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# Fiscal Policy for Managing Indonesia's Environment

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Successful implementation of an environmental management strategy that balances regulatory and fiscal instruments will require strong political support and stronger institutions.

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This paper — a product of the Country Operations Division, Country Department V, Asia Regional Office — is part of a larger effort in the World Bank to study appropriate policies to improve environmental management in developing countries. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Boonsri Prasertwaree, room A10-047, extension 82477 (34 pages). October 1991

Indonesia has made substantial progress developing sound environmental management policies, but has concentrated largely on regulatory instruments, making limited use of fiscal policy.

Almed contends that fiscal policy can and should play a major role in improving the quality of Indonesia's environment. But a comprehen-

sive environmental management strategy must be based on a balance between regulatory and fiscal instruments.

Successful implementation of this strategy will require strong political support and continuous efforts to improve the country's institutional framework.

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## SECTION I: INTRODUCTION

### Economic Role of Natural Resources

1. Natural resources play a critical role in Indonesia's development. In addition to crude oil and natural gas derivatives, the country enjoys substantial reserves of coal, tin, nickel, gold and other minerals. The world's richest commercial forest is found here, as well as very diverse fishery resources. Although agricultural diversity is also substantial, rice and tree crops (rubber, palm oil, coconut, etc.) dominate total production, benefitting greatly from the abundant water resources and fertile soil in many areas of the country.

2. The direct contribution of renewable and exhaustible resources to economic development in Indonesia can be approximated by the share of primary producing sectors--agriculture, forestry, fishing and mining--in total value added, exports and employment. As shown in Table 1, nearly 40 percent of GDP is contributed by the direct exploitation and primary processing of natural

Table 1: DIRECT CONTRIBUTION OF PRIMARY PRODUCTION  
(%)

	<u>1983-89</u>		Share of merchandise exports 1989/90	Share of employment 1988
	Share of GDP	Growth rate (p.a.)		
<u>Renewable Resources</u>	<u>21.8</u>	<u>3.7</u>	<u>22.1</u>	<u>55.6</u>
Agriculture	19.2	3.7	11.3	
- Food crops	13.5	3.2	0.8	
- Other crops	3.4	5.1	9.8	
- Livestock	2.3	4.8	0.7	
Fishing	1.6	4.9	2.6	
Forestry /a	1.0	1.4	8.2	
<u>Exhaustible Resources /b</u>	<u>17.9</u>	<u>0.6</u>	<u>61.4</u>	<u>0.8</u>
Oil and natural gas	16.7	0.3	56.6	
Other mining	1.2	4.8	4.8	
<u>Total Primary Sectors</u>	<u>39.7</u>	<u>2.3</u>	<u>83.5</u>	<u>56.4</u>

/a Logs, sawn timber and plywood.

/b Includes crude oil and condensates, natural gas, LNG and LPG, but excludes other oil products.

Source: Central Bureau of Statistics and Bank Indonesia.

resources. The inclusion of further stages of downstream processing will raise this proportion substantially. Despite the recent progress with diversification of exports, the foreign exchange contribution of the primary sectors has remained dominant--representing 84 percent of merchandise export earnings in 1989/90. In terms of employment contribution, an estimated 56 percent of the workforce was engaged in the primary sectors as of 1988.

3. Indonesia has a long-standing commitment to the basic concepts of sound environmental management, and a number of corrective steps have already been taken to reduce environmental degradation and promote a more sustainable pattern of development. Nevertheless, an important policy agenda for the appropriate management of the environment remains to be developed or implemented. Overall, the focus of environmental management has been on regulatory instruments. In many areas, appropriate regulatory policies have been formulated, although effective implementation in some instances remains to be accomplished. In a few other areas, further regulatory policies are necessary. The use of fiscal policy has been limited.

#### Objectives and Scope of the Paper

4. The objective of this paper is to examine the role of fiscal policy in the management of Indonesia's environment. The aim is to develop a framework that will allow an examination of possible fiscal instruments (taxes, subsidies, public expenditure) and their relevance to Indonesia's context. It is important to note that fiscal policy is one possible area of policy intervention. Regulatory policies would also continue to play a major role. A comprehensive environmental management strategy will need to be based on a balanced combination of regulatory and fiscal policy instruments. Furthermore, a critical element underlying the successful implementation of this strategy will be the availability of an appropriate institutional mechanism.

5. The paper is organized as follows. Following this introductory section, an overview of Indonesia's key environmental issues is provided in Section II. In Section III, the framework for fiscal policy instruments is reviewed briefly. In Section IV, the Indonesian Government's progress on environmental management policies is examined briefly to provide the background for the discussion of possible fiscal policy options in Section V. Finally, Summary and Conclusions are provided in Section VI.

SECTION II: OVERVIEW OF INDONESIA'S KEY ENVIRONMENTAL ISSUES 1/

Economic Development and Environment

6. Indonesia's environmental pressures are closely linked to the key development challenges that are faced by the nation. Despite very impressive growth performance since the 1970s and substantial progress in reducing poverty, Indonesia, at \$500 per capita income, remains a low income country, with some 30 million people still remaining below the poverty line. At the same time, an estimated 2.3 million new workers are entering the labor force annually in the 1990s. Consequently, poverty alleviation and employment generation remain among Indonesia's most pressing development challenges.

7. These development challenges have major implications for environmental management. One reason is the spatial pattern of Indonesia's development. Of the population of 179 million, about 62 percent are located in the inner islands of Java, Madura, Bali and Lombok, which together account for only about 8 percent of Indonesia's land. Population densities in Java are among the highest in the world. Yet Java's population continues to grow at about 1.8 percent per annum. There is very little scope to absorb additional labor in Java's agriculture. Manufacturing must necessarily provide the momentum for growth of output and employment in Java and other land-scarce inner islands. The threat to environment arises primarily from the growing population, industrial development, and the resulting pressures on land and water resources. Java's cities, for example, are expected to double in size between 1980 and 2000. Already, increasing population densities along Java's north coast are straining the capacity of coastal ecosystems to deal with municipal waste and industrial pollution, and shortages of clean water threaten both human health and industrial development. Another critical environmental concern in Java is the soil erosion resulting from inappropriate watershed management. In Java, virtually all the high-quality arable land is already under cultivation. The only land available for further agricultural expansion is the often erodible, low-yielding upland areas of upper watershed catchments. The erosion problems result from inappropriate cropping patterns in these upper watersheds.

8. The development process has also produced environmental pressures in the outer islands. These outer islands are the repository of most of Indonesia's forest and land resources. They account for close to 60 percent of all forested area in Southeast Asia, and more than 98 percent of all forests in Indonesia. These closed canopy forests are under increasing pressure as a result of population growth and economic development. In the decade between 1973 and 1983, dryland agriculture expanded at 1.8 percent per annum in Java, 3.7 percent in Sumatra, 4.6 percent in Kalimantan and 5.6 percent in Sulawesi. Since 1980, Government-sponsored programs in the outer islands have put nearly 2 million hectares in production and there has been a rapid growth in the exploitation of timber and other forest products. These factors have led to a sharp increase in the rate of deforestation and an uneven pattern of land use. Deforestation rate for national forests is estimated to have been about 1.3 million/ha (1.2 percent) per annum over the

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1/ The discussion of this section draws heavily from World Bank (1990a).

1982-90 period. The deforestation problem is further accentuated by the inefficient and unsustainable pattern of forest resource exploitation induced by the current incentive system.

### Land Management

9. There are two aspects of the land management problem as related to the environment: (a) inefficient, unsustainable land use in the outer islands; and (b) soil erosion in Java's upper watersheds.

10. Land Management Problems in the Outer Islands. The demand for land in the outer islands has been growing at an increasing pace in response to a relatively high natural rate of growth of population, migration and government-supported development projects. On the other hand, the availability of land has posed a serious problem. The main difficulties are: (a) prevalence of traditional land laws have precluded the emergence of a well-functioning land market; (b) government policies, which regard land as a national asset to be used for public benefit, discourage the payment of compensation for land intended for smallholder development; (c) the classification of land under forestry is unduly restrictive and inefficient, creating major difficulties for land procurement for other, more efficient uses; and (d) traditional shifting cultivators also face potential difficulties as government policies (The Basic Forestry Law) recognizes the right of local people to harvest forest products other than timber, but it does not allow local smallholders to log or to cultivate Forestry Department land. The implications of these policies have been: first, the lack of a well-functioning land market has resulted in encroachment on unclaimed forest lands; second, smallholders have little incentive in perennial crops or soil conservation measures; finally, local smallholders have only limited incentive to protect the forest or to invest in stable production systems. The end result has been inefficient and unsustainable deforestation, and loss of soil productivity.

11. The Problem of Soil Erosion in Java. In Indonesia, 36 watershed areas totalling 10.4 million ha are classified as critical lands. Most watersheds in Java are potentially subject to serious erosion, but "critical" areas are thought to cover about 1.9 million ha and include about 12 million people. Erosion rates are high in Java--about 6-12 tons/ha/year on volcanic soils and about 20-60 tons/ha/year on limestone soils.<sup>2/</sup> This compares with about 0.7 tons of soil/ha/year in the United States (World Bank, 1990a). These high rates are due mainly to the high levels and intensity of tropical rainfall, but they are exacerbated by the loss of ground cover in the hills. The latter problem is caused by inappropriate cropping patterns and absence of soil conservation measures.

12. Two types of costs are incurred from soil erosion: on-site losses in agricultural productivity; and off-site costs in the form of siltation of irrigation channels, reservoirs and ports, flooding in low-lying areas, damage

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<sup>2/</sup> It should, however, be noted that high erosion rates under tropical conditions are usually partially offset by higher rates of soil formation.

to coastal fisheries, disruptions to urban and industrial water supplies and increased damage due to fertilizer and pesticide runoffs. Costs of soil erosion on Java are estimated at about \$400 million per year (Magrath and Arens, 1989). Of this, nearly 80 percent are due to on-site costs such as the siltation of irrigation systems and the loss of reservoir capacity.

13. A number of studies demonstrate the potential for reducing soil loss with improved farm technologies (Roche, 1986; Saragih, 1986). Javanese farmers are quick to adopt new farming systems, provided incentives are appropriate. The main constraint to adopting recommended upland farming practices is their cost (Gauchon, 1976; Bersten and Sinega, 1986; Tampubolon and Saragih, 1986). Apart from research programs to develop lower cost technologies for upland farming, efforts are also needed to improve the returns to upland farming.

### Forestry Management

14. In 1950, the area under forest in Indonesia was reported to be about 144 million ha. In 1990, the forest base was estimated at 109 million ha (see Table 2). Of the 1990 forest base, 62.2 million ha were considered to have management potential, consisting of 40.8 million ha of mixed hardwood production forests, 2.1 million ha of tidal forests and 19.3 million ha of conversion and unclassified forests. Of the total base of production forests, some 30.4 million ha have not yet been logged.

Table 2: AREA AND FUNCTIONAL CLASSIFICATION OF FOREST, 1950-90  
(million hectares)

	1950	1990
Conservation forest	18.8	14.6
Protection forest	30.3	25.2
Production forest	64.4	46.1
Conversion forest	30.5/a	18.7
Unclassified	n.a.	4.0
<u>Total</u>	<u>144.0</u>	<u>108.6</u>

/a Includes unclassified.

Source: GOI/FAO (1990).

15. As noted, deforestation at the rate of 1.2 percent per annum has happened in recent years, which is significantly more rapid than the long-term trend of 0.7 percent (1950-90). Even with some improvement over the recent deforestation rate, about one-fourth of the natural forest cover remaining in 1990 could be lost by the year 2030, most of it accounted for by loss of conversion forests and production forests (GOI/FAO, 1990). Accordingly, the annual allowable cut from natural forest is expected to fall from some 34

million cubic meters at present to some 21 million cubic meters by the year 2030.

16. Although some deforestation is inevitable and is consistent with the efficient utilization of forest resources, deforestation on a scale as rapid as in the recent years could jeopardize the longer-term availability of forest resources. Moreover, the present rate of deforestation leads to land degradation, which reduces the productivity of farmers and disrupts water supplies. Deforestation also has a number of negative consequences of national and international concern. Large-scale clearing for agriculture provides smoke and carbon dioxide which contribute to global warming; and forest clearing threatens biological diversity and endangered species.

17. There are also serious inefficiencies in logging practices. Management of forest concessions is largely in the hands of private concessionaires. Recent surveys show that up to 40 percent of standing stock is damaged in logging operations and, where areas are relogged before the 35 year logging cycle elapses, the damage is higher (GOI/FAO, 1990). As valuable species regenerate slowly and only under specific conditions, selective logging also tends to preserve more robust but less valuable species. Since logged-over areas have greatly reduced value, many concessionaires do little to protect their holdings from encroachment and fire once they are logged.

18. The GOI/FAO study presents evidence which suggests that deforestation has a strong positive correlation with population density, and negative correlation with agricultural productivity and growth of real income. So, policies for improving the income prospects of the rural poor in the Outer Islands will play an important role in reducing deforestation. However, in addition to deforestation resulting from encroachment upon forest land, other factors contributing to the inefficient and unsustainable exploitation of forestry resources include: weak incentives for concessionaires to manage their holding sustainably; low capture of rent by the Government through taxes, thereby causing excessive forest resource exploitation; inadequate capacity to implement regulations (World Bank, 1990a; Pearce, et al. 1990, Gillis, 1988).

#### Water Resource Management

19. Water management issues are most intense on Java, with problems concerning both water quantity and quality. The discussion here concentrates on the quantity issue; the quality issue is considered later in the general context of the pollution problem. Although Java is well endowed with rainfall, most of the rivers are less than 50 km long, and very shallow catchments combined with deforestation have increased the variability in runoff and caused water shortages downstream, particularly in dry years. Under the circumstances, the allocation of surface water and groundwater for agriculture, municipal and industrial use is an issue of growing importance.

20. Java has total surface water flows of about 170 billion cubic meters ( $Bm^3$ ) annually, but firm water flows are only about 78  $Bm^3$  or 42 percent (IBRF, 1990a). Irrigated agriculture is the heaviest user of surface water, requiring about 60  $Bm^3$  annually. There are serious concerns regarding the

efficiency of water use for irrigation. Municipal water supply is low, at about 2.25 Bm<sup>3</sup>. Despite this relatively low supply, however, urban and industrial pollution are reducing the quality of raw water supply and competition for water in the dry season is already intense. Urban and industrial water use are expected to grow at high rates, reflecting rapid urban and industrial growth and current low levels of piped municipal water supply. Unaccounted for water accounts for about 45 percent of municipal water and efficiency improvements and better cost recovery are required if future supply targets are to be met.

21. Groundwater extraction is about 8.7 Bm<sup>3</sup>. Because groundwater is relatively safe and convenient, it supplies about 60 percent of water for rural domestic use and is the major source of water in cities that have polluted surface waters. In Jakarta, private groundwater abstraction provides about four times as much water as from municipal supply, and it provides 65 percent of the water for industry.

22. The growing demand for water suggests an emerging problem. Future water requirements in the year 2010 are projected at about 88 Bm<sup>3</sup>--a shortage of 10 Bm<sup>3</sup>. A large part of this shortage could be eliminated by ensuring the efficiency of water use, especially in irrigation. The cost to the Government for supplying irrigation water on farms in Java is estimated at about \$110 per ha/year (IBRD, 1990a). As against this, irrigation water is provided virtually free of cost.<sup>3/</sup> Appropriate charges for groundwater are even more important than those for surface water, as groundwater is only a partially renewable resource. At the present time, different institutions are responsible for irrigation, municipal water supply and groundwater use. This hampers planning and leads to resource conflicts. At the river basin and regional level, water resource planning, management and operations could also be improved to better take into account multisectoral needs and environmental concerns.

### Pollution Management

23. In Java, water pollution poses an immediate threat to human welfare and industrial growth. This problem is intensified by water shortages in the dry season, which prevents wastes from being flushed away from urban centers. The most excessive pollutant in Indonesian rivers is from human waste. Due to high levels of human and industrial waste, eight major rivers on Java's north coast are regarded as significantly or seriously polluted.

24. Apart from health hazards, severe water pollution has caused industries in areas such as Surabaya to close in dry years because of usable raw water shortage. Costs are also incurred from loss in fishing and aquaculture, and damage suffered by mangrove and fragile coastal areas.

25. Although industrial pollution is less pervasive than pollution from human waste, it is already a major factor in the overall pollution level on Java's north coast. Industrial pollution, particularly in the form of toxic substances, can also have far more serious consequences than human wastes, as

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<sup>3/</sup> An irrigation service fee has recently been initiated on a pilot basis.

these substances become concentrated in the food chain and cannot be removed from water by conventional water treatment processes. Monitoring in the Tangerang Industrial Zone, for example, found serious pollution at all ten monitoring stations, and excess levels of chromium, cadmium, mercury and selenium in different locations (World Bank, 1990a).

26. The environmental consequences of energy production, consumption and distribution depend critically on the mix of energy resources employed. The large share of oil in total energy has led to the pollution of delicate estuarine areas (in Riau and South Sumatra) and mangrove swamps (Cilacap in Central Java) through spillage, blowouts, disposal of brines, venting of hydrogen sulphide, and the disposal of mercury removed from natural gas. In addition, the transportation of oil in tankers is a major source of pollution of the marine environment, especially as a result of the heavy traffic in the Straits of Malacca and the associated need for deballasting, as well as uncontrolled cleaning of tankers, spillage during loading and unloading, and shipping accidents. Further, the use of gasoline and diesel in transportation causes significant air pollution, particularly in Jakarta, Surabaya and Bandung, through emissions of sulphur and nitrogen oxides, carbon monoxide, hydrocarbons and other organic compounds, other metals and sulphates, and emission of odor and noise.

27. While domestic coal consumption is still at very low levels, it is projected that consumption could rise thirty-fold by the year 2000. Experience with mining projects in Indonesia suggest that the environmental impact of exploiting coal reserves are potentially large--loss of usable land, erosion resulting in turbidity and sedimentation, and solid waste generation. Another major source of environmental management problem in the energy sector arises from hydropower projects, and revolves principally around the need to compensate and resettle the population affected by the reservoir construction.

28. Among the factors that have contributed to the pollution problem include: inadequate institutional arrangements for implementing industrial pollution regulations; lack of an incentive framework for limiting pollution; inadequate sanitation facilities; lack of environmental standards and policies for major energy projects; and lack of appropriate project siting and industrial location policies.

### SECTION III: THE FRAMEWORK FOR FISCAL POLICY

#### Introduction

29. Much has been written in the literature about how fiscal policy instruments could contribute to the control of environmental damage. The literature is especially rich on the subject of the role of fiscal policy in the management of pollution (comprehensive text books include: Baumol and Oates, 1988; Tietenberg, 1988; Pearce and Turner, 1990). The focus on the pollution aspects can partially be explained by the amenability of this particular environmental problem to the conventional tools of economic analysis. The pollution problem is a standard example of the problem of externality--a situation whereby the welfare of an individual depends upon both its own actions as well as on the decisions of others, even though the other individuals do not pay any particular attention to the effects of their decision on the first individual. In the case of pollution, the externality is negative, in the sense of having an adverse impact on the individual's welfare.

#### The Rationale for Public Intervention

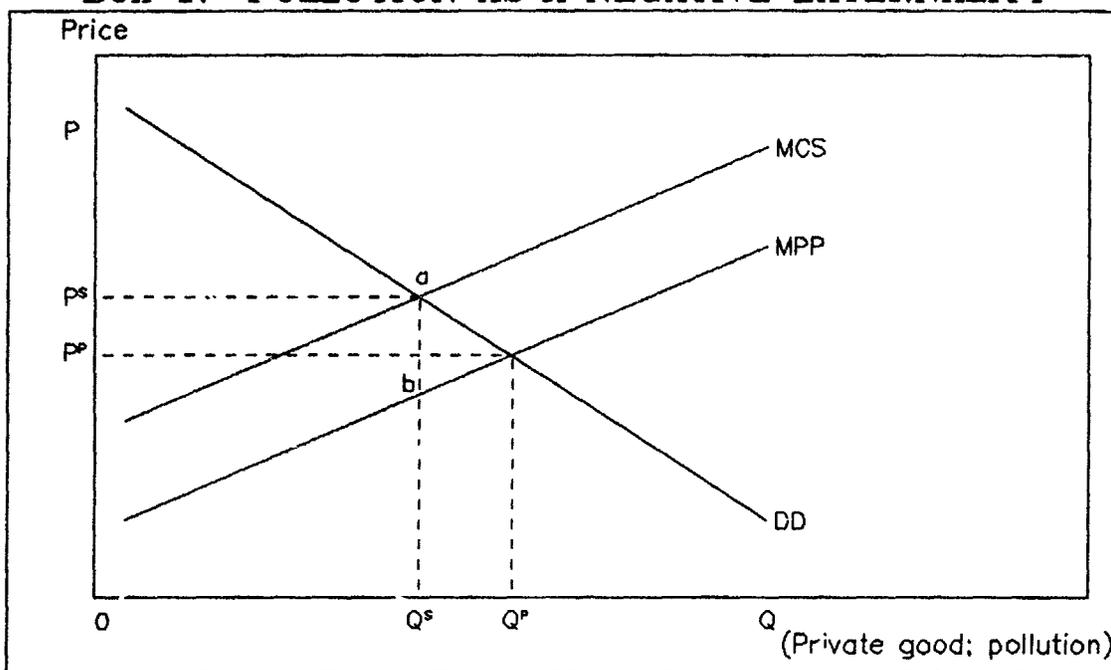
30. A standard example of environmental negative externality is the pollution of air by the emission of smoke from a factory. In a free market environment, the factory will produce too much smoke because it does not take into account the air pollution cost that it imposes on others. In Box 1, the DD line represents the demand curve for the factory's output (steel). The MPP curve represents the supply curve (the private marginal cost) for the factory's production. The factory produces two outputs, steel and pollution--the higher the price of steel, the higher is the production of both outputs. Although the factory does not consider the cost of pollution, society does. The social cost of producing steel is represented by the MCS line. The following problems emerge in a free market situation:

- o there is excessive production of the pollution-intensive good (steel);
- o there is too much pollution;
- o the price of the pollution-intensive good is too low.

Corrective action, therefore, is needed to induce the factory to produce the socially optimal level of pollution.

31. Coase Theorem. The mere existence of an externality need not necessitate public intervention--the market will still function efficiently, provided property rights are well defined. This is the central message of a classic proposition known as the 'Coase Theorem' (Coase, 1960). The Coasian proposition runs as follows. The reason that the market solution results in too much pollution is because the property rights for clean air are not well defined. If the factory were to hold these rights, the victims could always pay the factory to reduce pollution. If the victims were to hold the rights, the factory will buy the right to pollute. In either case, the bargaining process will continue until the optimal level of pollution is reached.

### Box 1: POLLUTION AS A NEGATIVE EXTERNALITY



32. Despite the elegance of this proposition, the practical relevance of the Coasian theorem is rather limited. Two critical assumptions are: (a) that the bargaining process is costless; and (b) there are a small number of parties so that bargaining is feasible. In the real world, both assumptions are likely to be violated in most situations underlying the management of environment. Nevertheless, the Coase theorem suggests the very important role of property rights that will need to be taken into account in designing proper policy interventions.

#### The Role of Fiscal Policy

33. The Pigouvian Tax. If market solution is inefficient, how can the socially optimal solution be attained? The answer was provided long ago by the well-known British economist Arthur Pigou (1932). According to Pigou, given competitive environment, the optimal policy intervention is to impose a tax (or effluent fee) on the factory that is equal to the marginal social damage. In terms of Box 1, the Government needs to impose a fee (tax) per unit of emission equal to "ab", or the gap between the private and the social cost curves.<sup>4/</sup> This tax, known as the Pigouvian tax, will ensure that the factory produces the optimal level of pollution. In other words, the Pigouvian tax will induce the factory to fully internalize the externality.

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<sup>4/</sup> By construction, the gap between MPP and MCS represents the marginal social damage.

34. A Pigouvian subsidy? An alternative fiscal policy instrument is the use of subsidies to induce the factory to produce the socially optimal level of pollution. While in the short-term tax and subsidy will yield the same level of pollution, in the long-term the results could be different. Thus, Baumol and Oates (1988) have shown that in the long-run competitive equilibrium subsidies will induce new firms to enter (as profits are higher with subsidies relative to taxes); hence a larger industry output and a lower price for the pollution-intensive good will result. Thus, even at the theoretical level, taxes are preferable to subsidies as an instrument for pollution control. At the practical level, taxes also provide revenues to the government, while subsidies impose a budgetary burden. This becomes an important element, especially in developing countries, for the design of an effective environmental management program.

35. Practical Difficulties in Implementing the Pigouvian Tax. At the theoretical level, the optimality of the Pigouvian tax breaks down if the underlying assumptions fail to hold. Among the critical assumptions are: the prevalence of competitive markets and well-behaved production functions (technically known as concave production functions). The market structure underlying the polluting industry is particularly important for the design of environmental policy. Under a monopoly or oligopoly situation, the polluting industry may routinely shift the cost of the pollution tax to the consumers, without attempting to reduce the level of pollution to reduce its tax obligation. As a result, the efficacy of the tax program will be severely constrained. The practical difficulties are compounded by the problem of measuring the marginal social damage function. In the absence of a direct estimate of damage, an indirect procedure has been proposed by Baumol and Oates (1971). This approach, known as the pricing and standards approach, begins with a predetermined set of standards and then imposes unit taxes to achieve these standards. Although this procedure may not always result in optimal allocation of resources, it represents the least cost method of achieving the specified standards.

36. As noted, the two main limitations of taxes are: (a) uncertainty concerning the industry's response; and (b) uncertainty regarding the time it will take to achieve the desired level of response. How about setting standards instead? The main attraction of direct controls is that, given effective enforcement, the desired reduction in the level of pollution can be obtained with little uncertainty. The key presumption is the ability to ensure effective enforcement. The cost of administration and the vigor and vigilance of the responsible public agency cannot, however, be taken for granted. Indeed, there is evidence that for the same level of pollution reduction, market-based instruments (taxes, subsidies, tradable permits) are less costly than controls (Tietenberg, 1988). Another problem with controls is the potential for resource misallocation, especially if the quotas are allocated to the firms arbitrarily (Baumol and Oates, 1988).<sup>5/</sup>

37. Combining Taxes with Controls. In designing pollution policies, a combination of taxes and controls are likely to work best. This is especially relevant to a situation where the initial environmental degradation is severe,

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<sup>5/</sup> A trading of pollution quotas will be more efficient.

requiring urgent attention. As Baumol and Oates (1975) note: "Hybrid programs of taxes and controls thus represent a very attractive policy package. The tax component of the program functions to maintain the desired levels of environmental quality under 'normal' conditions at a relatively low cost and also avoids the imposition of uneconomically demanding controls. The controls constitute standby measures to deal with adverse environmental conditions that arise infrequently, but suddenly, and which would result in serious environmental damage with normal levels of waste emissions. Such a mixed program should not involve notably higher administrative costs than a pure tax policy, since much of the monitoring structure used for the latter should also be available for enforcement of controls."

38. Public Investment. Direct government investment could play a major role in both current and prospective environmental programs. The variety of purposes served by these expenditures is enormous. The types of activity financed by the government could be grouped under the following categories: (a) damage prevention facilities (e.g., municipal treatment plants); (b) regenerative activities (e.g., reforestation, slum clearance); and (a) research (e.g., pollution level measurement and control techniques, agricultural production techniques to minimize environmental degradation). As noted by Baumol and Oates (1988), the rationale for public investment are: first, many environmental services (clean air) are "pure public goods", so that a market-based provision is unfeasible; and second, an efficient scale of operation of pollution control facilities may require investment levels that much exceed any single polluter's needs.<sup>6/</sup>

#### Fiscal Policy for Resource Management--Land, Forest and Water

39. The literature on the analysis of resource management distinguishes between a renewable and a non-renewable (exhaustible) resource. A depletable resource is one for which the rate of replenishment is so low that there is little potential for maintaining or augmenting the stock within a reasonable timeframe. A renewable resource, on the other hand, is characterized by a non-negligible rate of replenishment. Good examples are water, forest resources and fisheries. The policy implications of managing a renewable resource differ significantly from a non-renewable resource. The main policy issue for a depletable resource involves the inter-generational allocation of the shrinking resource base while developing a renewable substitute. For a renewable resource, the policy challenge is to ensure the maintenance of an efficient sustainable flow. In the context of this particular paper, the focus is on the sustainable use of three specific renewable resources--forest, water and land resources.

40. Forest Management. A critical environmental concern regarding a renewable resource such as forest is the risk of extinction--a situation that could emerge if the rate of extraction exceeds the rate of regeneration. Related concerns are the optimum rate of use over time and generation. An important question here is whether the market solution is necessarily inefficient, that is whether there is an externality problem. The market

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<sup>6/</sup> This is the traditional lumpiness or indivisibility argument; efficient private provision could entail monopolistic practices.

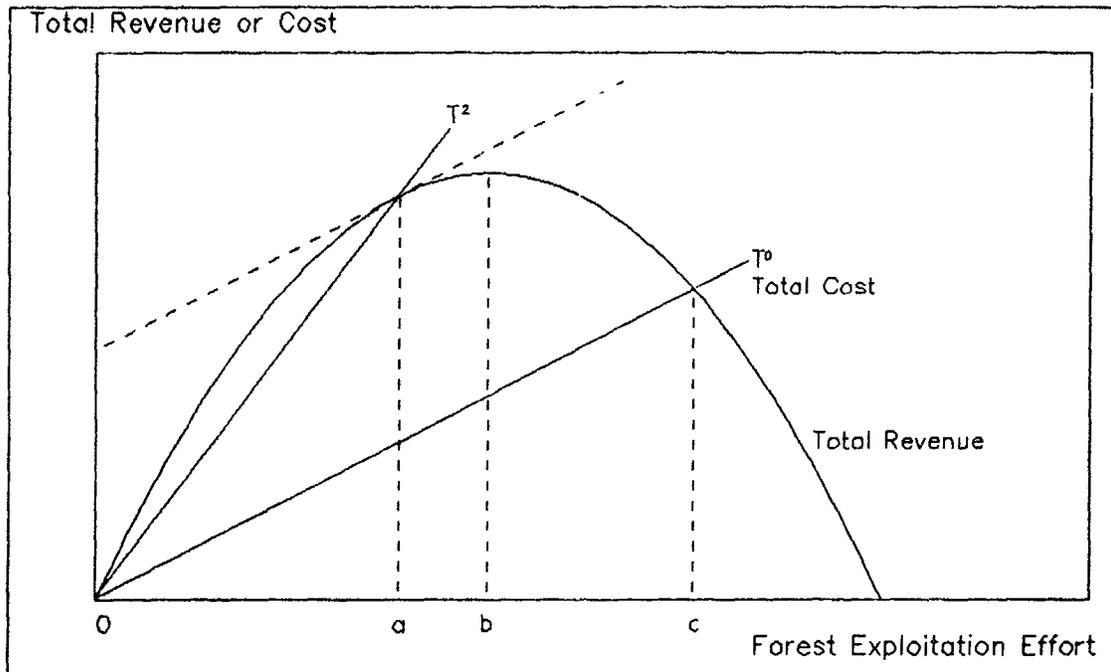
structure and property rights have important bearing on this question. For example, in the case of a monopolist owner, the market will yield the socially optimal rate of forest exploitation (Tietenberg, 1988).

41. The assignment and enforcement of property rights depend upon both informal traditional practices and formal actions taken by the state. Government policies regarding property rights will almost always be controversial, because the assignment of rights excludes non-owners from access to valuable resources. This is a key reason for state ownership of many natural resources. Although the state owns the bulk of the forestry resources, exploitation rights are, however, conveyed to multiple individuals, often without adequate control of logging activity. In effect, therefore, forestry becomes either an open access or a common property resource. The open-access situation (a large number of concessionaires with no effective quantity restraint on output) generates two types of externalities: a contemporaneous externality and an inter-generational externality. The contemporaneous externality, which is borne by the current generation, involves the over-commitment of resources to forest exploitation. New entrants in forest exploitation will continue until profits are driven to zero. As a result, each concessionaire earns a lower rate of return (See Box 2). The intergenerational externality emerges from the reduction in the stock of forest resources due to current over-exploitation. In the case of a common-property situation (i.e., the government gives exploitation rights to a limited number of concessionaires), the solution will still be inefficient and may result in unsustainable exploitation. These concerns can be illustrated with the help of the graph in Box 2.

42. Assuming constant prices, the shape of the total revenue curve is dictated by the forestry regeneration pattern--at low levels of stock, trees regenerate at a fast pace and eventually the stock converges to some maximum level (the ecosystem's carrying capacity). The cost of forest exploitation is a monotonic function of the level of effort. "Ob" level of effort corresponds to the maximum sustainable yield for forest output. "Oa" is the level of effort where returns are maximized--the efficient level of forest exploitation. A monopoly ownership would result in "Oa" level of effort, which is efficient and clearly sustainable. With open access, "Oc" level of effort will result (profits are driven to zero). In a common-property situation, where access is controlled, the solution will be somewhere in between, but still inefficient.

43. How can fiscal policy help? Various interventions are possible, including use of fiscal policy. For example, the Government might determine the optimal level of extraction and license concessionaires accordingly. Strict monitoring will be necessary to ensure this policy's effectiveness. The fiscal policy instrument relevant to this problem is somewhat analogous to the Pigouvian solution to the pollution problem--to impose a tax such that the efficient level of forest exploitation results. In terms of the graph in Box 2, the tax shifts the total cost curve from  $OT^0$  to  $OT^2$ .

### Box 2: FOREST RESOURCE EXPLOITATION



44. Land Management. Under natural conditions, lost topsoil is largely replenished from the subsoils. However, there is a threshold level below which land-use practices could render it non-renewable.<sup>7/</sup> The environmental management problem is to prevent topsoil from becoming a depletable resource through appropriate soil conservation measures. A first question is the nature of the market failure--what is the source of externality and inefficiency? As in the case of forest resource management, the externality and efficiency issues are linked to property rights and the market structure. If land ownership rights are well defined and if competitive markets prevail, land will be used efficiently and in a sustainable manner. If, however, land rights are not well defined so that land becomes a free access resource, there will be inefficient and unsustainable use. Due to the free access problem, there is no incentive to maintain land productivity. Conservation practices will not prevail, and excessive topsoil degradation will result in the loss of land productivity for future generations--this is the nature of the externality problem. A related external cost results from the deposit of sedimentation downstream.

45. An obviously attractive solution to the land degradation problem is to establish land rights and promote the development of an efficient land market. Even if complete privatization is not feasible and common property land prevails, (as would invariably be the case in developing countries where

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<sup>7/</sup> See Anderson and Thampapillai (1990) for a good summary discussion of soil conservation issues in developing countries.

a substantial amount of land will remain under state ownership), land degradation can be reduced by defining some form of property right, e.g., leasing land to a community or group of individuals with well-defined rules of collective ownership (see Ciriacy-Wantrup and Bishop, 1975; Quiggin, 1988).

46. While better-defined land ownership or use rights will certainly help improve soil conservation, this alone may not be adequate in practice. When the source of degradation is the lack of resources to invest in soil conservation, or that the cost of soil conservation is much higher than the benefits, private farmers may not invest adequately to maintain sustainable land use. The poverty of the farmers is a major source of land degradation in developing countries such as Indonesia. One way fiscal policy could help is through government expenditure on research to determine low-cost soil conservation techniques and more effective farming techniques. More fundamentally, a general reexamination of the development strategy focussed on improving the economic condition of the land users might be necessary to ensure sustainable land use over the longer-term.

47. Water Resources. The externality problem in surface water management emerges from the failure to charge appropriate price for its use. Many governments consider water as a "merit" good and therefore provide water free of charge or at a heavily subsidized price. This leads to inefficient and unsustainable consumption. In the case of groundwater extraction, the externality problem arises from the free access characteristic of ground water. No individual takes into account the fact that its extraction reduces the supply for others--both contemporaneously and intergenerationally.

48. Fiscal policy obviously has an important role to play. For both surface and ground water management, appropriate pricing/tax policy is needed to ensure efficient and sustainable consumption. In the case of ground water extraction especially, which is a partially renewable resource, a combination of regulations and water charges/taxes will be important to ensure efficient use.

SECTION IV: GOVERNMENT OF INDONESIA'S ENVIRONMENTAL POLICY PROGRESS

Introduction

49. As noted, environmental degradation in Indonesia is associated with overall economic development. Indonesia's economic activities are strongly dependent on natural resources. The bulk of Indonesia's poor depend on natural resource intensive activities for their sustenance. Economic development, poverty and environment are, therefore, interlinked. Over the past two decades, Indonesia has made remarkable progress in reducing the incidence of poverty (World Bank, 1990b). In the more recent years, significant progress has been made towards reducing the dependence on natural resources. Both factors have contributed to making the environmental challenges more manageable. Continued progress in reducing the incidence of poverty and reducing reliance on natural resources will play a critical role in ensuring the protection of the environment over the longer term.

50. To ensure the consistency of the poverty alleviation objective with natural resource conservation, careful attention to environmental management policies will be of critical importance. This has been well recognized by the Government of Indonesia and, increasingly, efforts are being made to develop appropriate policies and institutional framework for their implementation. The remainder of this section provides a brief review of the various policy initiatives undertaken by the Government to protect the environment. The discussion is organized around two main groups of policy interventions: (a) regulatory policies; and (b) fiscal policies. The section is closed with a discussion of progress made with the institutional framework for the implementation of environmental policies.

Regulatory Policies

51. Regulatory policies could be grouped under the following categories: (a) emissions standards; (b) marketable emissions permits; (c) resource extraction licenses; and (d) property rights. Emission standards specify emission limits on individual sources that emit pollutants. Marketable permits, on the other hand, allow a firm to trade this right to emit. Resource exploitation licenses restrict the level of extraction by limiting the total number of operators and or a total volume of extraction per unit of time. Finally, property rights aim at eliminating externality and environmental degradation resulting from free access to resources.

52. In Indonesia, progress has been most significant in the area of regulatory policies. This progress, however, has concentrated on industrial pollution control, forest management, and the regulation of pesticide use in agriculture. Regulatory policies for controlling pollution resulting from energy, transport and human waste disposal have received little attention. The types of regulatory policies used largely belong to groups (a) and (c) above.

53. Industrial Pollution Control. A number of Laws and Presidential and Ministerial decrees, dating back as early as 1974, have sought to improve and protect the quality of water by imposing regulatory restrictions on the emissions of industrial waste. More recent regulations also require that each

industrial activity, existing and proposed, complete a preliminary report (for proposed activities) or evaluation report (for existing activities). If the industrial activity is deemed to have significant impact, then a full environmental impact assessment is required. Although the legal structure for an industrial environmental control program is largely in place, implementation has been constrained by institutional difficulties. A major challenge is to strengthen the institutional arrangements for pollution monitoring and control at the central level, and to replicate this and provide enforcement powers at the provincial level.

54. A number of important initiatives have been taken recently to this end:

- o a presidential decree has been issued to establish a pollution monitoring and control agency reporting directly to the President;
- o a clean rivers program (Prokasih) has been initiated; this program, involving eight provincial governments, is aimed at reducing water pollution in 24 selected major rivers and will initially focus on industrial pollution;
- o a new regulation has been enacted for the control of water pollution, which gives provincial governors increased authority to control industrial water pollution and sets up a licensing system for industrial effluents; and
- o programs have begun to set up pollution monitoring and control agencies at provincial level in DKI Jakarta, West Java, North Sumatra and West Kalimantan.

55. Forest Management. The main type of regulatory policy used in forest management is the licensing of exploitation rights. Forest concession rights (HPH) are awarded to the private sector concessionaires. At the end of 1989, there were 561 forest concessions covering a total of 60.6 million hectares (GOI/FAO, 1990). By the end of April 1990, the number of concessions had increased to 575. The natural forest management under private forest concessions is regulated on the basis of the Basic Forestry Law (1967). Evaluations have indicated that the regulations prescribed to ensure sound management are largely ignored, leading to unsatisfactory implementation of management principles. Lack of adequate manpower and the large area under concessions have limited the exercise of control. Among other reasons for the situation were the use of contract loggers by the concession; lack of proper and detailed planning of forest management operations; lack of sufficient deterrent sanctions; lack of adequate information on silvicultural systems; and other organizational shortcomings.

56. Pesticide Use Regulations. One area where the Government has made good progress concerns the use of pesticides in agricultural production. Given their toxic ingredients, inappropriate or excessive use of pesticides can be hazardous to human health and the environment. Furthermore, excessive use facilitates the emergence of resistant pests, thereby reducing pesticide effectiveness in increasing farm productivity. For example, 50 to 60 thousand hectares of irrigated rice were destroyed in Indonesia in 1986-87 because of

an outbreak of a pesticide-resistant strain of the brown planthopper. As a result, about 1 million ton of rice was destroyed. Furthermore, 35 percent of the total harvested land had to be converted to a more pest-resistant but less productive rice variety. The result was a 10-15 percent fall in rice yields. The Government reacted promptly by developing an integrated pest management (IPM) program, with assistance from the FAO and the World Bank. The use of 57 pesticide formulations have been banned. Steps have also been taken to strengthen crop protection field staff and develop IPM crop technology packages for rice and other crops.

57. Groundwater Licenses. Some licensing requirements also exist for groundwater extraction. The Directorate of Environmental Ecology in the Ministry of Mines and Energy is responsible for evaluating groundwater resources nationwide, for groundwater mapping, and for issuing licenses for groundwater extraction. However, in view of implementation constraints, many private users circumvent licensing requirements and aquifers are being overdrawn (IBRD, 1990a).

### Fiscal Policies

58. Taxes and Charges. Although there are a number of taxes and charges linked to the use of forest and water resources, a systematic approach towards the use of fiscal policy instruments for environmental management remains to be developed. The number of taxes and charges in the forestry sector are too many and determined on an ad-hoc basis. There is no direct link between these taxes/charges and the objectives of efficient and sustainable use of forest resources. The two main forestry taxes are: royalty and reforestation fee. Timber royalty is levied at the rate of 6 percent of the check price fixed by the Ministry of Finance and is collected for an estimated volume, based on output of processed product assuming 50 percent conversion factor. The reforestation fee is levied on timber cut on concessions, based on scaled volumes. Until June 1989, the reforestation fee was set at \$4 per cubic meter ( $m^3$ ). In July 1989, the fee was raised to \$7/ $m^3$ ; the fee was raised to \$10/ $m^3$  in June 1990. While this increase in fees is a strong positive step, the share of rent collected through the tax system is still estimated to be around 30 percent. Furthermore, there are a number of inefficiencies in the present forestry tax system. A detailed discussion of the present Indonesian forest revenue system and how this can be made more effective is presented later in Section V.

59. The use of water charges for efficient and sustainable exploitation is even more limited. Irrigation, which is the single largest source of water use, remains virtually a free service. Recently, the Government initiated a pilot scheme to test the possibility of implementing an irrigation service fee. The main objective of this fee is to mobilize revenue at the local level, to help finance the operation and maintenance (O&M) of specific irrigation systems. In the case of municipal water supply, the main elements of the tariff structure are: (a) a relatively large cross-subsidy provided to connected households (in the form of subsidized water rates even at relatively high consumption levels), which is financed by a high surcharge levied on commercial and industrial users; and (b) high connection charges, which for certain areas are typically set above the cost of installation. The present tariff system for piped water is both inefficient and inequitable. By

subsidizing water consumption for all households, it encourages excessive use. Furthermore, the subsidy is poorly targeted; it disproportionately benefits the better-off who can afford the connection fee and who consume water more heavily, while the substantial standpipe connection charge prevents the poor from gaining access to subsidized piped water. At the same time, in view of the generally ineffective and low fees for groundwater extraction, the higher industrial and commercial water rates push these users towards private provision of water, which in turn risks inefficient overextraction of groundwater.

60. Subsidies. In Indonesia, subsidies on fertilizer and pesticides have been a major element of the Government's agricultural policy framework. Like the water subsidy, pesticide and fertilizer subsidies have tended to support inefficient use of these inputs in agricultural production. Although the immediate effects of over-reliance on chemical fertilizers are less apparent than those of overuse of pesticides, they have long-term adverse impact on soil fertility. Chemical fertilizers can also lead to water pollution. Agricultural runoff containing high levels of nitrogen and phosphorous can result in eutrophication of lakes and rivers. Although some progress has been made in reducing the fertilizer subsidy, through a series of price increases over 1988-90, it still remains large, especially in relation to economic prices.

61. Recently, however, fiscal policy has been very effective in contributing to the reduction of environmental degradation from the use of pesticides. In addition to the regulatory and technological measures noted in para. 56 above, the Government phased out the pesticide subsidy over a three year period. By 1990 the subsidy was eliminated.

62. Unlike the fertilizer and pesticides subsidies, a pro-environment subsidy is the reforestation subsidy. Since financial returns to plantation forests are low (less than 6 percent), the Government's policy is to provide a subsidy for encouraging reforestation. This subsidy is financed from the reforestation fee. There are, however, a number of problems with the present arrangements. First, there are no provisions for managing the trees after three years. Given the short tenure (20 years) of the lease, the concessionaires have little incentive to plant and maintain high value trees. Consequently, concessionaires have an incentive to plant the cheapest trees, abandoning them after the third year, thereby making a profit on the subsidy. Second, there is a risk that the subsidy might create an undesirable incentive in favor of short-rotation plantations, such as pulpwood, which is already financially viable.

63. Public Expenditure. The lack of an adequate data base precludes a reliable analysis of public outlays on environmental control activities in Indonesia. Fragmented evidence suggests that public expenditures are largely focused on solid waste management and kampung improvement programs (KIPs). Some resources have also been provided for research; however, the amount is believed to be very small. For example, research outlays in the forestry sector have amounted to less than \$2.0 million, one of the lowest levels in the Asia Pacific Region (World Bank, 1990a). Total public expenditure related to the disposal of human waste and slum upgrading (KIPs) have been in the range of \$50 60 million, which is less than 1 percent of total development

expenditure or less than a fifth of the outlay on fertilizer subsidy. This is one priority area where relatively modest levels of public expenditure can have large improvements in the quality of environment as well as in the welfare of the poor. Overall, there is an important policy need to reexamine the public expenditure priorities and programs with a view to enhancing the share of outlays for environmental protection.

#### Institutional Framework for Environmental Management

64. There are three major determinants of the effectiveness of an institutional framework for environmental management: (a) the adequacy of the legal framework; (b) the establishment of appropriate management agencies and interagency coordination; and (c) availability of adequate well-trained staff.

65. Legal Framework. The cornerstone of environmental law in Indonesia was enacted in 1982 (Law 4/1982). This law, entitled "The Basic Provisions for the Management of the Living Environment" serves as an umbrella for more detailed implementing regulations and decrees. Among its provisions are: (i) the role of the State Ministry for Population and Environment (MPE) as the coordinating ministry for the environment was codified; (ii) the provinces were given authority over provincial environmental matters; (iii) an environmental impact analysis was mandated for each project with environmental implications; and (iv) environmental protection was to be guided by new quality standards. The enactment of Law 4/1982 put environmental legislation on a solid legal basis; however, there remains an important unfinished agenda. Draft regulations on water/air and toxic wastes are yet to be finalized. The water quality guidelines have not been implemented so far. In general, the enforcement of regulations remain to be made effective.

66. Appropriate Environment Agencies and Coordination. As noted, the MPE is the key environmental agency in Indonesia. The main functions are to: (a) coordinate the formulation of Government policies on population and the environment; (b) develop regulations for implementation by national and local level institutions; (c) provide technical advice and assistance to line agencies; (d) monitor the environmental performance of ministries and provinces; and (e) coordinate the development of environmental awareness and participation.

67. In addition to the MPE, each ministerial agency is responsible for environmental matters in its particular area or territory. For example, the Ministry of Industry is responsible for environmental affairs in the industrial sector. In the past, line agencies carried out their mandates without explicit reference to the environment. The Presidential Decree 29/1986, however, established a process and an institutional arrangement for carrying out environmental impact assessment (EIA) at the line ministerial level. The most serious difficulty encountered with the EIA process is that, while there are many projects which need to be evaluated, implementation capacity is severely constrained (World Bank, 1990a).

68. Environmental issues at the regional level are handled by the provincial governments. The authority vested in the provincial governor is wide-ranging: (a) to set standards; (b) to license and check new projects; (c) to monitor adherence to environmental laws; and (d) to enforce laws. The

main planning and coordinating agency at the provincial level is the BAPPEDA, which works directly under the governor. A unit dealing with environmental matters has recently been established by presidential decree in each provincial governor's office. This agency, called The Bureau for Population and Environment (BKLH), is a low-level, advisory group which reports to an assistant secretary in the governors' office.

69. A number of important institutional improvements have occurred over the past few years. In November 1988, the Government established the National Land Board, reporting directly to the President. Subsequently, an inter-ministerial committee was formed to review policy issues related to spatial planning. In 1990, a presidential decree was issued to establish a pollution monitoring and control agency reporting directly to the President. The aims of these initiatives are to strengthen environmental policy formulation and improve inter-agency coordination.

70. Nevertheless, inter-agency coordination needs further strengthening. The role of the MPE as the key environmental management agency is limited by its lack of official authority over other ministries, its lack of influence over the budget process which generates line agency priorities, and by its own staffing and financing limitations. A major institutional bottleneck is the lack of appropriate environmental agencies at the provincial level. BAPPEDAS is a general planning agency at the local level, and its capacity to perform environmental-related functions is seriously limited. At the same time, as noted, the provincial counterparts of MPE--the BKLH--have little authority or resources to perform environmental control tasks effectively.

71. Staffing Issues. The lack of adequate trained staff is a serious constraint on the implementation of environmental policies. Although this is a general problem, the specialized skills needed for such activities as the measurement of environmental impact, monitoring of environmental standards, and environmental research are especially scarce. The problem is compounded by weak employment incentives at the government level. This suggests that the minimization of implementation costs needs to be a key factor in the design of a sound environment policy in Indonesia.

SECTION V: FISCAL POLICY OPTIONS FOR INDONESIA'S ENVIRONMENTAL MANAGEMENT

Importance of Fiscal Policy

72. The choice of policy instruments for environmental control has been extensively discussed in the literature. For example, excellent reviews are available in Baumol and Oates (1988) and Hahn (1989). The discussion, however, is mostly focused on developed countries and concerns pollution management. Nevertheless, a number of important findings are of relevance to the design of environmental policies in developing countries. First, market-based instruments (taxes and charges, subsidies, marketable permits, ownership rights) are more cost effective than command and control type instruments (standards, fixed permits). Second, taxes are likely to be more efficient than subsidies. Third, a balanced combination of policy instruments is likely to be more effective than major reliance on the use of any single instrument. Finally, the practical relevance of any single instrument and their effective mix is critically dependent on the administrative capacity to implement policies. The weaker this capacity, the greater is the potential role of market-based instruments. In developing countries, another critical dimension of the policy choice is the budget constraint.

73. The previous section reviewed the progress on environmental policy in Indonesia. The main findings are: (a) attention has mostly been concentrated on command and control type regulatory policies; (b) the use of market based instruments, including fiscal policy, has been limited and unfocused; (c) despite notable progress in setting up institutions, implementation capacity remains severely constrained mainly due to staffing problems; and (d) there is substantial scope for reallocating public expenditure in favor of environmental projects.

74. Needless to say, a balanced combination of taxes/charges, subsidies, public expenditures, ownership rights and standards will work better than full reliance on any single policy instrument. At the present time, however, there is a need for Indonesia to increase its use of fiscal policy instruments. Given serious administrative capacity constraints, greater reliance on fiscal policy instruments is likely to be more cost effective than the extensive pursuit of standards. An added advantage of fiscal policy instruments, such as taxes and charges, is their contribution to government revenues. These revenues will help finance the needed expenditure increases for environmental improvement activities.

Practical Applications of Fiscal Policy Instruments

75. Much of the experience with the use of fiscal policy instruments is focused on pollution control in developed countries. A wide range of emissions charges (both user and emission) has been used in developed countries (Table 3). User charges generally include payments for treating or storing waste, such as garbage. Emission charges generally apply to charges on specific pollutants that are discharged into the environment.

**Table 3: POLLUTION CHARGES IN SELECTED DEVELOPED COUNTRIES**

Charges -> Countries	Water	Air	Solid waste	Hazardous waste	Noise	Products
Australia	X		X			
Denmark				X		
France	X	X	X		X	X
Germany	X	X	X	X	X	X
Hungary	X					
Italy	X		X			
Finland			X			
Japan		X			X	
Netherlands	X	X	X	X	X	X
Norway		X	X			X
Sweden			X			X
Switzerland					X	
United Kingdom	X				X	
United States of America	X	X		X		X

Source: Hahn 1989.

Hahn's review of charge systems in France, Germany, Netherlands and the USA yields the following insights:

- o The major motivation for implementing an emission fee has been to raise revenues. Most revenues are earmarked for the improvement of environmental quality. Usually, the revenues are used to provide subsidies, grants or loans to private firms and to help support treatment plants.
- o The number of charges that have documented effects on polluter behavior is only a small subset of the total number of charges.
- o The main way charges had a positive impact on environmental quality was through the use of charge revenues for abatement activities.
- o There has been a tendency for charges to be raised over time, even after allowing for inflation.

76. The lack of conclusive evidence on the direct effect of charges on polluter behavior needs to be interpreted cautiously. First, data to test the impact of charges on the environment are generally scarce. Second, most charges have not been large enough to induce dramatic changes in firm behavior. And third, charges have generally been designed to promote environmental quality through the redistribution of funds to these activities. The indirect effect of charges on environmental quality has been significant. Apart from these caveats, an earlier study by Baumol and Oates (1975) found a significant direct positive impact of charges on pollution reduction. The

study concluded: "We are thus beginning to accumulate some evidence indicating that effluent fees can in fact be quite effective in reducing levels of industrial waste charges into waterways" (P.119).

### Fiscal Policy Options for Indonesia

77. Forest Management. The forest resource based charges currently levied in Indonesia include: license fees (per hectare), land tax (PBB), reforestation fee (per cubic meter), royalty (per cubic meter), and scaling/grading fee (volume/weight based). Of these, the royalty and reforestation fee are the most important charges. Timber royalty is 6 percent of the estimated market value of logs. The reforestation fee was set at \$4 per cubic meter (m<sup>3</sup>) up to June 1989. The fee was raised to \$7/m<sup>3</sup> in July 1989 and to \$10/m<sup>3</sup> in June 1990. Total revenue collected from forestry charges increased from Rp 117.5 billion in 1980 to Rp 439.0 billion in 1989. With the recent increase in the reforestation fee, the total revenues is expected to double to Rp 800-900 billion. The potential for revenue mobilization is, however, much higher.

78. A number of studies have indicated that there are serious inefficiencies with the present system of forestry charges (FAO, 1990; Pearce, et al. 1990a; Gillis, 1988; Sedjo, 1987). The main problems are:

- o the value of rent-capture from forest concessionaires is very low, estimated at around 30 percent only. As compared with this, rent capture in Sabah, Malaysia is 85-90 percent. The low rent-capture encourages excessive forest exploitation by promoting "rent-seeking" behavior as well as by inducing official support for higher production as a means for increasing revenue.
- o the assessment of timber royalties on the basis of timber removals rather than the stock of merchantable stems in the stand encourages logging operators to remove only the most valuable species and high grade stems. Such "high-grading" often leads to substantial damage to the stand and extensive forest destruction;
- o The lease on forest concessions is for a period of 20 years only. Given that regeneration extends over a 35-year period or longer, concessionaires have little incentive to ensure the long-term regeneration of the logged forest. On the other hand, there is a tendency to log the primary forest within the 20-year period;
- o The practice of basing timber royalty on processed wood encourages under-reporting of the level of logging and provides little incentive to improve mill efficiency. This latter problem occurs because a more efficient conversion adds more to the cost of production and tax obligation than to the value of added output.

79. Fiscal Policy for a More Efficient and Sustainable Exploitation of Forest Resources. A major factor underlying the distortions in the present system of forestry resource exploitation is the relatively short-term nature of forest lease arrangements. Most experts suggest the following alternative lease arrangements:

- o extending the lease period to 35 years or beyond to coincide with the regeneration period;
- o awarding leases on a rollover basis, whereby every five years the contract would be extended subject to satisfactory performance;
- o allowing the marketability of leases to provide incentives for maintaining the value of the lease.

80. A second source of distortion is the tax mechanism which is based on timber removal rather than the stock of merchantable stems in the stand. This could be corrected by shifting the tax base to the stock of merchantable stems in the stand. With this new policy, not only the concessionaire will avoid the logging of medium and smaller stems, because they will be worth more at maturity, it will also have an incentive to harvest defective and oversized stems of commercial but less-valuable species. The present problem of "high grading" of stands will be reduced.

81. There is a major need to increase the value of rent mobilized by the Government. This is necessary not only to raise revenues, but, even more importantly, to reduce excessive exploitation of forest resources resulting from rent-seeking behavior of concessionaires. Indicative estimates suggest that rents from forestry activities are in the range of \$30-40 per m<sup>3</sup>. As against this, the level of taxes collected are about \$7 per m<sup>3</sup>. Even after allowing for the recent increase in reforestation fees and assuming full collection, the surplus rent would remain at \$17-27 per m<sup>3</sup>--or about 60 percent. The aim of policy could be to reduce this rent to 10-15 percent.

82. Forest Subsidies. The Government's strategy for reforestation and associated subsidy arrangements need to be changed. A number of steps can be taken to improve the effectiveness of the reforestation program. First, the increase in the concessionaires tenure to 35 years or longer would help to provide better incentives for longer-term investments. Second the concessionaires could be given technical support for proper species selection and appropriate site selection. The latter could be targeted to wasteland and deforested areas to avoid conversion of natural forest land to plantations. Third, enrichment planting of selectively cut stands and the development of methods of regenerating indigenous hardwoods could be made eligible for reforestation funds. Finally, plantations involving short-duration trees (pulpwood) should not be eligible for subsidy.

83. Fiscal Policy for Pollution Management. The review of developed country experience indicated that a wide variety of pollution charges has been used. Experience also suggests that success was most notable for water pollution charges (Hahn, 1989). In France and Germany, the water effluent charge is imposed on the basis of the expected level of discharge by various industries. In the Netherlands, charges are based on the actual level of discharge for large polluters, while small polluters often pay fixed fees unrelated to actual discharge. In USA, a mixture of actual discharge and rule of thumb has been followed.

84. Given the difficulties of measuring and monitoring discharges for individual polluters, a simplified effluent charge is suggested for Indonesia

at this initial stage. The effluent charge could initially be levied selectively, focussed on the most heavily polluted areas (for example Jakarta, Bandung and Surabaya) and for industrial activities that are believed to be among the heaviest contributors to water pollution. Each firm within the industry would pay a uniform charge. As experience is gained and capacity to measure and monitor emissions is developed, the charge could be extended and linked to the actual level of discharge. At the initial stage, the fee would need to be at a somewhat modest level, but adjustments will need to be made over time.

85. Even if a direct emission reduction does not result from this fee, pollution reduction can still be achieved by using these funds for promoting the use of abatement equipments. The subsidy could be provided in the form of outright grants or as subsidized loans.

86. In view of the limited role at present for a direct effluent charge, fiscal policy can also focus on indirect means--through taxation of inputs and outputs in polluting sectors. An attractive option in this regard is the environmental user charge on energy. The applicability of this tax for the near future, however, is constrained by the need to first readjust the structure of energy prices on efficiency grounds; this itself will entail large increases in the prices of relatively high pollution intensive energy products. The first step, therefore, will be to realign the individual energy prices with reference to their economic values.<sup>8/</sup> As noted, this will automatically result in a more environmentally-sound pattern of energy production and consumption. Nevertheless, the possibility of a user charge on energy for reducing air pollution differentiated according to the "pollutant content" of each energy product, needs to be among the fiscal policy options for Indonesia's environmental protection.

87. Similarly, urban congestion pricing could be applied to reduce traffic densities, improve traffic efficiency and reduce air pollution in major urban centers. The Singapore Area Traffic Licensing Scheme of 1976 is the best known example of successful urban congestion pricing (Jones, 1989). This scheme mandated a license for access to the central business district during peak hours, with exemptions for buses, motorcycles and car pools. The scheme has (a) reduced peak traffic densities; (b) raised revenues for financing of urban services and infrastructure projects; (c) curtailed fuel consumption; and (D) reduced air pollution levels significantly. Such a scheme could be developed for Jakarta in conjunction with improved provision of public transportation.

88. One other fiscal option for reducing pollution in Indonesia is the reduction/elimination of the chemical fertilizer subsidy. Apart from reducing environmental and health hazards, a reduction in the financial subsidy on fertilizer, by say 50 percent, alone would finance almost a threefold increase in the level of public expenditure on human waste management and slum

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<sup>8/</sup> The most recent adjustment of energy prices that were announced in early July 1991 have reduced the extent of distortions in relative energy prices. Nevertheless, there still remains the need for further adjustments.

upgrading. This policy will also be a more cost-effective means of reaching the poor.

89. Fiscal Policy for Land Management. A major factor causing land degradation is the lack of a well established land market. The appropriate definition of property rights, removal of official barriers to land transactions, and a more flexible attitude towards forestry land classification, will all help in encouraging the development of efficient land markets. At the same time, to promote efficient use as well as revenue mobilization, allocation of public land for private use needs to be based on prices that reflect market values. Regarding the reduction of soil erosion, the main way that fiscal policy can contribute is through a reassessment of the Government's expenditure priority in agriculture in favor of activities that will minimize land degradation (Pearce, et. al., 1990b). Since upland farmers face significant costs in adopting soil conservation measures and changes in farming system, they are unlikely to invest in better land management unless there is a perceived economic advantage from this. Furthermore, poorer upland farmers, dependent on low-value crops, may simply be unable to afford high-cost soil conservation measures. A combination of general economic policies and public expenditures, that both increase agricultural productivity and incomes of upland farmers and reduce the economic pressures on farmers to deplete the land and accelerate soil erosion, will be required. The main priorities for public expenditure are:

- o research and extension to support low-cost farm technology for upland farmers;
- o building the physical infrastructure of the uplands, such as rural transport, for integrating post-harvest technology and processing.

90. Fiscal Policy for Water Management. User charges will need to play a major role in ensuring the efficient and sustainable use of water resources. As noted, irrigation water is virtually a free good. Although some progress has recently been made in implementing an irrigation service fee, its application so far has been very limited. Furthermore, the aim of the fee is to cover the cost of O&M; it is not linked to the volume of water used. Thus, while system efficiency will be improved through better maintenance, there may be no affect on the efficiency of water consumption. As a first step, however, the fee needs to be extended to the national level. With the successful implementation of this step, consideration will need to be given to redesigning the fee into a broader, volume-based charge for irrigation water.

91. In the case of domestic water, the main difficulty at present is the distortion of water charges that causes industrial and commercial users to substitute groundwater for piped water. This not only results in inefficient use of water, it also risks unsustainable groundwater extraction. The tax on industrial and commercial consumers is appropriate to mobilize resources needed to expand piped water. But major changes are needed in the tariff policy for residential consumers. The residential subsidy is poorly targeted; it disproportionately benefits the better-off who can afford the high connection charge, set above installation cost in some areas, and who consume water more heavily--the rates are subsidized even at relatively high levels of residential consumption. The intended equity objectives would be better

served by: (a) targeting the residential subsidy at lifeline consumption levels (say, five m<sup>3</sup>/month); (b) reducing the connection charge for the poor to actual cost; (c) allowing installment payments spread over five years for the connection fees to low income households; and (d) eliminating subsidy at higher levels of consumption.

92. Increased reliance on private groundwater extraction is an efficient means of meeting growth in the demand for water where it entails lower economic costs than public piped water and groundwater resources are plentiful. However, tariff policies favoring this source risk inefficient extraction of groundwater--only a partially renewable resource--at unsustainable rates where water is scarce. The latter is indeed the case in some major urban areas, notably in Jakarta where groundwater extraction is believed to be running well beyond sustainable levels. In contrast to the high tariffs on piped water for industrial and commercial use, fees for groundwater extraction are generally very low. In areas of plentiful groundwater resources, low fees sufficient to cover the administrative costs of licensing may be justified. However, as groundwater becomes scarcer, as in many urban areas, extraction fees need to be raised to reflect the increasing cost and scarcity of the resource and to align these fees with tariffs on piped municipal water.

93. The distortion of incentives resulting from the underpricing of groundwater is exacerbated by weaker enforcement of groundwater charges. In principle, licenses are issued for groundwater extraction, the rate of extraction is metered and fees are levied on water use. In practice, however, these are not effectively enforced. Unlicensed drilling and undercollection of fees are common, encouraging wasteful use of the resource. It has been estimated that up to 75 percent of groundwater drilling and extraction are done outside the official licensing and fee system. Accordingly, appropriate adjustments in groundwater charges need to be accompanied by measures to ensure more effective enforcement.

#### Use of Fiscal Revenues: Earmarking

94. A pertinent issue is the use of revenues generated through environment-based taxes and charges. The experience of developed countries suggest that the earmarking of pollution-based revenues for financing pollution abatement equipments is common.<sup>9/</sup> In the case of Indonesia, the reforestation tax is earmarked for reforestation activities. While some earmarking might be justified, it is not necessary or always efficient. Although the experience of developed countries suggest that the main source of environmental improvement has been the financing of pollution reduction activities, it is not necessary that such activities be only financed through earmarked funds. What is important is that the level of subsidy or expenditure that is needed to induce a desirable level of environmental improvement activity should be made available. This is an expenditure priority issue; whether it is financed through pollution/forestry taxes or whether revenues are obtained from other sources is not always a critical

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<sup>9/</sup> This is based on the "polluter pays principle"--that is, the polluter should finance the pollution abatement equipment.

consideration. However, earmarking could become an important consideration if tax/charge compliance is directly linked to the recycling of collected revenues and there is a risk of underfunding of the program.

95. On the other hand, earmarking could result in inefficient resource allocation. For example, the recent increase in the reforestation tax is expected to increase revenues from \$146 million in 1989 to \$350 million in 1991. These resources are too large relative to the level of efficient reforestation activity that could be financed. In view of the many other pressing activities, environment-related or otherwise, that could be financed from the surplus resources, keeping that fund unused would be inefficient. Even worse, the earmarking of funds could promote the financing of inefficient forestry projects in an attempt to exhaust the funds.

#### Implementation Issues

96. A major hindrance to the wider use of environmental taxes and charges is the possibility of a political backlash. The experience of developed countries indicates that the firms had initially opposed the introduction of emission charges (Hahn, 1989). This is a natural response of a private profit maximizer. Strong political support is, therefore, essential for the successful implementation of environmental taxes/charges. A second prerequisite is the improvement of the tax collection system. Availability of information is a major problem; this is compounded by the general problem of staff shortage. Fortunately, the initial staffing requirements of implementing the kinds of charges suggested in this paper are not expected to be overwhelming. For example, the mechanism for collecting forest taxes already exists. Much of the incremental tax revenues will come from the suggested increase in the tax rate, based on the logic of eventually raising rent-capture to 85-90 percent. Of course, there is an important need to improve the administrative efficiency of the present arrangements through better information, planning and enforcement. This, in turn, will require some increases in the number of tax staff. At the same time, there is a need to consolidate forestry revenues with the national budget to ensure proper accounting and appropriate use of these resources. In the case of pollution charges, the initial proposal is to introduce a simple effluent charge, and for a limited number of areas and enterprises. Although the initial tax rate will need to be based on some estimate of the average pollution damage, once this is known, the administration of the tax should be relatively simple. Similarly, the institutional arrangements for municipal water charges are in place; the correction of the present water tariff distortions should not result in an added administrative burden. An extra effort will, however, be needed to implement groundwater charges.

Section VI: SUMMARY AND CONCLUSIONS

97. Natural resources are critical to Indonesia's development. In recognition of the close link between economic development and environment, Indonesia has maintained a long-standing commitment to the basic concepts of sound environmental management. A number of corrective steps have already been taken to reduce environmental degradation and promote a more sustainable pattern of development. Overall, the focus of environmental management has been on regulatory instruments. The use of fiscal policy has been limited.

98. Indonesia's key environmental concerns are: (a) the degradation of land in Java and the outer islands; (b) deforestation in the outer islands; (c) inefficient and unsustainable use of water, especially in Java; and (d) pollution in Java. The Government's policy progress has concentrated on developing regulatory policies for industrial pollution control, forestry exploitation and the appropriate use of pesticides in agricultural production. Although significant progress has been achieved in developing the institutional framework for applying environmental regulations, the implementation capacity is still constrained by the lack of trained staff.

99. Although there are a number of taxes and charges linked to the use of forest and water resources, a systematic approach towards the use of fiscal policy instruments for environmental management does not exist in Indonesia. The number of taxes and charges in the forestry sector are too many and determined on an ad-hoc basis. Despite recent increases in the reforestation fee, rent capture is low (around 30 percent); moreover, there are a number of inefficiencies in the present forestry tax system. The use of water charges for efficient and sustainable water use is even more limited. Irrigation water remains virtually free, while there are significant distortions in municipal water charges. Groundwater use is not regulated properly and is often exploited as a free resource. There is no effluent charge/tax for pollution.

100. Subsidy and expenditure instruments are also largely ineffective or used inadequately. The reforestation subsidy is generally ineffective, while public expenditure for environmental improvement programs is very limited. Fertilizer subsidy, on the contrary, contributes to the degradation of the environment. One positive step, however, has been the elimination of the pesticide subsidy.

101. This paper concludes that fiscal policy can and should play a major role in improving the quality of Indonesia's environment. The rationale for this is: (a) the experience of developed countries suggests that market based instruments (taxes, charges, subsidies, marketable permits, ownership rights) are more cost effective than command and control type instruments (standards, fixed permits); (b) the effectiveness of command and control instruments in Indonesia is limited by the implementation capacity constraint; fiscal instruments are likely to be less constrained by this factor; (c) an added advantage of fiscal instruments, such as taxes and charges, is their contribution to government revenues. These revenues can help finance environmental improvement activities.

102. The main recommendations of this paper are:

(a) Forest Management

- o Extend the lease period for forest concessionaires to 35 years on a rollover basis, whereby every five years the contract would be extended subject to satisfactory performance.
- o Shift the forest tax base from log output to the stock of marketable stems in the stand.
- o Increase the effective tax rate on logging in stages to eventually allow a rent-capture of 85-90 percent.
- o Improve the effectiveness of the reforestation program by: longer-term lease; technical support for proper species selection and appropriate site selection; making enrichment planting of selectively cut stands and the methods of regenerating indigenous hardwoods eligible for reforestation funds; and making plantations involving short-duration trees (pulpwood) ineligible for subsidy.

(b) Pollution Management

- o Institute a simple effluent charge, levied selectively. The initial focus could be on the most heavily polluted areas (Jakarta, Bandung and Surabaya) and for industrial activities that are believed to be among the heaviest contributors to water pollution. Each firm within the industry would pay a uniform charge. As experience is gained and capacity to measure and monitor emissions is developed, the charge could be extended and linked to the actual level of discharge.
- o Even if a direct emission reduction does not happen from this charge, pollution reduction would be achieved using these funds for promoting the use of abatement equipments. The subsidy for this purpose could be in the form of outright grants or subsidized loans.
- o In view of the limited role at present for a direct effluent charge, fiscal policy can also focus on indirect means--through taxation of inputs and outputs in polluting sectors. An attractive option in this regard is the environmental user charge on energy. As a first step, however, the present distortions in energy prices need to be corrected. This, by itself, will contribute to a more environmentally-sound pattern of energy production and consumption. Subsequently, consideration could be given to imposing a user charge on energy, differentiated according to the pollutant content of each energy product.
- o Similarly, urban congestion pricing could be applied to reduce traffic densities, improve traffic efficiency and reduce air pollution in major urban centers.

- o Another fiscal option for reducing pollution is the reduction/elimination of the subsidy on chemical fertilizer.
- o There is an important need to reassess expenditure priorities in favor of environmental improvement projects, such as slum upgrading, human waste management and industrial waste treatments.

(c) Land Management

- o Promote the development of a well-functioning land markets through: appropriate definition of property rights, removal of official barriers to land transactions, and more flexible attitude towards forestry land classification.
- o Ensure that the allocation of public land for private use is based on prices that reflect market values.
- o Reassess public expenditure priorities in agriculture in favor of activities that will help minimize land degradation.
- o Improve soil conservation by supporting and disseminating research on low-cost farm technology for upland farmers, and by building the physical infrastructure of the uplands, such as rural transport, for integrating post-harvest technology and processing.

(d) Water Management

- o Extend the irrigation service fee to the national level. With the successful implementation of this step, consideration will need to be given to redesigning the fee into a broader, volume-based charge for irrigation water.
- o The residential subsidy for piped water, could be targeted at lifeline consumption levels with higher rates charged for higher consumption volumes. A part of the present subsidy could be allocated to support the construction of standpipes in poor residential areas.
- o Raise groundwater fees, in areas of relatively scarce groundwater resources, in line with user charges for municipal water. Improve enforcement of licensing and tariff regulations for groundwater extraction.

103. Although fiscal policy will need to play an important role, this is only one area of policy intervention. A comprehensive environmental management strategy will need to be based on a balanced combination of regulatory and fiscal policy instruments. The successful implementation of this strategy will require strong political support and continuous efforts to improve the institutional framework.

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