4. How economic instruments work in practice, with particular reference to nature conservation

4.1 The preceding section detailed the potential advantages of ETs, based mainly on the theoretical foundations of environmental taxation. This section addresses whether such benefits are likely to accrue in practice and, in particular, whether they are likely to meet nature conservation policy objectives.

4.2 The recent OECD report on Incentives for Biodiversity (OECD, 1999) provides a reminder that the problems of biodiversity protection are significantly different from the classic Pigovian model of pollution which provides the foundation for environmental taxation theory. The report concludes that 'biodiversity is comparable but not identical [to the standard pollution model]...The costs imposed by the loss of biodiversity are frequently of a different nature than the relatively more straightforward costs connected with pollution...frequently the value of biodiversity resides in its pure existence and future uses. In these circumstances, the logic of applying EIs to correct for externalities and market failures is put to severe tests'.

4.3 For ETs to be designed in a way that will deliver environmental benefits, 2 basic conditions must be met:

- An indicator of environmental damage must be designed which is measurable, is continuous and is correlated with the environmental damage;
- Market circumstances must favour a response to the price signal; or, in the absence of favourable market forces, revenue must be hypothecated for environmental protection or restoration.

Potential problem: Design difficulties

Measuring the environmental damage and associated costs

4.4 Where the intention is to set a tax level in relation to perceived environmental damage costs, measurement of these costs can be difficult. The classic Pigovian model, for example the river scene in figure 1, makes simplistic assumptions: some of the externalised costs are relatively easy to track in both a physical and monetary sense. Actual (ie explicit) monetary losses are observed, through a reduced market price for fishing permits and costs to the water supply industry. It is then simply a question of internalising this effect. A key problem for biodiversity, however, is that because of its public good nature, no markets exist to track the loss of utility in monetary terms. Thus the original problem of effects 'externalised' onto other markets is compounded by a fundamental lack of markets (Bowers, 1997). A quasi-market exercise is often needed to set at appropriate tax level, or to justify the need for a tax. Such willingness to pay exercises are relatively straightforward for some environmental effects, but are widely acknowledged to be especially difficult for biodiversity (Bowers 1997, DETR 1998a, DETR 1998b, Spash & Hanley 1995, Burgess et al 1998).

4.5 Monetary valuation problems can be compounded by problems in measuring the effects in physical / scientific terms. For example, it is widely held that over-use of pesticides is damaging for farmland birds. The actual proof for this assertion rests mainly on the

evidence from studies of the grey partridge. This shows that over use or insensitive use of pesticides has been one of several factors relating to agricultural practice that has caused the decline in numbers, and that manipulation of pesticide usage can lead to improvements in numbers. Pesticide usage is therefore but one of a number of factors affecting the species (Burn, 1998). Evidence for effects on other bird species is highly suggestive but not conclusive. Such lack of scientific certainty is 'music to the ears' of anti-tax lobbies as it brings into question whether the extent of externality costs are sufficiently significant. The case for the tax may, therefore, rest on the precautionary principle.

4.6 There may be different environmental effects, with different levels of 'measurability', and the different environmental impacts from a single effect may not all be in the same direction. This problem was evident in the first stage research for the aggregates tax (DETR 1998a). Quarrying can have different environmental effects, for example noise and dust nuisance to residents, visual landscape effects, and effects on biodiversity. The DETR research suggested that sand and gravel quarries should carry the highest tax level, with marine super-quarries the lowest band. This banding system is probably not consistent with nature conservation goals since there is no evidence that sand and gravel is on average worse than other rock type extraction. Thus measurability factors, highlighted above, can affect the tax design in ways that could provide perverse effects for nature conservation. Where nuisance externalities can easily be measured, but externalities relating to the existence value of biodiversity can not, the former is likely to dominate the tax design in a way that may deliver perverse effects for nature conservation.

4.7 Thus, difficulties in measuring externality costs can compromise the basic justification for the environmental tax, can lead to a tax rate set at an inappropriate level, or tax band rates that will lead to insufficient response or perverse effects.

Environmental damage may not be 'continuous'

4.8 The theory of ETs also assumes a gradually rising environmental damage function. This is appropriate for many areas such as noise pollution where, except at the very highest levels, the damage is about nuisance levels which gradually increase with output. However, there may be areas where the damage function is discontinuous and where, after a particular level of pollution, damage occurs exponentially (Burrows 1995). This has serious implications for the operation of ETs. Consider the extreme case of a damage function which rises gradually with output, but then after a certain level the function is vertical (damage costs escalate). In such cases the ET would deliver no advantages over regulation and could cause uncertainties if the tax level is not set at the right level.

It may be difficult to link correlate tax base with the environmental damage

4.9 The term 'tax base' is used to mean the indicator on which the tax is placed (eg units of emission or use of product). Getting the necessary 'linkage', to encourage behavioural change, can be especially difficult for nature conservation interests. In tax design, there is a cost-benefit trade off between 'linkage', ie the ability to define the tax base according to the environmental effects one wants to change, and the transaction costs of the policy. For example, in the proposals for point source water pollution taxes, it is recognised that using river quality classifications and Bio-Chemical Oxygen Demand as the tax base are

proxy measures for the polluting effects on biodiversity and other environmental considerations (DETR, 1998c). To control road transport, the fuel escalator provides reasonable linkage with greenhouse gas emissions. However, it has poor linkage with the land take and other effects of new road building on nature conservation; ideally what is required is a marginal tax per mile which is sensitive to high demand times and roads (Maddison et al, 1996). Better linkage is theoretically possible for both road and water pollution taxes, but would be much more expensive, bringing into question the cost-effectiveness advantages of the measure. In practice, therefore, ETs are often designed with a simple tax base aimed to capture the main externalities.

4.10 The problem for nature conservation is that the interaction between economic activity and its effect on the environment is usually highly complex and may be difficult to capture in simple tax design. The cost-effectiveness arguments against better linkage are compounded by transaction costs relating to scientific knowledge or monitoring of the damage for individual polluters. For example, one of the greatest concerns about pesticides is their indirect effects (eg on food sources for birds). However, research for DETR (ECOTEC, 1998) argues, controversially, that it is not practical currently to design a tax banding system to reflect this factor properly, since there is not a sufficient scientific consensus about the appropriate indicator to use. The aggregates tax proposal is another example, with a simple banding system based on rock type. It is for this reason that they are sometimes accused of being a blunt instrument for environmental policy. In both the pesticides and aggregates tax examples, the problem of 'linkage' is compounded by the fact that the same level of pollution can have different impacts, depending on its location. Correlating the tax base with location, which is potentially important for nature conservation, can be difficult.

4.11 The implications of inadequate linkage between environmental damage and the tax measure is two-fold:

- The positive behavioural changes caused by the ET will be more limited;
- The potential for perverse effects is increased.

Spatial variation in response

4.12 Paragraph 4.10 highlighted how it can be difficult to link the tax base with spatial variation in impacts. A further potential problem is that ETs may encourage spatial variation in polluters' response to the tax, which could have environmental implications. ETs allow the market to determine the distribution of pollution between a set of polluters (Bowers, 1997). Indeed, the cost-effectiveness advantages of ETs over regulation rely on the fact that some polluters will elect to change their activities to reduce pollution and avoid the tax, while others will elect to pay the tax. Consequently, a well designed tax will achieve the overall environmental target, but there could be a spatial pattern of effects. In some situations, for example controlling greenhouse gas emissions, the spatial consequences of the ET are of little consequence as long as the overall target is achieved. In other situations, the locational consequences of the instrument can be very important.

4.13 This has implications for nature conservation policy, since biodiversity protection is so locationally specific. The cost effectiveness benefits from ETs imply that some polluters will reduce output or install abatement processes, while others will carry on as before and

pay the tax. While the overall environmental target may be achieved, there will be differences in response which may have spatial characteristics. For example, with the proposals for water pollution from point sources, there were concerns that those dischargers least likely to implement pollution control measures are the ones in the most problematic locations for wildlife (Bowers, 1997; EN 1998).

Potential problem: market forces and structure can affect the behavioural response to the tax

4.14 There are 3 factors to consider here:

- Some goods have a low price elasticity in demand (eg pesticides, road fuel). This means that major changes in price levels are required to deliver even moderate behavioural changes. This means that the environmental response may be limited, albeit that this is still optimal in economic terms;
- For some products (eg pesticides, aircraft fuel), the price response is further dampened by government subsidies which the products attract (eg the Common Agricultural Policy);
- In some industries, for example water and other utilities, the effectiveness of the price signal may be constrained by the absence of competitive market conditions. With water pollution taxes, for example, government has to set the appropriate tax rate, but for this to work the regulator must also decide how much of the additional burden must be absorbed by the industry, and how much by consumers through higher prices. In such cases there is a high chance of imperfect transmission of price signals to decision makers.

4.15 Provided there is a commitment to flexibly changing the tax level until it bites, an environmental target can still be achieved cost-effectively, though there may be additional costs associated with a trial and error approach. Arguably, nature conservation policy in the UK, including a range of advisory, compulsory and incentive instruments, has typically armed regulators with a set of instruments that can be used flexibly. It is a matter for debate whether taxation allows the same level of operational flexibility.

4.16 Even where these basic conditions are met, there can be problems in relation to delivery of environmental benefits. These are discussed below.

Potential problem: ETs and 'fairness'

Social-distributional consequences

4.17 Given the present government's commitment to social issues as a key objective of its sustainable development strategy, this is an important question for policy design. Evidence has emerged that the burden of ETs can be uneven and can have a proportionally greater impact on the poor. It is for this reason that tax proposals for the energy sector are likely to exempt household consumption. Research on Vehicle Excise Duty (Ferguson and Skinner, 1998) shows how different designs of a tax can significantly affect the burden on the poor. Other research (Proops et al, 1998) suggests that environmental taxation has a general tendency to affect the poor disproportionally; this research concludes not that ETs should be abandoned, but that additional measures to minimise such impacts should be built into the tax design. For example, the distributional impacts of higher VAT rates on domestic heating could be minimised by a tax free energy allowance (Ekins, 1998c).

Again, however, while adverse distributional effects may be more obvious with a tax, they may also occur with a regulatory alternative.

International competitiveness

4.18 In part this is a matter of politics. Well designed ETs can help remove market distortions and, while they may damage industry competitiveness, the previous industry position was essentially the product of implicit subsidies due to their failure to internalise environmental costs. It also goes without saying that for ETs to have the necessary bite, they must affect a firm's competitive position. They are also likely to be less burdensome on average than an equivalent regulatory measure, since they provide flexibility of response for a firm. However, there can be problems in an international context, for example where ETs are implemented in the UK but where other exporting nations do not face the same constraints. The current proposals for aggregates and pesticides have been criticised on these grounds, though if anything UK industry is under-penalised by eco-taxes on average compared with some European countries. However, there are 3 ways to cope with this problem in tax design: first, to impose the instrument on imports as well as on domestic produce. Secondly, the revenues for a tax can be recycled, either to industry generally (as with the Landfill Tax which was accompanied by a commensurate reduction in national insurance) or to the particular industry (in the case of the energy tax proposals (H M Treasury, 1998b)). This is called **'revenue neutrality'**. Note, however, that this recycling should be to an industry as a whole, or to all industries. Recycling to individual firms based on their tax burden would be pointless as it would damage the incentives of the ET. Thus, 'revenue neutrality' will also involve individual winners and losers.

Cross-sectoral fairness

4.19 ETs can be perceived as unfair if they are not equally implemented across all sectors of the economy. For example, the UK energy tax proposals will exempt the domestic sector for social reasons, bringing the charge that it is unfair on the industrial sector.

Implementation timescale

4.20 ETs can also be perceived as unfair if they are implemented suddenly. Firms can reasonably claim that they have made significant investments in capital based on a Government climate which suggested that such equipment was acceptable, only to be taxed on the investment at a later date. There is a strong argument, therefore, to implement ET proposals gradually in order to give firms and households time to adjust their spending plans.

Potential problem: Economic instruments may not sufficiently address sustainability issues.

4.21 A tax rate based on monetary valuation of externalities, such as the aggregates tax proposals, will reflect the current generation's willingness to pay for biodiversity protection. Annex 2 and figure 2 explain that pollution may be occurring which is not being recognised by society and does not therefore impact on their current well-being; however, it could impact on future generations. The economic rationale for sustainable development policy is that, for reasons of uncertainty and irreversibility, extra policy protection is needed because the current generation is unlikely to value sufficiently the

need for environmental protection (Pearce and Turner, 1990). Bromley (1998) argues that the current generation has 'no right' to vote, via its economic choices, for irreversible losses. Thus, sustainable development implies more than the internalisation of externality costs as perceived by the current generation, albeit that these may include some 'bequest' value element. Additional measures may be required to protect against irreversible losses of important natural capital. A potential solution is to set the tax rate on a precautionary basis ie at a rate designed to reduce output further than the level indicated by measured externality costs. In any case, environmental taxes are unlikely to be the sole measure in any area of environmental policy.

5. International experience of environmental taxes: studies from elsewhere in Europe

5.1 A number of review studies have taken place in recent years, including those by OECD (1997), the European Environment Agency (1996), the Swedish Environmental Protection Agency (1997), and Anderson (1994). These review the effects of environmental taxes in general, not specifically relating to the benefits for nature conservation. Some European countries, for example Sweden, Netherlands and Denmark have a much longer experience of environmental taxes than the UK. These studies have been reviewed in a report for the European Commission (Ekins & Speck 1999).

5.2 Generally, the evaluation processes have been insufficient. The difficulties include the lack of definition of the environmental baseline prior to the implementation of the tax: the difficulty in evaluating the specific impacts of a tax given that it is usually one of a package of measures aimed at an environmental improvement; and problems in estimating the 'counter-factual' ie what would have happened in the absence of the policy. The need for better, in-built, evaluation processes is indicated.

5.3 The OECD study reviewed the evidence from the reports of Green Tax Commissions in Norway (1996) and Sweden (1997). The evaluations related to specific measures for specific circumstances, but the following general conclusions were drawn:

- Green taxes were effective and efficient instruments in these cases for environmental protection;
- A tax shift where environmental taxes are increased, and labour taxes reduced, will improve economic performance through improvements in the environment and some reduction in other economic distortions;
- These improvements are unlikely to involve significant employment losses overall: if anything, employment is likely to increase;
- However, such tax shifts would only make marginal improvements in terms of the overall unemployment problem;
- Adjustment costs can occur if different countries implement different policies.

5.4 The OECD study reviewed the evidence in a number of case study areas:

- The Swedish sulphur tax, implemented in 1991, led to a reduction in the sulphur content of fuel oils by almost 40% beyond the legal standards;
- In Sweden, the tax differentiation between different types of diesel fuels has increased the use of 'clean' fuel from almost 0% in 1990 to almost 100% in 1991;
- In Norway, in some sectors of the economy, where good alternative fuels exist, taxes introduced since 1991 have contributed to reductions in CO2 emissions from stationary combustion of up to 21%. In other sectors, however, the reduction has been more limited;
- Tax differentiation between leaded and unleaded petrol has been introduced in most OECD countries, together with regulatory measures. The overall result has been a strong reduction in the use and market share of leaded gasoline, to such extent that it is no longer sold in Canada, Denmark, Austria, Finland and Sweden. Although difficult to entangle the effect of different measures, it is widely acknowledged that the tax was successful in accelerating this process;
- In Denmark, a tax on non-hazardous waste has doubled the cost of waste dumping and incineration. Between 1985 and 1995, the share of waste dumping in overall waste

treatment decreased from 39% to 18% and the rate of re-use and re-cycling increased from 36% to 61%.

5.5 The Swedish Environmental Protection Agency also reviewed the effects of some of the more innovative tax measures in that country:

- A tax on emissions of hydrocarbons and nitrous oxides from domestic air traffic was abolished in 1997, having apparently achieved its objective of encouraging technical improvements to aircraft combustion chambers. Differential landing charges for noise were introduced in 1994, and a differential charge for pollutant emissions is now being considered;
- A tax on natural gravel extraction was introduced in 1996 to promote improved husbandry of natural gravel and increase competitiveness of alternatives. The share of natural gravel in total aggregates has decreased in recent years from 75% in 1987 to 53% in 1994; the share of crushed stone has increased during the same time;
- Swedish municipal refuse charges can be differentiated to encourage environmentally friendly waste management strategies. The SEPA review found it difficult to disaggregate the impact of the tax from other effects but concluded that the differential charges did lead to increased sorting of waste, especially industrial waste.

5.6 A review of water pollution charges in Denmark, France, Germany and the Netherlands (Anderson, 1994) highlights the importance of the institutional structure relating to the policy. The evaluation concluded that the charge based systems based in the Netherlands, France and Germany were all effective. The Danish system, based on consensus building and permits, was less successful. The importance of this study is its assertion that the decrease in pollutants in France was especially due to the use of technology-forcing subsidies, based on revenue from the tax. This provides an argument for hypothecation. Similarly, in the Netherlands the effect was greatest for those firms that were eligible for subsidies.

5.7 The UK Landfill Tax has been subject only to a preliminary, survey-based evaluation, relating to the previous, lower, tax rate. The survey by ECOTEC (1998) indicates that the tax has prompted behavioural changes; about a third of the sample of waste producing companies reported that they began or stepped up re-use, recycling or minimising strategies, while a further third were already engaged in such strategies.

5.8 The OECD review indicates increasing evidence that environmental taxes can work effectively to achieve environmental objectives. However, the body of evidence remains limited. The OECD review also made the following conclusions:

- Their role is as one of a package of policy instruments;
- The removal of existing subsidies, which may be damaging the environment, remains an especially pressing issue, especially in the fields of agriculture, energy and transport. (This corresponds with recent research in the UK that estimated £21bn in environmentally damaging subsidies (CSERGE)).
- Concerns about fairness and competitiveness effects are often over-stated. There is no clear evidence that higher environmental standards affects firms' or economies' competitiveness in the long term. In the short term, higher environmental taxes could have an effect on the competitiveness of some sectors;

- There is a good case for implementing environmental taxes gradually.
- Evidence about 'double dividend' benefits from reducing labour taxes is mixed.

5.9 Overall, the OECD concluded that 'there is a general case for more consistent and extended use of economic instruments in environmental policy. There is growing evidence that they can be effective in terms of environmental protection, when properly designed and implemented. Furthermore, eco-taxes can contribute to a better integration of economic and environmental policies than regulatory instruments'.

6. Tradeable permits

6.1 The main conclusion from the discussion of practical issues in section 4 is that while environmental taxes have cost effectiveness and other advantages, the potential downside is less certainty that the environmental target will be achieved. Tradeable pollution permits (TPs) is an alternative approach which has the potential to achieve many of the advantages of a tax in terms of promoting cost-effective solutions, but can be more reliable in terms of achieving a desired environmental standard (Hodge, 1995). TPs are likely to become increasingly prominent as a mechanism for the delivery of the Kyoto agreement on climate change. The economic principles outlined in section 3 and annex 2 also apply to TPs.

6.2 Using this approach, a firm would need a permit before it is allowed to discharge a pollutant. The authority will define a total level of activity which is consistent with the desired environmental standard. This could equate to the current level of emissions, or perhaps a reduction. This overall level is then split into individual permits, which are allocated to individual producers. This allocation may be made according to existing patterns of activity, known as grand fathering. Alternatively, permits may be allocated using different rules, or auctioned to the highest bidders. Permits may then be traded amongst producers according to need. TP type systems currently operate, albeit for reasons not primarily related to environmental protection, as part of the Common Agricultural Policy (eg dairy quotas) and the Common Fisheries Policy (eg Total Allowable Catches). The potential advantages and disadvantages of this approach are set out below.

Potential benefit: confidence that the environmental standard will be achieved.

6.3 Whatever trading activity takes place between players, the rules do not permit the overall level of pollution, or emissions, to be exceeded. In this way, environmental standards are more certain, at least as far as the overall target level is concerned. This contrasts with the potential uncertainties associated with environmental taxes.

Potential benefit: TPs can also achieve the cost-effectiveness advantages of environmental taxes.

6.4 This is achieved through the system of trading. Those firms that can adjust at low cost might choose to reduce their pollution level and sell permits. Other firms, with higher pollution control costs, would choose to buy permits rather than reduce their pollution levels. The total cost of pollution reduction would be minimised, in the same way as for environmental taxes.

Potential benefit: Dynamic incentives exist.

6.5 In the same way as for environmental taxes, there is a continuous incentive to reduce pollution provided there are other firms willing to buy the permits.

Potential benefit: Information requirements are less.

6.6 With environmental taxes, the authorities need to take a decision both on the appropriate

level of the environmental standard (using a charges and standards approach) and the tax rate that will achieve that standard. With TPs, however, only the former is required. The market will then deliberate the appropriate price for permits at auction and their price in subsequent exchange.

Potential problem: Market thinness.

6.7 The main practical problem for tradeable permits is that the system requires a large number of participating polluters to ensure that there is sufficient trading activity to achieve the cost-effectiveness gains. This is not always the case, however. For example, DETR considered using tradeable permits to control river and estuarine pollution (DETR, 1998c), but concluded in each case that there are likely to be insufficient players to deliver the gains from TPs. TPs have also been considered for controlling water abstraction but are unlikely to be implemented for similar reasons. In the absence of sufficient trading the mechanism becomes equivalent to regulation.

Potential problem: Locational effects.

6.8 The TP system relies on the ability of firms within a defined area to trade pollution permissions. The problem for nature conservation policy is that the locational impacts of such trading decision may conflict with biodiversity protection needs. A firm with very damaging operations because of its location is allowed to pollute further by purchasing permits from firms in other locations. A way round this is to define very tight geographical areas to ensure that trading only takes place between firms having similar effects on the environment. However, this is likely to exacerbate the 'market thinness' problem highlighted above. An alternative, therefore, is to define a wide trading area but then to sub-divide this into zones according to the environmental effect of emissions. Trading can take place across zones but will be subject to an 'exchange rate' depending on the difference in environmental effects between the zones. This approach was considered for the government's proposals on water abstraction (DETR, 1998d). However, some impacts on biodiversity are so locationally specific that the zoning system would need to be very well targetted.

Other practical issues for tradeable permits

6.9 Some (eg Green, 1998b) argue that TPs tend to be effective in allocating existing demand to its most appropriate use, but are less convincing as a tool for managing demand downwards to acceptable levels. However, this should be possible in principle: either the initial, or subsequent allocations, can be set at a level which is lower than currently exists. Or, permits can be purchased out of the system by Government.

6.10 There can be social justice issues to consider in the initial allocation of permits. For example, atmospheric emission permits could be auctioned, allocated to states on a grand-fathering basis reflecting current emissions, or allocated to states based on their population.

6.11 TPs may deter new entrants since the rules may only allow them to enter the industry at the next allocation round. Alternatively, they may be able to enter at any time but would have to await the next round allocation to receive their appropriate baseline permits.

6.12 There may or may not be a revenue stream from TPs, depending on the allocation system. If there is, this will be significant in scale but occasional (at each allocation round), rather than ongoing. This may have practical implications for the ability to substitute this revenue for other taxation sources and the provision of 'double dividend' benefits.

6.13 TPs may not deliver the same 'moral message' effects as a price signal, which has the potential to 'remind' the polluter of environmental damage at the point of each transaction or business period. Indeed, they could provide counter-productive, 'licensed to pollute', messages.

6.14 There is much debate about the transaction costs of TPs. These include costs to Government in administering the system, and private transaction costs to users of the system. Some stress the possibility of high start up costs for a TP system. Others argue that the in-period transaction costs are much lower than for either the tax or regulatory alternative, since the market sorts out the trading and pricing processes. However, some monitoring and enforcement costs will remain.

6.15 Finally, there appears to be a perception about cultural resistance to TPs. The argument is that economic agents will find such systems alien and complex, and will not trade to the extent that market conditions would suggest. Some evidence of this effect is apparent, for example, in a study of farmers' response to water abstraction permits (RSPB 1997). In the same industry, however, there is evidence from the CAP regimes, which operate quota systems, that once the system has settled down, economic agents adjust to the rules and trading takes place.

6.16 Much of the interest in tradeable permits to date has been in relation to their use in protecting the atmospheric environment. Some evidence has highlighted practical issues relating to the local geographical effects of tradeable permit schemes, for example the SO2 scheme in the USA (Ingham et al, 1994). More recent evaluation, however, suggests that local effects can be taken care of by careful design, and that this trading scheme is functioning well in terms of trading activity, environmental effectiveness and cost effectiveness (National Acid Precipitation Assessment Programme, 1998).

6.17 Tradeable permit schemes have also been suggested for the terrestrial environment. Such a scheme may, for example, be useful to control nutrient pollution given the potential design difficulties with environmental taxes in this area (Hodge, 1997).

7. Conclusion: evaluation of the role of economic instruments for nature conservation

7.1 This paper has highlighted how the potential advantages of EIs can be constrained by practical problems in their implementation, which are sometimes especially pertinent in relation to nature conservation objectives.

7.2 EIs have a number of theoretical benefits for environmental policy:

- **First, they implement the Polluter Pays Principle (PPP) by ensuring that polluters face the full costs of damaging activities.** This should either increase production costs, and thereby affect output levels, or will provide incentives for 'cleaner' production and consumption patterns. By ensuring all costs are taken account of, market distortions can be reduced. Failure to reduce such distortions is equivalent to providing a public subsidy to the industry or household causing the pollution. In effect, it means taxpayers as a whole are paying the costs of pollution.

- **Secondly, environmental taxes can potentially implement environmental policy more cost effectively than regulatory alternatives.** This is achieved because the imposition of a tax provides a choice of response. Those that can cost effectively change their behaviour will do so; those that can not will pay the tax.

- **Thirdly, environmental taxes can provide a dynamic incentive for environmental improvement.** By imposing an additional cost on all levels of output, an environmental tax can provide a continuous incentive to innovate beyond the basic minimum.

- **Fourthly, economic instruments can be, in some circumstances, more cost effective to administer than other policy approaches**.

7.3 Tradeable permits in principle have the same potential advantages as environmental taxes. However, they have an additional potential benefit in that by setting a cap on the total permitted level of pollution, the overall environmental target is more likely to be achieved. Against this, permit systems may not be as feasible as a tax in some circumstances.

Potential problems with environmental taxes, charges and tradeable permits

7.4 The hypothetical benefits outlined above need to be weighed against certain potential problems in practice:

- **First, getting the appropriate tax design to deliver behavioural change can be very difficult in practice.** For various reasons, it seems especially difficult for nature conservation benefits. The problems include:

    - Valuing the environmental damage, which is especially difficult for biodiversity;
    - Defining a suitable tax base (the measure of damage on which the charge is based) can be difficult in a way that maintains simplicity and cost effectiveness yet provides the correct incentives for behavioural change. For nature conservation, this problem is often compounded by knowledge gaps and the spatial variation in impacts from the same level of pollution.

- **Secondly, market conditions may affect the extent of behavioural change.** Market conditions relating to many environmental impacts are characterised by inelastic demand levels, presence of perverse subsidies, and uncompetitive or regulated markets. If revenue is not then devoted ('hypothecated') to environmental restoration, the implementation of PPP still makes economic sense but may deliver no environmental benefits.

- Thirdly, economic instruments can ensure that an overall environmental target is achieved cost effectively. **They have less control, however, over <u>where</u> damage is avoided (through abatement) and where it continues (ie where the tax is paid instead).** This is unimportant for CO2, for example, where the overall level of emissions is more important than where they occur. For the majority of nature conservation impacts, however, the location of the potentially damaging activity is critical. This problem suggests that economic instruments can provide benefits for nature conservation by reducing overall levels of damaging activity, but can not guarantee protection at specific locations. **Consequently, they should generally be seen as part of a package of measures for nature conservation.** Tradeable permit schemes, differentiated by geographical zones, may be more appropriate in some cases.

- Fourthly, the potential benefits from a tax or other instrument need to be weighed against possible loss of goodwill in the industry affected, and against other potential ways of achieving the objective.

- Finally, badly designed environmental taxes can have unfair effects. These mainly involve adverse social distributional consequences, unfair treatment of similar polluters in different sectors of the economy, unfair treatment of one country's polluters compared with similar polluters from another country, or unfairness in the implementation timetable which needs to give firms some time to adjust.

7.5 All the above problems suggest the following conclusions:

- Particular design difficulties may be evident for nature conservation interests; and
- Potential cost effectiveness advantages need to be weighed against a possible lack of certainty in achieving the environmental target.

The recent OECD report on Incentives for Biodiversity (OECD, 1999) provides a reminder that the problems of biodiversity protection are significantly different from the classic Pigovian model of pollution which provides the foundation for environmental taxation theory. The report concludes that 'biodiversity is comparable but not identical [to the standard pollution model]...The costs imposed by the loss of biodiversity are frequently of a different nature than the relatively more straightforward costs connected with pollution...frequently the value of biodiversity resides in its pure existence and future uses. In these circumstances, the logic of applying EIs to correct for externalities and market failures is put to severe tests'.

7.6 Tradeable permits may avoid some of the concerns about environmental certainty, because the overall permitted level of damage should not be exceeded. Zonally differentiated permits may help distinguish between the spatial effects of pollution, though the level of geographical specificity may not always be sufficient for nature conservation. Permit schemes may also be less practical for some areas of policy. For example, a large number of participants in the area is required to ensure that trading takes place.

7.7 The cost-effectiveness benefits of EIs should not be minimised. As nature conservation policy moves from a defensive, fire fighting phase based on protection of the best sites, to a wider countryside approach, some argue that it is impractical to rely on a museum-type approach to conservation (Edwards and Abivardi, 1998). To achieve environmental policy objectives over a sufficiently wide area, regulation will not in some cases be sufficiently cost-effective to have the necessary political support and policy reach. This dilemma provides a potential role for EIs, alongside other measures. At this broader scale, EIs may be useful in influencing environmental trends, as opposed to specific outcomes in specific places. Recent evidence from Europe seems to suggest that well designed instruments can be environmentally effective.

7.8 The rationale for EIs as an element of environmental policy is also provided by the widespread and continuing existence of distorted markets, with products such as peat being subsidised in respect of non-peat alternatives because of the failure of these products to fully reflect the costs of production (ie by exclusion of environmental costs).

7.9 Three further conclusions follow from this analysis:

- The trade-off between the static cost effectiveness advantages of environmental taxes, and the uncertainty of the environmental consequences, raises the issue of how important are the dynamic cost-effectiveness advantages highlighted in section 3? While this advantage is oft-quoted in text books, there seems little evaluative evidence of how important it is in practice. The Swedish sulphur tax provides one empirical example;
- The detail of EI design becomes a critical issue, with the particular need to avoid perverse effects on nature conservation;
- Provided perverse effects can be avoided, one might conclude that a tax proposal is unlikely, for the reasons discussed above, to deliver much behavioural change but will at least apply the polluter pays principle in roughly the right way. The aggregates tax proposals, for example, might be judged to have little direct benefits for nature conservation but are at least penalising the right firms on average. In these circumstance, the issue of hypothecation becomes crucial, suggesting that some hypothecation of revenues is necessary for the instrument to deliver benefits for nature conservation. Indeed, evidence from Europe suggests that tax instruments including hypothecation of revenues increases the environmental effectiveness of the policy.

7.10 The TP system has a potential advantage in its ability to deliver cost effectiveness advantages and certainty of the overall environmental target. However, this is subject to 2 major constraints in practice:

- Whether the conditions exist for enough trading to take place;
- Whether the achievement of the overall environmental target masks perverse effects in specific locations.

7.11 While the practical constraints of EIs have been stressed in this paper, there is also a danger that EIs can be rejected as a policy alternative on more subjective grounds. There remains within some parts of the scientific and environmental communities an instinctive tendency to reject the potential contribution that EIs can make, and to take a certain comfort in the more familiar regulatory alternative. Such a view, however, tends to ignore

the many examples of policy failure that exist, and the potential role of EIs to help achieve nature conservation objectives over the wider countryside, or to address the particular problems of the global atmospheric and marine environments. There needs, therefore, to be a **realistic** evaluation of whether other policy approaches provide better alternatives in practice, and whether or not they are practical or political alternatives at all. A set of different mechanisms is likely to be required. **Economic instruments for nature conservation will need to be used in association with a strong regulatory framework.**

7.12 EIs are almost always destined to have design problems in the early stages. Where an EI is not working well, it is necessary to decide whether this is a problem in principle (for example, it is the wrong instrument per se in this area) or whether it is an issue of design.

7.13 Getting the right objectives is a key design issue that is relevant to nature conservation. Specific objectives relating to nature conservation can sometimes be excluded from tax design, or conflated with other environmental objectives.

7.14 Some evidence is emerging that consideration of EIs as a policy instrument is extremely useful even if the eventual decision is not to implement them. In the case of the aggregates tax, for example, it is widely believed that the package of voluntary environmental measures proposed by the Quarry Products Association (1998) would not have emerged without the threat of a tax.

7.15 The use of subsidies in dealing with negative externalities, as opposed to using them to encourage provision of public goods, is sometimes discussed. Briefly, subsidies to encourage people not to pollute may be more cost effective in some situations. However, this approach is more difficult to justify in terms of the PPP, and could encourage higher pollution levels overall by affecting market entry conditions (Pearce & Turner, 1990). However, there is evidence that industrial subsidies with perverse environmental effects do remain in place (CSERGE, 1997).

7.16 Voluntary agreements have been a feature of British conservation policy. Increasingly, they are being considered as an instrument for pollution control. There is a view that the use of voluntary agreements with polluters allows regulators to harness the enormous creative abilities of the private sector, thus enabling environmental solutions to be developed in a way that industry feels more comfortable with, both in terms of cost and process. Against this, there is a danger that such agreements will not fully internalise environmental costs. It is also possible that transaction costs may be higher, given the process of painstaking negotiation of a voluntary agreement, compared with imposition of a tax or regulation. There is a need for voluntary agreements to be evaluated as a policy mechanism in the same way as for EIs and regulation.

7.16 **The conclusion from this analysis is that current and potential economic instruments for pollution control need to be objectively evaluated on a case by case basis.** The following 5 questions are suggested to help such evaluation:

1. *Do environmental 'externalities' clearly exist?*
2. *Is a tax feasible?*
   - 2.1 *Can the tax be designed appropriately?*
   - 2.2 *Will market circumstances deliver behavioural change?*

2.3 Are the proposals fair?

3. *Are tradeable permits or other types of economic instrument preferable to a tax?*
4. *Will there be benefits for nature conservation?*
5. *Is the proposal preferable to or complementary with other policy alternatives?*

Questions 4 and 5 above are the key questions for English Nature's advice role. However, questions 1 to 3 provide useful context analysis. Annex 3 attached provides a breakdown of these into more detailed sub-criteria, together with a summary evaluation against recent proposals. Other evaluation criteria that have been suggested in the literature are also included in annex 3.