WIDER

STUDY GROUP SERIES No. 7

The Environment and Emerging Development Issues

WORLD INSTITUTE FOR DEVELOPMENT ECONOMICS RESEARCH
OF THE UNITED NATIONS UNIVERSITY

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WIDER was established in 1984 and started work in Helsinki in the spring of 1985. The principal purpose of the Institute is to help identify and meet the need for policy-oriented socio-economic research on pressing global economic problems, particularly those impacting most directly on the developing countries. Its work is carried out by staff researchers and visiting scholars in Helsinki and through networks of collaborating institutions and scholars around the world.

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The Environment and Emerging Development Issues

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THE ENVIRONMENT AND EMERGING DEVELOPMENT ISSUES

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PREFACE

This Study Group Report seeks to identify the implications of achieving sustainable development reconciling the needs of socially necessary growth and the preservation of the environment in the developing countries. Today we are particularly concerned with those aspects of the environment, which are especially relevant to the well-being of future generations. In this context it is important to resolve the several questions arising out of pressing development needs in poor countries and the related ecological issues. Accordingly, this Report addresses the choice of appropriate policies, instruments, areas of application, mechanisms and the institutional framework that need to be put in place to facilitate a global environmental compact.

The proposals in this Report derive from the ongoing research programme at WIDER on environment and emerging development issues. The questions sought to be answered in this Report cover a wide range including policies on poverty alleviation, treatment of common property resources, decision making power and responsibilities, procedures for accounting of environmental resources, techniques for the study of environmental implications in project appraisal, and international treaty obligations. The establishment of an international protocol on environmental issues as well as the instruments for ensuring effective monitoring and compliance of agreed stipulations, have also been discussed in some detail. Flowing from all these considerations, the Report attempts to quantify the resource transfer implications of supporting feasible environment-sensitive development in the developing countries, and outlines a set of operational mechanisms for implementing a global environmental compact involving reciprocal obligations between donors and recipients.

Lal Jayawardena
Director

ENVIRONMENT AND DEVELOPMENT -- IMPORTANT POLICY ISSUES

WIDER's programme of research on the environment and emerging development issues has identified a number of specific policy implications.

In all societies the economic value of an environmental resource is higher to the community at large as compared to the individual or a household. Hence policy should always be designed to ensure that individual or household incentives get aligned in a way that facilitates a collectively favoured response.

There are several sources which act as trigger mechanisms for environmental degradation. Among these, the link between population increase and accentuation of rural poverty leading to the erosion of common property resources has important policy implications. Research carried out at WIDER also suggests that certain conventional prescriptions for poverty reduction not only reduce current poverty but also offer protection to the environmental resource base. Poverty eradication, environmental protection and fertility reduction work in tandem under these processes.

Women are the main extractors and users of environmental resources, and as such, are the repositories of detailed knowledge of the ecological processes at work. Hence decisions concerning the management of local common property resources should as far as possible be in the hands of rural women.

Most environmental resources do not have a market value; and their social value will differ from the private value. The valuation problem is further complicated by the fact that there is wide variation in the importance assigned to resource use between countries. In some countries, resources like forests and fisheries will be the most important resources, while in others it may be the atmosphere, and in still others, fresh water and so on. Hence a proper system of valuation and accounting of environmental resources needs to be developed.

In the past, project appraisal techniques did not explicitly provide for environmental concerns. However, it is now possible to use techniques for the valuation of environmental resources as part of the overall project appraisal exercise. Such appraisals should be considered as mandatory for all projects financed by or managed by international organisations.

Solutions to global environmental problems need international cooperation. Costs and benefits of environmental action vary from country to country. Hence international resource transfers are necessary to achieve agreements on effective policies for curbing emissions of greenhouse gases. Such transfers can be financed by a carbon tax or by the distribution of initial emission rights in a system with transferable emission permits. The size and direction of the transfers sought to be effected through these instruments have to be determined through international negotiations. Assuming that the cost of a carbon tax or the purchase price of an emission right will have to be borne by the ultimate users of the fossil fuels, both these instruments will promote the development of new cleaner technologies.

A feasible concept of sustainable development should accommodate both political and ecological concerns. In practice this will involve the achievement of a socially necessary growth rate for developing countries while at the same time supporting environmental protection and improvement in the future. In order to achieve these twin objectives, an estimated additional net capital inflow to the developing countries of US$60 billion in 1990 rising to US$140 billion by the year 2000, will be necessary. The best available operational mechanism for transferring resources to the developing countries is that of the traditional Aid Group. Under this mechanism, the developing country concerned becomes involved in a continuing policy dialogue with its donors, and more specifically with the World Bank and the International Monetary Fund, on the domestic policy reforms that are to be implemented and monitored. Typically this can lead to a negotiated agreement providing for reciprocal obligations on the part of the donors as well as of the recipients, within the framework of a global environmental compact.

THE ENVIRONMENT AND EMERGING DEVELOPMENT ISSUES

1 Introduction

There are a number of directions from which we may approach the subject of concern here. One route, much discussed in the recent literature on sustainable development, looks at matters from what one may call the "operations research" point of view. Stated simply, the idea is to study the empirical links between a number of observable variables reflecting the state of the environmental resource base of production and consumption. Typical inquiries in this line include identifying the impact of different types of technological change on environmental resource use, estimating carrying capacities of varying ecological zones, measuring the effect of population growth on environmental stocks, quantifying the notion of environmental stress, and so forth. It is an appealing and useful direction of inquiry.

But it has a serious limitation. The route for the most part does not study socio-economic processes. Instead it concerns itself with the direct study of a number of variables that are themselves determined by economic interactions. These variables are endogenous, and are therefore in need of explanation. A complementary route to an understanding of the link between the environmental resource base and economic development consists of studying the underlying socio-economic processes driving an economy. The present policy document is based on this latter mode of inquiry. We will present a number of specific policy implications which have emerged from WIDER's programme of research on the environment and emerging development issues. They are quantitative prescriptions, in as much as they identify biases in current modes of operation in most parts of the globe, and in that they point to policy prescriptions of a specific nature. They identify precise areas where policy should be put into effect. They also locate the relevant policy tools. But they are not numerical prescriptions. To obtain the latter one must go to detailed case studies.

In Section 2 we outline what we believe is the general prescription to have emerged from the WIDER programme. Subsequent sections will be instances of it.

2 The General Prescription

The environment is a commodity. Whatever other value a society may impute to an environmental resource, it will typically also impute an economic value to it. Over time this value to a community will change. It may find no such value to begin with; it may acquire a sudden increase in value due to technological change, and so forth. A pervasive problem in all societies is that the economic value to a person or household of an environmental resource differs, and typically falls short of its value to the community as a body collective. This implies that the incentives individuals and households have for protecting the resource base are less than what is collectively found desirable. This is what is meant by an environmental problem, and it leads to a general prescription: *policy should always be designed so as to ensure that individual or household incentives get aligned in a way which elicits from them the collectively-favoured response*.

It is hard to over-emphasize the importance of this, precisely because it leaves open what constitutes the right policy in any given instance. It may take the form of an outright prohibition on resource use in one case, a tax in another, a subsidy on an alternative resource in still another, and so forth. More subtly, it may involve the design of policy not on the resource directly, but on something seemingly different, such as for example increased primary education. Thus in particular, it is possible in many cases that what is in effect an environmental policy is not directed at the environment directly, but at something else entirely. This is possible because of the intricate links that exist between environmental resource use and all the other activities which go to fill our lives. This has been the central organising idea underlying the WIDER project. An understanding of this link is essential if a society is to locate the right environmental policy.

3 Biological Diversity

The supreme importance of biological diversity on human well-being has been much documented in the ecological literature. Among the various processes currently endangering this diversity, the ones most often studied are rapid population growth, increased industrial pollution, and changing patterns of resource use occasioned by rising incomes and urbanisation. The WIDER programme has identified and explained the importance of two further sources of degradation of biological diversity and the environmental resource base, being traceable in turn to (a) a country's macro-economic policy (e.g. overvalued exchange rates, implicit subsidies on deforestation, and export promotion of cattle products) and (b) shifts in property rights (e.g. a move from communal management of local environmental resources, such as grazing and forest lands, to privatisation or government expropriation). The WIDER programme has also tried to codify the way these two sets of sources act as trigger-mechanisms for environmental degradation.

A large number of case studies have shown that local common property resources are collectively managed by rural communities in a number of ways (e.g. through collective decisions, decisions arrived at by village elders, the use of social norms and their concurrent social sanctions, and so on). Common property resources not only offer insurance protection to the rural poor in times of stress, they also are a source of non-wage income to the otherwise assetless. The link between population increase, accentuation of rural poverty, and the erosion of common property resources has been a major theme of the WIDER programme. The studies' main policy implication is that governments should aim to protect and promote the communal nature of the property rights to local environmental resources. Privatisation of rural forest and grazing lands is usually a harbinger of additional misery to the assetless, and it often also endangers the resource base itself. Likewise, government usurpation of common property resources has in a large number of cases been itself a source of degradation.

Whenever policy reforms are contemplated, be it reforms of monetary policies, agriculture policies or any other government policies, their implicit side effects on incentives to use resources should be analysed and evaluated.

Local common property resources will in most cases be efficiently managed by local population.

4 Poverty, Population and the Environment

Two broad motivations for procreation have been much studied by demographers. The first sees children as durable consumption goods, and the second sees them as insurance for old age. The WIDER programme has studied in depth a third motivation, stemming from the fact that in rural communities of poor countries children are also income-generating assets, or in other words, producer goods. It may be noted that in the Indian sub-continent and in sub-Saharan Africa, children often work for the household from about the age of six. Among the main economic activities children are expected to engage in are fodder and fuel collection and the fetching of water. Both are time consuming in the drylands, and both are essential on a daily basis. Growing scarcity of the sources of these household goods (e.g. because of partial privatisation) can easily lead to an increased demand for children, which in turn precipitates further environmental degradation. On occasion, this turns to a scramble for resources (as with the famous Soccer War), damaging the communal nature of the remaining common property resource base, which in turn leads to further fertility growth. This somewhat surprising link has been a key finding of the WIDER programme, and it has obvious implications for policy. The social problem identified here is a lack of alternative sources of fuel and fodder and water for household needs. This suggests that certain conventional prescriptions for poverty reduction (viz the provision of rural infra-structure and the development of means through which rural incomes are raised) not only reduce current poverty,

they also offer protection to the environmental resource base, and therefore safeguard future well-being. Poverty eradication, environmental protection and fertility reduction work in tandem under these processes.[1]

Conclusions and recommendations

Economic development that reduces current poverty may offer protection to the environmental resource base.Public health services, female education, and the provision of rural infrastructure are among the key ingredients of environmental protection for rural communities

5 Decentralisation of Decision-Making

Women are much involved in the use of environmental resources. Not only do they collect fuelwood, fodder and water, they are often involved in extraction processes, such as collecting berries, extracting gum, and so forth. It is they who have detailed knowledge of the ecological processes at work. It is almost invariably held by them in a tacit form; it is not codified. Such knowledge is therefore not easily transferable. Both efficiency and equity considerations dictate that decisions concerning the management of local common property resources should as far as possible be in the hands of rural women, who are the main extractors of such resources. The State has a role to play in making this possible. Under changing economic circumstances, growing population and increased migration, the extent of stress on the environmental resource base can be expected to increase. Resource usurpation by competing groups is likely to increase. Women in particular are increasingly vulnerable as a consequence. Their protection calls for finding ways in which rural economic decisions can increasingly be made by the women of rural communities.

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[1] For further exploration, see P. Dasgupta (1991), 'Poverty, Resources and Fertility' (forthcoming), *Ambio*, 1992.

Conclusions and recommendations

For most local common property resources, the management should as far as possible be in the hands of the persons most knowledgeable of these resources, which most often are the local women.

6 Environmental Effects and Hidden Export Subsidies

Deforestation of the uplands causing damages to the lowlands, have unsuspecting consequences. (This is a case of a unidirectional environmental effect.) Often, the victims are many in number (e.g. peasants, fishermen) and live far from the source of the damage. The logging firm typically does not have to pay compensation. The private cost of logging is then lower than the social cost. We should then expect excessive deforestation. This in turn means that timber-based goods are under-priced in the market. Quite obviously, the less roundabout, or less distant, is the production of the final good from its resource base, the greater is this underpricing, in percentage terms. Put another way, the lower is the value-added to the timber, the larger is the extent of this underpricing of the final product. If the final product is exported, it carries with it an implicit export subsidy, paid for not by the general public, but by the downlands community. Similar export subsidies have been detected in the export of beef from the Amazon basin.

Conclusions and Recommendations

Export of primary products, such as timber and beef, often carry with them a subsidy, paid for by groups that are among the poorest in their society. This subsidy is often hidden, and is on occasion associated with unidirectional environmental effects.

7 National Accounts and Environmental Resources

National accounts have proved to be of immense value in providing a coherent framework for the statistics needed to analyse a variety of economic problems. The System of National Accounts (SNA), which is currently the international standard, ensures not only that such accounts are established in a logically satisfactory way, but also that it is possible to make meaningful cross-country comparisons.

SNA is expected to accomplish several tasks, among which the most important are: (i) to provide a basis for analyses of macroeconomic issues; (ii) to provide a basis for analyses of structural development; and (iii) to enable one to assess the performance of an economy.

For several reasons conventional accounts have been limited, with few exceptions, to include only market transactions. This limitation is appropriate for certain uses to which the accounts are put, but not for others. For example, the use of National Income or Gross National Product as a measure of aggregate well-being has frequently been criticized on grounds that they do not take the distribution of income into account and that some economic activities (e.g. household production) are excluded. Another example, of greater relevance to this Report, is the use of environmental resources, which is for the most part not the outcome of market transactions. It too does not appear in conventional accounts. Analyses of both structural adjustments and assessments of the performance of economies are likely to be seriously misleading if the resource base of economic activities is ignored. SNA, as currently constructed, ignores the resource base and the effects of production and consumption activities on this base. Put more sharply, SNA does not take into account the depletion (or growth) of stocks of environmental resources, and it does not deduct from income an allowance for the loss of welfare experienced by households as a consequence of environmental degradation.

A number of proposals have been made in recent years to modify the present System of National Accounts to include

environmental resources. The recommendations on how to go about it have varied.[2] The WIDER programme has concluded that it is essential that methods for incorporating environmental resources into SNA should be derived from the economic theory of resource allocation. If this is not adhered to, it will almost certainly result in *ad hoc* numbers being generated, open to all sorts of interpretation. As it happens, resource allocation theory provides clear guidance on how to construct the accounts.[3]

Briefly stated, the idea is to construct a measure of Net National Product (NNP) which is defined as:

NNP = Generalised Consumption plus Value of the Change in the Stocks of all Assets

where

Generalised Consumption = Consumption of Goods and Services minus the Environmental Damages suffered by Households and the Public Sector.

To put it even more briefly, NNP is the value of aggregate consumption plus the value of the net change in the stocks of all real capital assets. There is no ambiguity in unravelling from this general definition the various moves that need to be made in identifying which "transactions" should enter into each of the components of NNP.[4]

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[2] SNA is currently being revised at the United Nations, and it is unclear what changes will be made to it.

[3] Inevitably, the theory says less on how best to implement their empirical constructions.

[4] We are ignoring new discoveries and anticipated technological change here. For expositions of these ideas, and a rigorous derivation of the accounting system from basic principles, see also P. Dasgupta and K.-G. Mäler (1991), 'The Environment and Emerging Development Issues', in *Proceedings of the World Bank Annual Conference on Development Economics*; and K.-G. Mäler (1991), 'National Accounts and Environmental Resources', *Environment and Resource Economics*, Vol. 1, No. 1.

Thus defined, the measure is appropriate for an economy closed to international trade. The WIDER programme has provided a codification of the framework for measuring changes in economic well-being in a closed economy. The framework has also been extended to cover situations where a country is exposed to transfrontier environmental effects. However, in such situations one has to decide whether it is desirable to measure the well-being of the country's inhabitants (which is determined by domestic as well as international activities) or the effects from domestic activities on inhabitants of all nations.

The basic problem involved in all this is the measurement and valuation of changes in the resource base. Typically, the corresponding markets are missing, so there are no market prices. Therefore, use has to be made of shadow prices (or accounting prices). Shadow prices reflect social values. It is not possible to prescribe a general recipe for their estimation. The valuation technique should depend upon the characteristics of the environmental resources being valued. Forests and fisheries pose different sets of problems from soil erosion and water depletion. However, there is one guiding principle:

The valuation of environmental resources should be consistent with the basic principle underlying the use of market prices for valuing ordinary goods and services.

Fortunately, a number of methods have recently been devised for estimating shadow prices. They are promising, and need to be developed further.

Conclusions and Recommendations

There now exists a unified theoretical framework for developing national accounts which include environmental resources. This framework should be used for constructing empirical accounting systems. The United Nations Statistical Office should be asked to invite an expert panel to develop such a system.

8 Project Appraisal

By project appraisal we mean not only conventional appraisal of industrial or agricultural projects, but also evaluation of policy reforms, analysis of international agreements, and so forth. Project appraisal techniques have been widely applied when public projects or projects of great public interest have been designed and decided upon. These techniques were codified in the late sixties and early seventies in the UNIDO Guidelines and the OECD Manual.[5] Although these treatises did not address environmental concerns, techniques for the valuation of environmental resources were being developed in the environmental literature.[6] The WIDER programme has shown that it is possible to quantify the value of a wide range of environmental resources for purposes of project appraisal.

In evaluating environmental resources, basically two types of techniques can be used. The first is based on surveys of the population affected by a change in the resource base. It calculates the value of the change by directly assessing the values expressed by a sample of this population. The most popular technique of this type is *contingent valuation*, which means simply that individuals are asked for their valuation. The second type of technique is based on *a priori* assumptions about the technology of production within households and firms. The value of a resource can be estimated by estimating the value of its substitutes or complements.

These techniques are now quite advanced, and can be used almost routinely in a number of situations. However, they have been rarely used for the purposes of project appraisal in developing countries. In order to promote their use, a manual for project appraisal including the valuation of environmental resources should be developed (perhaps by the World Bank) and the

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[5] P. Dasgupta, S. Marglin and A. Sen (1972), *Guidelines for Project Evaluation* (New York: United Nations); and I.M.D. Little and J.A. Mirrlees (1974), *Project Appraisal and Planning for Developing Countries* (London: Heinemann).

[6] One of the earliest compilation of such techniques was K.-G. Mäler and R.E. Wyzga (1976), *Economic Measurement of Environmental Damage* (Paris: OECD).

inclusion of environmental effects in project appraisals should now be mandatory.

Two issues in project and policy evaluations call for special attention: discounting for time and discounting for risk.

Discounting for time

Market interest rates reflect transactions in markets and, if taxes and similar distortions can be neglected, offer the balance between the opportunity cost of real capital and individuals' marginal time preference rates. However, natural capital - e.g. stocks of fish, ecosystem services, the atmosphere - is not subject to market transaction. Therefore, its use is not reflected in market interest rates. Market rates of interest exceed the corresponding social rates of discount for similar risk classes; the difference reflecting net rates of growth of the natural capital base. There is a need to develop guidelines for the choice of a discount rate which includes the effects of changes in the natural resource base.

It is often suggested that projects with powerful environmental effects should be discounted at a higher rate than for those with less or no effects. This should be avoided. Environmental considerations should influence the choice of the general discount rate, but the introduction of a special rate for the "environment" would be bad practice.

Discounting for risk

Most project appraisal techniques are based on the assumption of risk neutrality. This assumption is correct when risks can be spread among a large number of people. Many environmental resources are public goods. Risks associated with their use cannot be spread among many individuals. Individual risks are perfectly correlated; so each individual has to bear the full risk. Projects associated with powerful environmental effects as a general rule should be costed for the additional risk they carry, or should be valued for the risk they reduce. The argument is reinforced if the environmental effect associated with projects are irreversible.

Conclusions and recommendations

There is a need for a comprehensive set of guidelines (or, alternatively, a manual) on project appraisal containing techniques for valuing environmental resources. Environmental guidelines in project appraisal should now become mandatory for all projects financed by or managed by international organisations.

9 The Global Environment and International Treaties

Global environmental problems require international cooperation, if they are to be solved. Problems such as the threat from a climatic change due to the emissions of "greenhouse gases" have a number of common characteristics of relevance:

- the costs and benefits from actions affecting the global environment vary among countries;
- the climate is a public good (a global commons), in that changes in the global climate affect all countries;
- the costs and benefits from actions affecting the global commons are very uncertain.

Each of these characteristics is of importance in understanding the problems of creating a truly cooperative atmosphere among the countries of the world.

Since costs and benefits vary among countries, some countries will expect larger net benefits from a proposed course of action than others (some of whom may even expect to lose from collective actions). Since agreements between sovereign states are by definition voluntary, countries expecting to lose will not be inclined to sign the agreement unless they are compensated in some way. International resource transfers are required so as to

induce all countries to cooperate in solving international environmental problems.

One example of such "side payments" is the Montreal protocol, in which developing countries are promised technology-transfer if they sign the protocol and reduce their use of chlorofluorocarbons (CFCs). In designing an international convention on climate change it will prove necessary to design a mechanism involving large resource transfers to countries expecting to lose from an agreement to control, say, the use of fossil fuels.

However, even if all countries expect to gain from a convention, it may still be beneficial for some countries to refrain from cooperating because the global climate is a global public good. Were the rest of the world to reduce its emissions of greenhouse gases, it would pay a country not to cooperate. *Countries have incentives to be free riders.* If too many countries choose to be free riders, even partial cooperation may prove impossible. But this does not necessarily follow. Some group of countries could find it in their mutual advantage to reduce their reliance on fossil fuels, in spite of the fact that countries not in the group will enjoy the fruits of free riding. As a general rule, international conventions on the global commons should be expected to involve a subset of countries, not all countries. The Montreal Protocol illustrates this well.

Were it possible to "punish" defecting countries suitably, more countries could be expected to participate in international conventions. Such punishment can take different forms. One way is the threat that cooperating countries will break their cooperation in the future unless the defectors decide to start to cooperate. Another way is to punish defecting countries through international actions. The ultimate punishment is obviously through military interventions, but other effective punishments can be trade restrictions, reduced access to international credit markets, and so forth. One implication of all this is that greater cooperation than is to be seen in today's world could be achieved if agreements stipulate explicitly the kind of "punishment" which is to be meted out to defecting members.

In order to implement an international agreement, a monitoring system is necessary. Without effective monitoring, no international treaty on reduced greenhouse gas emission can succeed. Conventions will require the backing of a monitoring system.

Since costs of reducing greenhouse gas emissions vary widely among countries, the allocation of emission reductions among countries is of substantive importance if an efficient agreement is to be reached and implemented. A recent study has found that the sulphur protocol of the Geneva convention on long range pollution is highly inefficient.[7] The protocol stipulates that all signatories should reduce their sulphur emissions by 30 per cent of their 1980 levels. The same reductions in the depositions of sulphur could have been achieved at less than half the cost were emissions more efficiently allocated among European countries. In short, there are better mechanisms than a mere uniform reduction among countries signing a treaty. Two such mechanisms have been much discussed and empirically tested:

- global trading in emission permits;

- global "carbon" tax.

Global trading in emission permits (sometimes called a bubble) would work in the following way. Each country would be allocated a right to emit a certain amount of greenhouse gases; say, carbon dioxide. This would be instituted in the form of an assignment of emission permits among countries participating in the agreement. However, countries would be permitted to buy and sell emission permits among one another. The idea is therefore to have the allocation of emission reductions among countries determined by the market. The total amount of emission is fixed by agreement, but its allocation is determined by the market. If the

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[7] K.-G. Mäler and C. Olsson (1990), 'The Cost-Effectiveness of Different Solutions to the European Sulphur Problem', *European Review of Agricultural Economics*, 17.

market operates effectively, the allocation of emission reduction could be expected to be efficient.

Instead of issuing rights to emit carbon dioxide, countries can, of course, agree on rights to burn fossil fuels. The principles are no different. As these permits (or rights) acquire a market price, they become equivalent to financial instruments, to be bought and sold across borders. The allocation of the initial rights implies an allocation of wealth. The necessary compensations can, therefore, be undertaken through the distribution of initial rights.

A global carbon tax would be collected on the use of fossil fuels. Since the tax would be uniform across countries, it could be expected to allocate emissions efficiently. The necessary compensations could be financed from the proceeds of the carbon tax.

In choosing between a global carbon tax and global trading in emission permits, the following points need to be considered:

(i) administrative costs of the two schemes;
(ii) feasibility of side payments;
(iii) uncertainties in the costs of reducing emissions, and uncertainties in costs borne by different countries from a climatic change;
(iv) incentives to develop new technology.

The main administrative costs (i) for either alternative will be monitoring costs.

As regards (ii), both systems make it relatively easy to implement international transfers for inducing countries to cooperate. In one case, side-payments take place through the allocation of initial rights. In the other, compensations are achieved from the proceeds of a tax (i.e. through cash payments). In both cases, the size and direction of the transfers have to be determined by negotiations. The allocation of initial rights appear to be administratively easier, as it is (approximately speaking) a once for all allocation, while the distribution of tax proceeds would be a recurring operation.

Turning to (iii) the following prescription suggests itself: If marginal abatement costs are more sensitive to the level of emission than the marginal environmental damage from emissions, a carbon tax is to be preferred. Were it to be otherwise, a system of trading rights would be preferable. Thus, if it is considered desirable to reduce emissions each year to a certain level, one should choose a system with transferable rights, while if the cost of reducing the greenhouse gas emissions rises rather abruptly, then a tax system should be preferred.

The design of a convention on global climate can be expected to have an impact on the shape of future technology. Assuming that the costs of a carbon tax (or the purchasing cost of rights in the case of tradable permits) are borne by the ultimate users of fossil fuels, the two systems we are discussing here offer greater incentives for the development of new technology than any other system. Among the two, the carbon tax can be expected to offer greater incentives.

Conclusions and recommendations

International agreements on the emission of greenhouse gases will require substantial international resource transfers. Such transfers can be financed either by a carbon tax or by the distribution of initial emission rights in a system of transferable emission permits. It is not clear which of the two is likely to be the more effective system. This requires further study. One possibility is for the International Panel on Climate Change to explore the practicality of both systems and their relative effectiveness.

10 A Global Environmental Compact

Three major conclusions of the WIDER research programme have been:

i) the basic incentive structure requires change if individuals and organisations are to act in a more environmentally concerned way;

ii) policies designed to alleviate poverty simultaneously reduce environmental stress at the local level;

iii) massive international transfers are necessary in order to achieve effective global agreements on international environmental problems.

The question in need of analysis is how these conclusions can be implemented within a realistic institutional framework. The WIDER programme has looked at this question, and some feasible proposals have been identified.

In order to advance the standards of living and to alleviate poverty, economies in the developing world must grow. A recent WIDER study has worked with the concept of a "socially necessary growth rate" for developing countries as a whole.[8] The study has estimated that the developing world as a whole would have to grow at around 5.5 per cent in GNP terms during the next decade to realise the objective of socially necessary growth. This socially necessary growth is substantially greater than growth rates experienced in recent years, and would require an additional net capital inflow of US$40 billion in 1990, rising to US$60 billion by the year 2000.

The definition of socially necessary growth makes no allowance, however, for the resources required to alleviate past environmental damage or to support environmental protection and

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[8] L. Jayawardena (1991), *A Global Environmental Compact for Sustainable Development: Resource Requirements and Mechanisms* (Helsinki: WIDER).

improvement in the future allied to the environmental damages which the process of growth brings in its wake. Very approximate orders of magnitude of the expenditures in developing countries that will be required to attain these environmental objectives - based on data available from the Worldwatch Institute in Washington[9] - are an additional US$20 billion in 1990, rising to US$80 billion by year 2000. Adding the environmental dimension to that of socially necessary growth, we arrive at totals for additional net capital inflows to the developing countries of US$60 billion, rising to US$140 billion. In other words, capital inflows of this order of magnitude would be required during the 1990s to achieve sustainable development, defined as socially necessary growth plus environmental protection to accommodate political and ecological concerns.

The environmental component of the expenditures in developing countries for sustainable development are presented in Table 1.

[9] L. R. Brown et al. (1988), *State of the World 1988* (New York: Norton), Table 10.5.

Table 1
Rough Estimates of Additional Expenditures in Developing Countries Required to Achieve Sustainable Development between 1990 and 2000

(US$ billion)

Year	Raising Energy Efficiency	Developing Renewable Energy	Reforesting the Earth	Protecting Topsoil on Cropland	Slowing Population Growth	Total
1990	1	1	2	3	13	20
1991	2	2	3	6	18	31
1992	3	4	4	9	22	42
1993	4	5	5	12	26	52
1994	5	6	6	16	28	61
1995	6	7	6	16	30	65
1996	7	9	6	16	31	69
1997	8	10	6	16	32	72
1998	9	12	7	16	32	76
1999	10	13	7	16	32	78
2000	11	15	7	16	33	82
Total						648

Source: Lal Jayawardena (1990), *The Macroeconomics of Sustainable Development*, paper prepared for the WIDER Conference on "The Environment and Emerging Development Issues", 3-7 September 1990, Table 6; forthcoming in (eds.) Partha Dasgupta and Karl-Göran Mäler, *The Environment and Emerging Development Issues*, WIDER Studies in Development Economics, (Oxford: Clarendon Press).

Thus, there is need for capital inflows rising from US$60 billion in the beginning of the present decade to US$140 billion in the end to ensure sustainable development in the developing countries.

This substantial increase in the flows of capital to the developing countries can be financed in two ways: (i) a significant rise in the current level of Official Development Assistance (ODA) committing the developed countries at the United Nations Conference on Environment and Development (UNCED) to implement during the early 1990s decade, the long established ODA target of 0.7 per cent of GNP, and adopting the new target of one per cent of GNP for implementation in the latter half of the decade; (ii) a phasing out of the US commitment to NATO and an agreement on either a global carbon tax or a system of transferable carbon permits. Clearly, a combination of the two would be most desirable.

What needs to be elaborated is a design for ensuring that development policies for the 1990s, as well as domestic policies in developing countries, will foster both socially necessary growth and environmental protection. Any such design would imply a global environmental compact which sets out the reciprocal obligations of the developed and developing countries. Here the WIDER programme has sought to build on the traditional Aid Group mechanism which operates under the aegis of the World Bank. An Aid Group brings together donors who have a long-term interest in supporting a particular developing country. The principal advantage of an Aid Group is that it involves an annual meeting, chaired by the World Bank, of representatives of the recipient and of the donor community. These meetings result in an annual aid pledge which responds to the World Bank's estimate of the country's external resource requirements. The developing country concerned becomes involved in a continuing policy dialogue with its donors, and more specifically with the Bank and the Fund, on the domestic policy reforms that are to be implemented and monitored. This need not necessarily entail specific agreements to draw on the facilities made available by each of these institutions involving more or less strict conditionality, though often it does. What is material is that the Aid Group arrangement, by encouraging a country to have recourse to the facilities of the Bank and the Fund at a very early stage in encountering economic difficulties, helps to prevent its economic policy from going off course too much.

Nevertheless, Aid Groups as they currently operate possess several limitations. First, even a Fund standby agreement relates only to a three-year indicative plan, so that longer-term operational planning involving a four to six-year horizon becomes problematic. Second, when there is an unexpected shortfall in exports, a developing country is simply driven to the currently existing facilities, which in the Fund are related to the country's quota and may therefore not provide anything like full compensation. The result is that current arrangements provide no assurance that the import capacity requirements of a socially necessary rate of growth that a country incorporates in its indicative development plan with the general blessing of its Aid Group, will in fact be maintained if, for example, export expectations go awry.

A third limitation of current Aid Group arrangements is that they involve no more than an annual aid pledge, and fail to provide the longer-term assurance of annual aid flows over the period of a development plan needed to underpin its import capacity requirements. Fourth, there is no assurance whatever of foreign savings support for environmental protection in the context of a country's development plan of the kind needed to make the global environmental compact envisaged above operational at the country level.

One important element in making such a compact operational is the development contract as suggested by Norway's Foreign Minister Thorvald Stoltenberg. Such a contract would offer to the developing country foreign savings support for human development or basic needs goals incorporated in a plan. Foreign savings support would be assumed in advance for its planned period, including compensation for export shortfalls so long as the country was continuing to adhere to its reciprocal obligations to maintain a suitable policy framework of production incentives. In general, the developing country's obligations would be limited to preparing its indicative development plan in terms of its own national priorities incorporating employment, human development and poverty alleviation goals and to devising the framework of incentives needed to implement its plan on the basis of a regime of self-reliant conditionalities. Apart from the discipline needed for initial inflation stabilisation, the country will, as a rule, be spared

the traditional requirement to mobilise domestic resources and savings at the outset of the development plan. The way in which the Development Contract framework would need to be modified to implement the global environmental compact is to extend the foreign savings support to include environmental protection.

A special case of such a global environmental compact would seek compulsorily to divert towards environmental protection developing country debt-service payments that would otherwise accrue as potential foreign savings to their creditors. This involves a carefully staged writing down of the debts of the developing countries, now totalling US$1.3 trillion, against the *quid pro quo* of commitments by debtor countries to implement development programmes chosen by them which combine socially necessary growth and environmental protection. In addition to these considerations, the design of the Environmental Compact could include an explicit political dimension in the form of a commitment, for example, to representative government, and to limiting military spending.

The framework described above depends essentially on the capacity of the developing countries to formulate and implement accelerated and sustainable development strategies on a long term basis together with the concomitant economic disciplines. These ideas deriving from a WIDER study[10] have been endorsed by the Secretary General of UNCED as a "Partnership in Additionality: contracts for accelerated and sustainable development"[11] and whose adoption by UNCED in 1992 he has also advocated. What is involved "is a drive for fast growth in production levels while at the same time reordering internal priorities toward a broadbased attack on poverty, concentrating, for example on basic education and rural infrastructure. Such strategies would be the basis for a commitment to increased funding from international and bilateral donor sources. A sustained commitment would be needed by both

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[10] L. Jayawardena. (1991) op. cit.

[11] United Nations General Assembly Document for Preparatory Committee for the United Nations Conference on Environment and Development (3rd Session, Geneva, 12th August - 4th September 1991) *Progress Report on Financial Resources: Report of the Secretary General of the Conference*, Document No. A/CONF.151/PC/51 OF 5 July 1991.

developing countries and donors. It would be essential for such programmes to enjoy broad popular support since the donor-recipient relationship could not endure a charge of unwanted conditionality".

The implementation of any such "Partnership in Additionality" would involve commitments by both developing and developed countries to at least the following elements: [12]

- A development strategy which fully embodies the priorities of the developing country with respect to the various objectives of development. The trade-off between the short run and the long run, the acceptable changes in income distribution, the minimum satisfaction of basic needs, the determination of a minimum programme of sustainable livelihoods for the poor etc. must be based on a consensus internal to the developing country itself.

- A longer-term perspective, recognising that development may be a matter of decades and that many of the specifics of the policy required cannot be determined and/or predicted in advance.

- An emphasis on development. This requires not only stabilization and adjustment, but also an explicit strategy in which private and public institutions can participate. The structural characteristics, institutions, and traditions of the recipient country will play a significant role in determining the nature of the strategy and the mechanisms of planning which it will imply.

- Reciprocity in the sense of a guarantee of credits or aid from the donor country(ies) over an extended period,

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[12] See L. Jayawardena, (1991) op. cit. See also F. Gerard Adams, *Towards a Concept of Development Agreements*, OECD Development Centre, Paris, mimeo, 28 June 1991 p. 13 . Adams, in effect, distinguishes the 'Partnership in Additionality; contracts for accelerated and sustainable development' framework from 'present IMF/World Bank procedures' in language which has been drawn upon in defining the elements of the 'Partnership in Additionality' in the text.

encompassing, for example, successive five-year development plans, subject only to limited concepts of conditionality.

- An assurance that a country's development programme would not be disrupted by external shocks such as export shortfalls by the timely provision of offsetting compensatory or supplementary financing, so long as the country was adhering to a policy framework for enhancing production incentives.

- The provision of foreign savings support for human development, minimum social security, and environmental protection elements of a country's development programme.

- The reduction by the developing country of its military expenditure to a defined level preferably not exceeding 2 per cent of its GNP by the end of its first 5-year development plan period.

Conclusions and recommendations

Large transfers to the developing countries are necessary for a global sustainable development. Such transfers should take place within a Global Environmental Compact between donors and recipients based on development contracts enabling countries to implement long term development plans for sustainable development.

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