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ECOLOGICAL FISCAL REFORM
A Review of the Issues

Final Report
November 1995

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1. What is ecological fiscal reform?

As most industrial countries continue to struggle with the multiple imperatives of promoting economic development, reducing public sector deficits, tackling persistent high unemployment and preventing environmental degradation, increasing attention is being given to the interrelationships of these different agendas. Although several prescriptions have been offered to resolve these problems, many converge on the apparent merits of a shift in part of the tax structure away from income, VAT and payroll taxes and towards consumption taxes, including environmental taxes. This shift is sometimes described as ecological fiscal reform (EFR).

EFR differs from the current largely piecemeal imposition of "green" taxes by systematically building on the links between environmental and fiscal policy. Environmental taxes can thus not only serve as a useful instrument of public policy in achieving environmental goals but can also yield revenues which can be used to offset other taxes.[1]

At the government level, EFR entails:

- eliminating existing environmentally-perverse subsidies;[2]
- reducing existing taxes on income, savings and capital; and
- increasing or imposing new taxes on environmentally-damaging activities.

More controversially, EFR could also include spending on new environmental programs to enhance the effect of environmental taxes. We return to each of these four elements below.

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[1] The word "tax" is used throughout this paper in its broadest form to mean sources of government revenue, which can also include instruments known variously as charges, fees, levies and permit trading systems. One reason for this approach is the difficulty of comparing terminology for taxes, charges, fees and related instruments across countries.

[2] One of the benefits of government efforts at reducing their deficits has been cuts in such subsidies. As the benefits of eliminating these subsidies have been reviewed elsewhere (Clément, 1992), we do not consider them in detail in this paper. There are some significant differences between subsidies and taxes in terms of their economic effects: (1) subsidies reduce exit rates from industries; (2) subsidies add to the public expenditure; and (3) subsidies act as a concealed form of protection (OECD, 1993).

For the firm, EFR would alter the relative cost of its factors of production -- labour, capital, energy and natural resources. Inasmuch as EFR would raise the cost of using energy and natural resources, it could lead firms to substitute away from these factors and make greater use of other factors of production, such as labour. Governments could encourage this substitution further by using the increased revenues to reduce payroll taxes. The extent of any such shift, of course, would depend on the size of the relative tax shift, the substitutability of the factors of production, and the time frame for the change.

For the individual consumer, EFR is meant to change patterns of consumption by discouraging the purchase of environmentally damaging goods and services and favouring more environmentally benign products instead. Depending on how it is implemented, EFR could also lead to reduced income taxes.

Being a relatively new concept, EFR raises many questions such as:

- What should be taxed? At what rate?
- What would be the impacts on competitiveness?
- How should the increased revenues from environmental taxes be used?
- What are the distributional consequences of tax reform both at the macro and micro levels?

This paper explores these questions without, however, attempting to answer them definitively. Instead, the paper summarizes the background to some of these issues and highlights the critical questions that EFR poses in order to promote an informed discussion of its merits. Although the paper focuses primarily at the federal level, EFR is a concept that can be applied at any level of government, including the municipal level.

2. Rationale

The argument first made in favour of EFR combined both environmental and economic perspectives: governments should introduce "green" taxes to correct market imperfections which lead to environmental degradation and the overconsumption of resources.[3] Since then, additional arguments have been advanced in favour of EFR. The three primary rationales are described briefly below.

[3] The use of taxes to correct environmental externalities was first promoted by Pigou (1920).

2.1 *Improved environmental quality*

In 1992, the U.S. National Academy of Sciences and the Royal Society of London , two of the world's leading scientific bodies, stated:

> If current predictions of population growth prove accurate and patterns of human activity remain unchanged, science and technology may not be able to prevent either irreversible degradation of the environment or continued poverty for much of the world (United States National Academy of Sciences and the Royal Society of London, 1992).

Although evidence of natural resource degradation is particularly evident in the developing countries, a recent assessment of twenty-one key environmental indicators in nine industrialized countries over the past two decades concludes that "while the governments of these nine countries all have expressed significant degrees of commitment to the environment, reform efforts have not on the whole counteracted the increasing stress on sinks and resource use characteristics of growth economies" (National Center for Economic Alternatives, 1995).

Despite these trends, however, Canada's current tax system, arguably governments' most powerful policy instrument, creates incentives to engage in environmentally damaging activities by:

- allowing free access to common goods (e.g. the atmosphere, the ocean), resulting in overexploitation of these resources (the "tragedy of the commons");
- failing to require economic actors to internalize the external costs of their activities, resulting in socially harmful pollution; and
- in some case, creating environmentally perverse subsidies, resulting in a misallocation and inefficient rates of use of resources.[4]

[4] The issue of perverse incentives was recognized by the Final Report of the Federal Task Force on Economic Instruments and Disincentives to Environmentally Sound Policy (1994). The Finance Minister stated the current government's policy with respect to subsidies in his October 17 presentation to the House of Commons Standing Committee on Finance: "protecting subsidies is almost always the wrong way to go .... Subsidies tend to operate in exactly the opposite way from what is needed: they slow rather than stimulate adjustment; they discourage rather than encourage innovation; and they tend to become permanent." (Martin, 1994: p. 17)

By contrast, environmental taxes can be an efficient tool for promoting less environmentally damaging activity by:

- putting a price on pollution, and effectively forcing polluters to internalize the environmental cost of their activities;
- minimizing the costs of improving environmental quality by allowing flexibility[5] for both producers and consumers; and
- providing incentives for ongoing improvement and innovation.

These advantages by themselves do not necessarily compel ecological tax reform if one believes that environmental problems are best resolved through a series of discrete measures. If, on the other hand, one believes that current environmental problems are largely systemic in nature and stem from the overproduction and consumption of our environmental resources, then a systemic approach, such as EFR, which addresses the roots of these problems may be more appropriate.

As Bill Rees has argued, "...it is not how we earn a living, but rather how much we consume, that determines our personal ecological footprint" (Rees, 1994). Taxing consumption, including the consumption of inputs that produce environmental costs, may therefore be a more effective environmental protection strategy than taxing income.

2.2 *Economic efficiency*

In addition to the potential noted above for eco-taxes to achieve environmental objectives more efficiently than regulations in many cases, proponents of EFR contend that it can also remedy distortions in the existing tax base. For example, the current tax base creates a disincentive to engage in economically productive activity by taxing income and investments, thereby creating a disincentive to save and invest.[6] Canada lags Germany and Japan in terms of domestic savings and investment rates, factors widely agreed to be the source of sustained growth. A shift in the tax base could help redress

[5] Eco-taxes create an incentive to improve environmental performance, yet do not restrict the manner in which to do so - a criticism often leveled against more traditional "command and control" regulatory measures to improve or maintain environmental quality. As environmentally damaging activities are curtailed, the tax bill drops.

[6] In 1995, the federal government derives almost half of its tax revenues from personal income taxes, about 11 per cent from corporate income taxes, 19 percent from unemployment insurance premiums, 14 percent from the GST and the rest from a variety of other taxes.

this disparity. The current tax system also reduces the marginal value of increased wages, thereby reducing the incentives to work more.[7]

Reflecting these concerns, Repetto *et al.* (1992, p. 2) write:

> At present, our taxes fall mostly on just those activities that make the economy productive: work, savings, investment, and risk-taking. Naturally, such taxes discourage people from undertaking these vital activities. A better system would place more of the tax burden on activities that make the economy unproductive and that should be discouraged: resource waste, pollution, and congestion, for example. Taxes on these environmentally damaging activities would not distort economic decisions, but would correct existing distortions.

In other words, environmental taxes can create welfare gains simply by replacing many existing taxes which distort individual decisions. Based on their analysis of EFR in the United States, Repetto *et al.* (1992) conclude that the total possible gain from shifting to environmental charges could easily be $0.45 to $0.80 per dollar of tax shifted from "goods" to "bads" with no loss of revenue. The gains would come in the form of improved environmental quality, reduced needs for infrastructure, increased employment, and faster productivity growth.

If EFR can offer an economically efficient means to reduce environmental impacts, it may be an important component of an overall strategy to address North-South issues. It is increasingly clear that the developing world cannot achieve per capita levels of material consumption equivalent to those in industrial countries without imposing unacceptable environmental costs globally. This realization has led some to argue that the South's environmentally-sound development opportunities will be constrained unless the North gradually reduces its disproportionate share of the Earth's assimilative capacity (MacNeil, Winsemius and Yakushiji, 1991). It has also been pointed out that the current pattern of consumption heightens the risk for international political tension as developing countries seek to increase their material standard of living (Homer-Dixon, 1992).

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[7] By increasing the costs of some products, an eco-tax will indirectly reduce incentives to work, though not by as much as income taxes, which directly decrease the marginal value of additional work.

2.3 *Reduced unemployment*

EFR may also offer a way to reduce the cost of employment. Current tax policy adds to the costs of labour (both by creating pressure for increased salaries in response to high income taxes and by directly imposing employment related charges), thereby reducing employment opportunities.

Public concern over rising unemployment is leading European decision-makers to consider the possibility of reducing payroll taxes which discourage firms from hiring. In this regard, the European Commission established a positive link between environmental protection and employment. In its 1994 White Paper on Growth, Competitiveness and Employment, the Commission states:

> The current development model in the Community is leading to a sub-optimal combination of two of its main resources, i.e., labour and nature. The model is characterized by an insufficient use of labour resources and an excessive use of natural resources, and results in a deterioration of the quality of life. The Community needs to analyze in which ways economic growth can be promoted in a sustainable way which contributes to higher intensity of employment and lower intensity of energy and natural resource consumption. (p. 161)

Relying on similar insights, some economists (e.g., Repetto *et al*, 1992) have suggested that using the proceeds of environmental taxes to reduce taxes on labour could yield a "double dividend" of a cleaner environment and lower unemployment. Majocchi (1994) concludes that a cut in employer paid social security premiums could have a positive impact on employment in 3 ways: i) by decreasing labour costs, it could allow employers to hire workers whose productivity was previously lower than the prevailing labour costs; ii) the decreased labour costs could allow firms to become more competitive, creating new jobs; and iii) the change in relative prices of production factors could promote a substitution of low skilled labour for capital. The European Commission study of the impact of a carbon tax on the countries of the European Union referred to in Section 2 above similarly suggests that, if such a tax were used to reduce payroll taxes, GDP would grow by about 1 percent in the medium term and unemployment would fall by about the same percentage over the same time period (DRI, 1994).

Although a recent survey conducted for the Ontario Fair Tax Commission (Donner and Lazar, 1992) suggests that many firms can be expected to resist the introduction of environmental taxes, the Business Council for Sustainable Development, an association of leading international business leaders, recently called for "a tax shift away from labour and investment to value depleting activities such as pollution and the inefficient use of environmental resources" (Andraca *et al.*, 1994). The current Minister of Finance has publicly stated that "there is nothing more ludicrous than a tax on hiring. But that's what high payroll taxes are" (Martin, 1994: p. 17). A recent Bank of Canada study confirms these views, concluding that policies to reduce current levels of payroll taxes could help reduce unemployment (Bank of Canada, 1995). Between 1976 and 1992, payroll taxes almost doubled as a share of labour compensation in Canada (Government of Canada, 1994).

Various economists criticize the notion of a double dividend, observing that the net social impact may be impossible to estimate since it requires accounting for the opportunity costs arising from not allocating the eco-tax revenue to other purposes. Presumably similar "double dividends" could be had in any other area where the revenues of an environmental tax were applied. The choice of where these revenues should be allocated, therefore, should be made on what macroeconomic objectives are being sought (e.g. environmentally adjusted GDP growth versus reduced unemployment versus the reduction of the most distortionary taxes in the economy). To the extent that EFR revenues are available to offset existing taxes, it should be the most distortionary taxes In the economy that are cut. While these may be payroll taxes in some cases, they may be taxes on capital or consumption in others.

The significance of the double dividend in the Canadian context thus remains unclear.

3. Main Issues

Several issues will need to be discussed in detail before implementing EFR on a large scale in Canada, especially if it includes a significant shift in the income tax base. Many of these issues are closely interlinked. Although we have tried to separate them out below in order to describe them, in practice they will need to be considered as a package.

3.1 *Subsidies*

Government subsidies have long played a role in economic development. Although estimates of such subsidies should be considered with caution, various studies by the World Bank, the OECD and the World Resources Institute suggest that subsidies to the principal resource sectors (agriculture, energy, mining, forestry and water) may amount to hundreds of billions of dollars worldwide, each year (e.g. World Bank, 1995). To the extent that these subsidies encourage the greater use of pesticides, marginal lands, energy, water and other resources, they exert environmental effects in the form of degraded lands, increased concentrations of toxic chemicals, air pollution, etc. Perhaps as a result of the reduced financial circumstances of most governments, several studies of subsidies and their environmental impact have recently been launched. These include government-sponsored initiatives (e.g., G7 review of energy subsidies) and independent reviews (e.g., the MacArthur Foundation and the Earth Council).

No comprehensive inventory of environmentally-perverse subsidies, that is subsidies with adverse environmental effects, has been undertaken in Canada although the 1993 Liberal Party campaign manifesto "Creating Opportunity" promised to underake "a baseline study of federal taxes, grants and subsidies". As a first step towards this study, the Ministers of Environment and Finance appointed in 1994 a *Task Force on Economic Instruments and Disincentives to Sound Environmental Practices* which, among other things, developed an analytical framework to identify fiscal and other barriers to sound environmental practice and decide how to address them.

In the absence of this baseline study, it is unclear how significant a problem environmentally-perverse subsidies may be in Canada although recent cutbacks in government programs (e.g., in the energy, agricultural and forestry sectors) imply that this problem has been shrinking rather than growing. Nevertheless, recent analyses have documented continued instances of fiscal bias in the treatment of virgin versus recycled material (Mintz, 1995) and in energy (Cairns, Campbell and Macintosh, 1995) which militate against sound environmental practices. In the case of virgin material, this bias amounts to almost $400 million annually, a significant advantage over the use of recycled material and one with clear environmental implications.

3.2 *When should environmental taxes be used?*

Several authors (e.g. Olewiler, 1990) have identified conditions under which environmental taxes will work most effectively. For example, Repetto *et al.* (1992, p. 9) describe several factors which will promote the use of environmental taxes:

- when the environmental problem is caused by the activities of numerous heterogeneous parties, so that private negotiations, permit trading, legal proceedings, or direct regulations would be difficult;
- when each party's actions contribute more or less proportionately, unit for unit, to the overall problem, so particular "hotspots" or "bad actors" are not significant;
- when the overall damages resulting from the activity are reasonably well-understood and regular - when, that is, neither catastrophic damage thresholds nor rapidly decreasing marginal damage thresholds are likely to be encountered as the level of activity increases;
- when the various parties face significantly different abatement costs because of differences in technology, age of equipment, availability of alternatives, size, and so on;
- when the dynamics of the environmental problem are changing, so that any regulatory solution would soon be obsolete;
- when the relevant behaviour of each party can be monitored accurately at reasonable cost, so that incentive-based mechanisms linked to the level of activity are enforceable; and
- when a conflicting regulatory framework based on permitted technologies or emissions levels is not already functioning, so that difficult transitional problems are not important considerations.

Taxes may not always be the preferred instrument to achieve an environmental objective. In some cases, immediate action may be required, warranting the use of "command and control" regulation. In other cases, alternative economic instruments, such as tradable permits, feebates and deposit-refund systems, or other non-regulatory measures, such as voluntary approaches, may be preferable for a variety of reasons.[8]

[8] Taxes may not always be the most efficient tool to promote other environmental related objectives. For example, a recent U.S. study of the relative effect of different instruments on innovation and the implementation of energy efficient technologies concluded that, in some cases, direct subsidies may prompt greater changes than taxes, which are generally preferable to regulations (Jaffe and Stavins, 1995). Like von Weiszäcker and Jesinghaus (1992), the U.S. study also concluded that the effect of a tax depends on its *perceived permanence*. This is in accordance with the recent recognition of the importance of expectations in shaping economic behaviour (e.g., work by Robert Lucas, the recent Nobel prizewinner in economics).

While regulation and tradable permits impose *direct* quantitative restrictions on emissions, taxes control emission levels *indirectly* by imposing a cost on the actual emission or on an input to the production process. In choosing among them, the policy-maker has to weigh who, in a world of uncertainty, should bear the burden of risk: the polluter or the environment? Where taxes are used, the polluter can calculate precisely the incremental cost of the environmental measure but governments can only estimate the trade-offs individual polluters will make and therefore the environmental benefits of the tax. Where quantitative restrictions are imposed, governments will know in advance by how much emissions will be reduced but the individual polluter's costs will vary. Given the variety of environmental problems, it would be undesirable for governments to prefer one instrument over all others in every circumstance.

If taxes are designed to achieve environmental objectives, they will complement regulations and other environmental protection measures. Care must obviously be taken to ensure that different policies do not work at cross purposes, or that scarce government resources are not expended on a redundant policy instrument.

In addition to these general considerations, several commentators suggest that there are some critical issues bearing on the relationship of taxes to regulations. For example, in his extensive review of US green taxes at the state level, Hoerner (1995) argues that, ideally, taxes should be designed to work with regulations by providing incentives to go beyond the minimum, and beyond whatever technology is currently available. To what extent is this true? To what extent does it require tax expenditures, or can this principle be promoted by positive tax measures?

The issue of what can or should be taxed depends also on jurisdictional considerations. The Belgian experience with environmental taxes illustrates both the need for interjurisdictional harmonization of environmental objectives and instruments and the risk of industry lobbies reopening at one level of government issues settled at the other (De Clerq, 1994). In Canada, the provinces and the federal government each share jurisdiction over environmental protection and the provinces have limited jurisdiction to tax[9]. This division of responsibilities complicates the integration of environmental and

[9] For a good overview of provincial jurisdiction to impose eco-taxes, see Valiente and Gibbons, 1991. The jurisdictional issues are not limited to the federal and provincial governments; the municipal governments often have a key role to play (e.g. in implementing land use or transportation-related measures.

fiscal policies, a complication that was most evident in the development of Canada's national action plan on greenhouse gas emissions.

Professor Aggie Paulus (1993) of the University of Limbourg has proposed the innovative concept of ecological tax units, which he describes as institutional arrangements to connect taxes to a particular ecosystem. While intriguing, his proposal squarely confronts the well-understood concern that what may make sense from an ecosystem perspective may not be legally possible since political jurisdictions do not necessarily coincide with appropriate ecological regions.

One of the constraints to EFR is a paucity of information. While decision-makers seldom have all the information they need, in the case of EFR, the lack of information is particularly troublesome. We have inadequate information on the costs of environmental degradation, including its economic costs. Because we have applied few environmental taxes in Canada, we have little information on their effectiveness. We also lack information at the microeconomic level on, for example, the demand elasticities for different kinds of environmentally-damaging goods and services.

3.3 What should be taxed?

There are basically three classes of taxes that could be or have been implemented: (i) inputs to the economic process, (ii) economic activities, and (iii) outputs, including both products and wastes. (See Box 1 for an illustrative list of charges and taxes.) The choice of what to tax will depend on the presence of a significant environmental effect, that is, an externality that could yield potentially large benefits if corrected.

Box 1

The options for environmental taxes include (adapted from Repetto et al., 1992)

1. effluent or emission charges
- *water effluents*
- *toxic releases*
- *vehicular emissions*
- *solid wastes*

2. charges on environmentally-damaging activities
- *user fees in protected areas*
- *highway congestion tolls*
- *noise charges on airport landings and take-offs*
- *impact fees on projects with negative environmental effects*

3. product charges
- *carbon content of fossil fuels*
- *ozone-depleting substances*
- *agricultural chemicals*
- *virgin material*

4. deposit-refund charges
- *vehicles*
- *appliances*
- *beverage containers*
- *batteries*

In addition, the 1992 Government of Canada's discussion paper *Economic Instruments for Environmental Protection* lists investment and financing incentives as possible green taxes.

The effectiveness of the particular tax at addressing the identified problem will also influence the selection of what to tax. If there is a tight link between the taxed item and the environmental problem, the effect will be easier to predict and it will lead directly to the desired behavioural change, but may also entail high administrative and compliance costs (Rajah and Smith, 1994). If there is a loose link between the tax and the problem, the tax may be ineffective, for example if there is a tax on inputs but the preferred response is in modifications to "cleaning" technologies at the end of the industrial process (Government of Canada, 1992). Carbon taxes are one of the few situations where there is a tight link between inputs and environmental effects (i.e. greenhouse gas release).

The effectiveness of a tax on a given item will also depend on the nature of the response. In the short term, changes in production levels and limited substitution can typically be expected. In the longer term, more substantial substitution, innovation and changes in the industry structure and size will be expected. The consequences of the likely

alternative paths should be well-understood to avoid creating new environmental or social problems. The elasticity of the response will be a critical part of this analysis (see next section).

i. The elasticity issue

Ideally, EFR should: i) change environmental behaviour; ii) contribute to a stable revenue base for government; and iii) do so without a) violating the principles of horizontal[10] and vertical[11] equity; or b) adversely affecting Canadian competitiveness or standards of living. In practice, it may not be possible to achieve all these goals simultaneously.

There is an apparent conflict between the first two objectives: the first objective (changed environmental behaviour) argues in favour of taxing activities with high elasticities (consumers will change their environmental behaviour in response to increased prices), while the second (stable revenue) argues for taxing activities with low elasticities (consumers will continue to purchase similar amounts even if they cost more).

Similarly, reconciling the first and second objective with the third will be difficult. Essentials such as fuel are relatively inelastic. Thus, a high tax on inelastic activities could be very regressive (see Section 3.7, below). Reconciliation of this apparent conflict is one of the key challenges of EFR. Von Weiszäcker and Jesinghaus (1992) argue that although the price elasticity of most natural resource inputs may be low in the short term, they should rise over time as new technologies and products emerge and, ultimately, as the basic "way of life" changes. Thus, they argue that EFR should be phased in:

> *Technological change, as the most important component of the impact of* ecological taxes, is not guided by the short term costs alone, but rather by the mid- and long-term expectations of companies. Therefore the certain expectation of raw materials and energy prices in 10, 20 or 30 years is preferable to a brutal initial tax increase with an outcome that would . . . be uncertain in both economic and political terms. (p. 26)

[10] Horizontal equity requires that the tax system treat likes alike.
[11] Vertical equity requires that the tax system impose an equivalent burden on all taxpayers, and therefore provides a rationale for progressive tax rates.

ii. Other considerations

The design of environmental taxes will depend principally on their objective: is it to reduce the consumption of a good of concern to an environmentally sustainable level? eliminate its use entirely? reduce compliance costs? raise revenues? Various reviews of eco-taxes (e.g., Project 88, 1988; Government of Canada, 1992; Jacobs, 1992) suggest that issues to be considered in designing environmental taxes include:

- effectiveness at achieving environmental objective;
- ability to realize potential cost advantages;
- impact on international competitiveness;
- distributional impacts;
- transition and adjustment costs;
- administrative, monitoring and compliance costs;
- consistency with other policies and public opinion;
- efficiency, including a consideration of geographical application;[12]
- political acceptability;
- certainty;
- reversibility;
- flexibility; and
- revenue stability.

A key issue in designing green taxes relates to avoiding unanticipated substitution effects. In designing environmental taxes, governments must ensure that an environmental bad is not favoured over another (e.g. favouring nuclear power over fossil fuel by imposing a carbon tax but continuing to subsidize the nuclear industry). Most of these issues, of course, are common to all other tax schemes.

Environmental taxes can also be used to capture or reduce the windfall profits arising from a regulation-induced shortage. In controlling the production of ozone-depleting chemicals (ODCs), the United States, for example, imposed both a regulated production cap and introduced a tax on a list of chemicals responsible for depleting the stratospheric ozone layer. The tax helped to keep actual ODC production levels below two thirds of the targets set by the government (IISD, 1994).

[12] As environmental externalities may vary regionally, environmental taxes or permit systems should be designed with these variations in mind.

It may not be possible to meet all these criteria. As we noted above, for example, a tax with a strong incentive component is unlikely to yield revenue stability. Experience suggests that political considerations, in particular, may require compromising the attainment of various objectives. In Belgium, for example, the government decided that exemptions to environmental taxes which either reduced their environmental effectiveness or increased their administration costs were necessary to make them politically acceptable (De Clerq, 1994). The structure and rates of the Ontario Tax on Fuel Conservation show a similar trade-off between environmental effectiveness and political acceptability (Bregha and Moffet, 1995).

3.4 *What level of tax should be applied?*

Economic theory suggests that, in order to promote a given environmental objective most efficiently, environmental taxes should be applied at the level where the value of the marginal gain in environmental quality equals the marginal increase in abatement costs. Furthermore, this determination should be made at the optimal pollution level. In practice, however, the calculation of the tax level is often difficult. Far less information, of course, is required to design a tax to change behaviour than to internalize social costs fully. It is therefore relevant to ask: What is the possibility of using imperfect taxes that nonetheless move in the right direction? The level of tax, for example, could be set on the basis of a predetermined environmental target or to bridge the price gap to an acceptable substitute (Oosterhuis *et al.*, 1994). The Government of Canada's discussion paper on economic instruments recommends this more pragmatic approach (Government of Canada, 1992).

Some advocates suggest that, as part of the transition to a more environmentally sustainable economy, EFR should also stimulate environmentally beneficial behaviour in excess of that which would occur in an efficient outcome (Postel and Flavin, 1991: p. 179). If so, which environmental behaviour should be so promoted? Should such incentives be permanent, or just temporary?

Traditionally tax policy serves two functions: it generates revenue in addition to supporting various policy objectives (e.g. equity) (Doern, Maslove and Prince, 1988: p. 55). Some observers argue that there is inevitably a conflict between the environmental and revenue objectives of EFR. For example, Olewiler (1990) argues that if green tax

revenues are used to reduce other revenues, governments will become very tempted to adjust the green tax rates to maintain a constant or increasing flow to their coffers. She warns that the taxes would soon be tied to objectives other than efficient levels of pollution. She therefore argues that "pollution tax rates should be tied to environmental quality, not to other fiscal requirements". (p. 194)

There are a number of possible responses to this argument. It can be argued, for example, that, while an objective of EFR should be to reduce environmentally bad behaviour, it should not necessarily eliminate all environmentally bad behaviour. It may therefore be possible to set a tax rate that maintains environmental harm at an acceptable level while ensuring continued revenue. It can also be argued that even if, at some point in the future the revenue objective dominates, ecological taxes as a source of revenue may be preferable to income taxes as a source of revenue, given that income taxes are distortionary. Oates (1994) notes, for example, that "in an optimal-taxation framework, the basic objective is to design a system of taxation that generates the requisite revenues at the least cost to society ... The intriguing and appealing property of taxes on pollution is that, over some range at least, they ... improve rather than distort the functioning of the market economy." This property has led some economists to argue that policy-makers should also consider the gains from a less distorting overall tax system in setting the levels of pollution taxes (viz., Lee and Misiolek, 1986 cited in Oates, 1994).

Von Weiszäcker and Jesinghaus (1992) suggest two options to overcome the problem identified by Olewiler. First, it should be possible in theory to set a revenue target and adjust tax rates annually. The problem with this, of course, is that it is unpredictable and therefore undermines one of the most desirable features of a tax system - certainty. The preferable approach may therefore be to increase green taxes by a pre-set percentage each year and reduce other revenue accordingly, recognizing that, ultimately, the government will have to continue to use other, more conventional taxes. Von Weiszäcker and Jesinghaus argue that the latter approach has the benefits of certainty and of phasing in the tax, to allow for adjustment and innovation.

The downside to Von Weiszäcker and Jesinghaus' proposal is that a system in which rates are gradually increased may not be appropriate for some environmental issues which could require significant tax increases in order to ensure immediate discernable

environmental benefits. Thus, while it may be appropriate to increase green tax rates gradually on average, some may have to rise more quickly than others.

3.5 *How should ecological tax revenues be used?*

The revenues from environmental taxes can be used for three basic purposes:

- to fund new programmes, including compensating those most adversely affected by the tax;
- to reduce the government's deficit; and
- to reduce other taxes.

In a survey about the possible use of revenues from a carbon tax conducted for the Ontario Fair Tax Study, Donner and Lazar (1993) found that 60% of the Ontario firms surveyed favoured cuts to corporate income taxes or direct subsidies while 40% favoured grants for the purchase of energy efficient equipment and new investment tax credits. (Apparently, the options of reduced income taxes or payroll deductions were not offered.)

In several European countries, pollution taxes are levied to fund abatement programs in the same area the tax is collected (e.g., water). This is a form of revenue earmarking which is consistent with the polluter pays principle. In these cases, however, it has been observed that the level at which the tax is set may have more to do with the needs of the agency administering the abatement program than with the objective of altering the behaviour of the polluters. While these programs have been successful at improving environmental quality, they may not provide the incentive necessary to eliminate the polluting behaviour in the first place (Tuddenham, 1995).

There are important reasons for considering whether the revenues raised through an environmental tax should be recycled in the same sector. Where the demand elasticity for a good or service is low (e.g., car transportation), the provision of alternatives to this good or service (e.g., urban public transit) could help increase elasticity and therefore the environmental impact of the tax. Such a link may also be important to alleviate potentially regressive impacts (by ensuring the availability of affordable alternatives, for example), and to enhance the political legitimacy of the new tax: it may be easier to

obtain labour union support for a gasoline tax, for example, if the government were to create jobs at the same time in public transit.

Economists, however, have traditionally opposed earmarking both for its distortionary impact and the institutional rigidities it creates in allocating revenues. This is a particularly relevant concern in the case of EFR, one of whose primary goals is to shift the tax burden in order to achieve greater overall efficiency. Such a shift would be precluded if the government were to earmark all of its environmental revenues to specific programs. The fact that most studies suggest that economic instruments are more likely to be accepted if they are revenue neutral on a program basis suggests that EFR could be difficult to implement on an incremental basis (since there will be pressure to implement each incremental tax in a program revenue neutral basis).

A related concern is that if the taxes raise sufficient revenue, the programs receiving these funds may be overloaded. This in turn could lead to inefficiencies in program delivery and inefficient allocations among programs. These distortions would counteract any economic efficiency argument for EFR.

While the potential long term revenues from eco-taxes are difficult to estimate, since they depend on a variety of factors including the demand elasticities for the products taxed, political will and implementation concerns such as competitiveness, they are extremely unlikely to displace fully large and relatively stable sources of revenues such as income taxes. Of the many environmental taxes that have been mooted, only energy taxes appear to offer a large potential for revenue generation. In the case of Germany, von Weiszäcker and Jesinghaus estimated in admittedly a crude fashion that environmental taxes could account for about 5 to 10 percent of GDP over several decades. Similarly, Repetto *et al.* (1992) estimated that environmental taxes could account for about 5 to 10 percent of U.S. federal revenues, a proportion already reached in several European countries (OECD, 1995). Thus, while eco-taxes could play an important role in internalising environmental externalities and would contribute appreciable revenue to government treasuries, existing taxes would still constitute by far the greatest source of government revenue.

3.6 *Should ecological tax reform be revenue-neutral?*

Revenue neutrality can take different forms:

- Revenue neutrality vis à vis the individual: an environmental tax would be exactly offset by some compensatory measure so that the individual was no worse off. Although possible in theory and appropriate in some cases - e.g. to induce energy retrofitting - this is obviously impractical on a widespread basis.

- Revenue neutral programs: the revenues generated by the tax are recycled within the program. Sweden's NO_x tax is an example of this type of neutrality. As noted in the previous section, this type of program revenue neutrality may be inimical to EFR, which, instead, requires that revenues be used to offset reductions of other distortionary taxes.

- Revenue neutrality within the government: the government offsets the increase in revenue through tax cuts elsewhere.

As we observed in Section 1, the concept of using eco-tax revenues to reduce other taxes is a basic characteristic of EFR. There is no economic rationale, however, for ensuring that such offsetting occurs in a revenue neutral manner. Indeed, some advocates (e.g. Repetto *et al.*, 1992) argue that EFR could be a source of revenue for deficit reduction. On the other hand, von Weiszäcker and Jesinghaus (1992) argue that EFR could be "sold" to the public most easily if it is presented as a way to induce the systematic environmentally positive change which is supported by many in the public. In today's circumstances, however, many governments may be more interested in the revenue potential environmental taxes offer than in ensuring that EFR is revenue-neutral.

3.7 *What are the potential competitiveness impacts of ecological tax reform?*

There are several elements to this question:

i. How will EFR affect business competitiveness and national productivity?

Most research indicates that environmental control costs have had little or no impact on the overall competitiveness of countries at the macro-economic level, primarily measured by trade balances and impacts on trade patterns (see, e.g., Jaffe *et al.*, 1994). In any event, von Weiszäcker and Jesinghaus (1992) argue that if overall revenue neutrality is observed, any competitiveness impacts at the macro-economic level due to increased costs should be offset by the reduction of other costs.

Environmental costs can, however, have more significant competitiveness impacts at the micro-economic level on particular sectors or firms. For instance, negative cost impacts resulting from the internalization of environmental externalities are often greater for certain resource intensive sectors. Competitiveness difficulties may arise at the margin in those cases where sectors or firms have competitive weaknesses in areas of their cost structure relating to labor, capital or technology (OECD, 1993).

The relative competitiveness impacts of environmental taxes will differ among sectors and firms for a variety of reasons. Recent studies suggest that large multi-nationals and industrial sectors which can benefit from technological improvements and market differentiated products may be best placed to address the competitiveness challenges and realize the competitive advantages from adjusting to environmental taxes (OECD, 1993). It could also be that small or medium size firms operating in a highly competitive domestic market would not be seriously affected by environmental taxes which impose similar costs on all competitive firms. By contrast, firms which depend on exports and which compete on the basis of relative prices, such as primary agriculture and resource commodities, may experience difficulties internalizing environmental costs and realizing competitiveness gains associated with the adaptation to environmental taxes. This is an important consideration for Canada which relies heavily on the export of primary goods to offset the deficit on our current account.

A key rationale for environmental taxes as compared to traditional regulation is that they should, in theory, reduce transaction costs and allow individual firms more flexibility to devise cost-effective means to reduce their environmental impact. Furthermore, some literature suggests that environmental policies, including environmental taxes and charges, may have positive competitiveness impacts for certain sectors or firms (the so-called "Porter hypothesis"). These positive impacts can include innovation, efficiency, front-runner and spin-off activity advantages (see, e.g., Schmidheiny, 1992). To what extent would a phased-in EFR induce Canadian industries

to become more competitive in the long run? Presumably the answer affects the rate at which Canada could move unilaterally to introduce environmental taxes for certain sectors.

Although the competitiveness issues are legitimate, environmental taxes would likely represent a small change in the overall cost of doing business in the short term given the gradual rate at which they are likely to be introduced. For instance, Majocchi (ref XXX) summarizes a number of European studies which indicate that a carbon tax should have little or no drag on competitiveness of national economies. In general, the models suggest that the impact will depend on the size of the tax, what is taxed and what revenue sources are offset. Many observers note also that countries currently face widely differing resource input costs. For example, Japan and Germany face much higher energy prices than the US and Canada yet remain competitive, even in highly energy intensive industries. At any rate, as Jacobs (1993c) observes, the short term competitiveness effects on national economies must be compared to the long term effects of failure to address environmental problems. The base case must therefore assume continued or even increased environmental degradation.

ii. How will EFR affect investment and plant location decisions?

The extent to which eco-taxes could influence decisions to invest in one country or another is not clear. Most research suggests that corporations take a wide range of economic, political and social factors into account in investment decisions. The influence of any one of these factors on these decisions is very difficult to sort out. Some studies have concluded that the impact of environmental policies on investment and plant location decisions is minimal (see e.g., the recent studies in Eden, 1995). An OECD "Workshop on Environmental Policies and Industrial Competitiveness" held in January 1993, however, cited evidence that industrial migration of certain environmentally intensive industries to lower income countries has been encouraged by environmental policies in OECD countries (OECD, 1993).

iii. Will firms be able to pass on eco-taxes to consumers?

There is much uncertainty about the extent to which firms will be able to pass the costs imposed by environmental taxes on to consumers. However, the ability of a firm to compete on the basis of product differentiation rather than price, and thereby to derive

advantages from marketing "green" products are important determining factors. Furthermore, the extent to which a firm is exposed to international competition and is dependent on export markets are very important factors. For instance, the survey conducted by Donner and Lazar (1993) indicated that respondents believed that international competitiveness concerns would preclude them passing on any added costs not shared by competitors. These findings suggest that the share of exports as a percentage of GDP may be an important factor determining a country's ability to implement EFR without impairing the competitiveness of its industries. Last, the structure of the market in which firms are operating will influence their ability to pass on taxes to consumers. For example, electrical utilities will be able to pass on price increases in their domestic markets that would be more difficult to implement in a highly competitive industry, especially an industry facing international competition.

iv. What will be the impact of EFR on inflation?

In their recent work, von Weizsäcker and Jesinghaus (1992) acknowledge that green taxes could induce inflation (because they shift monetary costs from the future to the present). The precise extent to which EFR might induce inflation is unclear, however. For example, its impact on inflation will depend in part on the rate at which EFR is introduced (i.e. the magnitude of the perceived price increase). Moreover, by decreasing unemployment, EFR should, over time, reduce the demand for unemployment insurance and other government expenses, thereby reducing public costs and perhaps slowing inflation. And, to the extent to which EFR stimulates more efficient production, it should enhance productivity, thereby further offsetting inflation. Finally, the perception of price increases could be offset by aggregate income compensation, or by removal (or reduction) of another general incidence tax (e.g. the G.S.T.).

v. Possible solutions

The ability of industrial sectors or firms to adjust to the competitiveness effects of eco-taxes, regulations or other forms of government intervention ought to be taken into account when making decisions about the rates and initial targets of environmental taxes. Recent secondary literature has identified several factors that may influence the ability of a sector or firm to adjust to competitiveness impacts and realize competitiveness gains from adjusting to environmental policies (e.g. OECD, 1993):

- the type and scope of externalities that arise in production or consumption of a product and the investment share of regulatory compliance costs;
- the overall competitive strengths and weaknesses of the sector or firm in non-environmental areas such as labor, capital and technology;
- the location of the sector or firm in the flow of materials from resource extraction to final product production and consumption and whether technological advantages can be realized from environmental improvements;
- the ability of the sector or firm to compete on the basis of product differentiation rather than price and derive advantages from marketing "green" products;
- the extent to which the sector or firm is exposed to international competition or depends on export markets;
- the size of the firm, which affects its capacity to invest in the environment and to realize economies of scale from environmental improvements; and
- the investment cycles of the sector or firm, which affect the ability to make environmental improvements along with other technological enhancements.

Some negative competitiveness effects could be offset in the case of value-added taxes which should not affect exports as export companies can deduct VAT. Tax concessions to exporting firms, however, can lead to them paying no tax at the margin. Where this happens (e.g., concessions to Swedish energy-intensive firms), the tax loses its incentive effect and becomes ineffective in protecting the environment (Sterner, 1995). Another way of offsetting some negative competitiveness effects would be to apply applicable environmental taxes to competitive imports at the border, so-call border tax adjustments. However, GATT trade rules make this option more feasible for some types of environmental taxes than for others. We address these trade rules issues in section 3.7 below.

As we have noted above, most observers agree that, in many cases, environmental taxes should be phased in gradually to allow for adjustment and innovation. For instance, in his recent study Majocchi (1994) summarizes a Directive from the EC to the Council proposing a conditionality clause with exemptions for highly energy intensive industries. However, the bottom line, as von Weizsäcker and Jesinghaus (1992) acknowledge, is that more analysis is probably required before governments will be prepared to introduce EFR. The question is what kind of analysis is required? what information do we need to know about competitiveness implications before implementing EFR?

3.8 *How should international trade rules be taken into account?*

International trade rules regarding border tax adjustments may be particularly influential in determining the rate and nature of EFR, particularly in an export-dependent economy such as Canada. The General Agreement on Tariffs and Trade (GATT) and the World Trade Organization (WTO) have no authority over domestic taxes but do have rules regarding how taxes are applied to imports and exports. Commentators agree that levying internal taxes on imported products poses no problem under trade rules. The GATT/WTO requires that these taxes be non-discriminatory, be applied only to "like" imported products, and not be designed to afford protection to domestic industry.

GATT/WTO rules are less clear when internal taxes are applied to production processes or inputs to products that are not constituted in the final products, such as in the case of applying a domestic energy tax to imports. Consideration and discussion must be given to how much flexibility countries have under trade rules to adjust for various types of environmental taxes at the border by applying them to imports. The impact of trade rules on constraining the application of environmental taxes to exports, for example to encourage conservation, must also be clarified.

In the EC, where the implementation of environmental taxes is well advanced, the international aspects of taxes have been the subject of significant debate. Prohibitions on border taxes have constrained the ability of members to institute unilateral environmental taxes (Rajah and Smith, 1994).

3.9 *How should the potential adverse distributional impacts be addressed?*

Environmental taxes can lead to several distributional effects: they can penalize certain consumers, manufacturers or regions, and they have an intergenerational dimension in that they bring forward in time the payment of environmental costs. Many of these effects can be attenuated by the rate at which environmental taxes are introduced and by associated transitional or compensatory measures. If the latter are used, however, it will be important to ensure that they do not weaken the incentive effect the tax is designed to achieve. In general terms, recycling the tax revenues to industry should help resolve some competitiveness concerns while recycling revenues to individuals should help address concerns over the possible regressive nature of these taxes.

There is relatively little empirical evidence concerning the distributional effects of environmental taxes, although the key analytical steps are well understood (OECD, 1994). What analytical work has been done has focused primarily on modeling the impact of new energy taxes, including CO_2 and carbon taxes.

i. Regional impacts

An analysis of the distributional consequences of a carbon tax in the United States suggests that the burden of the tax would fall unevenly because of regional differences in energy prices and fuel mix (Kopp and De Witt, 1991). Similar studies done in Canada confirm regional variations in the impact of a carbon tax. More generally, the strong regional differences in the Canadian economy, particularly in terms of the local economies' reliance on the primary sector, suggest that EFR could have different impacts across the country. Should these differences influence the choice of what to tax or the rate of taxation? Should they influence the use to which eco-tax revenues are put?

ii. Regressive impacts

Income taxes are usually structured so that they are progressive. By contrast, there is some evidence that environmental programs in the United States have had a regressive impact (Oates, 1994). Because they may increase the cost of basic amenities, such as heating fuel and gasoline, green taxes may also be regressive. For example, an energy tax would have a greater effect on poor families, who spend a higher proportion of their income on energy. Some studies indicate that, without corrective features, an energy tax could have the perverse result of changing energy use by poor households, but they would have less impact on energy use by wealthier consumers who could more easily assume the increased costs and who use more energy (Johnson, McKay and Smith, 1990).

While acknowledging that green taxes may affect the poor disproportionately, several economists predict that their net impact should be minimal. Hamilton and Cameron (1994), for example, predict that a carbon tax of $102 per ton would decrease consumable income for the lowest quintile by 1.1 to 1.2% more than for the highest quintile in Canada. Similarly, Repetto *et al.* (1992) found relatively small changes in the distribution of tax incidence for the taxes they considered.

Michael Jacobs (1993a) argues that there are essentially two ways in which governments can cushion the unfair distributional consequences of environmental policies. Ideally,

social and environmental targets should be integrated into policy design, ensuring from the start that distributional effects are equitable. This might require, for example, that some of the revenues from an automobile fuel tax be used to fund programs to increase the availability and affordability of cleaner alternatives. In some cases, that approach will be impractical: environmental policies may have to be designed without considering distributional issues, but with provisions to compensate the hardest hit through reductions in other taxes or increases in welfare benefits. Governments could also use green tax revenue to subsidize the poorest individuals: those who pay no tax and who would therefore not benefit from any income tax reduction (for the increased cost of their heating energy and other services). Alternatively, Weiszäcker and Jesinghaus (1992) argue that, if green tax revenue is used to reduce indirect taxes, such as the GST, which are equally regressive, then the distributional concerns can be effectively mitigated.

4. Political and Institutional Issues

4.1 Political issues

Environmental taxes are one area of public policy where it may be paradoxically easier to achieve agreement on the means than the end. While few will dispute the theoretical merits of environmental taxes, a vigorous debate has been engaged on the relative importance of the environmental problem they are designed to ameliorate. This debate arises not only because of the design considerations involved, but also because environmental taxes are likely to create winners and losers.

Typically, most budget changes occur only at the margins because there is little political incentive to attempt to reform the budget as a whole. This is in part due to the enormous scope of the undertaking. Comprehensive budget reform is also impeded by the fact that significant elements of the current budget represent an accumulation of special interests which usually resist change that threatens them. Because each of these interest groups can be expected to protect its turf vigorously, while the benefits of eliminating any given concession may be diffuse (in some cases benefiting as yet unborn, future generations), comprehensive budget reform can be politically unattractive (Hartle, 1988; Doern, Maslove and Prince, 1988; Good, 1980; Wildavsky, 1979, 1986, 1991; Mucciaroni, 1990; Peters, 1991; Rose and Karran, 1986).

All observers seem to agree that mobilizing public support for environmental taxes may be the biggest challenge to their introduction. Because their cost is more transparent than the burden imposed by regulation, environmental taxes have been and are likely to continue to engender considerable opposition. The experience both in Canada and other countries (e.g., Belgium, Sweden, the United States) bears this out. It demonstrates that it is essential to develop a political constituency for EFR for it to succeed. Introducing new taxes can be a politically hazardous endeavor at any time, but never more so than after successive tax increases, or in a climate where tax cuts are expected.

Experience with green taxes suggests that the political acceptability of environmental taxes probably will depend on a number of factors, including:

- the linkage between the environmental problem and the measure advocated. This is much more than a design issue as it also concerns the legitimacy of the government measure. Where public awareness of the environmental issue is low or where other instruments appear more appropriate, environmental taxes will be difficult to justify politically. A general-purpose tax disguised as an environmental tax is likely to be criticized as a "revenue-grab" (e.g., the since-removed tire tax in Ontario was described in these terms); and

- how the revenues generated are to be used. These revenues, for example, can be used to compensate those most affected, to enhance the effect of the tax by funding complementary programs, or to cut taxes (e.g., the German feebate program for catalytic converters or Iowa's goundwater protection program).

The Swedish experience with green taxes provides two lessons with potential application to Canada. The first is that "environmental taxes must be motivated by environmental problems and must actually result in an environmental incentive" (Sterner, 1995). Otherwise, their legitimacy is reduced. The second is that it may be difficult to sustain public support for unilateral action on global issues.

Canada's regional economic differences may make it difficult to introduce EFR in an incremental fashion since many individual taxes would affect one region more than another (e.g., carbon taxes). The experience with the National Energy Program is instructive on this point: it is difficult to imagine that the federal government would be

prepared to assume the political costs the NEP represented by introducing new taxes which appear to discriminate against a particular region.

Canadian politicians must also respond to international pressures. Countries like Canada with "open economies" - a high ratio of exports to GDP - face particular pressures to respond to the exigencies of international markets (Cameron, 1985; Peters, 1987). International organizations such as the OECD, GATT, the IMF and the World Bank can influence the Canadian budget process. Similarly, the U.S. Federal Reserve Board influences Canadian interest rates and private institutions such as the New York money market bond rating houses assign credit ratings to provincial governments and government owned utilities, thereby indirectly imposing their values and criteria on Canadian budget policies.

4.2 *Institutional constraints*

Several additional specific factors related to existing budgetary institutions shape and limit government's existing ability to integrate environmental factors into the budget process. These features include:

1. the disincentives to comprehensive evaluation inherent in the Canadian parliamentary system;
2. the absence of clear environmental objectives;
3. inadequate environmental indicators;
4. inadequate analytical techniques;
5. insufficient public input; and
6. institutional fragmentation of responsibilities for environmental policy.

Each of these will be described briefly.

i. The Canadian parliamentary process

The Canadian parliamentary process militates against the systematic consideration of long-term issues. The electoral cycle, political norms, party discipline and the strong media orientation of Question Period create a selective interest that is typically focused on the short term. In turn, the ability of parliamentary committees, interest groups, the media and academics to evaluate policies from the type of long term perspective

required by sustainable development is undermined by the predominance of executive power, the law and traditions of Cabinet, the principle of budgetary secrecy and the natural incentives on the part of government officials to minimize the release of information that might be used to criticize ongoing programs (Doern and Maslove, 1979; Bregha, 1992). While these factors may inhibit long-term planning, they are not unique to the Canadian system; indeed, the parliamentary system may perform better in this respect than a congressional system, for example (Hettich and Winer, 1994).

ii. Absence of clear environmental objectives

Current budget policies reflect a mix of Keynesian and monetarist policies. The primary focus of both policies is on stimulating economic growth. While the two theories differ as to the appropriate means to achieve growth and the appropriate target growth rate, there is no disagreement as to the inherent value of economic growth. This is the fundamental point of departure for sustainable development, which emphasizes the importance of adopting a broader set of objectives that explicitly also account for distributional and ecological goals, impacts and constraints. These objectives, however, are difficult to define, but bear on the implementation of EFR. They lead to questions such as: How clean is "clean"? What is the responsibility of the current generation to the future?

iii. Indicators

This problem of unclear objectives is compounded by a "technology" problem: governments lack the information and analytical tools to integrate ecological, economic and distributional concerns into decision making. This lack of information will affect both the challenge of selecting environmental taxes as well as evaluation of their effectiveness.

In particular, governments will require a new set of indicators to measure progress. In many cases, we cannot measure the environmental implications of our actions clearly enough to develop an appropriate policy response. We also lack indicators to measure environmental trends and their significance. We have only crude estimates of the economic costs of environmental degradation. In a related vein, the national accounts on which we rely to measure impacts of budgetary policies present a misleading indication of a country's assets and liabilities. Without information that can be used to document the results of EFR, it will be difficult to garner necessary political support for implementation.

iv. Inadequate analytical techniques

The integration of environmental considerations into government budgeting decisions will also require the development and adoption of new analytical techniques. For example, traditional economic tools, such as cost-benefit analysis, have limited capacity to address issues related to long term global change. Prevailing economic theory treats capital inputs and individual inputs to production as inherently productive, ignoring the potential negative impact that might be caused by the removal or damage to an element critical to continued ecosystem functioning. Moreover, by assuming the circular flow of exchange value, neo-classical economics and accounting techniques implicitly assume complete reversibility. By contrast, the second law of thermodynamics holds that all action - including the economy - is sustained by a unidirectional and irreversible flow of energy. In order to remedy these deficiencies, analysts will probably require new measures of environmental degradation, and will certainly require a re-thinking of discounting.

There are also important limitations to the ability of science to identify sustainable policies. Because of natural variations in ecosystem responses and because there is no control group for comparison with large scale ecosystem changes, the ability of scientists to predict outcomes and to define a sustainable limits to resource depletion is very limited (Ludwig, Hilborn and Walters, 1993). Moreover, neither science nor economics yet offer an effective means to account for the net result of multiple environmental changes.

v. Public participation

The structures put in place and the process followed to establish the revenue budget can determine which interests are listened to and what values are accorded importance, and can therefore shape the terms of the debate. Although it has been opened up in recent years, the budget process probably remains inimical to EFR. The current revenue budget process provides for minimal input, and encourages participants to frame their input either in terms of overall direction on major issues, such as the significance of reducing the deficit, or discrete interests, thus balkanizing the process and impeding the potential for comprehensive management or change (Lindquist, 1985).

On the other hand, it is not clear that opening up the process to public input would improve the situation. The ENGO policy community lacks many of the institutional

resources required to function effectively in the policy development process on an ongoing basis. Few members of the public can be expected to address the issue in an informed manner, especially in the absence of adequate information about environmental externalities. Would increased access therefore simply lead to the special entitlement of those few organizations with the resources to cope with the demands of the policy process? What democratic value would such a change support?

vi. Institutional fragmentation

By definition, environmental taxes are meant to achieve two objectives: raise revenue and change behaviour. Who therefore should play the dominant role in designing these taxes; the Department of the Environment or the Department of Finance? While there is no ready answer to such a provocative question, the current division of environmental policy instruments between two agencies raises obvious difficulties for the development of an environmentally effective and economically efficient protection regime. This division can be bridged: the German water agencies, for example, have the power both to issue water use licences and impose resource taxes.

5. Foreign experience

The public policy debate on EFR is much more advanced in Europe than it is in North America. Both the Danish and Swedish tax reforms of the early 1990's, for example, were justified explicitly in part on the need to reduce high marginal income tax rates and replace them by taxes on environmentally-harmful consumption. At the level of the European Community, as noted above, there is considerable interest in the potential EFR offers to advance the environmental agenda and reduce unemployment.

In the OECD countries that are using environmental taxes, notably the Nordic countries, or ones that are considering them, the following trends have been observed (OECD, 1995):

- a growing use of product charges;
- reforms to transport taxes and energy taxes to increase the amount of revenue collected; and
- continued serious examination of the potential for implementing or expanding the use of environmental taxes.

Despite this high level of interest and the fact that many countries apply environmental taxes, in only a few countries do the taxes currently represent a significant portion of overall government revenue. Although one needs to be careful in drawing conclusions from international statistics, the OECD suggests that Norway seems to derive the highest proportion of its total tax revenue from environmental taxes (10.75 per cent), followed by Denmark (7.3 per cent), Sweden and The Netherlands (over 6 per cent) and Finland (over 5 per cent) (OECD, 1995).

5.1 *Sweden*

Environmentally-related taxes are probably more important in Sweden than anywhere else, accounting for about 3 percent of GDP and 11 percent of central government revenues (OECD, 1995). Although Sweden taxes or imposes charges on a broad range of environmentally-harmful activities, 99 percent of revenues raised this way come from energy taxes. Bohm (1994) and Sterner (1995) argue that the impetus to reform the Swedish tax system in the early 1990's to reduce the negative effects of a very high marginal income tax rate was one of the major reasons for the introduction of new green taxes. Although it is too early to gauge the incentive effect of these taxes, economic modeling done at the time of the introduction of the new energy taxes suggests that they may achieve additional reductions of 5 to 15 percent in CO_2 emissions, 10 to 20 percent of SO_2 emissions, and about 1 percent of NO_x emissions. The environmental effect of non-energy taxes, however, is believed to be small (Bohm, 1994).

5.2 *The Netherlands*

Over the years, The Netherlands has introduced a broad range of environmental taxes and charges on aircraft noise, water pollution, soil protection, and motor vehicles, among others. The revenues the Dutch government collected from these taxes in 1993 nonetheless amounted to almost 6 per cent of its total tax revenues (OECD, 1995). With few exceptions (e.g., tax differentiation on gasoline), the primary purpose of these taxes is to raise revenue rather than change behaviour. In addition, the Dutch subsidize various environmentally-desirable activities, such as energy conservation and low emission heating technologies.

The introduction of green taxes in The Netherlands is subject to an elaborate evaluation framework which some have interpreted as "an indicator of bureaucratic reluctance on the issue of environmental taxation" (Oosterhuis and Lohman, 1994). The largest employers' associations have stated that they preferred regulatory approaches to incentive charges.

5.3 *The United States*

The decentralized American fiscal system, through which all three levels of government play an important role in both raising and spending revenue, makes generalizations about US environmental taxes difficult. A recent study found that the various state governments have enacted over 250 eco-tax measures, including a wide range of taxes, charges, fees and levies (Hoerner, 1995). The United States, however, differs from other countries in its experimentation with tradable permits schemes. These have been applied to eliminate lead in gasoline, phase-out ozone-depleting chemicals and reduce sulphur dioxide emissions.

Despite these developments, however, most environmental issues continues to be addressed by means of "command and control" measures. In a recent study for the OECD, Oates (1994) suggests that the reasons for the continued popularity of quantity instruments in the United States include: (i) greater direct control by the environmental authorities over the levels of waste discharge; (ii) strong political opposition to increasing taxes; and (iii) "the advantage of familiarity". To these, Arnold (1995) adds several reasons why taxes are not extensively used in United States:

- expectations that policy makers have concerning the operation of market-based approaches that are rarely satisfied in practice;
- unfair comparisons with other regulatory approaches;
- incompatibility of revenue generation objectives and environmental policy goals;
- conflicts between environmental policy objectives and the goal of corrective taxation; and
- difficulties associated with providing the necessary equity adjustment.

6. Conclusion

Environmental taxes offer an important opportunity to protect environmental quality by increasing economic efficiency and reducing material throughput. Since the proceeds of such taxes in most countries represent a negligible fraction of government revenues (except in Sweden), there is considerable scope for their introduction. With the exception of energy, however, these taxes, are unlikely to yield very large revenues. They will therefore not replace existing forms of taxation. The limited revenue-raising potential of environmental taxes should not represent a disincentive to their implementation since their primary objective should always be to change behaviour in order to achieve an environmental objective. Taxes portrayed as meeting an environmental goal but whose primary purpose is really to raise revenue are unlikely to be environmentally effective and may not be accepted as legitimate by the public.

Although in most cases environmental taxes should be introduced gradually to allow for adjustment and innovation, there will be instances where it will be appropriate to introduce environmental taxes quickly (e.g., US tax on CFCs).

EFR is clearly a long term proposition as it entails a series of adjustments in the current tax system, the impact of which is not yet fully understood. EFR's long-term goal is to alter the relative cost of the factors of production and thus alter the structure of the economy. Although the economic adjustments EFR may prompt will depend largely on the rate at which it is implemented, these are unlikely to be as significant in the short term as those which the oil price shocks of the 1970's or the economic globalisation of the 1990's have already imposed.

But if EFR should not be implemented all at once, its incremental implementation may be politically difficult if political pressure forces each new environmental tax to be revenue-neutral. Revenue neutrality could lead to well-funded environmental programs (although the evidence on this point is controversial), but it would not necessarily lead to EFR since the opportunity for a shift in the tax base would be lost.

So, where should a government interested in EFR start? While the answer will depend on individual circumstances, three avenues appear particularly worthwhile in the short term:

1. the identification and removal of fiscal barriers to environmentally sound practice that cannot be justified for other policy reasons. As part of the program reviews many are already conducting, governments should identify the environmental effects of their subsidy programs and determine whether these programs are still necessary or whether their objectives can be achieved at a reduced environmental cost. In the last election campaign, the Liberal Party committed the federal government to undertake a baseline study of grants, subsidies and taxes;

2. the introduction of selected eco-taxes on a pilot basis to test their environmental effectiveness and various design considerations. Beside achieving environmental objectives, the purpose of such experimentation should be to gather the information needed to design and implement such taxes on a broader scale;

3. investigation of EFR's apparent "double dividend". The modelling work done for the European Commission (DRI, 1994) implies that it may be possible to combine the achievement of some environmental goals (e.g., the stabilisation of greenhouse gas emissions) with a modest decline in unemployment at a very small economic cost. Canada should determine whether similar results are possible in the North American context: Could EFR really lead to a double dividend? What would be the impact of EFR on total factor productivity?

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