficiency or reduce fuel consumption. It is therefore not clear what long-term environmental impact this instrument will have.

Wastewater Discharge Rights

Water pollution has generated concern because it causes serious health impacts. The cost is about US\$3.6 billion annually, which includes the cost of illnesses related to water and food contamination.

Pollution loads are concentrated in a few basins. Of 218 basins in the country, 20 basins generate 89 percent of the total load. Just four basins—Pánuco, Lerma, San Juan, and Rafts—accounted for 50 percent of wastewater discharges. These receive the discharges of the main cities, as well as those coming from industrial and agricultural activities.

Population growth in zones where water is scarce, coupled with the high cost of developing new water supplies, dictates using wastewater recovery methods to satisfy the growing demand for water. However, existing water treatment capacity in the country is limited, treating only about 5 to 10 percent of total effluents.

Besides direct investment in treatment, Mexico uses direct control such as OMNs, as well as a system of charges tied to wastewater discharge rights. This last system was put into practice in October 1991 to decrease the volume of wastewater and to induce companies to invest in water quality improvements. It was one of the first environmental management instruments based on the polluter-pays principle and market incentives.

The design and calculation of the economic instruments is based on the Federal Water Rights Law. The amount paid for the right for each cubic meter of discharge is set in accordance with intervals established under the law. Intervals are set both for water quality (for example, suspended solids) and for total discharges. There is also a simplified procedure that is applied when the monthly volume of the discharge for a user is less than 3,000 cubic meters. In this case, the charges are dependent only on discharge volume.

One of the problems has been that the polluters generally do not pay the required amounts for their discharges. This is the case in practically all of the municipalities and a great proportion of industries. In 1992, N\$17.4 million were collected; revenues grew to N\$24.2 million in 1993, and N\$52.4 million in 1994. This increase is due to various measures taken by the CNA, but although collections increased, the impact in terms of the total amounts owed is not very significant.

In conclusion, although the purpose of the economic instruments is to induce agents to change their behavior by means of internalizing costs, the charges have not been high enough to modify behavior. Once taxpayers get used to the established norms, the CNA will collect based on unit discharges instead of only collecting from those that exceed the permissible levels.

Finally, it is necessary to recognize that early use of this economic instrument has not generated the intended results. However, these procedures require further revisions if they are to create a permanent stimulus for polluters to find new technologies and practical processes to reduce emissions.

Final Considerations

Economic instruments until now have suffered from a number of practical flaws. In some cases these flaws relate to the very design of the mechanisms, while in others the obstacles are of a more general nature. These obstacles must be overcome before economic instruments are extensively adopted within Mexico's environmental policies. The constraints may be summarized as follows.

Economic obstacles

- Costs to industry. One must consider the current economic situation that the country faces, as well as the situation of competitiveness of the industry.
- Costs of monitoring. Faulty institutional and administrative capacity increases the costs of monitoring.

Political obstacles

- An economic instrument could make environmental groups and other NGOs feel that they are left without "legal space." These groups might perceive the application of any economic instrument as a type of threat, because in effect it "permits" pollution.
- Lack of consensus regarding implementation.
- Economic instruments could have negative distributional impacts.
- Lack of consistency with other government measures.
- The application of economic instruments is perceived to be inflationary.
- Lack of a "body of support" toward these instruments.

Cultural obstacles

- Lack of information on their operation.
- Lack of information on likely impacts.
- Lack of confidence in the anticipated results.
- People do not find it moral or ethical to permit contamination through a polluter-pays process.

Administrative obstacles

- New administrative institutions are required.
- A strong policy tradition exists in command-and-control approaches.

Legal obstacles

- Mexico's legislation does not explicitly include the use of economic instruments.

To overcome these obstacles, it is not only necessary to facilitate the implementation of the economic instruments, but also to address environmental policies as a whole. To achieve maximum effectiveness of environmental policies, economic instruments should be used in combination with other policy instruments (education, regulation, infrastructure investments, etc.). Finally, the application of economic instruments may be used to promote the integration of policies.

Also, a key obstacle facing decisionmakers in environmental policies is that there is not enough reliable data. Although work has been carried out on this matter, there is still a long way to go. Information changes con-

tinually and often does not have the historical consistency required for certain types of analyses.

Finally, there is a general understanding that environmental policies until now have not been effective and that in general they have resulted in high costs to society. Now seems like a good time to try new alternatives that reduce costs and that are consistent with the economic changes the country faces.

Peru

Environmental Policy

Peruvian legislation on natural resources—especially forests, wildlife, and water—has been relatively well developed for more than 50 years, though its application has been limited.¹⁴ Currently, new laws proposed for these resources are awaiting approval.

Traditionally, natural resource management (“green”) issues have attracted the most attention in terms of legislation and institutional capacity building. By contrast, the development of a legal and institutional framework related to environmental pollution (“brown”) problems is very recent.

Before 1990, when the first Environment and Natural Resource Code was promulgated, the country only had scattered and conflicting legislation with widespread noncompliance. The code was a significant step forward, which tried to set forth a working outline for an effective national environmental policy. However, it has been subject to criticism since its inception, and various amendments to the code have diminished its effectiveness and made its application difficult.

The code did not set up a specific environmental authority, nor the financial mechanisms that would allow its effective application. These points reduced its strength. Other important limitations included lack of adequate financial mechanisms to carry out the mandates of the code, weak environmental institutions with few resources, and lack of sectoral regulatory frameworks, including standards for effluents, emissions, and environmental quality.

There have been no norms for effluents, emissions, and environmental quality in most sectors since the code was promulgated in 1990. Also, the periods set for carrying out the code’s mandates were very short.

The Democratic Constituent Congress of President Fujimori’s prior administration (1990-95) approved a law creating the Consejo Nacional del Ambiente (CONAM), which serves as the national environmental authority.

The country had never had an environmental authority at the central level, nor an institutional structure

for environmental management that allows coordinated actions for environmental protection at the local, regional, and national level. Currently, the functions of the executive branch in environmental matters is exercised through the environmental offices of various ministries such as the presidency, agriculture, fisheries, defense, interior, health, mining and energy, industry, tourism, transport and communication, housing and construction, international commercial trade integration, and the foreign office. This multiplicity of government agencies involved in environmental matters produces redundancy and overlapping responsibilities. Each ministry resolves whatever issues fall within its sector, in effect becoming “judge in its own case” and leaving other affected parties with no venue for administrative appeal. Civil society and government have come to recognize that it is necessary to have a central point of coordination, regulation, and policy that serves as a guiding institutional framework for these currently dispersed sectoral activities.

CONAM’s main functions are to (a) formulate, coordinate, lead, and evaluate national environmental policy and ensure that it is strictly carried out, (b) coordinate sectoral activities with the environmental activities of the central government as well as regional and local governments to achieve harmony with established policy, (c) establish general criteria and guidelines for environmental quality and regulation, and coordinate with the sectors in establishing permissible limits for environmental protection, (d) propose mechanisms that facilitate international cooperation to help achieve national environmental policy objectives, (e) establish general criteria for conducting environmental impact assessments, (f) supervise implementation of national environmental policy and directives by agencies of the central, regional, and local governments, (g) serve as the final administrative authority in resolving challenges to acts or resolutions related to the environment, (h) propose legal standards, play an official role in environmental controversies that affect the country, and issue opinions in environmental matters in cases where it is requested, (i) initiate appropriate administrative, civil, and/or criminal actions in cases where the policies, regulations, and directives mandated by CONAM are not followed, (j) help to recover and preserve indigenous knowledge and technologies related to the environment, (k) consolidate environmental information from the various public agencies, (l) develop a national environmental action plan, (m) propose the creation and strengthening of the means, instruments, and methodology needed to determine the value of the country’s natural heritage and resources, and (n) make an annual report on the state of the environment in Peru.

14. This section is extracted from Tolmos 1995.

Environmental Conditions in Urban Areas

Acute pollution of water resources and coastal zones is perhaps the most important environmental problem Peru faces. Most of the rivers flowing through the most important cities are polluted with discharges coming from domestic users, industry, and agriculture. Also, these rivers are used as final disposal places for solid wastes. It is also common for coastal waters to be contaminated by untreated wastewater from industrial and domestic sources. For example, it is estimated that 16.5 cubic meters per second of untreated industrial and domestic wastewater is discharged along the metropolitan Lima coastline. Also, coastal pollution by wastewater from fish meal production is widespread along the Peruvian coastline. Other problems are the scarcity of water to supply cities, aquifer exhaustion and pollution, insufficient collection and inadequate disposal of solid wastes, and air quality deterioration in large cities.

The situation in the Lima metropolitan area is critical and is the best illustration of the state of the environment in most urban areas. The Rimac River, the main source of water for domestic use in Lima, has pollution levels far beyond the maximum limits set by the General Water Law and prevailing international standards. Samples taken in 1991 at the intake for the La Atarjea treatment plant, which supplies drinking water for Lima, revealed total coliform levels that were on average 5.5 times higher than allowed, 90 percent of the time. Fecal coliform levels exceeded limits by an average of 15.5 times, 90 percent of the time. There is no industrial wastewater treatment, and along the river there are dumping sites for solid wastes. The Rimac River also is affected by discharges from mining centers in the higher parts of the basin and by pesticides from agricultural activities.

The average production of drinking water in the Lima metropolitan area in 1989, from wells and treatment plants, was 20.75 cubic meters per second, while demand was 23 cubic meters per second. Total urban demand (industrial and residential) is expected to reach 30 cubic meters per second in 1997, and 35 cubic meters per second in the year 2000.

The water supply problem facing Lima makes it one of the worst-supplied capital cities in Latin America, with a high percentage of its population going without adequate service (that is to say, a continuous water source 24 hours a day and 365 days a year, with adequate water pressure, no chlorine residues in the network, water supply adequate to meet demand, low rate of loss in the system, and tariffs that cover real costs).

For 1990, statistics indicate that nationwide only 52 percent of the population was connected to the drinking water supply system, and only 39 percent to the sewerage system. In the same year, 65 percent of the urban

population had drinking water service and 53 percent had sewerage service.

Regarding air pollution, the most polluted city in the country is the Lima metropolitan area, which has nearly 7 million inhabitants—almost 30 percent of Peru's population. In 1995, sedimentary solid pollutants exceeded the Pan American Health Organization's standard in 27 of the city's 33 districts.

Regulations and Economic Instruments

Environmental law in Peru is extensive but extremely dispersed among a number of different pieces of general and sectoral legislation.

The 1990 Environment and Natural Resources Code marked an important milestone in the environmental sector, representing a first attempt at developing a comprehensive regulatory framework for environmental management in Peru. It introduced the idea that any person has the right to demand quick and effective legal action in cases of environmental protection. On the other hand, it also incorporates a certain form of the polluter-pays principle by establishing that "the costs of prevention, monitoring, recovery, and compensation for environmental degradation are to be paid by the party that causes the damages."

Unfortunately, the code delegated several duties and responsibilities to the "competent authority," which was created just this year. This meant a fundamental institutional requirement was lacking from 1990 until CONAM was created.

Natural resource conservation and environmental protection in Peru are based on environmental legislation that depends exclusively on direct command-and-control regulations. These instruments include a system of natural protected areas, ecological zoning, sectoral environmental impact assessments, and fines and penalties, among others.

In Peru, experience in the use of economic instruments for environmental protection does not exist. Instead there is an ever-increasing number of sectoral and national environmental norms, which are based exclusively on command-and-control instruments such as fines, penalties, or environmental impact assessments. In practice, the amount collected from fines and penalties is minimal or nonexistent.

The newly proposed water law, based mainly on the Chilean experience, allows for water trading through water use rights. This constitutes the first effort to incorporate economic instruments in a particular sectoral legal framework.

Few people in public and private institutions know about the use of economic instruments in environmental policy. There is little information about the advantages

and disadvantages of these instruments for environmental protection.

CONAM is carrying out a national consultation to learn about environmental problems, institutional priorities for environmental management, and needs in terms of human and financial resources. CONAM is interested in incorporating economic instruments in the design of the Peru environmental action plan, for which it is responsible.

Solid waste collection and disposal service seems to face a problem of poor pricing. This in turn causes underbudgeting of the service. Today municipalities seem to be aware of the importance of conducting a study to estimate tariffs based on real costs. Tariffs charged by municipalities should reflect differences in the types of solid waste generated—that is, their different densities and volumes.

Pricing problems also are present in the case of water supply and sewerage services. Again, this results in underbudgeting of services and the waste of water. At the present time the tariff for water supply is based on average consumption and not on real consumption and the real cost of service. Although tariffs charged for water supply include a percentage to cover sewerage as well, in practice this amount is insufficient to finance the construction of treatment plants. For this reason industrial and domestic wastewaters are being directly discharged into rivers and the ocean. In the case of Lima, a tariff based on the real costs of treating those industrial and residential wastewaters—17 cubic meters per second are discharged into the ocean and 1 cubic meter per second into the Rimac River—needs to be introduced. Also, a water supply tariff based on the real cost of service is needed.

Regarding industrial wastewaters discharged into the Rimac River, a system of charges could be implemented. Charges should be based on toxicity since many mining and other highly polluting industries discharge their wastewater into the Rimac River's upper basin and because the volume discharged by all sources—including residential wastewater from some shanty towns—is only 1 cubic meter per second. Toxicity and water pollution levels are a crucial issue since water entering the La Atarjea treatment plant is not considered treatable for domestic consumption. Because the Rimac River is Lima's only source of water, the plant must incur very high costs to make this water drinkable.

However, implementing a system of charges would imply some requirements such as the establishment of standards for heavy metals and other contaminants, and appropriate institutional capacity. Determining the charge level would be a key issue.

At present, the PROMAR project (Project for Wastewater Management and Coastal Pollution Con-

trol), which is under SEDAPAL (Lima Water Company) and is funded by the World Bank, is starting a study on the regulatory framework and institutional requirements needed to effectively and efficiently deal with wastewater management and coastal pollution control in the Lima metropolitan area. It is important to point out that one of the study's specific tasks consists of identifying and evaluating the potential use of economic instruments in the context of these environmental problems.

Future Scope for Market-Based Instruments in Peru

There are three institutional constraints which prevent the implementation of economic instruments for environmental management in Peru: (a) lack of standards for emissions and effluents and for ambient air and water quality at the national level, (b) unclear establishment of responsibilities among governmental and nongovernmental institutions that participate in environmental management in Peru, and (c) lack of an enforcement strategy and experienced institutions at different levels of government.

In recent years, in part due to lack of a national environmental agency, each sector (energy and mining, fisheries, agriculture, industry, and health, etc.) has established its own environmental norms, and in few cases its own emission and effluent standards. These standards have been set up without paying adequate attention to ecological and health criteria. It is expected that this confusing situation of setting up sectoral standards for emissions and effluents and for ambient air and water quality will be resolved once CONAM establishes national standards.

There is a lack of coordination regarding the responsibilities of different institutions participating in environmental management (for example, local governments, the ministry of health, and the various economic sectors). This lack of coordination is especially evident among governmental institutions and among different departments within the same ministry (for example, in the ministry of agriculture). Also, it is fundamental that the ministry of economy participate in discussions about financial resources for enforcement activities and the implementation of economic instruments.

Avoiding overlapping responsibilities, for instance, between the recently created CONAM and INRENA (the Institute of Natural Resources), which is under the ministry of agriculture, is a fundamental issue that should be taken into account. Any rivalry among institutions might result in conflicting situations that can delay any initiative for successfully implementing economic instruments as part of environmental policy.

Given the macroeconomic and fiscal discipline pursued by the new government, it is hard to think about

applying economic instruments for environmental protection without getting support and collaboration from the ministry of economics. The target of 13.9 percent for taxation in 1995, after having fallen as low as 6 percent during the Garcia administration (1985-90), could make the use of economic instruments even more difficult, especially because the industrial and business sectors consider the current tax level excessive. Some entrepreneurs argue that imports of clean technologies and equipment should be tax-exempt. This proposal is not accepted by government.

At present, the free market policy advocated by the government seems to have priority over other policy considerations, including the environment. Under current circumstances, it is going to be problematic to apply economic instruments for environmental protection if these instruments affect the demand for imported goods. For example, INDECOPI (the National Institute for Defense of Competition and Intellectual Property) recently questioned the appropriateness of five directives from the ministry of agriculture. In INDECOPI's opinion, the agriculture ministry sought excessive sanitary requirements that are incompatible with the free market. Another example is the highly polluting secondhand buses and cars that have been freely imported since 1991. Government does not regulate or levy a tariff on such imports even though air quality in Lima and other big cities is getting worse. Using tariff and nontariff barriers as part of environmental policy probably would be seen as contradicting the government's free trade policy.

Institutional capacity to carry out enforcement activities is almost nonexistent. For example, there is a complete lack of liability legislation in environmental matters. Also, there is no allocation of enforcement tasks among institutions participating in environmental management at all levels, and these institutions do not have the human and financial resources needed for carrying out enforcement tasks.

Given CONAM's relative authority and autonomy, and its role as the institution responsible for designing and implementing environmental policies, it would be worthwhile for the World Bank and other institutions to provide their expertise in enforcement issues. CONAM does not have the expertise and the staff to deal with issues of enforcement and economic instruments. An additional point for discussion is whether an enforcement agency is going to be created outside of CONAM, or if that capability will be established within CONAM, or if existing environmental institutions are going to share the task of enforcement.

Economic instruments could be implemented once these constraints are overcome. High-priority areas for implementing economic instruments could be urban

water and air pollution from industrial and domestic sources, solid waste collection and disposal, coastal pollution from fish meal plants and harbor operations (for example, oil spill and leakage), and water and air pollution from mining activities.

Venezuela

Environmental policy in Venezuela is characterized by the implementation of direct controls; experiences involving economic instruments are scarce and isolated.¹⁵ As a result, management of natural resources and pollution relies on the enforcement of extensive and complex legislation. Environmental cost accounting and pricing of natural resources are not developed within the existing market system. According to the economic theory of environmental policy, market-based instruments can lead to the achievement of social environmental goals and economic efficiency. Another potential advantage of mechanisms such as pollution charges is the collection of resources for pollution abatement.

To evaluate market-based incentives as environmental policy instruments in Venezuela the study analyzes the current legal and institutional framework related to environmental policy. On the other hand, assessment of the macroeconomic, social, and sectoral impact of environmental management employing microeconomic instruments has enormous importance in Venezuela given the critical economic and social problems currently facing the country.

High-Priority Areas for Environmental Management

Oil exploitation and import substitution policies have determined patterns of development in Venezuela that have affecting environmental conditions in past decades. In particular, the import substitution scheme generated light manufacturing industries highly dependent on foreign technology and primary resources. As a consequence, industrial activity is not adjusted to national resource availability and it tends toward excessive production of wastes. The previous economic factors have also implied explosive urban growth, geographically concentrated in the traditional northern centers, with the consequent negative impact on air, soil, and water quality.

The following urban environmental problems are identified as high-priority areas for environmental management, based on their economic and ecological impact:

- *Energy Subsidies.* Internal price control for gasoline causes excessive fuel consumption; in September 1995, 87-octane gasoline was sold at a local price which represented only 27 percent of its international value (f.o.b.). The local price for

15. This section is extracted from Orlando 1995.

95-octane gasoline was adjusted to equal 65 percent of the international price. However, the most important problem related with gasoline production is the coexistence of unleaded gasoline, which meets international environmental standards and is exported by the industry, with leaded fuel which is sold in the local market. The state-owned oil industry argues that the financial deterioration of the domestic market is an obstacle to improving gasoline quality inside the country. Air monitoring regularly shows high concentrations of lead in the Caracas metropolitan area and other important cities.

- *Water Quality.* The study focuses on the Lake Valencia case to analyze water quality issues. The Lake Valencia basin encompasses very important urban and industrial areas (in recent decades more than 60 percent of private manufacturing activity has become concentrated in this area). The ecological impact of pollution in the basin and the cities of Valencia and Maracay is considerable. Since 1985 the area has been the subject of an Integrated Environmental Sanitation Program, partially financed by the Inter American Development Bank. Within the sanitation program a special legislative framework regulates industrial activity, imposing water quality standards for effluents discharged into the lake. There is a decentralized institutional structure of environmental authorities in the area, as well as an NGO presence. Enforcement of standards has been problematic, even though most firms have treatment plants.
- *Hazardous Waste.* Oil production, the heavy-metals industry, and the manufacturing sector make management of hazardous waste a critical problem. The country has no landfills that are safe for toxic waste disposal, and sanitary landfills for domestic solid wastes are very scarce. Thus, dangerous substances have to be stored in enormous concrete containers that are expensive and are difficult to monitor.

Institutional and Legal Framework—Command-and-Control Instruments and Economic Instruments

Environmental policy in Venezuela underwent a discernible change in emphasis over the past two decades, from a conservationist policy to an economic development policy based on rational resource utilization. Environmental objectives and policy strategies have become more independent since the Eighth National Plan (1990), which also included the possibility of using Pigouvian taxes for environmental management.

The environmental authority of the central government is the Ministry of the Environment and Natural Resources (MARNR), established in 1976. MARNR's main activity has been to provide public resources for sanitation efforts. Therefore, joint environmental management incorporating firms and NGOs does not receive enough human and financial resources. The organization of the ministry has evolved from a centralized structure to a horizontally decentralized one in which specific environmental problems have a corresponding unit. Some of the most important divisions of the current MARNR configuration are watershed conservation, air quality, and environmental education. However, these divisions are not financially independent and the ministry's budget depends on the national treasury. These factors are important in discussing the feasibility of implementing market-based incentives.

Venezuela's legal framework on environment is considered very advanced in terms of its standards and scope. Nonetheless, several authors point out the fact that it grants excessive discretionary power and assigns overlapping responsibilities to diverse entities. In some cases the energy ministry and defense ministry share enforcement responsibilities with the environment ministry; the public health ministry and agriculture ministry participate in formulation of standards. Some environmental standards are so far-reaching as to be unenforceable or not suited to particular ecosystems. The main legal instruments addressing environmental quality are the Organic Environmental Law (1976), and the Criminal Environmental Law (1992) defining environmental crimes and sanctions (fines and imprisonment). As in other Latin American countries with command-and-control environmental policies, compliance and enforcement has been problematic in Venezuela. With direct controls, optimal reallocation of environmental resources is not guaranteed.

At the local level, special regional agencies are taking an increasingly important role in enforcement of standards, sanitation programs, and environmental education. Municipalities are directly responsible for solid waste management. During the 1990s these institutions have been gaining strength both politically and financially. Municipalities have the right to collect their own taxes, and have control over industrial, commercial, and agricultural establishments within their areas. Neighborhood associations are represented at the municipal level. Hence, the municipal level is a potential unit for environmental monitoring and management programs regarding air, water, and soil quality.

As mentioned in previous paragraphs, environmental management in Venezuela has followed a command-and-control approach. In addition to standards, enforced by fines and environmental damage liability

and prosecution, land use restrictions are applied for preservation of forests, watersheds, and other ecosystems. Currently, licensing is also being used as an instrument for environmental management. It is important to observe that market-based incentives *per se* have not been considered, but there are some experiences with economic instruments or instruments that consider economic costs of pollution and environmental degradation. Some of these instruments implicitly recognize environmental problems as an externality, even if no accounting of environmental costs in the price system is generated by their implementation:

- *Fiscal Incentives.* Abatement of corporate taxes was implemented during the 1970s and 1980s, and was ended in 1991 by reforms in the Corporate Taxes Law. The purpose was to compensate for investments in equipment, technology, or infrastructure devoted to improvement or preservation of the environment. The abatement was for up to 15 percent for five years. This instrument did not produce improvements in resource allocation and might have led to excessive investment in capital-intensive pollution abatement mechanisms.
- *Industrial Tariff System Based on Volume of Solid Waste.* The purpose of this instrument is to recover the costs of the municipal collection and disposal system. It has been implemented with relative success in the north-central region and Zulia state. The main problems confronted are scarcity of sanitary landfills and monitoring difficulties. Tariffs for solid waste disposal are important in the operational costs of certain industries and provides an incentive for innovations to reduce solid waste production.
- *Financial Compensation from Natural Resource Exploitation.* Traditionally this occurs in the Venezuelan economy within the concession regime for oil exploitation. The general objective of this instrument is to stimulate rational utilization of resources. Royalties together with the income tax from the oil sector constitute the major income source for the government.
- *Deforestation Taxes.* National forest restoration taxes, paid by forestry companies that don't conduct their own reforestation programs, finance public reforestation projects. Deforestation taxes have not been effective because the tax rate does not cover the marginal cost of reforestation.
- *Final Demand Incentives.* These include self-imposed environmental management practices based on international standards and concern for domestic corporate image.

- *Recycling.* Deposit-refund systems have been very effective in glass recycling. Recycling of aluminum containers and paper is increasing considerably.

Market-Based Instruments as Part of Environmental Policy within the Venezuelan Economy

The most important factor to consider when evaluating market-based incentives within the Venezuelan economy is the current dysfunction of the market system itself. Because markets for industrial goods are highly concentrated, the allocative advantages of MBIs might not occur. Since 1994, economic policy has been characterized by interventionism, including price controls and a fixed official exchange rate. The products under price controls are basic consumer goods as well as goods and services provided by state monopolies (gasoline, electricity, and water). Labor markets are regulated as well through a minimum wage. Distortions caused by price controls affect multiple markets and periodically cause shortages of some food items. Firms also face restrictions on international currency exchange, which constrains their operations considerably.

Macroeconomic conditions give rise to an environment in which there is a combination of shrinking output, high inflation, and increasing tax pressure. Consequently, creating additional taxation by using MBIs has to be carefully evaluated in terms of its effects on output and prices. Nonetheless, considering the magnitude of the public sector deficit, the role of MBIs as a way of collecting resources for pollution abatement is especially important. Another of the prevalent elements characterizing Venezuela's economy in the 1990s is the high level of uncertainty regarding government policies. Uncertainty complicates the analysis of market-based incentives. Therefore, in general, theoretical benefits from MBIs would not necessarily take place in the context described, with the exception of certain ones that provide incentives for pollution abatement.

Despite the ambiguous effects of MBIs on economic efficiency in the allocation of environmental resources, in a situation where there are price controls, macroeconomic instability, and other market distortions the implementation of some market instruments at the local or regional level has the advantages of:

- Stimulating cost-effective pollution abatement
- Increasing consumer awareness
- Providing local authorities in charge of specific environmental problems the resources for environmental management plans.

Specifically, in the context of Lake Valencia's sanitation program, the regional basin authority monitors effluents that could be subject to pollution charges. Municipal taxes (paid by firms twice a year as a percentage

of sales) that create incentives for cleaner technologies and pollution control could also be implemented.

At the national level, environmental education, eco-labeling, and performance bonds under MARNR's supervision can have effects both on the supply of goods and on final demand.

General Recommendations for Environmental Management

- Progressive elimination of energy subsidies

- Improvements in water pricing
- Construction and management of sanitary landfills for toxic and solid wastes
- Revision of current standards on water and air quality
- Extension of MARNR's decentralization at the regional level.

Bibliography

Bibliographic Note

A panel of 11 countries—Barbados, Bolivia, Brazil, Chile, Colombia, Ecuador, Jamaica, Mexico, Peru, Trinidad and Tobago, and Venezuela—was formed and local experts were assigned to elaborate a country report to address legal, institutional, and political barriers and the importance of macroeconomic and sectoral policies affecting the application of market-based instruments for environmental management. Results of the background studies were discussed during two three-day workshops in November 1995 and July 1997 to share experiences and to synthesize the results of the studies. Participants at the first workshop included: Norman Hicks, Richard M. Huber, and Eugene McCarthy (World Bank); Jack Ruitenbeek and Ronaldo Serôa da Motta (Consultants); and Hugo Contreras, Maria Orlando, Juan Ramirez, Mónica Ríos, and Raul Tolmos (Country Study Authors). Participants in the second workshop are listed at the end of the Bibliography.

Background and Related Papers

*Papers marked with an * are summarized in the appendix of "Background Paper Summaries."*

- *Belausteguigoitia, J. C., H. Contreras, and L. Guadarrama. 1995. "Mexico: La Gestión Ambiental y el Uso de Instrumentos Económicos."
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Background Paper Summaries

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