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Sustainable development: greening the economy

Michael Jacobs



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Introduction

One of the most welcome aspects of the new concern about "green" issues is the recognition that action to protect and enhance the natural environment must be tackled within an economic framework.

In the past the environment has been considered a separate, minor field of government activity; the key fields of fiscal, monetary and industrial strategy have been conducted with almost no consideration of their environmental impact. The first signs that this segregation might be challenged have begun to appear. The Government has endorsed the "Brundtland Report" of the World Commission on Environment and Development, which specifically argued for the integration of environmental and economic policy. The publication of the Pearce Report by the Environment Minister Chris Patten has brought proposals such as environmental taxation into the centre of political debate.

This is a significant advance. The economy and the natural environment are inextricably intertwined. Economic activity is dependent on the biosphere for raw materials and energy, for the absorption of waste products and for the performance of life support services such as climatic regulation. The impairment and threatened loss of each of these functions are in turn the result of production, consumption and distribution. The Greenhouse Effect, the destruction of tropical rainforests, the worldwide deterioration in soil quality, the pollution of rivers and seas, acid rain, the extinction of species - these are not accidental or isolated products of economic activity. They are the inevitable and central consequences of current patterns of global resource use and waste disposal.

If the worst effects of the ecological crisis are to be averted, therefore, it is economic activity which must change. Such change is possible. But it can only be achieved if economic and environmental policies are integrated. This is not simply a matter of adding an economic dimension to the environment. It requires a fundamental reconsideration of economic strategy. New criteria by which to judge economic success are needed. Environmental protection can no longer be confined to a separate department of government. It is on the tables of the economic ministries that the "new agenda" of Brundland and Pearce belongs.

1 Sustainable Development

Since its first major public appearance in the World Conservation Strategy of 1980, the term "sustainable development" has become the key concept in the integration of environmental and economic policy.



Sustainable development, Brundtland declared, is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". This goal has received widespread acceptance. It was endorsed by the leaders of the G7 group of industrialised nations at the Toronto summit of 1988. Mrs Thatcher reiterated her support in her foreword to the official Government response to Brundtland. The term served as the original title of the Pearce Report for the Department of the Environment. Many academic articles, papers and books have now discussed and defined it more closely.

Such acceptance is significant for two reasons. First, because the economic policy which has been followed by the industrialised world in the post-war period has not been "sustainable" in this sense. The stark conclusion of the Brundtland Report was that current patterns of economic activity will not permit future generations to "meet their needs". The destruction of the natural functions upon which the economy ultimately rests risks catastrophic results. Sustainable development therefore implies that economic policy must change.

Second, the new goal does not relate just to environmental protection. Brundtland and Pearce did not label their objective (as others have done) "sustainable growth" or "improved environmental management". The use of the term "development", previously applied almost exclusively to the Third World, was an explicit choice. Development implies something more than mere economic growth. It implies qualitative as well as quantitative improvement. And it suggests a concern for the distribution of resources and wealth as well as their conservation and creation.

We may identify, in fact, three separate ideas wrapped up within the concept of sustainable development:

- Futurity, which demands that economic decisions take into account the interests of future as well as current generations.

- Welfare is an expression of the wider economic factors which make up the quality of life. Exact definitions of welfare are elusive, but the broad concept is readily understood. It includes income, but is not limited to it, and cannot necessarily be measured by it. Environmental quality is a major non-financial component of welfare. When environmental quality is in conflict with income growth, its full value must be weighed against the financial returns of degrading it. Welfare thus implies that economic performance should be judged not only by income growth, but by changes in a wider set of economic indicators.
- Equity is a concern that the distribution of economic costs and benefits should be fair, with inequality progressively reduced. Equity applies both within and between countries; it demands in particular that resources are redistributed from the rich industrialised North towards the poor countries of the South.

The connection between the three ideas is apparent. Equity is a fair distribution of welfare amongst the present generation, while futurity is a fair distribution of welfare between present and future generations.

In this sense the concept of sustainable development is a radical departure from the conventional objectives of economic policy. It demands, first, that policy be directed towards a wider notion of economic well-being, which must include a proper valuation of the environment; second, that the distribution of wealth is considered as important a goal as its creation; and third, that decisions are made not simply in the interests of the current generation, but in those of future generations too.

Zero Growth?

The concept of sustainable development has the advantage of bypassing the debate about the desirability of economic growth which has plagued the environmental movement since the early 1970s. After several years lying dormant, that debate has recently been revived. It is not a helpful one.

"Economic growth" has two different meanings. To economists and in most political discussion, it refers to annual changes in Gross National Product (GNP). To environmentalists it often means an increasing consumption of natural resources. These are not the same.

GNP and its growth are measures of income flows around the economy. They are not measures either of natural resource consumption or of pollution. Any productive activity which involves money exchanges adds to Gross National Product. But the environmental impact of different activities is clearly different.

Some products (for example, tropical hardwood furniture, cars, pesticides)

result in a great deal of damage to the environment, either from production or consumption. But others (for example, many services, natural-fibre clothes, temperate softwoods) have relatively little environmental impact. They rely primarily on human energy, or use resources which are not scarce, or generate little pollution. Some industries, such as organic farming, insulation and pollution treatment, positively improve the environment.

The extent to which any given growth in GNP is damaging to the environment therefore depends on what it is that is growing. As a monetary aggregate, GNP does not distinguish between different types of economic activity; it simply records the overall total. It is quite possible for GNP to go up with fewer resources being used, and less pollution being generated, if the content of growth shifts towards less environmentally degrading activities.

In the use of some resources this has indeed been happening. Since the second world war, technological progress and the trend away from manufacturing towards services have led to a reduction in the quantity of resources needed to produce each unit of GNP. Where such reductions have exceeded the growth rate of GNP, economic growth has actually been accompanied by a reduction in environmental degradation.

This trend should not be exaggerated. The statement that current patterns of economic growth are causing major ecological problems remains valid. But it is certainly possible to imagine major shifts in the content of GNP resulting in environmental improvement even while growth occurred. This is indeed a likely result of many proposed programmes for environmental protection. There is certainly nothing in the concept of GNP growth which rules it out.

More to the point, it is quite possible for environmental degradation to get worse even when growth is zero or negative. This is what happened in, for example, Poland during the 1980s. The Polish economy contracted in value terms but pollution increased severely.

Environmentally Adjusted National Income

The moral is clear. GNP does not measure environmental degradation, nor is it necessarily correlated directly with it. So it cannot be used as an environmental indicator. It might be possible to adjust GNP for environmental impact. Publishing a figure for "Environmentally Adjusted National Income" at the same time as GNP would certainly promote debate about the nature of economic welfare and the objectives of government policy. But it is notoriously difficult to make the adjustments. Neither the items to subtract nor their value are easy to identify.

Since no rate of economic growth, whether positive, zero or negative, can tell us what is happening to the environment, none is a useful target for environmental policy.

This does not necessarily mean that environmentalists are wrong when

they argue that growth should be reduced, if they are using the term to mean growth of resource consumption, measured in physical, not monetary, terms. While GNP growth may not be a useful indicator, the consumption of physical resources is surely important. In a finite world with growing population, there are clearly limits to the quantities of resources which each person can consume, both because of scarcity and, probably more importantly, because of the inability of the biosphere to absorb the consequent wastes.

But what does zero growth in this sense actually mean? Must consumption of all resources remain at current levels? This would be absurd. The environmental impact of consuming different resources varies enormously. While certain types of resource consumption have probably already reached their limits, and may actually need to be contracted, others clearly have not and expansion remains possible.

It might be argued that it is not the consumption of specific resources which must be maintained at current levels, but overall consumption. But this is precisely the problem. What does "overall" mean? In what units are different resources measured, such that an increase in the consumption of one can be weighed against a fall in another? Consumption clearly cannot be limited to a certain total weight or volume; this would be no guarantee of environmental impact. Nor can resources be valued in money terms for this purpose, since prices do not reflect environmental damage either. But without a common way of measuring the consumption of different resources, the concept of "overall zero growth" is meaningless.

2 Valuing the Environment

The environment can be thought of as having "competitive functions". The air can be used as a sink for industrial waste emissions, for example, or as a source of health and amenity.

Most of the functions which the environment performs in its undegraded state do not get valued in financial terms. Its functions as land for development or as a sink for wastes, however, are given a price tag. Here the benefits can be precisely calculated. They are equal to the costs of not using the environment for these purposes; of building elsewhere (or not at all) or preventing the pollution. This difference means that where the two types of functions are in direct competition, the degrading of the environment for industrial purposes always appears to offer net benefits. The costs of degradation, - felt in the direct loss of welfare of those using the environment in its undegraded state, do not appear in the balance sheet.

Such losses of environmental value need to be set against the financial benefits of industrial or other use of the environment. This must be done both at the micro level, where individual economic decisions are made, and at the macro level, where the overall benefits of economic policy are counted. This process could be labelled "the principle of optimal environmental quality".

At the micro level, it is not in fact true that the undegraded environment is not accorded any value, or indeed that it has no price. Pollution standards are a recognition that the environment does make a contribution to welfare and that its indiscriminate use as a sink for wastes cannot therefore be permitted. If complying with pollution standards forces firms into additional expenditure, this represents the effective "price" of using the environment.

Pollution standards are not set, however, by calculating the benefits provided by unpolluted air or water and matching these against the costs of not polluting (measured either by the expenditure required to prevent the pollution at source or by the foregone income of the polluting activities). It would be interesting to see the "optimal level" of, say, water pollution generated by such an exercise in cost-benefit analysis. Evidence from opinion polls suggests that the public's valuation of the health-giving, recreational and aesthetic functions of water purity may be high, justifying higher standards of pollution control than currently enforced. There is a powerful case for reviewing

pollution standards in the light of such an analysis.

It is also not the case that the countryside and "green areas" in towns are unvalued. Planning regulations, such as those protecting the Green Belt, are a mechanism by which their contribution to welfare is recognised. Here again however the process is *ad hoc*, and recent trends show a devaluation of the environment, as development is allowed in previously protected areas. There is a clear need for standardised procedures by which the costs and benefits of new developments are assessed.

The new regulations (introduced in July 1988) requiring that "environmental impact assessments" (EIAs) be carried out for all very large developments are a welcome step towards this. However, EIAs are discretionary for many major projects, including agricultural schemes, chemical, metal, paper and other processing industries and many infrastructure projects. They should be made compulsory. It is still the case that in the great majority of developments environmental costs are not adequately weighed against financial benefits. If the environment is to be properly valued, according to the contribution it makes to people's welfare, this must be done.

The key question is how environmental costs and benefits are measured. In cost-benefit analysis (CBA) monetary valuation may be used. That is, the benefits of the environment in its undegraded state are directly weighed in money terms against the financial benefits of the project being assessed.

The Pearce Report describes the range of approaches by which economists have attempted to put monetary values on the environment. These include calculating the changes in property prices or wages resulting from environmental deterioration, asking people about their "willingness to pay" for environmental amenities or "willingness to accept compensation for disamenities" and calculations of the value of the time taken to travel to recreational facilities.

Problems of Monetary Valuation

There are a large number of methodological and practical problems associated with these techniques, some of which throw considerable doubt on their usefulness and accuracy. These are listed by Pearce. I wish to concentrate here on the philosophical and political issues raised by monetary valuation.

- First, there must be serious misgivings about the assumption that all aspects of the environment can be given monetary values. Pearce argues, for example, that the Californian condor or African rhinoceros is not "beyond price" but merely commands a very high one. Many people, however, would regard this as a distortion of what is genuinely a non-monetary valuation. Pearce asserts that "many of us would pay substantial sums" to see these animals preserved. But this is not the only measure of

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value. Ask the same people, and many others who could not afford to pay "substantial sums", what it would take to compensate them for the extinction of the condor or rhinoceros and they would say "nothing". Extinction of a species, like a human life, is not the sort of thing which can be compensated by money, however much. It doesn't have a price.

- A price is an expression of value obtained in a market. It is therefore dependent on people's incomes. Asked what he or she would be willing to pay to preserve a particular stretch of countryside, for example, a poor person is likely to give a low answer. A rich person, with the cash to pay, is likely to provide a higher valuation. Yet it may be just as valuable to the poor person as to the rich.
- The costs and benefits of a project may not fall on the same people. For example, a new motorway may bring financial benefit to firms and their employees throughout the country, but the costs of destroying the countryside may fall on a relatively small number of people in a local community.

None of these problems of monetary valuation means that CBA should not be used. On the contrary, some systematic method of valuing the environment is required, and the alternative to CBA is too often no valuation at all. Indeed, for all its faults, CBA can be a powerful weapon in the case for environmental protection, proving that the environment does provide more welfare in its undegraded state than when used for development or as a waste dump. But the problems of monetary valuation require the application of cost-benefit analysis to be limited in two ways. Firstly, "sustainability constraints" must be established to protect environmental features with long-term benefits, such as essential natural habitats or the ozone layer. These features will not be given their full weight by CBA, since their major beneficiaries will be people living in the future, whose interests are "discounted" in CBA. Sustainability constraints, set by the processes of planning discussed below, will limit the use of CBA to smaller decisions which do not have damaging long-term effects.

Second, CBA cannot be used to make decisions by itself. Decisions about how to care for the environment cannot be derived from mere *calculation*; they require *judgement*. It is not possible simply to give everything a figure and then expect to compute the "correct" answer by addition and subtraction. Environmental decisions are political decisions, in which non-monetary valuations as well as monetary ones must be taken into account. They therefore need to take place in the political arena, not simply in the market.

Sustainability

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Much of the concern currently being expressed over environmental degradation reflects its adverse effects on current welfare. But at the core of the "green" idea is a concern for the effects of the ecological crisis on people not yet born.

If, as Mrs Thatcher put it, "we do not have a freehold on the Earth, only a full repairing lease", each generation has an obligation, as tenants, not owners, to leave the natural environment as productive, beautiful and stable as when it moved in. Clearly, most environmental measures which benefit the current generation will also contribute to the welfare of future generations. But the interests of the present do not *necessarily* coincide with those of the future.

Such concern for the future is expressed in the concept of "sustainability". There is now a danger that this oft-used term will become "so abused as to be meaningless". But it is possible, and indeed essential, to give sustainability a precise and operable definition

Sustainability implies that people living in the future should have the opportunity to experience the same level of wellbeing from and use of the natural environment as the present generation. Human society is dependent on the environment for resources (raw materials and energy), for the absorption of wastes, and for the climatic, geochemical and ecological functions which support life. So long as these environmental capacities do not decline, the welfare of future generations may be said to be protected. In general, therefore, sustainability means that the quantity and quality of natural resources and functions (environmental capacity) should be maintained at a constant level.

Sustainability can be seen as a commitment to intergenerational equity. It can be derived from a Rawlesian approach to distributive justice, in which people choose the distribution of resources in ignorance of the generation they themselves are to belong to. Or it may be regarded simply as a logical extension of existing commitments to equity within the current generation.

Sustainability is a moral concept, not one derived from market behaviour. Although consumers do value the future, there is no guarantee that current

consumers will value the future enough to ensure that environmental capacity is fully maintained, which is what sustainability demands. Indeed, there are strong reasons to suppose that they won't.

From the self-interested point of view of the individual, it is perfectly rational to behave "unsustainably". People are impatient, they cannot guarantee that they will be alive to enjoy future benefits, and they cannot guarantee that those benefits will in fact exist. So there is no guarantee that they will be willing to pay the present costs necessary to preserve, say, the tropical rainforests or climatic stability. The ecological costs here will fall primarily on future generations, and they are uncertain. Rational individual consumer behaviour would almost certainly discount these costs in comparison with the benefits gained in the present from timber, hamburgers and fossil fuels.

Sustainability, by contrast, implies that the future is not discounted; that decisions are taken as if their full costs were experienced now. It is based on a simple moral claim, that while discounting one's own future may be acceptable, discounting the lives of other people (those not yet born) is not.

Another problem is that the future is a public good. Individuals can only secure the preservation of major environmental functions such as climatic stability and ecological diversity if others also contribute; they face a "prisoner's dilemma".

The Political Arena

For these reasons we cannot expect to derive the principle of sustainability from observing consumer behaviour in markets. This does not mean, however, that people do not want to protect the interests of future generations. It is quite likely that they do, but this desire is expressed not in *market* but in *political* behaviour. People are not only consumers, they are also citizens. As citizens they act neither solely in their own self-interest, nor simply as individuals. In the political process they take wider interests into account and are involved in collective debate. They are members of society. Here, in the political arena, it is quite possible that the future will be valued fully, not discounted; that collective decisions to preserve it, decisions for sustainability, will be made.

That people have different preferences as consumers in markets from those they have as citizens is evident from the divergence between consumer behaviour and opinion poll data. In polls, which are proxies for political choice, substantial majorities of people say they wish to protect various aspects of the environment, and are willing to pay to do so. But as consumers, people go on buying goods and services which cause serious environmental degradation. This may partly be due to ignorance. But it is surely mainly a consequence of the inevitable fact that in markets we behave primarily in our own interest, whereas in the political arena we acknowledge wider values and interests,

including those of future generations.

This distinction between consumer/market and citizen/political behaviour is important to the understanding of economic-environmental policy. It separates the value of the environment to current generations from the need to protect it for future generations, a separation unfortunately obscured by Pearce. Although "valuing the environment" will assist towards the goal of sustainability, it is not sufficient. Consumer preferences cannot guarantee that environmental capacity is maintained. The only way this can be guaranteed is if it is specified as an objective of policy separate from, and prior to, the pursuit of consumer preferences.

Of course, even in their role as citizens, people may not choose sustainability as an objective. They genuinely may not value the future enough. But if they do, they can only achieve it by imposing constraints on themselves as consumers. Sustainability is thus a constraint on the market economy. It is a moral choice, made at the political level, to preserve the environment for future generations.

Sustainability in Action

What is actually meant by "maintaining a constant environmental capacity"? Can the environment be measured in some way as to make sense of this abstract idea?

With regard to renewable resources (those which regenerate through ecological processes, such as soil, crops, animals and fish stocks), the general rule can be easily stated: harvest rates must not exceed regeneration rates. Throughout human history this rule has been well understood (though not always followed) by agriculturalists. A "sustainably-managed" forest, fishing ground or farm is thus one which maintains its annual output over time. Each of these components of "environmental capacity" - soil volume and productivity, the size of marine stocks and the quantity and quality of water supplies - are measurable. It is quite feasible, through proper management, to maintain them over time. The sustainability principle is therefore operable in policy terms.

Applying the principle of sustainability to non-renewable resources (such as fossil fuels or minerals) is more difficult. Since there is no input, all output reduces the stock. Sustainability would thus appear to require us to stop using fossil fuels and minerals altogether - even though this would of course be no help to future generations, since if they were also bound by the sustainability constraint, they couldn't use them either.

The depletion of non-renewables is therefore inevitable. However, policy can be directed at expanding reserves, through exploration and mining, so that new stocks become available to replace those consumed. Clearly there is a limit to this process, especially if the ecological costs of mining (for example,

in Antarctica) are considered unacceptable. But for many resources there is little immediate danger of effective depletion. Metals can also be reused and recycled, which effectively replenishes the stock.

Meanwhile, demand for a scarce resource can be reduced through its more efficient use and through the substitution of other materials in less scarce supply. Tin, for example, has already been almost entirely replaced in industrial use by aluminium, steel, glass and plastics. Currently most substitutes for metals are other, more abundant metals. But increasingly substitutes are being manufactured from renewable resources, such as non-fossil oils.

Since continuing energy sources (such as wind power) do not run out, they pose no problems for sustainability. On the contrary, their development and more widespread use would be extremely beneficial.

Waste absorption

Waste products from all kinds of human activity are deposited in the soil, the air and water. So long as the rates at which the wastes are deposited, and their concentrations, do not exceed certain limits, the environment can go on absorbing them year after year. If these limits are exceeded, however, the capacity begins to decline. This is manifested in pollution - stored wastes which cause ecological harm or damage to human health.

Sustainability requires that absorption capacity is maintained over time. This will be achieved by restricting the disposal of each kind of waste to the absorption limits of its recipient medium. Since pollution levels - the purity of soil, air and water - are measurable, this is again an operable target. In many cases "acceptable" pollution levels will require reductions in pollution. Sustainability merely demands that - subject to further constraints outlined below - pollution should not increase over time.

Essential Environmental Services

So far we have defined sustainability as maintaining a constant environmental capacity. But in fact this may not be sufficient to protect the interests of future generations. The operations of some essential environmental services, such as climatic stability or the maintenance of ecological diversity, requires not so much a constant as a particular *minimum* capacity.

To maintain these services particular features, such as ozone levels, atmospheric composition or vegetation cover, must be preserved. So long as they remain above critical thresholds, the services will be unimpaired. If current levels are above this threshold, keeping it constant is therefore sufficient. But if it is already below the critical level, sustainability requires that the level is actually increased.

To achieve a sustainable economic policy, the economy needs to be con-

strained at the macro level. This requirement imposes significant restrictions on the operation of the market economy. Indeed, it means that market forces must be superceded.

It is important to be clear what is meant by "market forces". They are not the same as markets. A market is a micro-economic mechanism for allocating resources, in which price movements mediate between supply and demand. Markets may be more or less regulated; that is, the prices faced by producers and consumers may be more or less influenced by government policy, whether regulatory or fiscal. Market forces, by contrast, occur at the macro level of the economy. They are the collective result of the many millions of separate decisions made by firms and consumers where markets are largely unregulated. Because micro-decisions are taken separately and individually, their combined effect is unplanned. Market forces thus generate an overall result which no-one has determined.

The Invisible Elbow

Adam Smith called this the "invisible hand"; he believed it would bring general prosperity. But it is now clear that, with respect to the environment at least, market forces constitute an "invisible elbow" which is seriously upsetting the ecological balance of the planet. Few producers and consumers wish deliberately to degrade the environment. On their own, few do. But taken together their actions have this result. If we are to avert the worst consequences of the ecological crisis, the overall result of market activity must be planned.

Environmental planning does not mean that all economic activity must be controlled and directed by government; that somehow markets should be "abolished". On the contrary, one way in which particular macro-economic results can be achieved is to use market mechanisms to influence behaviour, for example through taxation and subsidy. But environmental planning does require that, whatever goes on in particular markets, the collective environmental result is constrained. Certain ecological effects should not be allowed to occur.

The principle of sustainability defines these effects: environmental capacity must not be allowed to decline, and it must be maintained above the minimum level at which crucial life support services are impaired. A sustainable economy is therefore an *ecologically-bounded one*. Economic activity can still be determined primarily by the choices of consumers and producers, and carried out by them, but its impact must be constrained within environmentally-defined limits.

Environmental planning is not a new idea. It is what occurs when governments set pollution standards. Such standards impose limits to otherwise freely-chosen economic activity. What is new is the need to constrain the economy over a much wider range of environmental effects, with a specific

goal of intergenerational equity.

Planning for sustainability is a two-stage process. First, targets need to be set for various types of environmental impact, establishing the macro constraints on economic activity. Then appropriate instruments must be chosen through which to achieve the targets: regulations, price incentives and so on.

A fully sustainable economy would be constrained across the entire range of economic-environmental interactions. This would require the government to establish operational targets for each environmental function: resource consumption, waste absorption and the provision of essential environmental services. For example, minimum threshold levels of key features of the environment which provide essential services, such as the composition of the atmosphere, ozone, vegetation cover and natural habitats, would be identified. Limits to any activity (such as carbon dioxide emissions or habitat destruction) affecting these features - along with any required increases in environmental capacity - would be established.

Priorities for Protection

Though a fully sustainable economy would require that all environmental impacts were constrained in this manner, the principle of "sustainability planning" - the setting of a target for maintenance of environmental capacity - can in fact be applied to particular problems individually. In the short term it is clear that certain environmental effects are much more serious than others. The priority must therefore be to establish limits for the most damaging activities. These might include, for example, carbon dioxide and other greenhouse gas emissions, CFC emissions, tropical rainforest destruction and leakage of nitrates into water supplies.

Perhaps the key question in respect of environmental planning is the scale over which targets are to apply. A variety of scales are available, from local government through regional and national to international and even global. The most appropriate will depend on the scale of the environmental problem in question. While soil quality standards may be set locally, carbon dioxide emissions must clearly be regulated on a global basis. Where targets are set internationally, a key question will be the allocation of quotas (eg of carbon dioxide emissions or resource extraction) between nations. Quotas allow a redistributive policy permitting greater proportionate emission/consumption by the poor countries of the South. The mechanisms for such redistribution are unfortunately beyond the scope of this essay. They require urgent attention.

The Instruments

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Once targets for sustainability have been set, at whatever scale, instruments must be found by which they can be implemented.

The setting of a target and the choice of instrument are sometimes confused. The choice of instrument does not determine the level of pollution or resource consumption or whatever else is the environmental target. This target must be set first. The instrument is simply the method used to achieve it. A variety of criteria might be used to choose one instrument over another, including lower cost, administrative simplicity, equity and political acceptability. There may also be circumstances in which some instruments are unable to meet particular targets.

Governments can sometimes encourage firms or individuals to take environmental actions without either forcing them or offering them any (additional) financial incentive to do so. This may be through the simple provision of information, through various types of "moral suasion" (appealing to people's goodwill or sense of civic responsibility), or - more radically - through attempts to change the prevailing "culture" of economic or social activity.

In certain circumstances non-statutory measures may be effective on their own. The provision of information, in particular, can have a significant role. Markets do not work perfectly; firms and consumers are often ignorant of the benefits to be gained from environmental protection measures. To take an example, a recent Department of Trade and Industry report on waste minimisation shows that many firms would be able to make substantial cost savings by changing production and waste management processes to cut down on waste. No additional incentives are required, only better knowledge of available technology and organizational methods (and perhaps some degree of "cultural change" in attitudes towards waste).

Similarly, some consumers could make substantial savings by installing domestic insulation (and could afford the initial costs) but are not aware of the possibility. In these instances, depending on the extent of the waste or energy saving target, information and persuasion may be sufficient.

In other cases, "moral suasion" is not necessarily sufficient, but it may be the only option available. This will be true where enforcement of environmental regulations is impossible. Appeals not to drop litter in the countryside or to save water in a drought are examples.

Nevertheless, in general, non-statutory measures are most useful as reinforcement for other instruments, rather than on their own.

Regulation

By and large, environmental protection measures in the UK are regulatory. That is, they use the law to lay down what can and can't be done. Fishing quotas are an example. Fishing fleets are limited in the number of fish they may catch each year.

Most environmental regulations occur in the field of pollution control. For consumers, examples of regulation include the ban on smoky fuels in urban areas and the forthcoming EC directive that all new cars must have catalytic converters. For industrial polluters, regulations usually come either in the form of "consents" which specify permitted emission levels (volume, concentration, timing) of different pollutants, or the requirement that certain pollution control technologies or product specifications are used. The location of factories is also controlled.

Regulations offer would-be polluters no legal choice: pollution above the consented level or through use of unsanctioned technology is simply forbidden. The cost of non-compliance is a fine (or in theory imprisonment). This means that enforcement is the key problem: where enforcement is difficult, the target may not be achieved.

Regulation continues to be the favoured method of pollution control in many parts of the world. Southern California, for example, has recently adopted an Air Quality Management Plan comprising 5,500 pages of regulations intended to reduce smog levels. They range from a prohibition on the use of barbecue lighter fuels to the compulsory adoption of "car journey reduction plans" by all companies with over 25 employees. New York State has passed new laws forcing people to separate household waste at source - with fines ranging from \$25 to \$500.

Price Incentive

Rather than force producers or consumers to take action by law, it is possible to encourage them to do so by giving financial incentives. Such incentives are designed to change the prices of particular activities, so that environmentally damaging ones become relatively more expensive, and benign ones relatively cheaper. If a firm is taxed on its waste emissions, for example, this will encourage it to reduce them, up to the point at which it is cheaper to pay the tax. Similarly, taxing a resource such as fossil fuel energy will encourage consumers to conserve it and electricity companies to switch to alternative (renewable) sources.

There are different types of price incentive: taxes on activities such as

polluting, or on consumer and industrial products, subsidies and "marketable permits" in which, for example, pollution permits are tradable between polluters. Different measures can thus be used to alter the behaviour of consumers or producers.

Several general issues arise with respect to environmental taxes. One is the question of what happens to the revenues generated. In the case of pollution charges, part of it could be returned to the polluting firms. Although this might seem strange, it is no more than a recognition of the fact that polluters are charged more than it costs to reduce pollution to the acceptable level (since the charge is payable on all polluting activity). Such redistribution occurs in most of the European systems of pollution charging, with the specification that redistributed sums must be spent on pollution control equipment.

The revenues could be used to compensate people whose environments remain damaged by residual pollution. However the "acceptable" levels of pollution are decided, certain communities will face higher local costs than others (for example those living near chemical factories or land fill sites). It may be appropriate that they should receive compensation, perhaps in the form of lower rates, or even in extreme cases by direct grants to individuals.

Hypothecation

Alternatively, environmental tax revenues could be "earmarked" by the state for expenditure on environmental protection and enhancement measures. Again this is done in the continental water charge systems, with funds going to public investment in water treatment. Income from the Swedish tax on fertilizers and pesticides is similarly used for research into more environmentally-sensitive agriculture. Such earmarking or "hypothecation" is alien to British custom, but it may be important if pollution standards are to be not only maintained but also improved. If revenues are not earmarked the Government may even have an incentive to discourage environmental improvement, since this would reduce valuable revenue. It also carries the advantage that those paying charges can clearly see what they are paying for, which may assist public acceptance.

Revenues could be used specifically for income redistribution, either by increasing welfare benefits or by reducing the income tax paid by the poor (or both). This would be one way of offsetting the regressive effects of higher prices likely to result from environmental taxes. Finally, revenues could simply be added to the general public purse, without specific earmarking. In this case it may be possible, or even necessary, to reduce other forms of taxation.

Other questions commonly raised about environmental taxes concern their distributional effects (do they hurt the poor?), and their effects on inflation

and on international competitiveness. Since these in fact apply to both regulations and price incentives, we shall deal with them in subsequent sections. Suffice it to say here that, with respect to competitiveness, the wider the geographical coverage of the environmental measure, the less the impact. The importance of international institutions, particularly the European Community, in harmonising environmental policy is evident.

Regulations versus Price Incentives?

Most of the instruments used for environmental protection in the UK are regulatory. Economists have long argued that price incentives are preferable. With its clear call for the introduction of pollution charges and other price incentives, the Pearce Report has brought fresh impetus to this debate. Several pitfalls need to be avoided, however, in assessing these arguments.

First, the labelling of different instruments on ideological grounds should be rejected. It is sometimes supposed that, because they make use of market behaviour, price incentives are somehow politically "right wing", whereas regulation, which stops firms doing things by law is "left wing". This is unhelpful. The distinction made earlier between market forces and markets is essential here. Price incentives do not leave protection of the environment to "market forces" (a choice which might legitimately be labelled right wing). On the contrary, they are an explicit form of intervention in markets, with the aim of controlling market forces. They are a way of planning the collective result of individual decisions, ensuring conformity to an environmental target or standard set by government. In doing this they have essentially the same impact on market behaviour as regulation.

This is not to say that there are no political choices to be made in environmental policy. There are, but they concern not the instrument used, but rather the extent to which environmental protection will be allowed to constrain private economic decisions (ie whether the sustainability constraint is adopted, or only lesser targets), and how the costs and benefits of such protection are distributed.

Second, it is not enough to compare the relative merits of regulation and price incentives in terms of theoretical models of economic behaviour, as is too often done. Not only do such models fail to represent the complexity of the real world, in which institutional factors crucially affect corporate and consumer decision making, they also ignore the wealth of evidence of real world experience which is now available. Detailed empirical analysis of such experience is needed.

Third, arguments must be focussed on specific instruments for specific environmental problems. There are a number of different types of price incentive; a matching set of regulations could be devised to meet each of the same goals. Arguments in favour of regulation or price incentives in one

context cannot be extended to another; each case must be argued on its merits. Regulations will prove more appropriate in some circumstances and price incentives in others.

Fourth, care needs to be taken to relate the instrument not simply to a specific problem, but also to the environmental protection target required. In certain cases, this may lead to the conclusion that neither regulation nor price incentives are adequate.

Bearing these points in mind, it may be helpful to examine the arguments comparing in general the two types of instrument. Commonly cited grounds for favouring price incentives over regulation are that incentives are more efficient than regulatory methods (meaning that they require less cost to meet the required standard), that they provide a continuing motivation to reduce the environmental damage, that incentives are more libertarian, interfering less in private activity, and that they are administratively less cumbersome, involving less bureaucracy and legal enforcement.

Efficiency

Efficiency is not always the principal objective of environmental policy, but it is clearly an important one, especially as standards for protection are tightened and the costs of meeting them correspondingly rise. Minimising these costs makes the target more acceptable and also saves resources for other purposes.

The argument that price incentives are more efficient than regulation is most commonly applied to pollution control. It is easy to prove in theory: if the costs of cutting polluting emissions varies between firms, it is cheaper for society as a whole if those for whom it is less expensive cut them further than those for whom it is more expensive. Under a regulatory system this will not occur; all firms have to cut to the same standard (or introduce the same technology) irrespective of cost. But with pollution taxes, high cost firms will prefer to pay the tax while low cost firms will prefer to cut their emissions; the end result will be a lower total expenditure to meet the same standard.

Since neither actual firms nor actual incentives conform to the model, the theoretical demonstration that incentives are more efficient than regulation is not always sustained in practice. Empirical evidence suggests that many firms are not cost-minimizers, because of the ignorance and inertia of management. Managers may not know their marginal cost curves, may not understand how the charging system works, and may be unaware of or unwilling to invest in new pollution control techniques. (This indicates that price incentives need to be accompanied by non-statutory measures of education and persuasion on the part of pollution inspectors.) If pollution charges are a small percentage of total costs managers may not give priority to this particular area of cost minimisation.

Nevertheless, studies of pollution charges and tradable permits in practice do show that savings in control costs can be made. The German system of water pollution charges is estimated to have saved about one-third of the costs of a regulatory system for the same standard, while in the US it has been estimated that up to 1985, emissions trading for air pollution had yielded savings of approximately \$4.5 billion.

Where pollution control costs differ between firms, therefore, and where monitoring of emissions is possible, the case for some kind of incentive system appears strong. It should be noted, however, that the cost advantage over regulation diminishes as the target level of pollution is lowered. This is because if firms are required to reduce their emissions by very large amounts, the availability of low-cost measures declines, and firms will face more similar costs, for example in introducing wholly new technology.

Continuing Motivation

Allied to the claim of greater efficiency is the argument that price incentives provide a continuing motivation for firms or consumers to reduce their pollution, even below the target. Under a regulatory system firms have no incentive to reduce emissions below the permitted level. But in a charging system, all reductions cut their tax bill. Similarly, a tax on electricity would constantly encourage consumers to use less. Tax measures provide a particular incentive for firms to innovate in pollution control techniques, both for their own emissions and in the consumer goods they make. (Though in fact again it seems that in practice institutional inertia within firms may make this less of an advantage over regulation than the theory suggests.)

The third case often made for price incentives is that they are more libertarian than regulations. Whereas regulations force firms or consumers to do certain things, incentives merely encourage them to do so; they still have the freedom to choose. It is a moot point how far higher prices do in fact allow freedom to choose (or, perhaps more strictly, how valuable that freedom is if it cannot be exercised); but there may be a subjective difference in how regulations and price incentives are perceived which makes the incursions on freedom of the latter more acceptable. This may be particularly true for consumer goods, where the idea of banning certain goods may be unacceptable.

Against this, pollution taxes may be seen as inequitable, since they allow rich individuals and firms freedom to pollute simply because they can afford to, whereas poor people cannot. If the benefits of polluting are great, this creates "environmental inequality". Car use is an example. If cars or petrol were heavily taxed, richer people would become much more mobile than poorer people. Though the polluter would be paying, it might be thought fairer if everyone were forced to cut down or stop altogether.

Price incentives place the environmental costs of production and consump-

tion activities "out in the open", where they can be seen and measured. Often the costs of complying with regulations are hidden. Taxes make firms and especially consumers constantly aware of the environmental effects of their actions. In this way they may encourage a wider "green awareness".

A further case often made for price incentives is that they are administratively simpler than regulation: instead of the complexities of framing laws and enforcing criminal penalties, taxes simply need collecting. This argument is false. First, taxes require laws too, and any complexity involved in drawing up regulations (for example, establishing allowable volumes, concentrations, location and timing of discharges, or setting standards for consumer goods) have to be mirrored in the schedules for taxation or design of permits. Price incentives need as much monitoring and enforcement as regulation (tax evasion is as illegal as non-compliance with regulations); indeed, the measurement of emissions or "pollution content" for taxation may be considerably more onerous. The additional educational and persuasive functions of regulators are just as necessary under tax systems, with the added function of tax collection. Almost certainly, therefore, the bureaucratic implications of price incentives are as great as those of regulatory mechanisms.

Limitations of Price Incentives

The general arguments for price incentives over regulations are therefore positive on some grounds (and in certain circumstances), less so on (and in) others. There are three important limitations of price incentives, however, which must also be considered.

- Incentives are often of little use if the goal of policy is to reduce some environmentally damaging activity quickly. They are likely to take longer to introduce or to change than regulations, and almost certainly reaction to them will be slower.
- Incentives are not helpful if the environmental target for some activity or good is zero. Only regulation - outright banning - can ensure that such a target is met. Certain cases for banning, such as particularly toxic pesticides or imports of endangered species, can be identified easily. More interesting are those cases where zero use is not absolutely necessary, but the availability of a relatively cheap, environmentally preferable substitute makes a ban feasible. Examples might be energy-inefficient electric appliances, or non-biodegradable detergents. Here it would be possible to tax the more damaging good, but if the costs of substitution were small it might be simpler (and as we have seen, not much more costly) to ban it. This is the way most countries control energy efficiency standards in buildings. For many consumer goods regulatory standards may thus be preferred to taxes.

- In certain circumstances incentives may not work without high tax increases. This will be the case where the good or activity in question has a low elasticity of demand (the degree to which demand for it rises or falls when its price changes.) In order to get demand to fall significantly, high taxes would have to be imposed.

Energy use falls into this third category. The 1974 and 1979 oil shocks increased prices fourfold. Although energy demand did fall as a result, it did not fall greatly per unit of output. That is, in relation to the existing long-run trend towards greater energy efficiency, the price rise had only a small additional effect on demand. This suggests that, unless a carbon tax were set at high rates, it might not have the effects desired. Similarly, it appears that car drivers are reluctant to switch to public transport even when it is not available, has been estimated that the price of petrol would have to rise to between £2.50 and £3.00 per gallon for private consumption to fall just 10-15%.

The sort of carbon tax rates that would be sufficient to overcome the problem of elasticity - to reduce carbon dioxide emissions by 20% by 2005 (the Toronto target) - have been modelled for British manufacturing industry. Depending on a number of assumptions, in particular the projected rate of economic growth, it is estimated that taxes on coal would need to be between 123% and 277% by 2005, those on oil between 57% and 128% and on gas between 71% and 160%. These rates would translate into electricity price increases of between 38% and 79%. There must be doubts about the political acceptability of such tax rates unless others measures were introduced at the same time to mitigate their effects.

How can the problem of low elasticity be overcome? First, taxes could be accompanied by subsidies, for example for insulation in buildings, the installation of energy efficient technology by firms, and so on. Low elasticity implies that the tax receipts from even a low carbon tax might be considerable. These could be used to provide the subsidies. Second, regulations could be used in addition to (or instead of) taxes, to ban environmentally damaging goods, technologies or activities. Third, governments may be able to assist in the provision of non-polluting substitutes, through an improved public transport system or by investing in the research and development of new technologies.

The Government's Role

5

Collective action - that is, direct government expenditure programmes - may be desirable for a number of reasons, including equity and political control. However, collective action may also be necessary on purely environmental grounds.

This will be the case where private decision-making does not adequately or efficiently provide collective goods and services. Such goods and services include the collection, treatment and disposal of waste, investment in research and development and environmental reclamation and enhancement, such as reforestation. Direct government expenditure in these fields has a long history.

Government programmes are likely to be particularly important when the changes in economic behaviour required to protect the environment are large. In general, the debate between regulation and price incentives tends to assume that the changes necessary to protect the environment are small. In these cases, regulations and taxes are likely to be both effective and politically feasible. If the necessary reductions in consumption or pollution are large, however, systemic change may be required. That is, a whole new infrastructure may be required for the production, distribution or consumption of a good. While in theory regulation or price incentives can effect even systemic change, in practice the scale on which they would have to be introduced would almost certainly make them politically impossible. Expenditure on infrastructure has therefore generally fallen to government.

The goal of sustainable development does require large-scale changes in the environmental impact of many economic activities. There is often an alarming gap between accounts of the seriousness of global and national environmental problems and the minor policy changes which are suggested to deal with them. If sustainable targets are adopted as defined here, significant reductions in certain types of resource consumption and pollution will be required.

The Greenhouse Effect is the obvious example. The *minimum* target set by the Toronto conference was for carbon dioxide emissions to be reduced by 20% from 1988 levels by the year 2005. To avert the risk of catastrophic global

warming, a 50% reduction was estimated to be necessary. Given that Britain's CO2 output is officially expected to increase substantially in the same period, it is clear that dramatic changes in energy consumption patterns are called for.

A proportion of these changes can be achieved through regulations and price incentives, notably in relation to energy efficient appliances and building insulation. But to reduce carbon dioxide emissions over the longer term to the rates necessary to prevent significant global warming, taking into account likely increases in Third World consumption, measures of a qualitatively different nature are required. They involve systemic change in the production of energy and in transport, changes which can only be undertaken by government.

At present 60-70% of energy input to power stations is wasted in the generation of electricity. As much as half of this could be saved by supplying the wasted energy as heat for industrial and domestic use. A major infrastructural programme of district heating schemes using "combined heat and power" (CHP) stations in urban areas would make a substantial contribution to reducing primary energy demand. District heating from CHP is now supplying 20% of Denmark's heating requirements. In Britain the estimated savings on CO2 emissions from CHP installation would be 39 million tonnes, or 7% by 2005. Such a programme would require significant government investment, but its cost-effectiveness (in terms of "tonnes of CO2 saved per pound") would be high.

Perhaps even more important over the longer term will be the generation of energy from renewable sources: wind, tide, wave, hydropower and geothermal. It is estimated that renewables can feasibly generate 40% of UK electricity demand. To some degree price incentives (for instance, a carbon tax) will encourage the development of new sources such as wind power by the private sector. But larger developments - such as the building of tidal barrages and offshore wind generators - will require major government investment. The cost of the Severn barrage, for example, is estimated at nearly 10 billion. As an immediate measure, government funding for research and development in renewables needs to be increased.

After electricity generation, the largest source of carbon dioxide pollution comes from the transport sector. Road transport is responsible for just under 20% of all UK emissions. Emissions are projected to rise by between 20 and 40% by 2005. While taxes on petrol, higher vehicle efficiency standards and other incentive and regulatory methods can affect some reduction, they would have to be introduced on a draconian scale to reduce emissions by the amounts required. It is evident that a major restructuring of the public transport system and, over the longer term, changes in land-use planning and regional policy are also required

Who Pays?

6

Neither the benefits of the environment in its undegraded state nor the costs of its degradation are experienced equally throughout society. Poorer people almost always live in worse environments than the more affluent.

This is true not only of local pollution levels, but of health and safety conditions at work and the general amenity of residential neighbourhoods. Moreover, income is a crucial determinant of access to the countryside and other areas of natural beauty and recreation. This "environmental inequality" is likely to be made worse by the impact of measures to protect the environment. The distribution of the benefits of environmental measures will vary. A general reduction in air pollution may have a greater impact on the poor, since the air in poorer neighborhoods is currently more polluted. Protection and enhancement of the countryside, on the other hand, is likely to be more appreciated by the better off, who visit it more often. But the costs of protection measures will fall unevenly in nearly all cases.

Such costs occur both in job loss and in higher prices and taxes. While environmental protection measures are not likely to reduce employment generally, they will undoubtedly cause some jobs to be lost in some industries while others are gained elsewhere. Higher costs will therefore fall on some people than on others. Given the uneven geographical distribution of industry, this is likely to increase existing regional inequalities of employment and income.

As regulations or price incentives are introduced, the retail prices of environmentally damaging goods will rise, either directly through consumption taxes or through increased costs of production. Where governments offer subsidies or undertake collective action, direct taxes may increase. The distributional effect of direct tax increases depends on the tax structure.

There are two different impacts to note here. The first is the proportional impact on different income groups. If a given price rise takes up a higher proportion of the expenditure of the poor than that of the rich, it contributes to greater inequality. The small amount of research which has been done suggests that existing environment programmes are indeed regressive in this way. Significantly higher proportional costs fall on lower income groups.

Even if a given price increase is progressive overall, however, it may still have an absolute effect on the poor which is inequitable, because the extra expenditure is taken out of a small budget. Carbon taxation would almost certainly fall into this category. In general, as a proportion of their total expenditure, richer people use more energy than the poor. They spend more on energy-intensive activities such as travel, and have more domestic appliances such as dishwashers and tumble dryers. The overall effect of a carbon tax might therefore be progressive, penalising the rich more than the poor. But the absolute impact on poor people is likely to be severe, because they cannot afford any extra expenditure: they may indeed already be living in "fuel poverty" because of lack of income. Whether the extra energy cost they would have to pay is proportionately more or less than that spent by the rich is then irrelevant.

These effects do not mean that such measures should be rejected. After all, they are designed to avert other adverse effects occurring to future generations - that is, to promote equity over time. But they do make it essential that the environment is not treated in isolation. Environmental protection must go hand-in-hand with social protection, so that the benefits and costs are distributed fairly among income groups and regions.

Protecting the poor

How can the inequitable effects be minimised? One option would be to increase the disposable income of poorer groups. This could be done both through reducing income tax rates and by increasing welfare benefits. Some contribution might come from the proceeds of environmental taxation.

Alternatively, minimum entitlements to essential goods and services could be established. This might work simply through low prices for the first units of consumption and then higher prices thereafter, or through a system of vouchers. Domestic energy, for example, could be priced at a low rate up to a minimum amount needed to heat a home adequately. All consumption above this amount would then be subject to heavy taxation. Free (but possibly tradable) vouchers might be offered for visits to scenic areas under threat from overuse. This would ration the benefits of tourism fairly, instead of allocating them simply according to ability to pay.

A third option would be for the public sector to subsidise some environmental goods and services. Assuming general taxation is progressive, subsidised products, such as public transport, water and the protection of the countryside, are paid for proportionately more by the rich than by the poor. A programme of domestic housing insulation could also be publicly funded. This is likely to be the most effective way of protecting the poor from the effects of higher energy prices.

Alternatively, job guarantees or other forms of protection could be given to

those whose jobs are lost as a result of environmental policies. Wherever possible, new employment opportunities resulting from these policies, in pollution control, energy efficiency and recycling industries, in the manufacture of new technologies, in railway, housing and sewer construction, and so on, must be located in areas where they can replace jobs lost. This is likely to require substantial support for regional development and for retraining. The concept of industrial "conversion" - changing the output of existing factories - will need to be developed. Clearly, worker and trade union involvement in these programmes will be essential.

The effect on economic performance

It will obviously be asked what effect a policy of sustainable development would have on the conventional indicators of economic performance: inflation, competitiveness, the balance of trade, growth and employment.

No definitive answers can be given to these questions. They depend crucially on what the sustainable targets for resource consumption and pollution are held to be. This in turn depends on how environmental resources are distributed between North and South. The greater the degree of global redistribution, the lower will be the targets for resource consumption in the industrialised countries.

The answers also depend on the time over which it is intended that sustainable (or other environmental) target should be reached. The longer the transition period, the lower the costs of adjustment, since new industries, technologies and products will have time to develop.

Some general observations can however be made, based partly on theory and partly on the experience of previous environmental policies, whose macroeconomic impacts have been modelled by the OECD. Such evidence cannot simply be extrapolated to gauge the impact of future environmental policies, since these may be much more severe, and other conditions may have changed; but they may give some guide.

It is likely that environmental protection measures will be inflationary. Since one of their purposes is to reflect the full cost of production and consumption activities, prices will probably rise. But the extent of the inflationary impact depends partly on the distribution of extra costs between producers and consumers, and partly on how far the proceeds of environmental taxes are compensated for by reductions in other taxes which reduce prices elsewhere. In the OECD study, the maximum inflationary effect attributable to environmental programmes was of the order of 0.5% per annum.

It should, however, be asked whether the inflationary effect of environmental policies is necessarily a bad thing. Inflation is redistributive, taking away income from savers and people on fixed incomes. But neglecting the environment is also redistributive: it transfers benefits from those harmed by envi-

ronmental degradation to those causing it. If environmental policies rectify this, a small amount of additional inflation may be regarded as an acceptable price.

If environmental protection raises prices, it may affect the competitiveness of firms in comparison with those from countries where controls are weaker. This is certainly a likely complaint of industry. This may be a reason for favouring consumption taxes (which apply to all competing goods in the domestic market but not to exports) over producer-based measures. It is more strongly a reason for levying common environmental measures at an international level. With its existing record of environmental policy, the EC is a crucial institution in this context.

The impact of environmental policy on the balance of trade depends on how far other countries implement their own or common measures, and the composition of domestic industrial output. It is clearly possible for a country to specialise in, say, pollution control technology and make trade gains, while others lose. Similarly, greater recycling may save on imported virgin materials, or require greater imports of recycling technology. In the OECD study different countries experienced opposing balance of trade impacts.

Up to now, environmental protection policies adopted in industrialised countries are estimated to have had only a small negative impact on economic (GNP) growth, and in some countries the effect has been positive, with demand for pollution control equipment and so forth raising output. Of course, the additional income represented by GNP growth may disguise higher environmental costs.

Jobs and the environment

Even if not desired for its own sake, growth may be a means of maintaining employment. Here the OECD study provides an important lesson, namely that environmental protection measures have in most cases increased employment. This result is confirmed in a Dutch macroeconomic model, where much higher standards of environmental protection are applied.

The reasons for employment growth are not difficult to understand. Stricter standards will require new technologies for production, pollution control and energy efficiency. They will stimulate new recycling industries and the development of new materials, for example through biotechnology. Environmental clean-up activities, in rivers and on landfill sites, tend to be labour-intensive. New infrastructural investments, such as combined heat and power, renewable energy sources, public transport and waste collection and reclamation, are likely to create many jobs. Research and development and environmental services of all kinds are likely to flourish. There is no doubt that jobs will be lost as a result of environmental measures. But evidence from an analysis of EC policies suggests that the net employment effect will be positive.

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