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Financing Pollution Abatement: Theory and Practice

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The World Bank



**Pollution and Environmental
Economics Division**

**Financing Pollution
Abatement:
Theory and Practice**

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Contents

Glossary

Executive Summary i

1. Pollution Abatement Financing - Theoretical Background 1

Market and Regulatory Failures - The Need for Intervention 1

Environmental Policy and Implementation Instruments 2

Fiscal Policy Framework 4

The Role of Financial and Capital Markets 6

Micro-perspective of Environmental Financing 7

2. OECD Countries 9

Environmental Policy Framework 9

Public Pollution Abatement Financing 10

Private Pollution Abatement Financing 11

Earmarked Environmental Financing Mechanisms 15

Summary of Pollution Abatement Financing in OECD Countries 19

3. Transition Economies 23

Macroeconomic Policy Framework 23

Environmental Policy Framework - The Legacy of Central Planning 24

The Role and Characteristics of Comprehensive National Environmental Funds 27

Revenues 27

Public Pollution Abatement Financing 29

Enterprise Pollution Abatement Financing 32

Disbursement Mechanism 33

Institutional Issues 35

Long-term Perspective 36

Summary of Pollution Abatement Financing in Transitional Economies 37

4. Developing Countries 39

Macroeconomic and Environmental Policy Framework 39

Public Pollution Abatement Financing 40

Private Pollution Abatement Financing 42

Environmental Funds 44

Summary of Pollution Abatement Financing in Developing Countries 45

5. The Role of External Finance 47

<i>Economic Policies, Environmental Priorities and External Finance</i>	47
<i>Financial Intermediary Loans and the Experience of the World Bank</i>	48
<i>The Experience of Donors with Environmental Funds</i>	50
<i>Debt-for-Nature Swaps - A Special Form of External Finance</i>	53
<i>Global and International Pollution Issues and Donor Coordination</i>	54
<i>Summary of External Financing Issues</i>	55

References 57

Tables and Boxes

Boxes

Box 1 <i>Costs and Benefits of Pollution Abatement for Investors</i>	3
Box 2 <i>Water Quality Management and Financing in the U.S.</i>	10
Box 3 <i>Effluent Taxes in the Netherlands and Germany</i>	11
Box 4 <i>Public Water Sector Financing in the U.S.</i>	12
Box 5 <i>Market-based Financing of Municipal Environmental Investments</i>	13
Box 6 <i>Directed Credit and Technical Assistance for Industrial Pollution Abatement in Japan</i>	16
Box 7 <i>Federal Environmental Credit Programs in Germany</i>	17
Box 8 <i>Liability Issues Financed from Environmental Fund in Japan</i>	18
Box 9 <i>Environmental Clean-up Financed from Environmental Funds in the U.S.</i>	19
Box 10 <i>Earmarked Financing in the French River Basin Management Agencies</i>	20
Box 11 <i>The Consolidation of Earmarked Charges in the Netherlands</i>	21
Box 12 <i>Setting Emission Charges in Russia</i>	24
Box 13 <i>Industrial Pollution Abatement Financing in China</i>	25
Box 14 <i>Emission Charges in Poland</i>	29
Box 15 <i>Financing Categories of the Central Environmental Protection Fund (CEPF) of Hungary</i>	33
Box 16 <i>Cost-recovery in the Water Supply and Sewerage Services in the Ivory Coast</i>	41
Box 17 <i>Financing Municipal Services in Colombia</i>	42
Box 18 <i>Pollution Abatement Subsidies in India</i>	43
Box 19 <i>Directed Credit for Pollution Abatement in Mexico</i>	44
Box 20 <i>Comprehensive Environmental Funds in Turkey</i>	45
Box 21 <i>The World Bank's Experience with Industrial Pollution Control Financing from the 1980s in Brazil</i>	49
Box 22 <i>Types of Externally Financed Fund Mechanism</i>	50
Box 23 <i>Financing Pollution Abatement Projects from Parallel Environmental Funds in China</i>	51
Box 24 <i>The Polish DNS</i>	53

Tables

Table 1 <i>Types of Earmarked Pollution Abatement Financing Mechanisms</i>	5
Table 2 <i>Pollution Abatement Expenditures in the U.S. (1986-1991)</i>	14
Table 3 <i>Main Types of Environmental Subsidies for Private Investments in OECD Countries</i>	15
Table 4 <i>Main Characteristics of Environmental Funds in Selected Transition Economies in 1993</i>	27
Table 5 <i>Sources of Environmental Expenditures in some Transition Economies in 1993</i>	28
Table 6 <i>Changes in the Real Level of Emission Charges in Russia (1991 - 1993)</i>	30
Table 7 <i>Projects Supported from NEF Expenditures in the Czech Republic During 1992-93</i>	31
Table 8 <i>Expenditures of the Hungarian NEF by Domestic and EC PHARE Sources in 1994</i>	52

Glossary

BADESP	Sao Paolo State Development Bank
BMFT	German Federal Ministry for Research and Technology
BMWI	Bundesministerium fuer Wirtschaft
BNH	National Housing Bank of Brazil
BOD	Biological Oxygen Demand
CAC	Command and Control
CEE	Central and Eastern Europe
CEPF	Central Environmental Protection Fund
CCF	Capital Construction Fund
COD	Chemical Oxygen Demand
DAB	Deutsche Ausgleichsbank
DE	Water Directorate
DEM	German Mark
DFI	Development Finance Institution
DNS	Debt-for-Nature Swap
EAI	Enterprise of Americas Initiative
EAPCEE	Environmental Action Programme for Central and Eastern Europe
EF	Environmental Fund
EIB	European Investment Bank
EPA	Environmental Protection Agency
EPM	Environmental Program for the Mediterranean
ERP	European Recovery Program
EU	European Union
FFDU	Urban Development Fund of Colombia
FIL	Financial Intermediary Loan
FNA	National Sanitation Fund of the Ivory Coast
FNE	National Water Fund of the Ivory Coast

FNH	National Water Works Fund of the Ivory Coast
FONEI	Industrial Equipment Fund of Mexico
FSU	Former Soviet Union
GEF	Global Environmental Facility
ICICI	Industrial Credit and Investment Corporation of India
IDA	International Development Agency
IDBI	Industrial Development Bank of India
INSFOPAL	National Institute of Urban Development of Colombia
KfW	Kreditanstalt fuer Wiederaufbau
LDC	Less Developed Country
LUST	Leaking Underground Storage Tank
MBI	Market Based Instrument
MDF	Municipal Development Fund
MEPNR	Ministry of Environmental Protection and Natural Resources
MOE	Ministry of Environment
MPC	Maximum Permitted Concentration
NAPA	National Academy of Public Administration
NEF	National Environmental Fund
NEPA	National Environmental Protection Agency
NGO	Non-Government Organization
OECD	Organization for Economic Cooperation and Development
PAC	Pollution Abatement and Control
PHDCPA	Pollution-Related Health Damage Compensation and Prevention Fund
PPP	Polluter Pays Principle
RSFSR	Russian Soviet Federal Socialist Republic
SODECI	Ivorian Water Distribution Company
SRP	Sector Reform Program
TMPCF	Tianjin Municipal Pollution Control Fund
TRF	Technology Renovation Fund
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme

Executive Summary

Theory

Market and regulatory failures result in extensive levels of pollution, causing damage to human health, and natural and productive assets. The prevention and mitigation of these effects at local, regional and global levels call for the proper set of environmental policies and policy implementation instruments. Pollution abatement financing, the mechanism of raising and allocating financial resources for the prevention and control of negative effects due to pollution of the environment, is one instrument of a complex policy approach aiming to correct market and administrative failures. The first part of the paper reviews theoretical issues influencing the pollution abatement financing framework including (i) the need for government intervention to correct externalities; (ii) the effects of environmental policy and implementation approaches; (iii) the connection with fiscal policies; and (iv) the development of capital and financial markets.

Experience of OECD Countries

Reviewing the experience of OECD countries, the second part of the paper concludes that heavy reliance on command-and-control-based environmental regulations did not lead to cost effective solutions in the past. In response, OECD countries increased the role of market-based mechanisms in the implementation of environmental policies. A strong regulatory framework and improved enforcement have led to a substantial increase in the share of privately financed pollution abatement and control measures in most OECD countries. Recently, air pollution abatement

has been financed almost exclusively from private sources, while the role of public environmental services has been significant in water treatment and waste management. In the provision of public environmental services, there has been a trend towards full cost-recovery through the collection of user charges. Improved cost-recovery has increased the efficiency of collective services and facilitated the use of commercial financing mechanisms.

The paper reviews various subsidy schemes that OECD countries used to speed up private pollution abatement and to reduce the financial burden of compliance with new regulations and standards in the past decades. Most subsidy programs operated on a temporary basis. Some countries provided grants to promote the development and application of cleaner technologies. In other countries, directed soft loans were used to support private pollution abatement investments. Temporary tax incentives were even more widely used fiscal instruments of providing subsidies. These measures included tax credits, accelerated depreciation, the creation of tax deductible funds, and the use of tax-free bonds by investors. The use of subsidies distorted the relative prices, and certain tax incentives created a bias towards the installation of control equipment (end-of-pipe control) as opposed to the application of cleaner technologies and processes.

Earmarked financing mechanisms that were created in some countries, typically tackled local, regional, or media-specific environmental problems. In some cases, environmental funds were established to finance national

priority programs on a temporary basis. Environmental charges were frequently levied with the purpose of raising revenues needed to finance environmental investments. Generally, the more remote the connection between taxation and spending objectives is, the less clear the advantage of earmarking becomes. The benefits of earmarking are more pronounced when direct environmental charges are earmarked in decentralized programs. The main advantages of that scheme in OECD countries have been the incentive effect of charges, and the increased transparency and political acceptability of the system due to the close relationship between revenue sources and the spending of the revenues. Earmarked mechanisms, however, have not played a dominant role in the environmental financing system of OECD countries.

Transition Economies

The third part of the paper discusses environmental policy and financing issues in transition economies. The paper concludes that overly ambitious environmental quality objectives combined with weak enforcement capabilities characterized the central planning era. The reliance on comprehensive national environmental funds (NEFs) for pollution financing is another legacy of central planning. The transition to market economy, however, is expected to generate positive environmental changes, and a dramatic increase in the role of private environmental financing in the long run. During transition, several factors, including weak environmental management, severely curtailed availability of private financing, slow pace of privatization, inadequacies of banking, underdeveloped capital markets, uncertain political and fiscal systems, inadequate information, and weak public participation constrain the development of an effective environmental financing system, and NEFs preserved their role in environmental financing. There are numerous problems, however, with the current structure of environmental funding that relies heavily on NEFs in transition economies:

- Earmarking creates an obstacle to increasing charges and fines to more efficient levels in the long run;

- Subsidies provided through NEFs may replace investments from private resources;
- Public and commercial financing functions are mixed in the operation of NEFs, and commercial banking functions may overshadow the main objective of environmental financing;
- Banking operations create a self-perpetuating function for NEFs without a motivation to improve the effectiveness of policy framework;
- Revenue allocation is rarely supported by clear environmental priorities; and
- Transparency, accountability and financial supervision are inadequate.

Therefore, the role of NEFs should be defined and their relationship vis-a-vis the enterprise sector clarified. NEFs can play a catalytic role by (i) strengthening the environmental policy framework; (ii) financing priority investments where no alternative to public financing exists; and (iii) accelerating environmental improvements in the enterprise sector on a temporary basis. NEFs should have only a limited mandate in enterprise financing during the transition. They should concentrate on priority areas, help to mobilize private and enterprise resources, improve the effectiveness of environmental regulations, promote cost-effective solutions, improve project preparation and assessment techniques, and enhance a constructive relationship between the environmental policy authority and the enterprise sector. NEFs should avoid, however, extending their operation to areas where they have no expertise or comparative advantage and should minimize exposure to commercial risk. Their project preparation, assessment and post-project evaluation capabilities, decision making procedures, and accountability should be significantly improved.

Improvements in environmental management, a stronger private sector, and tightened budget constraints for the public sector can gradually eliminate the need for NEFs. The combined impact of a gradual increase in the incentive effects of environmental taxes and

strengthened enforcement will significantly increase the role of private investments, while tightened budget constraint will contribute to improved cost-recovery in public services. As a result, the spending structure of NEFs will shift to the funding of areas where no alternative to public finance exists, such as research and development of new technologies, education, and information dissemination. With improved political decision making, information availability and citizen and NGO participation, the routine budgeting process should ultimately take over the role of earmarked funds.

Developing Countries

In the forth part, the paper reviews pollution abatement financing in developing countries. Besides direct regulations that typically dominate the selection of environmental policy instruments, MBIs are increasingly applied in several countries, and informal bargaining frequently plays a significant supplementary role. Due to traditions and political considerations in water and waste management, cost-recovery in public environmental service provision is generally low, and service charges levied on industrial discharges are typically ineffective to encourage significant industrial pretreatment and waste minimization measures. As a result, the bulk of capital expenditures and operating costs of public environmental services are financed through general municipal revenues and national budget transfers. In some countries, Municipal Development Funds (MDFs) have been established to finance infrastructural services. MDFs, however, typically cannot achieve self-sustainability.

Underdeveloped and dysfunctional financial and capital markets constrain the private sector's access to financial resources and the menu of financing options. Therefore, directed credit programs have been widely used to enhance lending to priority areas in several countries. Typically, directed lending for pollution abatement has been carried out by financial institutions responsible for directed industrial lending. The provision of directed credit at subsidized rates, however, has been demonstrated to favor large companies that

comply with bureaucratic conditions more easily than small borrowers.

Additionally, private pollution abatement is supported by various other types of subsidies that try to compensate for the lack of strong enforcement of environmental regulations. Subsidies are sometimes channelled through environmental funds, that have been established to provide a relatively steady flow of resources for pollution abatement. Due to the limited amount of revenues raised by environmental charges, EFs frequently rely on budget allocations and external funding. Allocation of environmental revenues is typically not guided by clear environmental priorities and cost-effectiveness criteria.

External Financing

Finally, the paper reviews the role of external financing in pollution abatement. The paper notes that donor assistance has shifted from addressing specific problems to aiming at complex policies that support environmentally sustainable development. Donor financing supplements domestic resources, but cannot compensate for the lack of domestic environmental financing systems. Donor assistance, therefore, should focus on the establishment of a proper environmental policy framework before large scale investments are undertaken. Investment assistance should evaluate all pollution abatement alternatives (including changes in management practices, the application or cleaner technologies and processes, and the installation of pollution control equipments) according to their cost-effectiveness.

The paper reviews the experience of various mechanisms applied to channel donor assistance. The experience of the World Bank with industrial pollution abatement financing has demonstrated that strengthened environmental management and directed financing result in improvements in private pollution abatement, and subsidies could be phased out as a result of better environmental enforcement. There has been a shift in World Bank assistance from the support of end-of-pipe pollution control towards a more complex approach of pollution prevention and the application of cleaner technologies.

The paper also points out that existing NEF mechanisms in transition economies have not been extensively used to channel donor funds, probably due to incompatibilities in project evaluation, selection and decision making procedures, the lack of transparency in existing fund mechanisms, and the lack of clear division between the public financing and the commercial banking functions of NEFs. During the transition period, donors may be willing to channel funds through earmarked environmental funds if the operations, project selection and decision making processes, transparency and accountability of NEFs are significantly improved. An umbrella fund may be useful to channel both donor contributions, and domestic resources. Such a mechanism would coordinate various revenue sources, integrate them into the domestic environmental financing system, and

provide consistency in lending terms and in resource use to finance environmental priorities.

The paper underlines that differences exist in the valuation of global environmental quality between various countries, and points out that mismatches occur at the national level between the benefits and costs of investments mitigating global pollution effects. Therefore, donor intervention is necessary to identify and support the least cost solutions. Despite theoretical advantages in donor coordination and in the establishment of "clearing houses" for donor funds, such mechanisms have limited appeal to donors, and the higher the number of donors is, the more narrow the area of mutually acceptable environmental objectives becomes.

1 Pollution Abatement Financing - Theoretical Background

Pollution abatement financing is the mechanism of raising and allocating revenues for the prevention and control of negative effects due to the pollution of the environment. Sometimes, improvements can be achieved by changing management practices such as maintenance and industrial housekeeping. The financial requirements of such measures are usually minimal. Frequently, however, capital investments are needed to reach the required level of pollution abatement. Rajah and Smith (1993) distinguished three types of pollution abatement measures: (i) "add-on" control measures (end-of-pipe technologies) installed in the production processes, representing the classical cases of pollution abatement; (ii) "add-on" investments with private benefits generating some revenue besides pollution reduction, for example by recovering useful materials from waste; and (iii) integrated technology choices that are mainly productive investments with significant pollution reduction potential, for example by replacing old technology for newer, more productive and less polluting alternatives, or installing energy saving technologies. Other categorizations also exist. In Agenda 21 adopted by UNCED, for example, two main environmental protection strategies were distinguished: (1) end-of-pipe technologies; and (2) the use of cleaner technologies.

Revenue-generating and productive investments are usually undertaken as part of normal business operations. Environmental regulations, however, influence investment decisions. Ideally, investments could be divided by the motivation of investors into productive and pollution control components.

When pollution abatement decisions are integrated with decisions about production technology, however, such division is nearly impossible. Available statistics concentrate on expenditures that are directly aimed at the abatement of pollution. While relying on these statistics, this paper will nevertheless try to address the issue from the broader, more complex perspective.

Pollution prevention is frequently less costly than control. Additionally, the integration of environmental considerations into productive investment decisions by the application of cleaner technologies and processes may lead to simultaneous financial and environmental benefits ("win-win" scenarios). Environmental policy makers, therefore, should adopt a comprehensive approach to pollution abatement issues.

Market and Regulatory Failures - The Need for Intervention

Most pollution problems are the results of market failures. Economic agents make decisions about the level of their production and consumption based on market prices, considering the costs and benefits of their actions. Environment doesn't have a market price, however, and private costs don't include the external social cost of damage caused to other members of society by using and polluting the environment. Although optimally polluters should internalize all the costs¹ of damage caused by pollution, without government intervention they have no incentive to do so, causing excessive pollution of all environmental media.

Macro policies that support economic growth and development may also contribute to environmental problems. Environmentally harmful subsidies reduce the private costs of producers and/or consumers resulting in over-utilization of natural resources. Energy subsidies, for example, lead to energy-intensive economic structures and technologies, and wasteful management practices. The environmental consequences are more atmospheric pollution, causing damage to human health, properties and natural resources, and contributing to global warming. It has been estimated (Shah and Larsen, 1992), that the elimination of energy subsidies world-wide would reduce global carbon emissions by 9.5 percent (by reducing carbon emissions in the subsidizing countries by 21 percent).

The extensive role of the public sector in the economy also introduces inefficiencies that adversely affect the environment. Governments as owners of public enterprises establish production targets, but usually don't hold enterprise managers responsible and accountable for efficient operation. The result is output maximizing, rather than cost-benefit optimizing behavior. The inefficient management and operation of productive assets lead to wasteful use of resources and inadequate housekeeping, contributing to pollution.

Environmental Policy and Implementation Instruments

Environmental policy addresses the correction of market and administrative failures and determines long-term objectives for environmental quality. The correction of administrative failures through the elimination of environmentally harmful price distortions, for example, should be an important part of environmental policy objectives². Ideally, environmental policy should lead to optimal levels of pollution by imposing the social costs of external damage on those who cause the damage. In practice, the determination of the external social costs of pollution and environmental degradation is hindered by (i) the lack of precise information concerning the causality of damage³; and (ii) the exact monetary value attached to the damage⁴. As a result, instead of pursuing the economically optimal

level of pollution, policy makers approximate and substitute it by politically acceptable and desirable environmental quality objectives (ambient standards).

Compliance with environmental quality objectives requires substantial financial resources that may be beyond the financing capacity of the society. Therefore, intermediate targets and phase-in periods may be build into the policy framework to harmonize achievable, realistic objectives with available financing resources. Further, unless the achievement of objectives is guided by well defined priorities, resource allocation becomes suboptimal. Therefore, government intervention in pollution control should be based on the careful analyses of (i) the main environmental concerns (human health damage, damage to ecosystems, and the productivity of assets); (ii) the main causes of damage; (iii) alternatives for mitigating the damage; and (iv) the cost-effectiveness of alternatives. The selection of priorities based on such analyses should provide guidelines for the allocation of scarce resources.

Policy instruments determine the style and cost-effectiveness of policy implementation and create a framework for financing mechanisms. Environmental objectives can be achieved by governments directly regulating pollution-generating activities (command-and-control (CAC) approach), or indirectly, by influencing the decision making process on the micro level (market based instruments (MBIs)).⁵ Both CAC and MBIs can induce polluters to finance pollution abatement from their own sources. The CAC approach constrains polluting activities for each source uniformly by setting standards for technologies, processes or emissions. By setting and enforcing standards, the regulator can be assured that emissions and ambient quality will stay at a predetermined level. The cost of pollution abatement, however, varies across polluters, and the same environmental quality could be achieved by making polluters with lower abatement cost to abate more, while others with higher costs abating less. Such a cost-effective solution can be achieved by MBIs that provide price-based choices. Polluters may decide whether to abate their emissions, or to pay pollution charges (alter-

Box 1. Costs and Benefits of Pollution Abatement for Investors

Polluters will undertake pollution abatement investments if their benefits exceed their costs:

$$PV(P) + PV(p[T]) + PV(p[L]) > (C\&I) + PV(O\&M) - S$$

Where:	PV(P):	present value of profit stream from the investment
	PV(p[T]):	present value of avoided pollution taxes and other environmental charges during the lifetime of the investment with p probability;
	PV(p[L]):	present value of the difference between avoided legal costs (due to environmental liability with p probability) with and without the investment;
	C&I:	capital equipment and installation cost;
	PV(O&M):	present value of operating and maintenance cost during the lifetime of the investment.
	S:	subsidy.

Environmental authorities can induce abatement by influencing three factors: (i) the probability of taxes and charges levied by strengthened enforcement; (ii) the level of taxes; and (iii) the size of subsidies.

Interventions on the left side of the equation are more efficient ways to influence polluter behavior and should get priority over subsidies.

natively, to buy emission permits on the market). As a result, MBIs are generally more cost-effective than CAC regulations (Tietenberg, 1992). Several empirical studies have demonstrated that gains from efficient allocation of abatement are substantial when compared to direct regulation (Atkinson and Lewins, 1974, Seskin et.al, 1983). In addition to efficiently allocating abatement across polluters, MBIs may also create incentives for finding least-cost technologies and measures for prevention and control rather than concentrating on end-of-pipe solutions.

Theoretically, subsidies may be used to achieve incentive effects similar to those of efficient pollution taxes by equivalent subsidies paid for each unit of pollution abated. Practically, subsidies are used to compensate for the cost of pollution abatement investments (rather than for actual pollution abatement achieved), when (i) environmental policies otherwise don't induce the required level of pollution abatement; and (ii) other market failures, such as dysfunctional financial and capital markets, or access to information about available technology prevent pollution abatement investments. Equal levels of subsidization can be achieved by providing (i) low interest rate (soft) loans; (ii) grants blended with commercial credit; and (iii) other forms of subsidies, such as tax incentives. However, the costs attached to, as well as the effectiveness of various subsidy pro-

grams may vary. From administrative point of view, grants are more transparent and simple to handle than soft loans, while the system of tax incentives, for example, requires administrative procedures and inter-agency coordination between fiscal and environmental authorities.

Subsidy programs always face the conceptual and practical problems of defining (i) the eligibility of investments; and (ii) the size of subsidies. While end-of-pipe control investments are easy to identify, pollution abatement investments frequently combine productivity and environmental performance characteristics, so the separation of environmental and profit-oriented components is nearly impossible. Defining eligibility criteria very narrowly (for example end-of-pipe control only) creates unjustifiable bias towards these investments, and defining them broadly leads to unnecessary support of profitable investments. Further, it is difficult to design a subsidy program that relates directly to the activity to be encouraged and doesn't crowd out market based financing. Subsidies are typically applied in combination with policy instruments (environmental taxes and regulations) that also contribute to the correction of the same market failures. The necessary level of subsidies, therefore, would depend on the combined effect of all environmental policy instruments (see Box 1.). Further, abatement costs vary across polluters depending on the

age of assets, type of processes and location of plants. Uniform subsidy programs, therefore, cannot achieve efficient allocation of resources.

Although theoretically the use of subsidies leads to the same level of pollution abatement as the use of other MBIs, subsidies could lead to a suboptimal situation in the long run; as subsidies reduce the equilibrium market price for industry output, they tend to expand sales attracting more polluters and altogether more pollution to the market (Baumol and Oates, 1988, Conrad and Wang, 1993). Subsidies provided for industrial pollution abatement also tend to bias decision making in favor of capital intensive end-of-pipe control investments, as opposed to pollution prevention and low-cost alternative control measures. The larger the subsidy element is in pollution abatement financing, the more serious the long term negative effects of subsidies can be on the total pollution load. In addition, subsidies also weaken fiscal performance (as opposed to environmental taxes that strengthen it). Due to these negative effects, subsidies should be avoided as environmental policy instruments.

Various environmental policy instruments applied in combination is most likely to cost-effectively achieve the desired environmental quality. Finding the combination of the various instruments requires the solution of complex political, economic, trans-sectoral and trans-media issues. Setting sensible environmental objectives, and selecting the optimal combination of implementation instruments and financing mechanisms, however, can only be effective if supported by clear regulations and strong enforcement measures that, in turn, require certain legal and institutional capabilities. Additionally, public access to information can significantly enhance, or in some cases supplement policy implementation by facilitating public participation, informal and formal bargaining, and social pressure.

Fiscal Policy Framework

Environmental financing is also closely influenced by the fiscal policy framework. The extent to which taxation can be used as an

instrument of environmental policy and the degree of decentralization of the taxation system effect environmental policy decisions. Pigou (1920) recommended the use of corrective taxes to eliminate the distortive effects of negative externalities. Such taxes would be designed to adjust the marginal private costs of economic activity to include its social costs. Taxes levied on measured quantities of polluting emissions are Pigouvian taxes that, when they are set right, change the behavior of polluters by internalizing external social costs.

Similarly to Pigouvian taxes, indirect taxes (such as value added or excise taxes) on goods and services that are associated with environmental damage may influence the decision making of polluters. For example, carbon taxes levied on fossil fuels raise the price of energy and, as a result, reduce energy demand, change the structure of energy demand shifting away from fossil fuels, and reduce the emission of carbon dioxide emitted per unit of energy used. Due to the looser connection with the source of pollution, these taxes are generally less effective than taxes levied on direct emissions, however, they require lower administrative costs, since the existing tax collection and enforcement system can be utilized. There is, therefore, a trade-off between lower administrative costs connected with indirect taxes and greater incentive effects associated with direct environmental taxes.

The integration of taxation into environmental policy involves (i) redesigning existing (indirect) taxes to reflect environmental concerns; and/or (ii) introducing direct environmental taxes (Pigouvian taxes) aimed at correcting negative externalities. The reform of tax systems could be carried out in a revenue-neutral way by replacing existing taxes (for example income taxes) with environmental (direct or indirect) taxes. Several analysts (Pearce, 1991; Terkla, 1984) argue that such revenue-neutral tax reforms may offer a "double dividend" by simultaneously improving environmental quality and reducing distortions and costs of the tax system. Although there has been no scientific proof of the existence of double dividend (Goulder, 1994), the notion of "greening the tax system"

Table 1
Types of Earmarked Pollution Abatement Financing Mechanisms

Revenues	Expenditures	Characteristics	Examples
Media-specific emission charges levied at local/regional levels;	Regional/local, media-specific pollution abatement programs; public and private abatement;	Main purpose is revenue raising; close connection between revenue sources and expenditures; transparency; accountability;	French River Basin Management Agencies
Media-specific emission charges levied at national levels;	Media-specific pollution abatement programs at the national level; frequently temporary; mainly public; pollution abatement programs;	Main purpose is revenue raising for priority or media-specific programs;	U.S. Superfund; earmarked sulfur-dioxide emission charges in France; earmarked aircraft noise charges in Belgium, France, Germany;
Various types of emission charges and other environmental taxes levied at the national level;	Wide range of environmental and pollution abatement expenditures at local/regional and national levels; public and private abatement;	Dominant sources of national pollution abatement financing systems; blurred lines of public and enterprise/private responsibilities;	Environmental funds in transition economies (for example, Bulgaria, Hungary, Poland);
General tax (budget allocation);	Specific pollution control investments; public abatement programs;	Fixed amount allocated from budget; temporary character;	U.S. State Revolving Funds
General tax; external funds; and environmental taxes;	Wide range of pollution abatement investments at the national and local levels; public and private abatement;	Environmental taxes alone don't cover expenditure need; dependent on other funds;	Environmental funds in some developing countries (for example, Sri Lanka, Algeria, and Thailand).

by introducing efficient environmental taxes in a revenue neutral manner is a widely recommended policy approach.

Fiscal policies also determine the autonomy and revenue raising capabilities of the various levels of governments, and the allocation of public environmental expenditures. Generally, the level of government that is responsible for carrying out environmental programs is in the best position to determine funding needs, and to choose the most efficient funding source and mechanism. Theoretically, local or regional governments should provide those public services for which local residents are willing to pay for. Directly charging for services increases the efficiency of resource allocation and supports social equity by imposing the costs on those who benefit. The failure to recover costs is frequently the result of considerations that try to protect the poor. Free or highly subsidized environmental services are, however, very ineffective means of addressing equity issues. Less than full cost-recovery may be justified, however, by the existence of collective benefits that cannot be allocated to specific individuals. Therefore,

local taxation may be needed to supplement user charges. Central intervention may also be necessary if fiscal capacities and the costs of environmental improvements vary across lower levels of jurisdictions, and uniform federal or national regulations impose an uneven burden on regional or local governments. Predictability and transparency of central government support are essential requirements to avoid inefficiencies. Since central budgetary allocations may create disincentives for the generation of local revenues, the application of matching funds is advisable.

Various forms of earmarking (see Table 1.) may attempt to secure a steady flow of revenues for pollution abatement investments. Such mechanisms operate at national or local levels, and their revenues come from the budget or from designated general or environment-related taxes. Politically, earmarking environmental taxes for pollution prevention and control investments is attractive because it can lead to environmental improvements and raise revenues simultaneously. Although a distinction sometimes is made between

environmental charges raised to achieve incentive effects and those levied with revenue raising purposes, there is no rationale a-priori to make such a distinction. Even a minimal charge may have incentive effects when there are polluters that can decrease their emissions at a lower cost (for example, the cost of better housekeeping may be small).

Earmarking (assigning revenues from specific taxes⁶ or groups of taxes to specific government activities or areas) may have serious disadvantages, including (i) the loss of fiscal control and accountability; (ii) inefficient use of revenues; (iii) inefficient management and disbursement due to the lack of public scrutiny; (iv) mismatch between revenues raised and the financing need; and (v) the burden of a separate administrative mechanism (EPM 1992). Even if taxes are matched with the financing need initially, a mismatch is likely to occur over time. As a result, pollution abatement spending will be determined by the size of revenues rather than by economically justified expenditure allocation. While general revenues of the budget fluctuate, earmarked funds may attract disproportionately large share of revenues compared to other, socially equally or more worthwhile causes. In certain cases, however, limitations on the reallocation of revenues can be acceptable. Smith (1992), for example, points out that under imperfect political and administrative systems, public support for taxes is weakened by concern that they will be diverted to undesired purposes, and earmarking may generate support. McCleary (1991) similarly underlines that earmarking ensures a the minimum level of financing for causes which are considered socially worthwhile, but would otherwise become neglected. Environmental considerations typically become neglected during the budgeting process due to (i) the lack of public awareness of the extent and cost of damage due to pollution; and (ii) weak or non-existent political representation of the environmental protection cause.

Public investment in pollution abatement can be justified only if private investment is unavailable, less economical or the benefits of investments cannot be directly linked to

economic agents. Research and development in advanced pollution abatement technologies, or clean-up of past pollution damage, for example, may be justified on this ground. Mainly due to the public good nature of knowledge generated by research, public finance of basic and applied research is considered better policy than tax incentives that would be needed in order to compensate the private sector for the high financial risk and the risk due to changing environmental regulations. In cases of clean-up, the liability for past damage is frequently impossible to determine and, as a result, no alternative exists to public financing. Governments can also play a catalytic role in mobilizing private resources and accelerating environmental improvements due to changing macro-economic conditions or environmental regulations. The government's role in these areas is temporary by its nature, harnessing the effects of market conditions and environmental regulations that induce changes in the behavior of private economic actors.

The Role of Financial and Capital Markets

Well functioning financial and capital markets are necessary for an effective pollution abatement financing system. Pollution abatement financing needs to provide for both current and capital investment costs. The operation and maintenance of control technology and housekeeping measures are recurrent costs that are normally funded from operating revenues. The financing of capital investments can come from internally generated cash or from external financing sources such as new common or preferred stock issues, debt financing in the form of bond issues, and commercial borrowing. Under well functioning financial markets, investors have unrestricted access to various financial sources, and their choice of financing is mainly determined by their preferred capital structure.

Dysfunctional, underdeveloped financial markets, however, may significantly reduce the volume and the allocative efficiency of funds invested. Additionally, restrictions implied by governmental regulations of the

financial sector may increase the cost of lending by banks and other formal financial institutions. Informal money markets may supplement formal markets in the provision of credit. The informal markets, however, are usually fragmented, non-competitive, and not well integrated with the formal market. As a result, in dysfunctional financial markets, self-financing frequently constitutes the main source of funds, and institutional credit becomes rationed by governments pursuing their own credit policies through designated financial institutions and channels.

Small and medium size enterprises frequently face special difficulties in obtaining financing: (i) their internally generated cash funds are generally limited; (ii) they are precluded from capital markets due to their size; (iii) their relative transaction cost of project preparation and assessment is high; (iv) the risk and cost of lending to small enterprises by financial institutions is perceived to be high due to the lack of conventional credit securities and small size of credits; and (v) small enterprises lack adequate information about application requirements and available financing sources. In order to support small and medium sized enterprises overcoming these difficulties, national or local governments sometimes intervene in various forms, such as (i) creating special financial institutions that channel funds through small credit programs managed by commercial banks; (ii) setting interest rate ceilings; (iii) creating subsidy programs; and (iv) providing technical assistance and advisory services. While technical assistance programs tackle the root of the problem (information disparities), subsidy programs and special financing institutions can easily lead to misdirected credit, perpetual dependence on government subsidies, and inefficient allocation of public resources without addressing the causes of high transaction costs and poor access of credit.

Lending for environmental investments is a relatively new field for financing institutions. A change of lending policy and better understanding of environmental projects are necessary at the level of the (i) management; (ii) owners; and (iii) staff members of the financial

institutions. In addition, staff training in project evaluation and risk assessment techniques is also needed to enhance policy changes. Although the start-up phase of these new lending programs may be quite costly, cost-effectiveness improves over time with increased experience and economies of scale.

Micro-perspective of Environmental Financing

As long as environmental policies induce the internalization of external costs caused by pollution, "environmental investments" are not different from any other investment. Investors will undertake such investments if the expected financial benefits of these investments exceed their costs (see Box 1.). Investments with a pollution abatement component, however, introduce a great deal of uncertainty into traditional enterprise decision making. This uncertainty originates from (i) the complex impact of pollution on human health and the environment; and (ii) changing environmental regulations. A number of factors such as expectations reflecting current experience with environmental costs, subjective judgement, and perceptions also influence project evaluation. Additionally, procedures and practices of (i) traditional enterprise decision making; (ii) capital budgeting; (iii) cost accounting; and (iv) financial accounting influence the way environmental costs and benefits are being considered and evaluated. The organizational structure of enterprises, for example, may inhibit the participation of environmental management in strategic decision making and limit information flow among environmental and financial management. Limited time horizon of project evaluation in capital budgeting may ignore long-term benefits of pollution abatement investments. Financial accounting practices may prevent the monetary valuation of potential liability costs. Cost-accounting practices may also blur the sources of specific environmental protection costs and benefits (White, 1993). Enterprise organizational structure, decision making culture, and capital budgeting and accounting practices, therefore, are important factors that determine the way enterprises respond to environmental regulations.

¹ These costs include (i) the cost of health damage due to the population's exposure to harmful substances emitted into the environment; (ii) the cost of productivity loss elsewhere; (iii) cost of damage caused to nature and biodiversity; and (iv) lost amenity value due to lost environmental quality.

² In addition to their environmental benefits, the correction of administrative failures generally contributes to improved fiscal balance and balance of payment (Gupta et al., 1993).

³ The human dose-response functions of harmful substances in the environment, for example, are not known precisely (however, estimates of such relationships have been established).

⁴ The costs of health damage, for example, can be estimated by using the cost of illness or willingness to pay methods. The former uses the economic costs of hospital treatment, emergency care, loss productivity days etc., associated with exposure to pollution, while the latter estimates the costs of damage based on individuals' willingness to pay for improvements in environmental quality, primarily based on the contingent valuation method.

⁵ For a detailed analysis of environmental policy instruments, see Eskeland, and Jimenez, 1991.

⁶ Although the mechanism of financing through earmarked emission charges and other environmental fees may be viewed as a "self-financing" mechanism that is outside of the taxation system, there is no conceptual justification not to consider these charges environmental taxes that are returned to polluters in the form of subsidies.

2 OECD Countries

Environmental Policy Framework

The increased concern about environmental quality during the last decades has made policy makers of OECD countries search for instruments that can guarantee the achievement of their environmental goals. CAC regulatory approaches appeared to suit their objectives for a number of political, administrative and practical reasons, and the application of MBIs was rejected (see Opschoor and Vos, 1989). The U.S. Congress, for example, voted against the Proxmire Amendment to the Clean Water Act that proposed the introduction of effluent fees in 1971. The factors influencing the decision included (i) an aversion to new taxes; (ii) a perception that fees would provide the "right to pollute"; (iii) conviction that regulations were the only appropriate legislative means of answering a social need; (iv) uncertainties regarding the effects of effluent fees; and (v) strong industrial lobbying against the fees claiming that the money taken away would otherwise be used on pollution control (Casey, 1988). Potential effects on international competitiveness due to new environmental taxes also frequently invoke opposition from certain industrial groups. As a result, cost effectiveness considerations remained unimportant in most countries for a long time. The political acceptability of MBIs, however, was not equally low across countries. Effluent charges, for example, were acceptable in some countries (for example, in the Netherlands, France, Germany).

Recently, OECD countries have become increasingly concerned about the rising costs

of environmental improvements and the efficiency of resource allocation, and started to recognize the benefits of MBIs and the integration of environmental considerations into their fiscal policy. As a result, direct regulations are being gradually supplemented by MBIs (Opschoor et al., 1993) and taxes are increasingly used with the dual purpose of generating revenues and providing incentives for environmental improvements. Although there are examples (see Box 3.) of direct taxes (emission taxes), the introduction or increase of indirect taxes on energy, fuels, and products (for example, fertilizers and pesticides) with environmental protection purposes are the more widely applied instruments. Taxes are frequently levied only on a narrow range of commodities such as batteries, plastic bags or non-recyclable containers. Tax differentiation is extensively used, for example, to speed up the introduction of cleaner cars on the domestic market. Tax differentiation have been provided according to air pollution characteristics (Netherlands, Germany), car size, weight, or age (Sweden, Germany). Different rates apply to imported crude oil according to sulfur content in Japan. Sales tax differentiation proved to be successful in the Netherlands, for example, where the number of cars complying with future Euro-standards increased dramatically (Bressers and Schuddeboom, 1993). Fuel tax differentiation according to sulfur content was similarly successful in Sweden, where diesel fuels were divided into three environmental classes in 1991, and the various classes of fuels were taxed differently. As a result, large oil companies have shifted their production toward cleaner fuels, and a dramatic increase oc-

Box 2

Water Quality Management and Financing in the U.S.

The Federal Water Pollution Act of 1972 established technology-based standards for all sources of pollution, and aimed to ban all discharges of wastes into public waters regardless of the costs and benefits of such an approach. By setting overly ambitious quality objectives and imposing uniform standards, water quality policy required large costs that frequently exceeded the benefits of improved water quality (Freeman, 1990). The implementation and enforcement of regulations relied heavily on the threat of punishment (fines, imprisonment) rather than on inducing polluters to reduce their discharges to public water bodies. Neither the choice of environmental objectives, nor the means chosen to achieve them were driven by economic efficiency criteria, and the result was the wasteful use of resources. As a result, large public resistance has developed to unfunded mandates and overly ambitious goals with little consideration to the costs and benefits of the implementation of such goals.

curred in the cleaner fuel classes. The existing tax system has been frequently adjusted to accommodate environmental considerations in a revenue-neutral way. In Austria, for example, a tax on car registration was introduced in 1992 based on sales price and average fuel consumption. Simultaneously, value added tax rates on new vehicles were reduced.

Public Pollution Abatement Financing

The majority of public pollution abatement and control (PAC)¹ expenditures (including direct public investments, operating and maintenance costs of environmental services and subsidies to the providers of public environmental services) in OECD countries was spent on collective water pollution abatement (over 70 percent in the U.S. and Finland, and around 60 percent in a number of other OECD countries in the mid 1980s) and on waste management programs (around 20 percent in the U.S., and even higher in other countries, reaching 40 percent in Norway and Sweden in the mid 1980s).

The role of the subsidized public sector in the provision of water and wastewater treatment was justified by the public good nature of these services. Public treatment, however, was often less cost-effective than private measures for pollution prevention and control. Also, subsidized public wastewater treatment usually resulted in a lack of incentives for cost effective preventive measures

such as good housekeeping practices or the application of cleaner production technologies. Therefore, traditional public approaches have been revisited and cost-recovery mechanisms introduced. In Britain, for example, about 60 percent of the cost of sewerage and sewage treatment was financed by subsidies through the "rate support grant" until 1974 (Dangerfield, 1979). Since 1974, a gradual move towards greater degree of self-financing has taken place, and now borrowing is frequently used to finance the investment costs of wastewater treatment facilities.

Public services including collective pollution abatement are typically delivered by local governments in most OECD countries, therefore, public sector PAC expenditures (both investment and recurrent costs) were typically concentrated at local levels of government. Local governments were responsible for around 90 percent of total public PAC expenditures in the mid 1980s, for example in Denmark, Sweden and Finland (OECD, 1990b). User charges and local taxes constituted the main sources of local public environmental service expenditures, however, they were frequently supplemented by transfers from higher levels of governments, typically in the form of grants (see Box 4.). Historically, the private sector has played an important role in the development of environmental services in most OECD countries. Currently, both private and public sectors provide these services, for example, in France, the United Kingdom and the U.S.

Box 3
Effluent Taxes in the Netherlands and Germany

In order to finance the construction of water treatment facilities in compliance with the water quality requirements of the Surface Water Pollution Act of 1970, water effluent charges were introduced in addition to CAC regulations in the Netherlands. The effluent charge system operates through two subsystems: (i) the State Water Authority levying charges on the pollution of state waters; and (ii) Water Boards levying charges on industries and households discharging into other than state waters. In addition to fulfilling their declared primary financing function, the charges have proven to be effective policy instruments by influencing the amount of industrial effluent discharges. A dramatic decrease in pollution took place in the early 1970s, despite the growth in economic activities. As indicated by the results of a statistical analysis (Bressers and Schuddeboom, 1993), the reduction of industrial wastewater discharges was due to the increased incentive role of effluent charges rather than to CAC regulations. Due to increased voluntary abatement as an unexpected regulatory side-effect, there were signs of potential overcapacity in water treatment facilities.

Effluent charges were also introduced in Germany in 1976. Although the level of charges was too low to achieve the desired water quality objectives through incentive effects alone, even these low charges were shown to have noticeable incentive effects when private abatement costs were lower than the effluent charge. Brown and Johnson (1984) demonstrated, for example, that BASF (a large chemical firm) achieved low unit abatement costs by a large-scale integrated treatment process that treated not only the company's own waste water, but the waste of neighboring municipalities as well. Individual branches were subject to implicit effluent charges based on an accounting price per unit of effluent for the branch. The internal charge system resulted in a substantial voluntary decrease in discharge through process change, recycling, and other management responses.

Municipal Development Funds (MDFs), created to provide financing for local infrastructural investments (water supplies, sanitation, drainage, waste disposal and collection), have existed in many countries since the 19th century (for example in Belgium, Denmark, Netherlands, Japan). Typically, the majority of funds have been used for water related expenditures. Although MDFs are initially capitalized by the central or local governments (for example subscription of share capital), lending is typically funded by the financial markets. Pension funds, insurance companies and commercial banks have been the major financing sources through bond issues or directly negotiated deposits (Davey, 1988). Due to the ability of borrowers to recover their costs through fees and charges, loans are reliably serviced, and MDFs are self supporting.

Private Pollution Abatement Financing

As a result of strict environmental regulations, private expenditures on PAC exhibited a steady increase in several OECD countries

during the last decades, both in absolute terms and as a percentage of GDP. For example, private expenditures for PAC increased by 86 percent in real terms between 1972 and 1986 in the U.S. (from 0.67 percent of GDP to 0.86 percent), and by 67 percent between 1975 and 1985 in Germany (from 0.57 percent of GDP to 0.74 percent). Air pollution control, that was almost exclusively financed from private sources, represented the largest share of private sector expenditures (around 60 percent of private pollution abatement expenditures during the 1980s in the U.S., and 40 percent in the Netherlands, Germany and Austria). The share of expenditures spent on water pollution abatement and waste management programs varied across countries. Depending on the sectoral composition of industries, a small number of industrial branches (typically the chemical, metal products, machinery, paper and pulp industries) represented the bulk of private pollution control expenditures.

Direct regulations are generally enforced by a formal enforcement apparatus supplemented to greater or lesser extent by administrative bargaining between the regulator and regu-

Box 4
Public Water Sector Financing in the U.S.

The provision of straight federal grants between 1972 and 1989 contributed to the inefficiencies of water quality management under the Federal Water Pollution Act of 1972. The provision of federal grants to cover up to 75 percent of the construction costs of wastewater treatment facilities, together with local and state budgets available for further subsidies, resulted in large inefficiencies and no incentives to recover costs. There were indications that municipalities simply substituted federal grants for their own funds (Freeman, 1990) and drastic over-capacities were created (Vaughan, 1983). By subsidizing municipal waste treatment, subsidies were practically transferred to private polluters creating an uneconomic mix of industrial and municipal wastes (Renshaw, 1974). Even when user charges levied by municipalities on industries covered operation and maintenance costs, charges were lower than economic costs, and the system imposed an excessive burden on the budget. Therefore, large-scale straight federal grant financing was eliminated in 1989.

State Revolving Funds replaced federal grants.² They reflected the growing financing responsibilities of states and encouraged the increase of efficiency and cost-recovery in program implementation. State Revolving Funds are credit mechanisms capitalized from federal grants and matching state funds (80 percent and 20 percent, respectively). They provide low-interest rate loans and other non-grant assistance to local and municipal governments to build or improve sewage treatment systems. While in the framework of the construction grant program states typically provided grants up to 10-15 percent of costs to municipalities, under the revolving fund program, states typically discontinued this practice (U.S. EPA, 1991). As a result of the change from grant to loan mechanism, the increase in household user fees was typically around 20 percent (U.S. EPA, 1991), and annual adjustments in charges have become common. Additionally, the incentive to construct lower cost facilities to minimize the impact of capital costs on user fees has increased (U.S. EPA, 1991). As a result of shrinking federal funding, states and municipalities had to find alternative channels of financing, and were forced to require greater efficiency and greater cost-recovery in service provision. With increased cost-recovery, market-based financing schemes (see Box 5.) gained larger acceptance. Earmarked funds have been established in some municipalities. In Los Angeles, for example, all wastewater system costs are financed from sewer-related revenues accruing to the Sewer Construction and Maintenance Fund. Such revenues include sewer service charges, industrial waste quality surcharges, inspection and other fees.

lated sector. Bargaining can significantly change the cost of pollution abatement for polluters by influencing (i) the stringency of regulations; and (ii) the effectiveness of enforcement. The role played by bargaining doesn't always depend on the style of administrative system and the traditional role of law. In Germany, for example, regulatory agencies widely apply bargaining in air and water pollution control despite the authoritarian Prussian tradition of control (Hucke, 1978).

Various subsidy programs have supported private pollution abatement investments in most OECD countries. These programs were generally aimed at speeding up the implementation of environmental programs and assisted those industries that faced sudden cash flow problems due to abnormally high costs required by new regulations. Assistance

schemes were frequently of transitory character, introduced to tackle specific environmental problems with a pre-set time limit for operation. During the 1970s, most assistance to industries was directed to air and water pollution abatement investments, while in the 1980s, several schemes aimed at specific individual pollutants, and the assistance provided to research and development of new technologies was also increased (OECD, 1990a). In the United Kingdom, for example, the government provided up to 50 percent of the cost of industrial research projects aimed at improving environmental standards. Subsidies were also used to tackle problem areas where long-term pollution effects created policy concerns. Such an area was, for example, the protection of groundwater resources from irreversible damages (and the reduction of related health threats) due to agricultural activities in Denmark. The

Box 5

Market-based Financing of Municipal Environmental Investments

Equity financing. In publicly owned utilities, equity is simply the net worth of the utility (assets less liabilities), while in investor-owned utilities, equity can be divided into common capital stock, paid-in capital and retained earnings. Equity financing may be preferred to debt financing when the cost of debt is high or the capital structure is overly leveraged.

Long-term debt financing. Municipal governments can raise funds to cover capital costs by issuing general obligation or revenue bonds. General obligation bonds are backed by the issuer's financial power, while debt service under revenue bonds is provided from user fees generated by the project itself after completion. Higher level governments can offer bond issues with lower interest rates due to their better credit rating. In the U.S., for example, states support smaller communities or municipalities with lower or no credit rating by selling their own bonds, and use the proceeds to purchase local community bonds. Alternatively, small communities can create bond banks by pooling their smaller long-term loans together into a large issue. In either case, small communities have to finance interest and principal payments through the application of user charges.

Leasing. Leasing may be attractive to utilities as a means of acquiring the use of needed equipment and facilities if debt limitations restrict direct purchase. Based on the lease agreement, the lessor purchases the equipment or constructs the facility, while the lessee (utility) pays rental and, typically, O&M costs. Main sources of lease financing include large banks, equipment manufacturers, real estate developers and leasing companies.

Privatization. Privatization may extend to the financing, construction, ownership and operation of a facility that provides public environmental services. Frequently, privatization is supported by government incentives provided through the tax system.

Agricultural Investment Support Act of 1987 introduced subsidies to farmers who were obliged to undertake investments to reduce nitrate, phosphorus and organic matter contamination of surface and ground waters in order to comply with more stringent environmental requirements.

Direct grants were typically provided for the installation of clean production technologies. Such a program was introduced, for example, in the Netherlands under the Air Pollution Act of 1970. Surveys found that the compensation program indeed induced businesses to invest more extensively in environmental measures than they would have done otherwise (Bressers and Schuddeboom, 1993). Several of these programs were gradually phased out or terminated. In Denmark, for example, up to 50 percent of eligible investments by existing firms were compensated by grants from 1975. The ceiling was later reduced to 25 percent, and the program was finally abolished in 1986 (OECD, 1990a).

Directed soft loans were extended to industries in several countries. Such loans were typically channelled through state owned

banks at interest rates ranging from zero to just marginally below commercial interest rates. In Japan, for example, interest-free loans up to 50 percent of capital expenditures supported technology updates during 1973-75, and loans at lower-than-market interest rates have been provided for other pollution abatement investments (see Box 6.). In Finland, subsidized loans were provided at 3.25 percentage points below market rates between 1974 and 1976 for water pollution abatement projects. The interest rate subsidy was reduced later, and the scope of eligible environmental projects was extended to air pollution control and waste recycling in 1979 and 1983, respectively. In the U.S., the Small Business Administration provided long-term low interest loan programs for financing pollution control facilities for marginally viable firms (however, excluded profitable firms that were able to obtain financing through commercial sources). Government guarantees for environmental investment loans were also provided, for example, in Finland under the State Guarantees for Industrial Pollution Control Act of 1973 (revised in 1984) for both normal commercial loans and for already subsidized environmen-

Table 2
Pollution Abatement Expenditures in the U.S., 1986-1991

Year	Total industrial capital expenditures (U.S. \$M)	Industrial pollution abatement capital expenditures (U.S. \$M)	Share of pollution abatement in total industrial capital expenditures (%)	Industrial pollution abatement recurrent costs ¹ (U.S. \$M)	Total industrial pollution abatement cost (U.S. \$M)	Change from previous year (%)
1986	76,354	2,847	3.7	12,258	15,105	NA
1987	78,648	NA	NA	NA	NA	NA
1988	80,572	3,423	4.2	14,008	17,431	NA
1989	97,187	4,309	4.4	15,626	19,935	14
1990	101,953	6,031	5.9	17,071	23,102	16
1991	98,916	7,390	7.5	17,387	24,777	7

Source: U.S. DOC, 1993.

¹ Including payments to the government.

tal loans. Finally, directed environmental credit lines were also established on a revolving basis. The European Recovery Program (ERP) in Germany, for example, was capitalized from the Marshall Plan to provide loans for small and medium sized enterprises to accelerate economic development, as well as to support special priority areas. In 1993, 14 percent of ERP loans were directed to investments in environmental protection (BMW, 1993). The original capital has remained intact, while interest revenues and repaid loan amounts are used for subsidized credit (see Box 7.).

Temporary investment tax incentives have been the favored fiscal instrument for pollution control in many OECD countries. Rajah and Smith (1993) pointed out that temporary incentives may have larger effects on investments than permanent ones by changing the timing and level of investments. Besides environmental considerations, tax incentives often corresponded to concerns about industrial competitiveness and promoted employment, productivity improvements and technological progress. Investment tax credits that provide an outright tax reduction by subsidizing the purchase price of an asset have been widely used, for example, in Canada, the Netherlands and Norway. Investment tax

credits are usually claimed against positive tax liability. In order to mitigate potential inequities among enterprises with and without taxable profits, credit carry-over and transfer schemes have been introduced (for example in Canada).

Other tax incentives have allowed the depreciation of certain assets at higher than normal rates or over shorter periods (or both), postponing tax liabilities in the early years of the life of the asset, and reducing the net present value of future tax liabilities. Germany, for example, allowed the accelerated depreciation of water, air and soil pollution abatement technology, as well as noise control equipment between 1975 and 1980 (60 percent was the allowed depreciation rate in the first year, and 10 percent per annum in the following four years compared to the 6.67 percent standard straight-line depreciation extended over 15 years). Investments in capital equipment qualified for the accelerated depreciation until 1991, if the pollution-abatement aspect of the investment accounted for at least 70 percent of the cost of investment. In the U.S., the Tax Reform Act of 1969 provided rapid amortization of eligible pollution control facilities over a five year period for the first 15 years of depreciable life of the pollution control equipment at old industrial facilities for a

Table 3
Main Types of Environmental Subsidies for Private Investments in OECD Countries

	Grants	Soft loans	Accelerated depreciation	Tax reduction	Tax deductible funds	Earmarked taxes
Austria		X				
Canada			X	X		
Denmark	X					
Finland		X	X	X	X	
France	X		X			X
Germany		X	X			X
Japan		X	X	X	X	
Netherlands	X				X	X
Norway	X	X	X	X		
Sweden	X					X
U.S.		X	X	X	X	X

limited time. In Luxembourg, assets acquired during 1984 and 1992 that contribute to energy saving may qualify for accelerated depreciation. In Canada, water and air pollution control investments at sites that started operation before 1974, and energy-saving equipments can qualify for accelerated depreciation or "capital cost allowance". Japan tax authorities similarly allow investors of pollution abatement, recycling, solar and energy-saving equipment to use accelerated depreciation of such assets.

Tax deductible funds (used, for example, in Japan) have similar effects than accelerated depreciation: when company income is set aside for environmental investment, such funds become tax exempt. Once the funds are withdrawn for environmental investments, they are subject to taxation. The main advantage of the system is derived from the deferral of taxes. In other cases (for example in the U.S.), large industrial corporations could often save 1.5-2.0 percentage points on the cost of borrowing to cover pollution abatement investments by issuing tax-free industrial development bonds (Renshaw, 1973)³. Yet in other examples, (in Louisiana), business property tax rates have been linked to the environmental records of enterprises (Schneider, 1991).

In most countries, tax incentive schemes have been available principally for equipment purchases, that may have led to a bias against the adoption of cleaner production processes. Additionally, some analysts (Jenkins and Lamech, 1992) pointed out that tax incentives distorted the relative price signals and, in some cases, the removal of subsidies could have reduced pollution levels allowing a more effective use of economic instruments. Differentiation in eligibility and conditionality that try to account for differences among polluters in abatement costs has been demonstrated to help improve the environmental cost-effectiveness of incentives (Jenkins and Lamech, 1992). Such differentiation has been introduced, for example, in Canada, where accelerated capital cost-recovery incentives are provided only to older plants (commissioned before 1974), that are likely to achieve higher cost-effectiveness in marginal pollution abatement than newer ones.

Earmarked Environmental Financing Mechanisms

In some countries, special earmarked financing mechanisms are used to secure a steady flow of revenues for certain environmental protection objectives. Typically, they have

Box 6

Directed Credit and Technical Assistance for Industrial Pollution Abatement in Japan

The Environmental Pollution Control Service Corporation, later renamed Japan Environment Corporation (JEC) was established and capitalized by the government of Japan in 1965. JEC has become a significant financial instrument of the government to promote pollution abatement. JEC has three main areas of operation: (i) it provides basic infrastructure for industrial development providing open space, municipal services and measures to reduce the impact of industrial pollution (for example, development of green belts and parks); (ii) it provides long-term loans for industries at lower-than-market interest rates for pollution abatement investments; and (iii) it provides technical assistance and guidance to industrial enterprises.

JEC played a significant role in financing private pollution abatement investment during the 1960-70s, when commercial banks were reluctant to lend for nonproductive investments. Since then, its role vis-a-vis enterprise investments has shifted to the provision of technical assistance. In 1991, JEC loans contributed to 6 percent of private pollution control investments.

In addition to JEC, other governmental lending institutions finance about 18 percent of the total private investment costs. These include: (i) loans by the Funding System for Modernization of Facilities of Medium and Small Businesses that are extended for pollution prevention facilities specified by the government; (ii) loans by the Small Business Finance Corporation for People's Finance Corporation assisting small and medium-sized businesses to relocate; (iii) loans by the Japan Development Bank for pollution control representing a small share of total lending, mainly for general industrial development; and (iv) other institutions such as the Metal Mining Agency of Japan and the Hokkaido and Tohoku Development Corporation.

Source: MEIP, 1994.

been used to finance investments in public environmental services to achieve compliance with regulations. The more direct the connection between the revenue source and its use is the more politically acceptable the earmarking system becomes. Earmarked mechanisms that use revenues from non-environment related taxes, or the budget, have neither direct connection nor the incentive effect that earmarked environmental charges may have. The only purpose of earmarking non-environmental revenues is the provision of funds that would not be available through the general budgeting process.

Earmarked environmental funds capitalized from the budget were established on a transitory basis in Sweden in the early 1970s, for example, where environmental funds extended grants to industries, municipalities and water companies up to 75 percent of investment costs. Besides accelerating environmental improvements by providing public support through the funds, policy makers also intended to have an incentive effect on employment. Although these earmarked funds were abolished after a few years of operation, grant financing from the general budget for pollution control investments have been

maintained through normal budget allocations. Similarly, earmarking budgetary revenues provided a stable source of financing for public wastewater treatment facilities in the U.S. in the framework of Construction Grants program during 1979-89, and the State Revolving Fund program from 1989 (see Box 4.). Besides revenues coming from the existing tax system, additional revenues may be raised specifically with the purpose of earmarking for environmental protection. Frequently, sin-taxes levied on tobacco and alcohol appear to be the least difficult way politically to raise funds for environmental protection programs. Washington State in the U.S., for example, levies a cigarette tax to be earmarked for financing water quality programs.

Environmental funds (EFs) have been created by earmarking environmental levies at the national level in some countries to provide guaranteed financing for priority public programs. Not economic efficiency, but the political priority assigned to certain environmental issues has been the primary criteria of establishing these funds. Very frequently, these priority programs are connected with environmental liability issues. Since the

Box 7

Federal Environmental Credit Programs in Germany

Most federal environmental credit programs are carried out by two public financial institutions in Germany: the Kreditanstalt fuer Wiederaufbau (KfW) and the Deutsche Ausgleichsbank (DAB). While the main objective of KfW and DAB is the promotion of economic development, both banks have gradually developed an environmental protection lending program:

The European Recovery Program (ERP). ERP is a revolving fund mechanism that was capitalized by the Marshall Plan after the Second World War. The ERP program was carried out by KfW until 1992, when it was taken over by DAB. ERP credits have supported small and medium size private enterprises (with less than 500 million DEM annual revenues) by providing funding up to 50 percent of the investment costs at fixed interest rates. Pollution abatement credits are provided for (i) sewage treatment; (ii) waste management; (iii) air pollution abatement; and (iv) energy conservation investments, carrying favorable interest rates, loan maturity, grace period, and no penalties for early repayment. After the unification of Germany, differentiated credit terms were awarded to the Eastern States (0.25 percentage points lower interest rates, 5 years longer maturities, and 2 years longer grace periods). The credit program is executed through commercial banks that bear the credit risk, provide advisory services, and carry out financial assessment for a one percentage point margin.

Municipal Credit Program. The program is available for municipalities and communities in the former East German territories. Investments supported by the program cover environmental and infrastructural improvements. One of the main objectives of the program is the support of water supply and water treatment projects through credits extended directly by KfW or DAB. KfW's primary field is lending for water treatment, water supply, noise reduction, air pollution abatement, and traffic infrastructure investments, while DAB specializes in lending for waste management, energy saving, waste recovery and hospitals. Besides communities, investors providing public environmental services can borrow from this credit line up to two-thirds of the investment cost. KfW and DAB raise the capital needed in the capital markets, while the Federal Government reduces the interest rate on the loans to municipalities by 2 percentage points from the budget. KfW and DAB lend to municipalities at their own risk.

Environmental Guarantee Programs. Since the introduction of new products is frequently constrained by the lack of sufficient securities, the Guarantee Programs support the introduction of innovative environmentally friendly products through guarantees provided for up to 80 percent of the amount of environmental assessment of projects carried out by the MOE.

KfW/MOE Environmental Demonstration Program. The program was developed in 1992 to be carried out by the MOE and Federal Banks. The objective of the program is to accelerate the adoption of cleaner technology in environmental protection through supporting demonstration projects. Noise, air, and water pollution abatement, energy saving, waste management, waste recovery and integrated and cross-media pollution abatement projects are supported. Large enterprises in metallurgy, electronics and chemical industries have been the largest beneficiaries of the program. Currently, interest rates are fixed for maximum 10 years at 6.5 percent. The interest rate subsidy provided by MOE is 5 percentage points during the 5 years of the program's lifetime.

In addition to environmental credit programs carried out by KfW and DAB, several other federal programs exist with significant environmental objectives:

Federal Environmental Endowment Program. The federal environmental endowment was capitalized by the sale of the previously state owned Salzgitter Ltd. DEM 200 million is available annually to support the introduction and transfer of environmental technology, and the protection of cultural heritage from environmental damage. Small and medium size enterprises have priority in obtaining support from the program.

Regional Economic Improvement Program. Water treatment, energy saving, and waste management investments are supported through 12 to 18 percent contributions to project costs (23 percent in the new territories). The programs are financed jointly from state and federal funds. A special contribution is provided from the federal budget for the new states.

Energy Saving Program of the Federal Ministry for Research and Technology (BMFT). The BMFT provides support for the wider use of solar and wind energy utilization programs. Investment contributions of 50 percent (60 percent in the new states) of project costs are extended, while additional subsidies can be provided for the production costs of wind energy generation. BMFT provides additional support for the development of new environmental technologies under the Environmental Research and Technology program.

Source: KfW & DAB documents.

Box 8

Liability Issues Financed from Environmental Fund in Japan

In 1973, a law was adopted on the compensation of pollution-related health injuries. The law categorized eligible victims into two groups; (i) those suffering from illnesses that cannot be related to specific pollution sources, although nonspecific, pollution-related statistically significant correlation between pollution and disease has been established; and (ii) those suffering from specific pollution-related illnesses traceable to individual sources. In the latter case, victims could be compensated directly by the companies responsible. In order to finance compensation for the first group of pollution victims, pollution levies were directed to a fund administered by the Pollution-Related Health Damage Compensation and Prevention Association (PHDCPA). PHDCPA proved to be highly effective in collecting levies, based on detailed statistics on fuel use by industries. The levies were based on sources of sulfur-dioxide emissions.

liability for pollution is often hard or impossible to determine when (i) the pollution occurred in the distant past; or (ii) causal relationship between pollution and damage cannot be proven with certainty, government intervention may be necessary to provide compensation for the victims, and/or finance the cleanup. In Japan, for example, an EF was created to provide compensation to those victims of pollution related health injuries, who could not be compensated by individual companies (see Box 8.).

Due to the marginal role of these funds in the environmental management system, the funds seldom have significant impact on the efficiency of the national environmental financing system. In many cases, the priority programs are of temporary nature. In the U.S., for example, the Superfund and the Leaking Underground Storage Tank Funds were created to mitigate contamination from hazardous waste sites (see Box 9.). After cleaning up the most health threatening sites, the role of the funds was envisaged to diminish.

In case of earmarking direct environmental taxes, incentive effects are important by-products (see Box 3.). As a result, some earmarked financing systems achieve simultaneous revenue raising and pollution abatement functions. The benefits of earmarking have been most pronounced when direct environmental charges were earmarked in decentralized programs. Most pollution problems are local in nature, and revenues from charges on local pollutants are very often

used at the local level. Usually, effluent charges provide the revenue base for these funds. In most cases, however, the charges are set too low to significantly influence the polluters' behavior, and the financing function of these systems is more important than their incentive function. The level of charges reflects a compromise between the affected main stakeholders (industries, municipalities, agriculture) and local environmental protection agencies. With growing acceptance of the funds, however, there has been a gradual increase in the charge levels (Opschoor and Vos, 1989). Since the link between expenditure and revenue in these arrangements is a close one, the danger of a mismatch between the amount of revenues raised and the financing need (a serious drawback of earmarking) is greatly reduced. Earmarking at the local level is more likely to gain political support and compliance (beneficiaries are easier to identify). The local nature and transparency of these models contribute mainly to their acceptability. Best known systems are the French River Basin Management Agencies that levy effluent charges in order to cover the costs of water supply, as well as water quality management in the river basin (see Box 10.). Similar mechanisms also operate in Germany and the Netherlands.

In most cases, environmental taxes (charges) are levied with only revenue raising purposes. Earmarked mechanisms established from environmental charges for air quality control exist, for example, in Canada, Portugal, France and the U.S. (Opschoor et al., 1990). In the U.S., states levy air emission charges

Box 9

Environmental Clean-up Financed from Environmental Funds in the U.S.

In the late 1970s it became apparent that uncontrolled environmental contamination from hazardous waste sites was a nationwide problem. The Comprehensive Environmental Response Compensation and Liability Act of 1980 created an earmarked federal fund, known as Superfund, to finance the cleanup of those toxic waste sites that (i) present threats to public health or the environment; and (ii) create liability that cannot be assigned to individual polluters. The Superfund was originally conceived as a short-term program. In 1986, by the Superfund Amendments and Reauthorization Act (U.S., 1992), Congress asked EPA to develop permanent remedies for Superfund sites. The Superfund is financed from petroleum and feedstock chemical excise taxes, environmental taxes, and by appropriation from general revenues.

Responding to an increasing threat of groundwater contamination through leaking storage tanks of petroleum and other hazardous substances, the U.S. Congress created another earmarked financing mechanism in 1988, the Leaking Underground Storage Tank (LUST) trust fund. LUST was assigned to finance corrective and remedial actions at abandoned sites or in cases where liability could not be determined or enforced. The revenues of the fund are generated from gasoline taxes.

earmarked to support air quality programs (Shields, 1989). Air emission charges have been typically levied on certain types of polluters or on a limited number of pollutants. In France, for example, only industrial enterprises that generate power beyond certain capacity, or emit sulfur oxides or nitrogen oxides beyond certain volume are charged. Aircraft noise charges are also typically earmarked to cover noise abatement costs (Belgium, France, Germany, Switzerland), and waste disposal taxes are directed to treatment and recycling expenditures in a number of countries (Opschoor et al., 1993). Frequently, the connection between the source and allocation of tax revenues is distant, and direct incentive effects are not detectable. Generally, the more remote the connection between taxation and the objective of the fund is, the less clear the advantage of earmarking becomes. Product charges, for example, are less directly connected to the sources of pollution than emission charges. Additionally, the proliferation of earmarking reduces the efficiency of the environmental financing system (see Box 11.).

Summary of Pollution Abatement Financing in OECD Countries

- Environmental financing mechanisms in OECD countries have been significantly influenced by the dominance of CAC instruments that did not lead to cost

effective solutions of environmental problems, and the environmental financing systems frequently reinforced policy inefficiencies. More recently, however, environmental considerations increasingly influenced the taxation system, and MBIs have become more widely applied to supplement other policy implementation instruments. Although the main purpose of MBIs has been revenue raising, their effects of influencing polluter behavior increased the cost-effectiveness of environmental protection measures.

- Due to improving environmental management, the share of the private sector in total PAC expenditures has been increasing. Industrial pollution abatement is typically financed from private resources in OECD countries. Air pollution represented the largest share of private sector PAC expenditures.
- Various forms of subsidy schemes have been used in most OECD countries to speed up the process and reduce the financial burden of compliance with new regulations and standards. Investment tax incentives have been the favored type of fiscal subsidies. The use of certain incentives created bias towards end-of-pipe control investments as opposed to the application of cleaner technologies and processes. Typically, these schemes have operated on a temporary basis that changed

Box 10

Earmarked Financing in the French River Basin Management Agencies

Six river basin agencies¹¹ represent the main hydrographic basins of France. The river basin agencies are managed by Basin Committees, the Boards of which are representing the main stakeholders (national, regional and local governments, industrial and agricultural interests and citizens). The Basin Committees, supported by technical and financial basin agencies, prepare five-year environmental action programs based on (i) the analysis of problems in the basin, (ii) selection of projects and their costs and benefits; and (iii) amount of fees necessary to ensure the projects' financing need. The fees collected are earmarked for these purposes.

Effluent charges that represent the largest part of the agencies' annual revenue sources (close to 70 percent) have been levied for various water pollutants (suspended solids, oxidizable matter, soluble slats, BOD, organic/ammonia nitrogen and total phosphorus) since 1969 (Bernstein, 1993). These charges are paid by industries, municipalities and households (Hahn, 1989). The level of effluent charges is generally low, and rarely based on actual performance. Instead, the charges are based on expected levels of discharges by various industries. The number of pollutants on which charges are levied has grown since the initiation of the program.

In addition to the effluent charges, resource fees (representing roughly 14 percent of the agencies' annual revenues) are collected for water withdrawal, based on the volume of water abstracted (measured or estimated) and on coefficients of various types of water usage. Resource fees vary depending on the geographic area, seasonality of usage, etc.

Grants provided by the basin agencies range from 15 to 50 percent of the capital costs, while low interest rate loans range from 20 to 50 percent (Bower, et al, 1981). The size of subsidies depends on the type of project, the beneficiary and the zone in which the project is to be implemented. In addition to subsidies from the basin agencies, the national government may also provide subsidies or grants to public entities. Investments in water quality improvement represent the majority (about three fourths) of financial outlays. Typical projects financed from the funds are municipal and industrial waste treatment, toxic pollution control, and interceptor sewers. Municipalities receive the bulk of the subsidies.

the timing of investments and accelerated polluter response to environmental regulations.

- The main contribution of the public sector to PAC expenditures has come from public enterprises, whose revenues are financed from user charges, occasionally supplemented by central government subsidies directed to municipalities. There has been a trend towards greater cost-recovery. This has increased the efficiency of collective treatment services, and led to the use of market-based financing mechanisms.

- Financing schemes through earmarked environmental taxes have been created with the purpose of tackling media-specific or local/regional environmental problems. These earmarked mechanisms have not played a major role in the environmental financing systems of OECD countries. In some cases when direct environmental taxes have been earmarked, incentive effects also appeared supplementing the primary revenue raising functions. The advantages of earmarking have been greater in local/regional financing schemes, when a close relationship exists between the source and spending of revenues.

Box 11
The Consolidation of Earmarked Charges in the Netherlands

Charges for air pollution, chemical waste, traffic and industrial noise were formerly earmarked in the Netherlands to finance environmental programs in the area where the revenues were raised. The practice of different environmental programs, each charge financing only part of the environmental investments, led to a nontransparent, fragmented, inflexible environmental finance system. In response to the need for a more integrated financing system, the various types of product charges were consolidated in 1988 into a single charge levied on fuels (in 1990, the sulfur-dioxide tax was also incorporated into the fuel charge) that was considered to provide a general link with pollution. Clearly, the purpose of the fuel charge was revenue raising rather than creating pollution abatement incentives. Since the previous taxes on air pollution and traffic noise were already based on the same fuels, the transition was carried out with little change in the country's energy policy or in the effect the taxes had on polluters. The more general the charge became, however, the less sustainable the earmarked system was. Additionally, the character of the charge changed from a specific financial instrument to a taxation instrument. Therefore, earmarking was eliminated in 1992. The revenues of the previously earmarked fuel charge now accrue to the general budget, and the allocation of funds for environmental expenses takes place in the normal budgeting process.

¹ PAC expenditures data refer to investments and current expenditures directly aimed at environmental protection. Due to difficulties estimating the share of expenditures that is due to PAC requirements, differences in interpretation, definition and data collection, reported figures may not be comparable across countries.

² The program came into effect in 1989, with a five-year mandate.

³ The Revenue and Expenditure Control Act of 1968 effectively eliminated industrial revenue bond financing except for small issues and pollution abatement financing.

3 Transition Economies

Macroeconomic Policy Framework

Central planning severely restricted and distorted the function of markets. The government as the owner of production means concentrated in large public enterprises, established production targets but didn't hold enterprise managers responsible and accountable for technically and commercially efficient operation. Cost-plus price controls generally assured profits for public enterprises without the risk of being displaced by less costly or more innovative competitors. Inefficient management and operation of productive assets led to stoppages, breakdowns, and inadequate housekeeping practices, contributing to excessive levels of pollution. The emphasis on heavy industries combined with highly subsidized energy and raw material prices led to very low energy-efficiency, wasteful use of resources and high pollution intensity. In order to support domestic industrial development, high import protection was introduced and external price signals didn't reach domestic economies. Underdeveloped financial systems relied on a dominant central bank that, as an agent of the government, allocated credit according to central plans.

The transition from central planning to market-oriented economies that started in most countries of Central and Eastern Europe (CEE), the former Soviet Union (FSU) and China in the late 1980s, introduces complex macroeconomic reforms that are expected to generate positive environmental changes:

- *Public sector reforms* decrease the dominance of public enterprises, reduce state interven-

tion in public enterprise autonomy, break up large state monopolies and promote competition that improves management practices and resource use;

- *Monetary reforms* introduce tight control over money supply and eliminate interest rate subsidies, resulting in a reduction in capital-intensive investments, more realistic valuation of resources, and changes in the economic structure in the long term (particularly the decline in the share of the heavy industry);
- *Fiscal policy reforms* reduce subsidies and price controls, and create a more efficient tax system, resulting in more efficient resource use and less pollution intensive practices; and
- *Trade policy reforms* change protectionist foreign trade policy, by eliminating the over-valuation of exchange rates and reducing trade restrictions, resulting in efficiency increases due to increased import competition and increased import of cleaner technologies.

Not all the effects of economic restructuring and macro-policy changes are environmentally positive. The environmental effects of macro-policy measures greatly depend on the coherence of structural adjustment. Negative environmental affects occur when reforms are not fully coordinated¹, and market failures are not addressed comprehensively (Munasinghe and Cruz, 1994) – for example, clarification of property rights concerning natural resources such as forests and fisheries.

Box 12
Setting Emission Charges in Russia

Ambient standards (maximum permitted concentrations (MPCs)) were established during the former Soviet regime, based on the requirement of zero damage from pollution sources to human health, demonstrating the idealistic objectives of Soviet-type legislation. In practice, the permanent emission limits determined to achieve MPCs had to be supplemented by temporary emission limits corresponding to the technological and economic capabilities of the society.

Environmental damage calculations undertaken from the early 1970s created the basis for the emission charge system, that was gradually introduced starting from 1988 (NAPA, 1994). During the experimental phase, large differences existed between regions in the methodologies of calculating charges, and also in actual charge levels. Emission charges for carbon-monoxide, for example, showed variation in the order of several hundred between the cities of Perm and Dnepropetrovsk (Ukraine).

The national charge system introduced in 1991 included some 200 base rates for both air and water pollutants (Lvovsky et al, 1994). The rates were determined by using MPCs, and reflected the desire to centrally evaluate and mitigate environmental health and other pollution risks. Regional characteristics such as background pollution and the assimilative capacity of the ecosystem were expressed by coefficients determined by national regulations (MEPNR, 1993). Despite the intention to create corrective taxes that induce optimal pollution levels, charge rates were calculated merely to yield enough revenues for mitigating damage.

The present system of charges in Russia is a combination of noncompliance penalties and emission charges. The base emission charge system applies when discharges are within maximum permitted levels, set according to MPCs. Charges increase considerably (up to 5 times) for discharges between the maximum permitted and temporary permitted levels, and yet even higher are the penalty charges for emissions beyond the temporary permitted levels (up to 25 times the base rates). The level of charges, however, is still very low (even in the highest category), and doesn't meet the objective of inducing optimal pollution levels.

Since 1992, agreements between polluters and the environmental protection authorities create the legal basis for the collection of pollution charges. Such agreements specify (i) the permitted level of discharges; (ii) base rates and penalty rates for each pollutant discharged; and (iii) the schedule of charge payments.

Source: NAPA, 1994; Averchenkov, 1994

**Environmental Policy Framework -
The Legacy of Central Planning**

Transition economies inherited a unique environmental policy framework that emphasized overly ambitious and strict environmental quality objectives (ambient standards), supported with relatively weak capabilities of policy implementation and enforcement. The combined effects of market and administrative failures during central planning increased the social costs of pollution and excessive use of natural resources, and led to serious environmental deterioration. Environmental deterioration contradicted the environmental quality objectives manifested in strict ambient standards and basic environmental laws enacted in some countries as early as in the 1950s. These environmental quality objectives and laws represented a set of idealistic

principles rather than guidelines to set priorities and resolve conflicts. Their implementation and enforcement were less important than the declaration of commitment to these ideals. The good intentions frequently remained unfulfilled and laws unenforced.

The need to address the problem of environmental degradation in a more effective way and provide a financing mechanism for environmental protection became acute in the 1970s-1980s. In response, several countries increased the responsibility of enterprises for pollution abatement. Some countries (Bulgaria, Hungary) introduced non-compliance fines, and others created a framework of corrective taxes. In Poland, for example, environmental fees were introduced in the 1970s with the declared intention of motivating polluters to adjust their behavior. The system of environmental fees in the Soviet

Box 13. Industrial Pollution Abatement Financing in China

Financial resources for industrial pollution abatement come from various earmarked sources in China:

- Capital Construction Funds (CCFs) accumulated from 7 percent of new investment costs designated for pollution control;
- Technology Renovation Funds (TRFs) or depreciation funds that carry out the rehabilitation of existing technologies, 7 percent of which should be spent on pollution control;
- Comprehensive Utilization Profits gained from utilization of waste are allowed to remain in the industry instead of being transferred to local finance bureaus;
- Environmental Funds (EFs) accumulated from pollution charges and fines at local environmental protection bureaus. Eighty percent of total environmental levies is earmarked for industrial pollution control investments.

The largest share of industrial pollution abatement investments (45 percent in 1990) is financed from CCFs and TRFs. Other environmental investments are financed from industrial bank loans, and also from grants or loans from EFs. Since 1986, the role of soft loans as opposed to grants has increased among the expenditures of EFs. However, upon completion of pollution abatement projects, many polluters have been given exemption from repaying the loan.

The system of pollution control financing in China exhibits the characteristics of revenue allocation under central planning. Enterprise resources are designated to centrally determined purposes. The practice of legally mandating the use of 7 percent of investment and amortization funds for pollution abatement, for example, (i) leads to inefficient resource allocation among polluters; (ii) favors capital investments over other pollution abatement measures; and (iii) doesn't promote the effective operation and maintenance of abatement technology.

Source: NEPA, 1992

Union was based on a complex economic valuation methodology trying to estimate the value of environmental damages, and setting charges accordingly. Under central planning, however, enterprise managers had very limited authority. Inputs and outputs in the production process were externally determined, and profits centralized and reallocated. Decisions about investments were made centrally, and enterprises became mere executors of the central plans. In addition, political pressure discouraged environmental protection authorities from introducing truly incentive charges. As a result, pollution charges couldn't effectively change the behavior of polluters, and served merely as revenue raising mechanisms, earmarked through comprehensive national environmental funds (NEFs).

NEFs, as one of the numerous earmarked mechanisms operating in the fiscal systems of centrally planned economies, became an

integral part of a public financing system that provided all the capital needs of enterprises by centralizing and redistributing enterprise revenues (see Box 13.). Typically operating as off-budget mechanisms, NEFs blurred the distinction between the budgetary tasks of the government and the financing tasks of enterprises. They became supplements to the budgetary revenues of the central environmental protection authority, with a complex mandate to finance (i) institution building and strengthening of the environmental protection authority; (ii) R & D activities in pollution control technology and development; (iii) environmental education, information collection and dissemination; (iv) nature and biodiversity conservation; (v) public environmental services (such as wastewater treatment); and (vi) pollution abatement investments in commercial activities.

The development of the private sector, public enterprise restructuring, and tightening

budget constraints are changes that shift financing decisions from the center to the enterprises. Environmental improvements are increasingly financed from private resources in response to the combined effect of incentive policy instruments, environmental regulations and enforcement. Commercial banks are transforming themselves from passive allocators of credit who simply follow government instructions into real financial institutions. As a result, the role of enterprises in financing environmental investments is expected to increase dramatically in the long term. In the early stage of transition from centrally planned to market economies, however, there are several factors that constrain the evolution of an effective environmental financing system:

- Changes in enterprise behavior typically lag behind the introduction of macro-economic changes and incentives;
- Weaknesses of the environmental policy framework: taxes, regulations and enforcement are not effective enough to induce private and enterprise investments to reach the desired level of pollution abatement;
- The failure to recover full costs of public environmental services creates large financing need;
- Severe financial constraints at industrial enterprises delay the replacement of outdated, polluting technology;
- The slow pace of privatization hinders positive changes in management practices;
- Insufficiencies of the banking system create credit shortage and rationing, severely limiting access to financial resources;
- Underdeveloped capital markets constrain the use of advanced financing instruments;
- Environmental issues are frequently neglected in the political decision making and budgeting process;
- Changing fiscal systems result in uncertain revenue raising capabilities at various government levels;
- Inadequate information on the extent and social costs of environmental damage, and

poor understanding of cost-effective solutions make decision making suboptimal; and

- Weak NGO movements and citizen groups don't influence effectively the political decision making process.

Due to these difficulties, environmental financing through private sources and normal budgetary allocations remains insufficient to achieve socially desired environmental quality goals, and comprehensive NEFs have preserved their role in the environmental policy systems as important factors in environmental financing of most transition economies. Even new NEFs have been established in some countries. Earmarking environmental levies have made them politically more acceptable due to the connection between tax payments and environmental expenditures.

The role of NEFs in pollution abatement financing varies widely. More mature NEFs (for example in Poland) with large revenue sources finance the bulk of environmental investments, while others appear to be less dominant, but still significant. The importance of NEF in environmental expenditures appears to be growing in most countries. In Russia, for example, the share of NEFs in capital investments for pollution abatement increased from 6.6 percent in 1990 to 29.6 percent in 1991. In Poland, the share of NEFs from total environmental expenditures increased from 2 percent in 1990 to 22.3 percent in 1993 while the contribution of regional funds to total expenditures showed a similarly strong increase. The significant share of municipalities in environmental expenditures indicates the low cost-recovery of public environmental services, and share of enterprise and private pollution abatement financing is generally low.

Due to similarities of history, institutional framework, and economic and environmental problems in transition economies, the operation of NEFs exhibits similarities. Differences are determined, among other factors, by (i) the state of domestic economy; (ii) the development of private sector; (iii) the political commitment to address environmental problems; (iv) the development of domestic financial and capital markets; (v) the sources

Table 4
Main Characteristics of Environmental Funds in Selected Transition Economies in 1993

	Sources of revenues (% of total revenues)	Size of revenues (U.S. \$M)	Contribution to total environmental expenditures (%)	Main expenditures (% of total expenditures)	Disbursement mechanism (% of total disbursement)
Bulgaria	pollution fines (58); import tax on used cars (33) other (9);	2.3	7	monitoring (40); loans to enterprises (32); public services (19);	grants (68); interest-free loans (32);
Czech Republic	water charges (41); air emission charges (30); waste charges (13); land charges (12);	107	10	water projects (58); air pollution control (33); other (9);	grants (71); soft loans (29);
Estonia	water pollution charges (35); waste disposal charges (35); air pollution charges (18); other (12);	1.7	10	public environmental services (50); loan guarantees for enterprises (25); other (education enforcement) (25);	grants (50); soft loans (25); loan guarantees (25);
Hungary	fuel tax (44); traffic transit fee (20); PHARE grant (19); pollution fines (17);	27.7	11	air pollution control (70); waste management (15); water pollution control (11); other (4); ¹	grants; interest-free loans; other soft loans;
Poland	air pollution charges; water pollution charges; water use charges; waste charges;	515	58	air pollution control (47); water pollution control (35); other (soil protection, monitoring, education, etc.) (18);	grants (17); soft loans (77); loan interest subsidies (6);
Russia	pollution charges (83); claims for damages (7); fines (2); other (8);	84	NA	capital expenditures for pollution control (24); current expenditures (11); R&D (7); institution building (28); bank deposits (22); other (8);	grants;
Slovak Republic	state budget (37); water pollution charges (30); air pollution charges (25); other (8);	34.7	20	water pollution abatement (48); air pollution abatement (27); waste management (8); other (17);	grants (99); loan interest subsidies (1).

Sources: Averchenkov, 1994; REC, 1994; Personal interview with Eva Krav, Chairperson of the National Board of the Estonian NEF.

¹ Doesn't include the Water Management Fund.

and size of NEF revenues; and (iv) the maturity of NEFs.

The Role and Characteristics of Comprehensive National Environmental Funds

Revenues

The sources of NEF revenues are non-compliance fines (for example in Bulgaria and

Hungary), and emission charges (in China, Czech Republic, Estonia, Poland, Slovak Republic and the Russian Federation). Additional revenues are raised from product charges (for example, fuel tax in Hungary), other environment-related taxes and levies (for example, transit traffic tax in Hungary, import tax on used cars in Bulgaria), and other sources (for example, external sources from the PHARE program in Hungary, state budget in the Slovak Republic). Although

Table 5
Sources of Environmental Expenditures in some Transition Economies in 1993 (percent)

	Bulgaria	Czech Republic	Estonia	Hungary	Poland
State budget	46	29	20 ¹	48	5
Municipalities	2	61 ²		30	10
Enterprises	34 ³			8	23
NEFs	7	10	10	11 ⁴	58
Other	11 ⁵		70 ⁶	3	4
	100	100	100	100	100

Source: REC, 1994

¹ Includes municipal and enterprise expenditures.

² Includes enterprise expenditures.

³ Mainly state-owned enterprises.

⁴ Excludes expenditures from the Water Management Fund.

⁵ EC PHARE program.

⁶ Foreign assistance.

finances and charges are set in proportion to the damage caused, their level is rarely high enough to achieve more than raising revenues. In Estonia, for example, the charge for sulphur-dioxide emissions below permitted limits is set at \$0.05 per ton, for carbon-monoxide at \$0.008 per ton (Kallaste, 1994). The Polish example shows, however, that charges can be increased considerably if there is a political will. At \$72 per ton, emission charges for sulphur-dioxide (Zylicz, 1994), for example, are likely to have substantial incentive effects in Poland (the marginal abatement cost in the U.S. set by the market is about \$150 (Selling..., 1994), and enterprises in Poland may be at a flatter part of the pollution abatement curve due to the large potential for management, operation and maintenance improvements).

Emission charges are typically levied for a large number of pollutants, making the administration of the system overly complicated. In Russia, for example, charges are set for 217 air pollutants, and 198 water pollutants. Although such a complex set of charges may try to effectively approximate the damage caused, the large administrative costs compared to the current low levels of charges and revenues make the system inefficient.

Even if emission charges were increased to higher, more efficient levels, the cost-effectiveness of the system would be questionable. Increased real level of charges levied on a smaller number of pollutants would be more desirable. Direct regulations would be more effective for other pollutants that are hard to detect and monitor (for example, heavy metals).

The principle of measuring and charging for actual damage is further compromised by (i) the centralized determination of charges with limited differentiation among regions; (ii) severely constrained capabilities to reliably monitor even a limited number of pollutant discharges; (iii) ineffective tax collection; (iv) widespread exemptions; and (v) the dilution effect of inflation. Centrally determined charges are incapable of reliably approximating environmental damage and, there is mismatch between revenues and the financing need at local and regional levels even with decentralized revenue allocation schemes. Given the serious constraints of monitoring capabilities, most typically, charges are based on discharge estimates rather than actual measurements, that greatly reduces their effectiveness. Due to economic hardship and lax enforcement, the efficiency of revenue

Box 14
Emission Charges in Poland

Environmental charges were introduced in Poland in the 1970s, with the intention of influencing the behavior of polluters. Although fee levels were increased several times during the central planning era, their effects were counterbalanced by the lack of financial motivation of economic actors, mainly state owned enterprises facing budget constraints.

Environmental authorities utilized a political opportunity during the collapse of the old regime to strengthen the role of environmental charges by increasing their real levels, pegging them to the official inflation index (later changed to predicted inflation rate pegging), and changing collection frequency. As a result, some charges have the potential to provide significant incentives to abate. In most cases, however, charges are below the estimated damage functions, and site-specific damages are not reflected in a satisfactory way (Zylicz, 1994).

Charges are levied on a high number of water and atmospheric pollutants, the reliable monitoring of which exceeds available capacities. As a result, levies are frequently challenged by polluters. However, it also provides motivations to monitoring agencies to upgrade their capabilities.

collection is low. In Poland, for example, only 65 percent of imposed charges were collected in 1993 (REC, 1994). Another characteristic of NEFs is the ability of polluters to negotiate the payment of pollution charges. Polluters in many countries may be totally or partially exempt of taxes if they undertake pollution abatement investments. Considering the outdated technology of many industrial enterprises in these countries, investments in technology update lead to considerable reduction of pollution and qualify for pollution tax exemption. Consequently, collected tax revenues are substantially reduced (in Russia, for example, about one-fourth of the taxed amount is not collected due to exemptions). Finally, since many transition economies experience high rates of inflation and the pollution fee systems are generally not indexed (Poland is the only exception), the dilution of revenues creates another problem for NEFs (Table 6).

Public Pollution Abatement Financing

The transition from central planning to market economies, facilitated by institutional reform process, changes the role of government. Traditional revenue sources, expenditure structures and the organizational framework of financial flows are changing dramatically. Tax administration, accounting, auditing, tax collection and enforcement procedures, compatible with requirements of market

economies are being introduced. The budgeting process is slowly changing, however, and still shows the characteristics of central planning in many countries. The lack of functional and economic classification of expenditures, for example, often skews transparency and economic analysis. Additionally, extensive political and fiscal decentralization is taking place.

The autonomy over local matters is increasingly being decentralized. However, despite the expenditure autonomy assigned to subnational levels of governments, their autonomy on the revenue side is frequently curtailed. Additionally, the adjustment of user charges in the public environmental sector depends on national reforms of social protection systems due to the traditional distributional functions of these charges. Setting charges right is further constrained by political resistance and weak accounting systems. The adjustment of prices for public sector services has been very sluggish even in countries where national price reforms liberalized private sector prices and public sector pricing appears likely to be one of the last areas to be reformed in most countries (Bird and Wallich, 1993). It has been estimated that in some transition economies, raising the prices of public utilities to cost recovery levels could cost households more than 50 percent of their average household income (Schiavo-Campo, 1994). Therefore,

Table 6
Changes in the Real Level of Emission Charges in Russia (1991-93)

	1992	1993
Adjustment of Emission Charges (1991=1)	5	25
Ruble/U.S. \$ Exchange Rate (1991=1)	12.50	48
Ratio	0.4	0.52

Source: Averchenkov et al., 1994

while responsibilities for providing services have been transferred to local levels, frequently, the central governments set uniform prices due to equity considerations.

As extra-budgetary funds, NEFs are not affected by the fluctuations of normal budget revenues. By design, NEFs can tackle a wide range of environmental problems in a comprehensive way at various levels of governments. Realistic environmental objectives and clear financing priorities should, therefore, guide NEFs to allocate resources to those areas that most effectively speed up positive environmental processes. The following areas, therefore, are expected to receive high priority in NEF spending structures:

- *Improvement of the environmental policy framework.*

Strengthening of enforcement capabilities. NEFs should ensure that environmental improvements are sustainable. In order to improve enterprise compliance with environmental regulations, and increase the role of environmental financing from private sources, NEFs should contribute to the development of an effectively operating, independent environmental inspectorate system. The organization of inspectorates should ensure their freedom from political influence and isolation of industrial pressures.

Upgrading of information systems. Reliable environmental information is necessary for an effective environmental policy framework: information is needed to set priorities, design a well functioning emission tax

system, monitor and enforce compliance with regulations, and collect taxes. Upgrading monitoring systems in priority areas, where high ambient concentrations of certain pollutants expose the population to high health risks, and the monitoring of the disposal of hazardous, toxic and nuclear wastes should receive high priority. Improvements in the maintenance and operation of existing equipment should be carried out before new investments are financed. Improvements in information analysis and reporting should involve coordination with various levels of government agencies. Applied research should be funded in high priority areas to find cost-effective solutions to environmental problems (for example, groundwater protection from nitrate contamination, prevention of ecological damage caused by large-scale development projects).

- *Financing of high priority public pollution abatement programs and services.*

Abatement of pollution from non-point sources. NEFs may play a significant role in areas where private benefits of pollution abatement are not enough to compensate for the full cost of investments, or pollution abatement is hard to measure and control. Such area is, for example, the protection of groundwater reserves from contamination. Solutions to this type of problems generate both public and private benefits, and household resources available to pay for the private benefits can be effectively mobilized by NEFs supporting these environmentally beneficial investments.

Table 7
Projects Supported from NEF Expenditures in the Czech Republic During 1992-93

	Number of projects		Value of projects (U.S. \$M)	
Wastewater treatment plants	154	(30%)	113	(51%)
Municipal fuel conversion program	116	(22%)	22	(10%)
Fuel conversion in district heating	88	(17%)	30	(13%)
Air pollution abatement	34	(7%)	13	(6%)
Solid waste management	19	(4%)	5	(2%)
Waste incinerators	5	(1%)	6	(3%)
Other	96	(19%)	34	(15%)
Total	512	(100%)	223	(100%)

Source: REC, 1994

Reinforcement of the impact of macroeconomic policies. In response to the incentive effects of macroeconomic policy reforms, behavioral changes are expected to result in positive environmental impacts. Fuel price changes and technical development, for example, have led to the replacement of coal for gas in households, district heating systems and small-scale industries in many large cities in the world, contributing to significant improvements in urban air quality. However, behavioral changes in response to market incentives (for example, the reduction of fuel price subsidies leads to energy saving investments) may be sluggish. Therefore, NEFs can play a catalytic role in accelerating the adjustment of polluter behavior by mobilizing private resources.

Priority public pollution abatement services. Most public environmental services are provided locally and are expected to be increasingly financed from user charges. However, due to slow changes in cost-recovery and the uncertain revenue raising and allocating capabilities of local administrations, increased pressure is put on NEFs to support investments in public environmental services such as the construction of

wastewater treatment and solid waste management facilities. However, large public investments are seldom cost-effective solutions to environmental problems in CEE (see EAPCEE, 1993) and, therefore, should be supported by NEFs on an exceptional basis only. Such support can be justified if (i) investment in public facilities is a cost-effective alternative to solve an environmental problem; (ii) NEF funding is the best available alternative²; (iii) matching contribution is provided from the municipality or locality; and (iv) cost-recovery criteria can be satisfied.

In practice, NEFs don't appear to support the most stressing environmental problems in transition economies. Although air pollution in big cities is the a main health threat in most Central and Eastern European countries (EAPCEE, 1993), a large proportion of fund resources are used to finance capital investments in water pollution control (for example, 58 percent in the Czech, 48 percent in the Slovak Republic, see: Table 7, and REC, 1994). Few NEFs seriously support the improvement of environmental policy framework. National environmental strategies (if they exist) frequently fail to provide practical guidance for NEFs to set their spending priorities. As a

result, long "wish lists" are created and any project with some positive environmental impact may receive support. Some funds allocate their resources on a "first-come-first-served" basis. Cost-effectiveness criteria don't appear to have much influence on the selection of projects.

Enterprise Pollution Abatement Financing

In the central planning system, enterprise investments were financed from designated sources, and blurred responsibilities characterized government-enterprise relationships. In this system, NEFs served as one of the designated financing channels fulfilling a dual role of budget and enterprise financing. As long as state ownership of enterprises dominated, and resources were centrally controlled and allocated, the contradiction between these roles did not become apparent. The reform process, however, increases the role of the private sector, changes government-enterprise relationships, and increasingly delegates investment decisions to the micro level. Due to tightening budget constraints, enterprises are expected to rely more on their own retained earnings and on the financial markets for investment resources. As a result, the controversial functions of NEFs vis-a-vis the enterprise sector have to be clarified and streamlined during the transition.

Transition economies have a large portfolio of inefficiently operating public enterprises. Although privatization of the public sector is under way, it is clear that (i) the process of privatization takes much longer than previously anticipated; and (ii) several large, highly polluting industrial complexes will stay in state ownership for long periods of time without sufficient financial resources to undertake investments. Most economies in transition attempt to restructure and provide budgetary support to these enterprises. In many cases, liquidation is rejected due to social reasons (mainly to avoid large unemployment). State-owned holding companies have been established in some countries to manage the portfolio of public enterprises and to restructure individual companies to increase their efficiency. While most of the budgetary support for the restructuring of state owned enterprises are channelled

through sector ministry budgets, pollution abatement investments are being neglected due to the weakness of environmental management framework. For these enterprises, support from NEFs, therefore, may be justified on a temporary basis.³ However, NEF should only have a limited mandate in enterprise financing during the transition period with the following conditions:

- Clear environmental priorities should guide revenue allocation focussing on highly polluting industries or "hot spots" only;
- NEFs should contribute to the strengthening of enforcement capabilities parallel with enterprise support to change enterprise behavior;
- With their financing role, NEFs should facilitate a long-term partnership between industries and the environmental policy authority using a carrot-and-stick approach;
- NEFs should mobilize enterprise resources by requiring matching investment funds (i) to ensure the commitment of enterprises; and (ii) to avoid the moral hazard of enterprises deferring investments in anticipation of support;
- Eligible enterprises should be financially viable with positive net present values of future operations;
- NEFs should facilitate changes in the management and operation of enterprises by (i) co-financing environmental audits that identify low-cost solutions; (ii) requiring the assessment of alternative solutions in project evaluation; and (iii) emphasizing cost-effectiveness in project selection;
- NEFs should require the use of environmental assessment methods in project preparation, enhancing enterprise capital budgeting;
- Specific environmental improvements should be conditions of financing and their attainment and maintenance should be monitored;
- Enterprise support should be temporary.

Box 15

Financing Categories of the Central Environmental Protection Fund (CEPF) of Hungary

The CEPF categorizes environmental investments into four groups:

- Profitable investments are environmental investments that generate profit. These are eligible for a credit guarantee up to 70 percent of commercial credit amount from CEPF;
- Cost-saving investments that save costs (for example, by reducing emission charges or fines) to cover part of the investment and operating costs. These can be financed by interest free or low-interest credit from CEPF (CEPF interest rates vary from 60 to 120 percent of the central bank base rate);
- Revenue-generating investments that cannot cover the costs of investments and operations. Environmental impacts rather than financial return are the main criteria of project evaluation in these cases. All types of support can be extended.
- Not revenue-generating investments are generally eligible for grants or interest-free loans or their combinations up to 60 percent of the investment costs.

Source: CEPF, 1994

In addition to their public financing role, several NEFs have shifted their operation to quasi-commercial banking by financing profitable investments with positive environmental impacts. During a period when the economy is restructuring and obsolete technologies are replaced by new, modern and environmentally cleaner ones, a large share of profit-maximizing investments have significant environmental benefits ("win-win" investments). Such investments, however, are mainly driven by market forces, rather than by environmental requirements. By financing "win-win" investments, NEFs are simultaneously (i) correcting financial system failures; and (ii) subsidizing certain environmentally friendly investments. Although public outlays in order to compensate for market imperfections (for example the failures of the financial system) can be justified during the transition to support private initiatives, NEFs are not the best choice since:

- NEFs have no special expertise or advantage in carrying out banking activities;
- NEFs handle public money that should not be exposed to commercial risk;
- NEFs are not subject to banking supervision and regulation, therefore, there are limited checks and balances built into their operation;

- Commercial banking operations may overshadow or overtake NEF's main function of environmental financing;
- Banking operations create a self-perpetuating function for NEFs without improving the effectiveness of environmental policy and financing.

Therefore, the finance of profitable investments and commercial banking operations should not be undertaken by NEFs and better be left to the banking system.

Disbursement Mechanism

In the early stage of NEF operations, enterprise subsidies were distributed mainly as grants. The reforms immediately before and during transition intended to increase the financial independence of enterprises, and their awareness of the costs of capital. Subsidies that didn't cover the full amount of investment costs, had to be supplemented by own resources or commercial bank loans. However, the immaturity of the commercial banking sector in central planning and during transition have constrained access to borrowing, and soft loans were used to supplement or replace grant financing. In China, for example, soft loans increased their share from 5 percent in 1986 to 68 percent in 1991 (NEPA, 1992), and in the Czech Republic, from 6

percent in 1992 to 28 percent in 1994 (REC, 1994). The share of soft loans is highest in Poland (77 percent in 1993, see: REC, 1994).

However, there is no a-priori advantage in using soft loans as opposed to grants to allocate public resources. The same amount of subsidies can be provided either way. The provision of soft loans rather than grants have reduced the transparency of NEFs and required banking expertise that NEFs lacked badly. In response, some (for example, the Hungarian) NEFs delegated their banking operations to the commercial banking system. Others (for example, in Bulgaria), have decided to undertake the task themselves. This has imposed large administrative burdens on the NEFs, and created numerous inefficiencies. Setting up a lending program rather than providing grants has also unnecessarily tied up financial resources, as the subsidy had to be spread over the lifetime of the loans (in the form of the difference between market and subsidized interest rates).

Generally, banking operations should not be undertaken by NEFs, and better be left to the banking system. If NEFs decide to provide soft loans rather than grants, they should minimize their exposure to commercial risk. For example, reimbursing the difference between commercial and subsidized interest rates to the commercial banks that extend loans for environmental projects, is preferable to direct loans. Seconding lending operations to commercial banks (i) helps to spin off banking functions where NEFs have no expertise; (ii) introduces environmental evaluation techniques into bank project assessment; and (iii) imposes more rigorous regulations and supervision on the financial operations.

Some NEFs have made steps to separate some of their commercial banking functions by founding ecological banks. In Poland, for example, the NEF was co-founder of the Environmental Protection Bank, in the Russian Federation, 80 percent equity contribution was provided from NEF resources to the capitalization of the National Bank for Environmental Protection (Econatsbank). Eco-banks may facilitate investments in priority areas, for

example, in environmentally friendly technologies or in the acceleration of conversion to cleaner fuels in households. The experience of OECD countries shows that directed credit programs have been frequently used in developed countries to temporarily support, for example, the introduction of new technologies in the private sector. Such programs, however, should be connected to strong enforcement of environmental regulations in order to change enterprise behavior and mobilize enterprise resources. Further, environmental improvements don't necessarily require large capital investments. Old central planning practices that tended to emphasize the role of investments and ignored the importance of efficient operation and management, have to be re-evaluated and low-cost alternative measures identified. Eco-banks are not strongly motivated to support this process and facilitate a change in investment-biased enterprise behavior. Additionally, backed with the steady revenue flow of environmental funds, eco-banks don't face the same scrutiny as normal banks do. Besides one-time capitalization, equity contribution of NEFs to Eco-banks should be restricted. Finally, without clearly defined mandate and financing objectives, sub-optimal resource allocation and distortions in the financial system may occur. Eco-banks, therefore, are not a preferred form of pollution abatement financing, should have a limited mandate, and transform into normal commercial banking institutions.

The proliferation of earmarking is characteristic of the operation of most NEFs. Revenues derived from certain groups of polluters are earmarked to be returned to the same group, or sub-funds are established for further earmarking. In Poland, for example, resources transferred to the NEF from provinces are kept on separate sub-accounts, while functional earmarking exists for charges to be recycled for pollution abatement concerning saline coal mining waters, and atmospheric sulphur dioxide and nitrogen oxide emissions. In Hungary, revenues from the fuel tax can only be spent on investments in traffic-related pollution abatement, and several windows are established for different spending categories. In the Czech Republic, revenues are pre-

earmarked according to their origin both by media and geographic regions: charges for air pollution are used to support air pollution abatement programs, and 60 percent of the funds are returned to the area or region where the revenues originated from (REC, 1994). In China, enterprises are entitled to receive subsidies from the fund up to 80 percent of the emission charges paid. Such close earmarking prevents the funds to reallocate revenues according to immediate priorities, while potential advantages (political support of charges, matched revenues and expenditures, transparent allocation) of close relationship between revenue sources and uses (a characteristic of the French River Basin Management Agencies) are largely lost due to (i) the complicated bureaucratic process of revenue collection and reallocation; and (ii) the lack of transparency in decision making and revenue allocation.

Frequently, NEFs don't spend all the revenues available to them. Averkhenkov (1994) reported, for example, that large parts of the earmarked resources of NEFs at the regional levels in the Russian Federation remained unspent in 1993. The unused amount was 67 percent of the total resources, for example, in Tyumen, 62 percent in Tver, and 54 percent in Murmansk regions. Similar situation was reported from Poland (REC, 1994): despite increasing revenues of the NEF during 1992-93, its expenditures decreased. While 92 percent of NEF resources were spent in 1992, only 70 percent was disbursed in 1993. Such phenomenon may be the result of the lack of (i) clear priorities and spending strategies; (ii) viable investments under current conditions; or (iii) information about investment options. Unspent NEF resources create a serious cash management problem, especially under high inflation conditions. The practice of the Polish NEF of equity investment in "environmentally friendly" ventures may indicate an attempt to invest excess cash rather than being the outcome of an established strategy for revenue allocation. The practice of not fully spending NEF resources also points out one of the main weaknesses of earmarked financing mechanisms: NEFs manage idle funds or invest suboptimally while other, socially worthwhile programs may remain unfunded.

Institutional Issues

Most typically, the management of NEFs is assigned to the central environmental protection body. In Russia, for example, the Ministry of Environmental Protection and Natural Resources has control over the funds through its committees at various government levels; in Hungary, the NEF is one of the departments of the MOE; in Bulgaria, the work of the NEF is carried out by various departments of the MOE with one department functioning as coordinator. The role of the environmental minister is generally significant in appointing the directors of NEFs, approving the guidelines for NEF operation, and making final decision about resource allocation. Even in Poland, where the NEF was established by the parliament as a structurally independent institution, members of the supervisory board are appointed (and can be recalled) by the environment minister.

Close connection to the MOE underlines the public financing functions of NEFs. Although it facilitates the integration of national environmental policy objectives and priorities into the operation of NEF, it may blur the lines of responsibilities for budgets and operations. Some degree of separation, therefore, is necessary between the management of the environmental protection body and that of the NEF, in order to clearly distinguish between their roles, budgets and decision making procedures, and to reduce potential political pressure and conflicts of interest.

Parallel with the gradual decentralization of political and fiscal systems, NEFs established nationally may decentralize their revenues to regional or local levels. The collection and disbursement of revenues, then, are carried out regionally or locally, however, the rules of revenue generation and regulations of operation are still determined nationally. In the Russian Federation and Belarus, for example, environmental funds receive 90 percent of total environmental revenues (10 percent is accrued to the budget) that is divided among national (10 percent), regional (30 percent) and local (60 percent) levels. In Bulgaria, 70 percent of the revenues from non-compliance fines are transferred to national, and 30 percent to municipal levels. The greater

freedom is provided to regional and local authorities in operating the funds, the closer the relationship between the source and use of revenues is. With decentralized revenue allocation, the spending structure of NEFs at the national level are likely to shift towards international and global environmental problems, while funds at local and regional levels may become more involved in financing environmental programs of local and regional character.

When national NEF systems decentralize the allocation of revenues, local and regional authorities have no control over the determination of charges (although there are incentives to increase collection efficiency). In this sense, they remain executing bodies of a centrally regulated financing system. In Russia, for example, Ministerial Order No. 151 on "Standard Regulations of Environmental Funds" approved in 1992, recommended that local and regional governments adopt common procedures for operating the funds. Consequently, mismatches between local/regional financing need and revenue sources are inevitable. The extent of real decentralization depends, besides political considerations, on the degree of decentralization in the fiscal system. Strictly centralized fiscal systems resist the allocation of revenue raising capabilities to local and regional authorities. Decentralization also requires that NEFs at various levels possess capabilities to set clear priorities and operate efficiently. Such capabilities are frequently missing.

Funds frequently measure their effectiveness in the amounts of pollutants controlled or number of projects completed rather than by improvements achieved in environmental quality or costs saved in achieving environmental improvements. However, investments supported by NEFs don't necessarily lead to environmental improvements. In China, for example, the operation and maintenance of pollution control technologies are not monitored, and the equipment is frequently not operated to save operating costs that typically exceed emission charges. Post-project evaluation and monitoring capabilities of NEFs are usually non-existent or weak. Only the

Hungarian NEF requires the repayment of financial support and interest charges by NEF beneficiaries if expected environmental improvements are not achieved.

The movement toward market economy is frequently associated with a trend toward more political freedom and democracy. In the public finance and budgeting process, two features are expected to be strengthened: (i) transparency ensuring that main stakeholders are involved in decision making; and (ii) accountability ensuring that services are delivered in an efficient and effective manner by creating a system of checks and balances. The operation of NEFs should reflect this process. The representation of major interest groups in the decision making process of NEFs can also (i) increase the acceptance of pollution charges; (ii) facilitate the development of a consensus between polluters and the regulating authorities; and (iii) help to set priorities.

Several NEFs established administrative framework for inter-ministerial consultations and more transparent decision making. In Bulgaria, for example, the board of directors consists of representatives of the Ministries of Finance, Construction, Industry, Agriculture, Environment, Energy and Health, the Committee of Geology and Mineral Resources, Committee of Tourism, Institute of Ecology, and a private insurance company (the invitation for an NGO was, however, revoked). In Hungary, an Interministerial Committee (representing the Ministries of Environment, Transport, Telecommunications and Water, Industry, Agriculture, Finance, Welfare and Internal Affairs) participates in the decision making process. Although considerable progress has been made in the coordinating function of NEFs, still no public participation is built into NEF operations. NGO and citizen participation has been minimal or non-existent.

Long-term Perspective

The majority of spending for pollution abatement should come from private sources in the long run, while public spending should be

part of the budgetary process, competing with other public expenditures. The proliferation of earmarking, as it was demonstrated by the Dutch example, leads to inefficiencies in the fiscal system and distortions in environmental financing. NEFs, therefore, should be viewed as temporary instruments to correct imperfections during transition.

In order to increase the role of private pollution abatement, the environmental policy framework should be strengthened considerably. CEE countries have a unique opportunity to build on the existing system of emission taxes, and establish a policy framework that gives a significant role to market incentives. Environmental taxes can induce voluntary private pollution abatement and, supplemented by a carefully selected set of direct regulations where incentives are insufficient to achieve environmental quality objectives, could result in environmental improvements in a cost effective way. With the transition to market economies, constraints created by underdeveloped, dysfunctional financial markets are expected to disappear, and many financing channels become available for private (and public) direct investments.

Strengthening the environmental policy regime requires a serious effort of consensus building with the decision makers responsible for financial and fiscal policy, and is likely to take a long time. NEFs can effectively contribute to this process. A gradual approach is most realistic, during which NEFs support the development of strong environmental policy framework, and mobilize private financial resources. NEFs can be politically attractive, since voters (and polluters) are more willing to support taxes if a direct connection is provided between tax payments and environmental improvements. Earmarking, however, not only creates inefficiencies in fiscal policy, but also hinders the introduction of a more effective environmental policy instruments, since the combined effect of environmental taxes, regulations and financial support through NEFs would lead to excessive levels of pollution abatement. Therefore, the earmarked share of environmental tax revenues should be gradually reduced over time,

parallel with increasing the real level and incentive effect of emission taxes, and improving the environmental management framework. A timetable for this should be negotiated with fiscal authorities. As the role of private environmental financing increases, and greater cost-recovery is achieved in the provision of public environmental services, NEFs are expected to shift their investment priorities to areas where no alternative to public finance exists. Under improved political systems, information availability, and increased role of NGOs, these traditional public finance functions, however, should be overtaken by normal budgeting in the long run.

Summary of Pollution Abatement Financing in Transition Economies

- Macroeconomic reforms introduced during the transition from central planning to market economies are expected to generate positive environmental changes. The development of the private sector, public enterprise restructuring, and tightening budget constraints gradually shift financing decisions from the center to the micro level. As a result, the role of enterprises in pollution abatement financing is expected to increase dramatically in the long run.
- Comprehensive NEFs that currently constitute an important source of environmental financing in CEE countries, are legacies of central planning. In the transition period, they should be considered as temporary financing instruments that can play a significant role in speeding up positive market processes and financing environmental priorities by redistributing and allocating revenues to investments in priority areas that reduce environmental damage in a cost-effective way. The operation of NEFs, however, should reflect the long-term objective of creating a sustainable environmental financing system. NEFs are expected, therefore, to (i) improve the environmental policy framework; (ii) finance high priority public environmental programs and services; and (iii) provide

temporary support to the enterprise sector by mobilizing enterprise resources in priority areas.

- NEFs should have only a limited mandate in enterprise financing. NEFs should play a catalytic role by (i) focussing on priority areas only; (ii) facilitating a long-term partnership between industries and the environmental policy authority; (iii) mobilizing private financial resources; (iv) influencing enterprise behavior by focusing on cost-effective solutions; and (v) ensuring the sustainability of environmental improvements. The role of NEFs in enterprise financing should be temporary.
- NEFs should improve their revenue raising, resource allocation and decision making procedures. The current practice of levying very low emission charges on a large number of pollutants should be evaluated and revised; revenue collection should be significantly improved, exceptions reduced and charge levels automatically adjusted to the rate of inflation. Clear environmental

priorities and cost-effectiveness criteria should guide their project selection, supported by increased transparency and accountability in the decision making processes. Post project evaluation functions should ensure the sustainability of environmental improvements. Institutional capabilities of NEFs at regional and local levels should be strengthened and the separation of roles, management and budgets of NEFs from those of the environmental protection body should be ensured.

- With a stronger private sector, the restructuring of the public sector, tightened budget constraint, and improved environmental regulations and enforcement, the burden of environmental financing is expected to shift to the enterprises and improved cost-recovery can be achieved in public environmental services. Therefore, the role of NEFs in pollution abatement should diminish, the share of earmarked environmental charges reduced, their spending structure shift to traditional public finance roles, and eventually taken over by normal budgeting.

¹ If price subsidies are lifted, for example, on hydrocarbons but not on coal, adverse pollution affects occur.

² Besides NEFs, other earmarked funds are also frequently used to finance public environmental investments. In Hungary, for example, wastewater treatment facilities can be financed from (i) the NEF; (ii) the Water Management Fund established from earmarked water charges and fees; (iii) Regional Development Funds mainly designated for infrastructural investments; and (iv) directed municipal support programs. There is inadequate coordination among the various sources and, as a result, there are overlaps and inconsistent eligibility criteria and financing conditions.

³ Priorities may include as (i) the installation of dust collection systems in metal smelters; (ii) investments in equipment to reduce toxic pollutant discharges where large populations are exposed; and (iii) pre-treatment of wastewater in small- and medium-sized industrial plants where water contamination by heavy metals and toxic chemicals is a serious environmental threat (EAPCEE, 1993).

4 Developing Countries

Macroeconomic and Environmental Policy Framework

In order to protect their "infant" industries during the process of industrialization, most developing countries increased the role of public sector in their economies, introduced central planning, price and interest rate controls, and strict import protection. Financial markets have been often characterized by distortions due to controlled interest rates, credit ceilings, and selective credit policies. Subsidized interest rates encouraged capital- and pollution intensive investments and capital structure. By the 1970-80s, complex structural inefficiencies led to low rates of productivity, slow economic growth, budget deficits, and serious balance of payment problems in many developing countries around the world, and adjustment programs became necessary to restore macroeconomic stability. The environmental effects of central planning and macroeconomic reforms, as well as the constraints of developing an effective environmental financing system are very similar to those described in chapter III.

The system of environmental regulation and the institutional framework are still evolving in most developing countries. Environmental policy formulation and regulatory functions are not well defined. Environmental protection functions are typically dispersed among several line ministries even if a separate environmental protection body is established, or one of the line ministries is assigned to carry out the main environmental protection functions. Further, the regulatory agencies' ability to monitor pollution and enforce

regulations is generally inadequate, largely curtailing their choice of policy instruments for pollution control. Environmental management, therefore, frequently relies on sectoral self-control and self-regulation.

CAC instruments such as emission standards and licensing dominate the choice of environmental policy implementation instruments. In Mexico, for example, federal laws created a framework for the establishment of minimum industrial emission discharge standards by major industries for the main pollutants. In Brazil, state licensing of polluting activities creates a framework for establishing individual emission limitations. The issuance of compliance certificates and authorization to construct and operate industrial plants are the main regulatory instruments in the Philippines. In Thailand, source-specific emission standards are applied. However, the enforcement of environmental regulations in most developing countries is generally weak, frequently relying on self-regulation and warnings. The level and collection probability of non-compliance fines are typically low, and plant closures, even if legally allowed, are extremely rare due to the lack of political will to seriously tackle industrial pollution. In cases (for example in Turkey and Mexico) where fines have been set according to the severity of the pollution damage, they were effective in reducing pollution at the source (Bernstein, 1993).

In many countries, MBIs are increasingly used to supplement direct regulations, and taxation is increasingly used with the purpose of achieving environmental improvements. Tax

differentiation policy on gasoline in Mexico, for example, successfully contributed to the reduction of traffic-related pollution. Additionally, direct environmental taxes and other MBLs have been introduced in several countries. For example, an air pollution permit trading system supplemented CAC measures in Santiago, Chile to curb point source emissions. In Korea, emission charges and non-compliance fees are applied for discharges over effluent limits, and product charges and a deposit-refund system supplement waste management regulations. In Malaysia, effluent-related license fees are charged on the BOD load discharged to waters. Some states in Brazil (Sao Paulo and Parana) introduced effluent charges based on pollutant content in order to cover the costs of public water treatment. The tariff imposed on polluters has resulted in an impact on pollution abatement behavior, reducing pollution coefficients (World Bank, 1993b).

Informal regulation through bargaining between polluters and the environmental protection authority frequently supplements laws and regulations. In Brazil, for example, agreements between the State Environmental Protection Agencies and polluters are formalized to determine implementation schedules for pollution abatement plans. In countries where formal regulation is missing or weak (for example, in Bangladesh and Indonesia), information dissemination about the pollution records of large polluters facilitates informal bargaining between polluters and affected communities. Community pressure is generally able to tackle highly visible and easily identifiable pollution sources. Information asymmetry between negotiators, transaction costs and social considerations such as employment, however, create constraints to the sole use of informal regulation.

Public Pollution Abatement Financing

The process of urbanization and industrialization resulted in the degradation of the water quality of rivers and reservoirs, uncontrolled discharging of solid wastes, untreated municipal and industrial sewage and runoff that have adversely effected the health of popula-

tion and created a need for sustainable strategies for water resource, water quality and waste management. Traditional water ownership rights and political and social considerations, however, frequently prevent the water sector from establishing an efficient management and financing system. Wastewater treatment, waste collection and management are frequently considered basic social services that governments should provide free. Charges, therefore, are typically too low to cover costs. Sewerage tariffs are generally set as a certain percentage of the applicable water tariffs (in Colombia, for example, sewerage tariffs are set at 60 percent of the water tariff in Cali, 50 percent in Cartagena, 30 percent in Bogota (Bahl and Linn, 1992)).

Sewerage charges levied on industrial discharges into the sewerage system are typically low on the (incorrect) assumption that there will be significant pre-treatment of industrial wastewaters. Higher levels of sewerage charges, however could significantly influence the treatment level and the volume of emissions. Bernstein (1993) cited, for example, the case of Suzano in Sao Paulo state where high tariff levels set by the state sanitation company induced the local paper mill to construct its own treatment facility. The treatment costs of the facility were lower than the sewerage charge, demonstrating that industrial treatment is frequently cheaper than collective treatment.

Management and operating practices in the public environmental services sector are poor and, as a result, service levels are low. Water supply and sanitation systems only rarely achieve high levels of cost-recovery. There are a few exceptions where cost-recovery allowed the involvement of private sector in water service provision (see Box 16.). Typically, however, most expenses are financed through municipal general revenues and national budget transfers, supplemented in some cases by external financial resources. Significant decentralization of public expenditures and responsibilities have taken place in most developing countries in the past decade. Frequently, decentralization of government functions has been the reflection of democratization processes marked by the adoption of new constitutions (for example, in Brazil,

Box 16

Cost-recovery in the Water Supply and Sewerage Services in the Ivory Coast

According to the National Water Supply Program of 1973, pricing policies in the water supply and sewerage sector were aimed to provide full cost-recovery of operating costs and debt service. Two funds, the National Water Works Fund (FNH) and the National Sanitation Fund (FNA) were set up to manage water sector finances. The Ivorian Water Distribution Company (SODECI), operating all urban piped water systems, maintaining rural water facilities and also the sewerage and drainage systems in Abidjan, collected the fees for water services. A fixed amount of the fees were periodically retained to cover O&M costs, while the balance of revenues were transferred to the sector funds.

While SODECI's compensation from the collected revenues remained fairly constant, the portion transferred to FNH and FNA contributions varied substantially. Additional difficulties emerged in the late 1980s, when arrears of unpaid public water bills have started to threaten the survival of SODECI, and the financial sources of FNH. Due to the limited amount of cash FNH could generate, it had to borrow money from the Central Bank, contributing to the increasing indebtedness of the sector. While FNH was running a deficit, however, FNA showed surplus.

The sector funds were used to finance water supply and sanitation projects. Although FNH and FNA had the responsibility to manage sector finances, they were never in full control, since investment decisions were left to the Water Directorate (DE). Recognizing the negative effects of fragmented responsibilities for investment programming and finance, the Government decided to rationalize the financial management of the sector. In 1987, FNH and FNA were replaced by the National Water Fund (FNE). The function of FNE is to (i) keep an account for the surcharges on water sales levied by SODECI, the sanitation tax collected by the Treasury and the user charges paid by operators of private wells; (ii) pay for the operation and maintenance of sewerage networks in Abidjan to SODECI; and (iii) service the debt used to finance investments. Over time, unlike most water supply and sewerage management systems in developing countries, the Ivorian system has achieved a high level of sustainability and self-financing.

Source: World Bank, 1990b.

Colombia and the Philippines), redefining the roles of various government levels and providing more authority to local government levels. In some cases, local governments received authority to create new tax bases and charges (for example, in Venezuela) or to adjust existing tax bases. In other cases, revenue raising responsibilities remained with the national or federal government, but larger proportions were shared with lower government levels (for example, in Argentina, Brazil, Venezuela). In many countries, central governments require a large part of their revenue transfers be dedicated to local capital investment in infrastructure facilities. In some countries (see Box 17.), central government transfers were coupled with increased lending to municipalities to stimulate local spending on infrastructure. The reliance on national budget transfers for environmental service provision has been especially significant in countries where the authority of the municipalities to set tariffs remained curtailed (for example, in Mexico).

Municipal Development Funds (MDFs) have been created in several countries to provide the financing need for municipal infrastructure management. MDFs are managed by the central government (Kenya, Tunisia, Uganda), or by autonomous institutions with separate legal and financial identity. Autonomous institutions may be municipal development banks, whose primary objective is municipal investment financing (for example, Honduras and Jordan), or they may be part of lending institutions with broader scope of operations (for example in Mexico and Colombia). In some cases, they are part of lending institutions established to manage state controlled pensions, insurance and saving funds (in Brazil and Morocco). Many of the specialized MDFs also provide technical assistance. Generally, the management of these institutions is appointed by the central government, however, municipal governments are frequently represented. Due to low cost-recovery, MDFs are dependent on budgetary contributions, while service provision quality

Box 17

Financing Municipal Services in Colombia

A revolving fund managed by the National Institute for Urban Development (INSFOPAL) served as the principal financial mechanism in Colombia for many years. INSFOPAL's responsibilities included the distribution of Government grants and other financial resources. Cost-recovery, financial viability, and administrative and operational efficiency played secondary role in its operation. Loans were the general form of financing provided by INSFOPAL for the execution of sanitation works, however, grants were awarded under special circumstances decreasing financial discipline and opening the possibility for more lenient financing terms. Due to unsatisfactory debt service, the revolving fund never developed into a viable source for sector investments, and INSFOPAL had to rely on contributions from the national budget.

As part of the Sector Reform Program (SRP) adopted in 1989, responsibilities for decision making and administration were transferred from the central Government to municipalities. INSFOPAL was abolished, and Findeter, an independent financing institution took over the financing role for sector investments, with responsibilities for mobilizing domestic and external resources, and identifying, preparing, evaluating, approving and supervising sector projects. One of the most important objectives of SRP was to promote the establishment of autonomous, operationally efficient and financially viable municipal or regional water supply and sewerage utilities. Institutions eligible for SRP loan funds should comply with the cost-recovery principle.

Findeter is operating through the banking sector financing up to 70 percent of public works, requiring 30 percent counterpart contribution. Onlending rates are pegged to the market interest rates, covering the costs of funds. In lack of competition in retail banking, a cap on interest rate spread of 2.5 percent has been set to prevent excessive rates charged by intermediary commercial banks to municipalities and utilities. Positive cash flows of utilities used as collateral make the lending program viable. Findeter has demonstrated a significant impact on the preparation and management of investments, and contributed to the development of municipal credit market and banking relations.

Source: World Bank, 1988.

is low. Selective credit policies frequently support the poorest areas through grants or low interest rate loans.

Private Pollution Abatement Financing

Compliance with emission standards and permits requires extensive monitoring that is beyond the capabilities of most developing countries. Therefore, environmental protection authorities frequently pursue a selective approach concentrating on the largest polluters. In the Philippines, for example, due to limited resources available for the enforcement of environmental regulations, the twelve most polluting industrial units in each region were targeted by the "Dirty Dozen" program (World Bank, 1993c). Such approach imposes the burden of financing on a selected group of polluters without regard to the cost-effectiveness of pollution abatement. Additionally, the initial enforcement of compliance is rarely followed by the continued monitoring of the

proper maintenance and management of pollution control equipment, contributing to further inefficiencies in the use of financing resources.

The menu of financing options available for industries is typically severely limited in developed countries due to underdeveloped and dysfunctional financial and capital markets. The absence of open markets for securities (such as bonds, stocks, mortgages, commercial bills), combined with macroeconomic instability inflicts more risk on the financial system. Therefore, strong government regulation was generally introduced to ensure the safety of the banking system. Although several countries experimented with financial liberalization by rapidly (for example, Chile and Argentina) or gradually (for example, Korea and Indonesia) abolishing interest rate ceilings, central credit allocation and market entry barriers in the late 1970s and early 1980s, the full liberalization of financial markets has been constrained by various macroeconomic imbalances. Con-

Box 18

Pollution Abatement Subsidies in India

Fiscal incentives for pollution abatement financing have been widely used in India:

- Soft loans are provided for technology upgrade by the Industrial Development Bank of India (IDBI) and the Industrial Credit and Investment Corporation of India (ICICI);
- Depreciation allowances are higher (50 rather than 30 percent) for certain pollution control equipment;
- Excise taxes are reduced (from 15 to 5 percent) for certain pollution control equipment;
- The maximum customs duty is reduced from 85 to 40 percent for all pollution control equipment; and
- The income tax exemption is extended to private contributions to environmental organizations.

Incentives, however, should be combined with strong environmental management and enforcement in order to be effective. In India, subsidies have only a limited effect stimulating pollution control measures. Entrepreneurs try to maximize government subsidies, and minimize their individual contribution to environmental investments, even if that requires the delaying of planned investments.

Source: World Bank, 1991b.

trolled interest rates for directed government lending and free rates for other lending frequently coexist. The cost of collecting information to screen and monitor debtors is very high. As a result, a large portfolio of non-performing loans and the high administrative costs of the banking system have raised interest rates substantially in many countries, restricting borrowing for investments with moderate returns (for example, average real lending rates in the 1980s were over 20 percent in Argentina, Chile and Uruguay (Morris et al, 1990)).

Institutional financing appears to be especially constrained for small-scale enterprises. Banks frequently play a more significant role in financing larger firms, while the use of credit by smaller firms is limited, indicating discriminatory credit rationing practices. As a result, small-scale enterprises are frequently forced to turn to more costly, informal credit sources. Due to the high cost, such sources can only be used, however, for financing investments and operations with relatively high returns.

Under these conditions, financing pollution abatement investments through normal commercial banking channels is considerably limited. Therefore, directed credit programs have been established in order to support pollution abatement financing in several

countries. The most common channels of directing credit to priority areas have been (i) commercial bank loans rediscounted by the Central Bank; (ii) lending by state-owned financial intermediaries; (iii) regulations mandating banks to lend certain share of their portfolios to specific purposes; and (iv) easing the banking regulations applicable to lending to priority sectors (for example, by requiring lower reserves).

Typically, directed lending for pollution abatement has been carried out by financial institutions responsible for directed industrial lending. In Mexico in the 1980s, for example, the earmarked environmental lending mechanism of the Industrial Equipment Fund (FONEI) was capitalized by the government (see Box 19.). In India, development banks with majority state ownership such as ICICI and the IDBI provide directed credit to industries for various priority projects, including pollution control. The provision of directed credit at subsidized rates has been demonstrated to favor large companies that comply with bureaucratic conditions more easily than small borrowers (Morris et al, 1990). Such loans suppress competition and discourage the development of commercial banking and credit markets.

Other types of subsidies also frequently supplement environmental regulations and

Box 19

Directed Credit for Pollution Abatement in Mexico

The Mexican Government set up several trust funds in the 1970s to provide long-term financing to priority sectors. Trust funds were typical in a highly fragmented fiscal system. FONEI, established in 1971 and administered by the Central Bank, provided financing for industrial projects through the entire network of Mexican investment and multipurpose banks. In the 1980s, FONEI started to promote lending for pollution control financing.

FONEI's highest decision making body, the Technical Committee, consisted of high level government officials (finance, commerce and industrial ministries, banks and the private sector). The Committee defined the types of projects, terms and limits of loans, interest rates, criteria for project selection and procedures for authorization of financing. FONEI's pollution control loans were eligible for 2-5 percentage points below market interest rates. The majority of FONEI's pollution control loans supported air pollution abatement investments. After FONEI was abolished, the National Finance Institution took over lending for pollution abatement investments.

charges that are typically not effective enough to induce the level of private pollution abatement investments necessary to achieve the required environmental quality. In India, for example, tax and interest rate incentives are used (see Box 18.). In Malaysia, subsidies are provided for companies that establish facilities to store, treat and dispose of their wastes, and import duty and sales tax exemptions are extended for technology used for the storage, treatment and disposal of hazardous wastes. In Thailand, import duties are reduced to below 10 percent on pollution control and treatment equipment. A law enacted in 1977 in the Philippines allowed the waiver of import tariff on pollution control equipment for a period of ten years, and rebates for domestically produced equipments were also introduced. Subsidized credit has been provided in some countries to support the relocation of highly polluting industries. In Turkey, for example, loans at negative real interest rates were extended to leather tanneries that relocated from Izmir. Subsidies have also been frequently justified by political considerations such as the promotion of industrial development and trade.

Environmental Funds

Environmental funds have been established in some developed countries, mainly where economic growth was accompanied by serious environmental degradation that led to government intervention, and outlays from general budget for the environment sector were

inadequate without earmarking. Since emission charges and other environmental taxes do not play an important role in most developing countries, the revenue sources of the EFs are usually derived from or supplemented by (i) designated, not directly environment-related levies (the National Environmental Fund in Algeria, for example, has been set up to raise its revenues from international airline tickets); or (ii) external sources (the Pollution Abatement Fund in Sri Lanka was created with the help of donor contribution). In some developing countries (see Box 21), the creation of EFs reflects the failure of the fiscal mechanism, leading to the proliferation of earmarked funds as means of public revenue allocation.

The characteristics of EFs, disbursement mechanisms and use of resources vary among developing countries. In cases when EFs are established to correct failures in the fiscal system (for example, in Turkey), funds finance a wide range of environment-related projects including investment in pollution abatement equipment, environmental cleanup, natural resource protection, as well as education and training programs. The majority of these investments are classic public expenditures in the form of grants. In other cases, especially when environmental charges are earmarked, the scope of eligible use is narrower. In Thailand, for example, the EF is designated for investments in wastewater treatment and solid waste disposal facilities; in Nigeria, the majority of EF resources are used for disaster

Box 20
Comprehensive Environmental Funds in Turkey

The Turkish fiscal system is highly fragmented with numerous earmarked financing mechanisms. Several environmental funds exist with a broad range of mandate.

- The Pollution Prevention Fund was set up in 1985 from the collection of environment-related taxes and levies including taxes on motor vehicles and transportation (for example, motor vehicle inspection fees and vehicle purchase tax), as well as pollution permit fees and fines.
- The Environmental Protection Fund was created in 1989 from earmarked shares of property, income and corporate income taxes.
- The Special Protection Fund derives its resources from various charges in connection with recreational activities in environmentally sensitive areas.

Spending priorities are broadly defined and include (i) research activities in pollution prevention; (ii) environmental cleanup; (iii) education and training; (iv) purchase of technology; (v) nature conservation; and (vi) provision of credit for pollution abatement investments. However, EF resources have been used mainly for capital transfers to municipalities and to the Ministry of Finance. EF mechanisms in Turkey are fiscal, rather than environmental policy instruments.

relief, environmental cleanup and flood control projects; in Sri Lanka, loans, as well as technical assistance are financed from the EF. Frequently, especially in cases when revenue sources are not directly related to environmental damage, eligibility criteria and revenue allocation mechanisms are not clearly defined (for example in Egypt or Algeria).

In addition to institutional weaknesses, the managerial capability, technical, economic and administrative expertise available in developing countries are also inadequate to properly assess, quantify and prioritize environmental costs and benefits. Comprehensive environmental policy and clearly defined environmental priorities and strategies are typically missing. Consequently, the use of EFs is often based on ad hoc decisions, emergencies, or political priorities. Although EFs may function as catalysts to mobilize private and enterprise resources, without significantly increasing the level of environmental charges the role of these financing mechanisms remains marginal.

Summary of Pollution Abatement Financing in Developing Countries

- The evolving environmental policy and regulatory framework is inadequate in developing countries to induce substantial

levels of private pollution abatement investments. Dominantly CAC policy approaches are supplemented with MBIs, but monitoring capabilities and the enforcement of regulations are typically weak.

- Due to traditions, social and political considerations, cost-recovery in public environmental service provision is typically low. User charges are not high enough to encourage industrial pre-treatment or waste-minimization measures, further increasing the demand for public services. Municipal and national budgets are the main sources of funding. Due to the limited availability of these funds, however, the quality and coverage of these services are low. Public environmental services may be financed through special lending institutions, such as municipal development funds. Their sustainability and success depends on the financial viability of environmental service sector.
- Due to underdeveloped and dysfunctional financial and capital markets, the private sector has limited access to financing resources. Therefore, directed credit has been extended in several countries to finance priority investments. Directed lending for pollution abatement investments is typically channelled through

financial institutions responsible for directed industrial lending. Private pollution abatement financing is supported by various types of subsidies such as grants, tax incentives and soft loans to compensate for the lack of strong enforcement of regulations.

- Subsidies are sometimes channelled through environmental funds that have

been established to provide a relatively steady flow of resources for pollution abatement. The reliance of EFs on budget allocations and external funding is largely due to the limited amount of revenues raised by environmental charges. Without clear spending priorities and adequate institutional capabilities to evaluate expenditure alternatives, EF resource allocation decisions are frequently suboptimal.

5 The Role of External Finance

Economic Policies, Environmental Priorities and External Finance

Donor assistance has gradually shifted from addressing problems to aiming at complex policies that support sustainable development. Environmental considerations and policy implications have become integral part of macroeconomic stabilization, structural adjustment, and sectoral development programs. Most stabilization and adjustment programs have generated substantial environmental benefits, however, additional external assistance was sometimes needed to mitigate potential environmentally harmful effects due to unaddressed market failures (Munasinghe and Cruz, 1994). Most donor agencies have established mechanisms in their project preparation processes specifically aimed at reducing potentially negative environmental impacts using environmental guidelines and impact assessments. Additionally, sector development programs have frequently been supplemented by environmental components.

External funds in the form of grants, soft loans, commercial loans or equity investments may supplement domestic resources available for pollution abatement financing. These are exogenous factors, however, that cannot compensate for the lack of a comprehensive environmental financing system based primarily on domestic resources. Grants and loans from bilateral and multilateral organizations may serve as catalysts to establish domestic environmental financing mechanisms and to attract additional funding from commercial sources.

Before substantial environmental investments are undertaken, a proper framework for comprehensive environmental policy needs to be established and financing priorities determined. Without this approach, investments may be directed suboptimally (see Box 21.). Integrated environmental management and coordinating mechanisms should be developed by strengthening institutional capabilities. In order to set clear and cost-effective environmental priorities and financing mechanisms, technical assistance is often needed to (i) contribute to the improvement of environmental management systems, regulatory framework, and institutional capabilities (including monitoring and enforcement capabilities and cost-recovery mechanisms); (ii) support environmental education, training and research; and (iii) facilitate information dissemination that promote pollution prevention and the application of cleaner technologies. Donors may assist in the preparation of national environmental strategies, reviews and action plans that also serve as guides for investment assistance.

Investment assistance in pollution abatement should promote sustainable development. Traditional emphasis on end-of-pipe control has, therefore, been supplemented by greater reliance on the application of technologies, processes and management practices that improve the efficiency of environmental resource use and reduce the damage caused by pollution. Less developed countries (LDCs) generally lack financial, technical, institutional and human capabilities to initiate significant technological change. Donor

assistance, therefore, may facilitate the transfer of cleaner technologies¹ to LDCs. The feasibility of the transfer of technology depends on (i) the adoptive capabilities of the recipient country; and (ii) the extent of market failures in the recipient country.

Recipient countries may not be able to adopt new technologies efficiently if, for example, human capital constraints the effective operation, management and service of the technology, or there is a lack of capability to integrate new technology to other areas of the economy. The application of cleaner technology is effective if it contributes to the improvement of environmental quality at the least cost. Cost-effectiveness requires the combination of end-of-pipe control and the application of cleaner technology approaches. Market failures may also constrain investments in pollution abatement and the diffusion of cleaner technologies in LDCs:

- When environmental regulations and enforcement capabilities are non-existent or weak, the social costs of pollution are not built in the cost of production, and investors face no incentives to pay a premium for clean technologies;
- When protectionist trade policies support domestic industries, the import of cleaner technologies is discouraged;
- When the public sector is dominant in the economy, enterprises are not motivated to improve performance;
- When financial markets are underdeveloped or dysfunctional, access to credit is severely limited, frequently rationed and also very costly;
- When the dissemination of information carries high transaction costs, investors are not able to make optimal decisions.

Donors frequently support the correction of these market failures through assistance with macro-economic restructuring and sector development programs. Additionally, policy makers in LDCs may decide to use temporary subsidies in order to accelerate environmental investments. Such subsidies, however, (i) should not crowd out commercially viable

investments at market terms; (ii) should not create a bias towards certain types of pollution control investments; (iii) should be supplemented with measures to correct market failures, and strengthen environmental management; and (iv) should be gradually phased out.

Financial Intermediary Loans and the Experience of the World Bank

In order to avoid large inefficiencies of direct lending due to the large number of final borrowers and small amounts of individual loans, World Bank funds have been frequently channelled through financial intermediaries (FIs). FIs not only operate as mere executive agencies of the Bank but, strengthened by technical assistance, they also serve as development financing institutions (DFIs) that can play a catalytic role in domestic development and domestic resource mobilization. Their objectives frequently include a mix of commercial and development goals. When DFIs are expected to correct not only financial sector failures but also market, administrative, or regulatory failures, directed credit and interest rate subsidies are frequently used. The goal of financial intermediary loans (FILs) is to supplement domestic investment resources without crowding out domestic financing credit mechanisms or undermining the efficiency of domestic financial markets.

Typically, pollution abatement FILs simultaneously attempt to correct the failures of the financial sector and the failure and inadequacy of the environmental management system. However, when serious macroeconomic, real sector or financial sector distortions exist, FILs are not likely to succeed unless these distortions are removed. When, for example, high inflation rates prevail, long-term borrowing is crowded out, and when governments directly allocate credit, FILs are likely to fail in creating a market-based credit mechanism. Therefore, FILs should not be extended under severe macroeconomic and sectoral instability and should be preceded by and coordinated with complex macroeconomic, real sector and financial sector reforms. Market failures and the inadequacy of environmental management are

Box 21

The World Bank's Experience with Industrial Pollution Control Financing from the 1980s in Brazil

Several Bank projects have been designed to channel resources through FIs for industrial pollution abatement investments in Brazil. The objectives of Bank projects have been to (i) provide financial sources for pollution control investments; and (ii) strengthen the environmental management system. Basic environmental regulations, standards, environmental institutions and permit systems had been put in place before lending started. However, monitoring and enforcement mechanisms operated inefficiently. As a result, private sources and the banking system played a marginal role in environmental financing, and industrial pollution control investments relied heavily on grants from the budget.

The early industrial pollution control projects did not attempt to address environmental problems in a comprehensive way and, as a result, the lack of comprehensive environmental strategy and priorities led to suboptimal revenue allocation. The Sao Paulo Industrial Pollution Control Project, for example, successfully reduced industrial dust emissions, however, the city's ambient dust levels didn't improve due to the dominant role of mobile pollution sources (World Bank, 1987). Recognizing the need to set priorities and base lending on well defined environmental policy, the Brazil National Industrial Pollution Control Project (World Bank, 1992a) made the existence of Bank-approved environmental strategies as a condition of credit eligibility.

The success of industrial pollution abatement credit programs also strongly depended on the environmental management capabilities and the enforcement of environmental regulations. Inadequate enforcement was one of the main reasons why the credit lines for pollution control investments remained under-utilized during the first Sao Paulo project (World Bank, 1989). Improved monitoring and enforcement also reduced the need for subsidies extended through lower-than-market interest rates. While subsidized interest rates were offered during the first two industrial pollution control projects in Brazil (World Bank, 1980 and 1987), the third project (World Bank, 1992a) has eliminated the subsidies by matching subloan interest rates with longterm market rates.

Bank projects considerably strengthened the environmental assessment capabilities of the financial intermediary (BADESP), creating a special expertise in environmental lending, and BADESP gradually took over most project evaluation functions from the environmental protection bodies.

usually addressed by directed credit for pollution abatement investments, frequently at concessional credit terms. The subsidies provided this way supplement private resources committed for pollution abatement that are insufficient to achieve socially desired environmental quality objectives. Subsidies, however, are suboptimal environmental policy instruments, therefore, with the improvement of the environmental management system that increases private abatement measures, subsidy programs should be gradually phased out.

Multilateral and bilateral donor agencies are rarely ready to soften their lending terms to provide subsidies for their borrowers, and government contributions to the capitalization of DFIs have been frequently encouraged to soften lending conditions for final borrowers without jeopardizing the financial viability of DFIs. Donor lending blended with other

sources can achieve the desired financing conditions. As the World Bank's experience with industrial pollution control credit lines showed, subsidies could be gradually eliminated and normal commercial lending could take over subsidized environmental lending as environmental management and the enforcement of environmental regulations were strengthened (see Box 21).

The first World Bank credit lines (World Bank 1975, 1980, 1987) limited assistance to direct pollution control investments. In the first free-standing pollution control project (World Bank, 1975), for example, project selection criteria strictly excluded alternatives to end-of-pipe pollution control investments. In the first Brazilian pollution control project (World Bank, 1980), the identification of alternative pollution abatement solutions was not discouraged, however, project preparation and selection criteria were biased against alterna-

Box 22

Types of Externally Financed Environmental Fund Mechanism

Trust Funds are created by legally allocating financial resources to be used for specific purposes and designated beneficiaries. The assets of trust funds are invested to earn interest and appreciate market value, while the income earned is distributed for the beneficiaries of the fund.

Foundations are similar to trust funds. While trust funds typically operate in countries with common law systems, foundations are mechanisms allowed by civil law. Foundations are legally independent entity under government supervision.

Endowments are grants or gifts provided by multi- or bilateral donors. They can be designated for financing specific projects or areas and can be managed by trust funds or foundations.

Sinking Funds are designed to disburse their principal amount over a specified period of time. Trust funds or foundations may also operate as sinking funds.

Revolving Funds have a steady source of revenues either by continuous replenishment of the assets or by preserving the value of core assets and disbursing only the income earned. Trust funds and foundations are frequently established as revolving funds.

Source: Mikitin, 1995.

tive approaches. The financing of subprojects was limited to the costs that would have been required to achieve required performance by the least-cost direct control option. Although this criterion was aimed at safeguarding against financing (subsidizing) investments not directly associated with pollution control, it led to a time-consuming, bureaucratic project selection process that increased loan processing costs and discriminated against alternative pollution abatement solutions.

Recently, the Bank's approach has shifted from the support of direct pollution control to pollution prevention and alternative solutions of abatement. Most recent projects did not express preference to one type of pollution abatement investment as opposed to others (World Bank, 1992a), or specifically emphasized investments in cleaner technologies, waste recovery, energy conservation, recycling and other "win-win" measures (World Bank 1993a, 1994a, 1994b, 1994c). In these projects, credit is allocated to final borrowers at market (or near-market) rates, however, limited subsidies in the form of grants have been maintained in some cases. In India, for example, grants were allocated for investments in innovative technologies and processes that didn't qualify for commercial financing, but showed potential for widespread use of the proposed pollution abatement or cleaner technology (World Bank 1991b). In other cases (for example, World

Bank 1993a), subsidies were awarded according to estimated social costs saved by pollution abatement but not internalized by polluters due to failures of environmental management.

Due to their cost-recovery capabilities, "win-win" investments with simultaneous financial and environmental benefits are more suitable for investment lending than end-of-pipe control investments that do not generate revenues. However, if this preference is translated to an eligibility criterion that excludes end-of-pipe control investments (for example, World Bank, 1994b), the objective of supporting least-cost solutions to environmental problems may not be met. Such approach could be justified only to correct existing bias in the financing system towards end-of-pipe investments (for example, when other channels exist that are more suited to finance end-of-pipe control investments).

The Experience of Donors with Environmental Funds

Donor contributions capitalized several EFs in developing countries. Although the majority of externally funded EFs tackle nature and biodiversity conservation issues, several EFs were also established with pollution abatement objectives. In Sri Lanka, for example, a revolving pollution abatement fund was established by a contribution from the Gov-

Box 23

Financing Pollution Abatement Projects from Parallel Environmental Funds in China

Revenues generated from pollution charges have represented the major source of pollution control financing in Tianjin municipality. The earmarked charges are typically provided as grants or, since 1986, as soft loans for the installation of pollution control technology. However, the demand for soft loans has been low and repayments sluggish. In practice, loans are frequently converted to grants. Beneficiaries have little incentives to choose the most efficient pollution abatement alternatives and to maintain the positive environmental effects of investments.

In the framework of the Tianjin Urban Development and Environment Project, the Tianjin Municipal Pollution Control Fund (TMPCF) was established in 1992 as an autonomous legal entity capitalized from pollution levies and from IDA credit (40 to 60 percent, respectively). Its board of directors includes representatives of various government agencies, and the day-to-day operations are carried out by permanent staff. The main objective of TMPCF was the creation of a sustainable pollution abatement financing mechanism. Forty percent of the pollution charge expenditures accruing to the municipal environmental fund are transferred to TMPCF, creating a steady flow of revenues.

TMPCF finances investment projects that are financially viable and reduce pollution at existing industrial plants. Loans are extended at market interest rates (similar to rates charged by local banks for similar maturity), however, a small part of resources is designated to be provided as grants (up to 30 percent of project cost) in order to encourage projects that don't generate enough returns, but significantly reduce pollution.

While the domestic EF is essentially a financing instrument of the municipal government, TMPCF is a financial development institute. TMPCF simultaneously attempts to correct the failures of financial sector to provide adequate credit for financially viable investments and to achieve environmental improvements.

Source: World Bank, 1992b.

ernment of the Netherlands in order to support enterprise pollution abatement investments with loans and technical assistance. Similarly, OECD funding and budget allocation capitalized the EF in Thailand. Externally founded EFs encourage the participation of a wide range of interested parties and the public review of EF operations. Externally capitalized EFs are typically established through multi-or bilateral grant contributions or debt-for-nature swaps. EFs can also be created as trust funds (see Box 22.), however, this arrangements are most typical for nature conservation funds. Although many of the externally capitalized pollution abatement EFs have their own designated domestic revenue sources, these sources are generally inadequate, and sustainability of EFs typically depends on further donor contributions.

So far, limited experience and success have been achieved in channelling donor funds through existing EFs in transition economies. Several Bank projects have established EFs

besides existing domestic earmarked financing mechanisms in China (World Bank, 1992b, 1993a, 1994a), and the Russian Federation (World Bank, 1994b). By creating separate legal entities, own professional staff, and project selection procedures, these funds may duplicate already existing ones. The establishment of parallel earmarked financing mechanisms may lead to the proliferation of EFs resulting in inefficient resource use and the disintegration of environmental objectives. Further, differences in the financing conditions (for example, interest rates and loan application mechanism) between the existing EFs and those created by Bank projects may contribute to the segmentation of domestic environmental financing and create inconsistencies in lending terms. In China, for example, Bank-supported funds offer environmental loans at interest rates considerably higher than those offered by the domestic counterpart. Coordination between domestic and Bank-assisted EFs is minimal, however, Bank resources have been supplemented by pollution charge revenues from domestic EFs

Table 8
Expenditures of the Hungarian NEF by Domestic and EC PHARE Sources in 1994 (%)

	Domestic	PHARE
Air pollution control:		
industrial emission control	12.6	
traffic-related emission control	22.6	
household-related emission control	11.8	
reduction of ozone-depleting substances	0.4	31.0
energy saving investments		8.0
transport-related environmentally friendly solutions	21.2	
abatement of air emissions from incineration and hospital waste	0.6	
Waste management:		
waste neutralization	0.9	15.0
waste utilization		15.0
transport-related waste management	7.1	
Water quality protection:		
protection of vulnerable water resources	1.5	31.0
Infrastructure and environmental protection:		
	17.6	
Nature conservation:		
	1.2	
Noise and vibration control:		
	0.4	
Public awareness programs:		
	2.1	
Total:	100.0	100.0

Source: Adopted from REC, 1994

in some cases (for example, World Bank 1992b, 1993a), to cover the cost of subsidies (see Box 23.).

The main reasons why NEFs have appeared to be incompatible with donor lending objectives and procedures originate from the nature of NEFs inherited from the central planning era. Their public financing role dominates over their commercial banking functions. Eligibility criteria for the various types of financing forms (grants or soft loans) are frequently skewed. In China, for example, the forgiveness of loan repayment is standard practice. As a result, NEFs, as quasi-lending operations don't have clear project selection criteria, rigorous operational procedures, appraisal

requirements and prudent financing practices that external donors require in order to channel their resources through a financial intermediary.

Channelling donor resources in the form of grants has shown similar difficulties with harmonizing the financing objectives, resource allocation criteria and procedural requirements of existing EFs and donor organizations. In Bulgaria, for example, a separate structural unit was established within the MOE to manage resources provided by the EC PHARE program. So far, external (PHARE) resources have been channelled successfully through an existing NEF only in Hungary. Channelling donor resources through the

Box 24
The Polish DNS

Creditor countries of Poland (the Paris Club) agreed in 1991 to reduce the country's debt by 50 percent with optional bilateral DNS agreements to cover further 10 percent of the original debt. Such deals were completed with the Governments of Finland (1990), the U.S. (1991), Switzerland (1993), and France (1993), capitalizing the Ecofund from the proceeds (a total of 481 million U.S. dollars).

The Environmental financing criteria of Ecofund represent a mix of pollution abatement and nature conservation objectives:

- Greenhouse gas emission abatement;
- Transboundary air emission abatement;
- Pollution abatement in the Baltic Sea; and
- Biodiversity conservation.

Pollution abatement projects financed from the Ecofund included the conversion of coal to gas in the heating system in Zakopane Valley, a pilot project for the use of geothermal energy in an urban heating system, desulphurization of flue gases in power plants and investments in various waste water treatment facilities along the coast of the Baltic Sea.

Hungarian NEF has resulted in significant improvements in project appraisal, selection, and post-project evaluation procedures in decision making processes, and in the transparency of operations. It has also demonstrated that donor objectives and financing priorities can be harmonized with existing NEF operations (see Table 8.), and that NEFs can restructure their operations and procedures to accommodate donor requirements. Clearly, the flexibility and willingness to adjust NEFs to donor requirements depend on the size of donor contribution. Even in the Hungarian case, however, there are inconsistencies in the lending terms between the domestic and PHARE resource allocation procedures. For example, municipalities can receive straight grant support from the domestic funds of NEF, while PHARE provides interest-free loans to the same beneficiaries.

EFs may offer an administrative framework, expertise and financing for donors who wish to finance small-scale pollution abatement investments without direct involvement in the revenue allocation process. In order to (i) provide a consistent and coherent policy framework; (ii) facilitate improved information flow and use; and (iii) utilize existing

mechanisms for project-level coordination of assistance, an umbrella EF may be an attractive mechanism for pooling donor resources. In Bolivia, for example, the National Fund for the Environment provides a framework for a number of sub-funds that have been set up by donors with various financing and fund management objectives.² Through the sub-funds, each donor's specific requirements can be taken into account, while the umbrella fund provides coordination and ensures the integration of funds into the national environment program.

Debt-for-Nature Swaps - A Special Form of External Finance

Debt-for-Nature Swaps (DNSs) represent a special form of debt conversion programs, as well as a special form of external financing through EFs. DNS programs have dual functions to (i) reduce the debtor country's foreign debt obligations; and (ii) attract capital for environmental investments that otherwise couldn't be funded. In a typical DNS deal, an international environmental agency (usually an NGO) raises funds to buy the debt of a developing country on the secondary market at a deep discount, then exchanges the debt

with the debtor country for a commitment of the country to spend the equivalent amount on nature protection. The funds raised by NGOs are typically capitalized from donations of private parties or of commercial banks. DNS deals have been carried out in numerous Latin American countries (Bolivia, Costa Rica, Ecuador etc.), in Africa (Nigeria, Niger, Zambia) and in Eastern Europe (Poland).

The majority of DNS arrangements involved commercial debts for which well functioning secondary markets exist. Recently, however, official creditors have also started to initiate such programs. In 1990, the Paris Club of official creditors introduced a range of new repayment conditions for lower middle income countries, including the possibility of DNS transactions on a bilateral basis. Such transactions have been announced, for example, between the Swedish and the Tunisian Governments in 1992 and 1993. Canada also initiated a program in 1992 to convert debt owed by Latin American countries into local funds to finance environmental and other sustainable development programs. In the U.S., the Enterprise of Americas Initiative (EAI) opened the way for DNS transactions. Under this initiative, concessional debt owed by Latin American and Caribbean countries is exchanged for new and restructured debt with reduced face value. The principal on the new debt is to be paid in hard currency, however, the interest is payable in local currency, and is deposited in an Environmental Fund. The first debt write-down and DNS arrangements under the EAI programs were carried out in Chile, Bolivia and Jamaica.

DNS transactions, similarly to other externally funded programs, usually target specific programs or areas. Donor organizations often wish to choose "high profile" programs to demonstrate their commitment to environmental protection. Although the majority of DNS deals completed so far, has targeted nature or biodiversity conservation, pollution abatement financing has not been excluded (see Box 24.). Global and transboundary pollution abatement is likely to gain larger role in the objectives of DNS transactions.

DNS transactions are, however, not without problems. In order for such transaction to take place, both debtor and creditor countries have to acknowledge that the debtor's outstanding foreign exchange obligations cannot be serviced. Consequently, DNS deals are appropriate only for those countries, that otherwise would be seeking debt rescheduling or other debt reduction schemes. Furthermore, swapping foreign exchange obligations to local currency outlays doesn't relieve governments of the fiscal burden of debt service, and such deals may increase the country's inflation rate.³ Finally, creditors are not willing to release very large amounts of their debt holdings at deep discount rates, and the amounts involved in typical DNS deals have been rather small: the average face value has been around \$6 million (World Bank, 1993-94).

Global and International Pollution Issues and Donor Coordination

Although most pollution problems are local in nature, some have serious transboundary and global effects. The mitigation of transboundary and global environmental problems receives increased donor attention. Priorities assigned to the solution of international and global environmental problems may differ among countries due to (i) different values assigned to the same international and global environmental quality; and (ii) a mismatch between benefits and costs at the national level. Global and international environmental problems, however, have to be solved nationally, at the level where the least-cost solution can be found. Domestic pollution abatement measures that simultaneously contribute to the mitigation of international and global problems produce generally the most environmental benefits. Global intervention may be justified to finance the incremental costs of investments that are needed to mitigate global environmental problems.

Since the same level of global environmental improvement can be achieved by implementing projects with different marginal abatement costs, cost-effectiveness considerations call for the joint implementation of international

obligations and the solution of international and global environmental problems (for example, using carbon offsets). Transition economies and developing countries may benefit from such opportunities. Joint implementation has already been agreed between Norway and both Poland and Mexico (within the GEF framework). Norway will finance a conversion programs from coal to natural gas. According to the U.S. Government's Forest for the Future Initiative, carbon offset agreements will be negotiated between the US and other countries including Russia, Mexico, Guatemala and Indonesia. In another example, the state electricity generating board in the Netherlands has established a non-profit enterprise to invest in forest rehabilitation in Czechoslovakia and several other countries with the purpose of absorbing carbon dioxide (Pearce, 1994).

Donor coordination of various aid programs was initiated decades ago in the form of consultations and roundtable discussions. It has been suggested recently that donors set up "clearing houses" by placing their funds in a jointly managed pools. Although the idea of a "clearing house" is a logical response to the coordination problem, it is not without difficulties. Donors often have strong political motivations when providing support to specific projects or countries. They focus on different sectors, countries or regions. It has been demonstrated (Arnold, 1982), that historical factors such as previous colonial relationships, and foreign policy and foreign trade considerations significantly influence donor orientation. Informal agreements are frequently negotiated between donors and beneficiaries, together with associated political commitments. A "clearing house" of donor funds, therefore, may lead to the loss of individual donor control over the use of funds, and, consequently, may weaken the political support in donor countries leading to the overall reduction of contributions. Also, due to varying donor interests, the scope of assistance provided by a "clearing house" would need to be reduced to areas agreeable to all donors. The greater the range of donors is, the narrower the scope of mutually acceptable priorities and objectives is going to be.

This has been demonstrated during the establishment of the Global Environmental Facility (GEF); after several years of negotiations, participants could agree only on four global environmental objectives (Sjoberg, 1994). Regional "clearing houses" of donor contributions are likely to agree on a more complex set of priorities and strategies than global ones. Altogether, institutionalized donor coordination has limited appeal for donors.

Summary of External Financing Issues

- External financing supplements domestic resources. Environmental considerations are increasingly becoming part of macroeconomic, structural and sectoral aid programs with the aim of achieving environmentally sustainable development.
- External lending for pollution abatement has been frequently channelled through financial intermediaries. Borrower governments have supplemented funds when the softening of the credit terms for final borrowers was considered desirable. Intermediary lending for pollution abatement demonstrated that strengthened environmental management, parallel with pollution control lending could result in improved compliance with environmental regulations, and subsidies could be eliminated over time.
- Donors have established environmental funds in some countries in order to support pollution abatement financing. The existing environmental funds, however, have been frequently unable to meet donor requirements. In order to avoid the proliferation of earmarked lending mechanisms, inconsistencies in lending terms, fragmentation of financing mechanisms and inefficiencies of resource use, it is proposed to establish national umbrella fund mechanisms. These umbrella funds would integrate donor preferences with domestic financing mechanism and environmental policy objectives.

- Debt-for-nature swaps represent a special form of external environmental financing that has been mainly used to solve nature conservation problems. Although the role of global pollution abatement programs is expected to increase in DNS in the future, the volume and applicability of DNS arrangements will remain limited.
- Donor intervention is necessary to solve international and global environmental

problems due to differences among nations in the values assigned to international and global environmental quality and a mismatch between the cost and benefits of global pollution abatement investments at the national level. Although several advantages may come from coordinated donor assistance through "clearing houses", the possibility and scope for such institutional coordination is limited.

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