

Distr.
RESTRICTED

LC/R.1009 (Sem.61/16)
24 June 1991

ORIGINAL: ENGLISH

E C L A C

Economic Commission for Latin America and the Caribbean

Regional Seminar on Policies for the Management of Urban and Industrial Wastes, organized by the Economic Commission for Latin America and the Caribbean (ECLAC) under the Project on Guidelines and Consultancy Services on Controlled Environmentally Sound Waste Management, carried out with the support from the Government of the Federal Republic of Germany.

Santiago, Chile, 1-3 July 1991

ECONOMIC POLICY MEASURES FOR THE IMPROVEMENT
AND PROTECTION OF THE ENVIRONMENT

This document was prepared by Mr. Michael Betts, consultant to the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ). The views expressed in this work are the sole responsibility of the author and do not necessarily coincide with those of the Organization. Document not subjected to editorial revision.

91-6-943

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ECONOMIC POLICY MEASURES FOR THE IMPROVEMENT AND PROTECTION OF THE ENVIRONMENT.

- Paper in Support of a Presentation by Michael Betts, GTZ Short-Term Consultant.

1. Introduction

Economic instruments are policy tools used in the fields of air and water quality, noise abatement, soil protection and waste management. The environmental objectives of these policies are achieved either by stimulating producers to change their behaviour towards the environment ("incentive") or by financial redistribution for implementing policy measures elsewhere ("revenue raising").

They place financial burdens on producers. In some cases they provide incentives to reduce pollution, but in others they may take the form of incentives (subsidies) to encourage the modification of impacts upon the environment. They have always formed part of environmental policy (although they may not have been explicitly recognised as such) but their role has tended to be secondary to more direct regulatory measures. In recent years, economic instruments have been proposed as a more flexible, effective and efficient option than direct regulatory control for achieving the objectives of environmental policy.

This paper reviews the scope for economic instruments assuming a more significant role in environmental policy in the future. In doing so, it examines the theoretical and practical differences between the regulatory and economic approaches to environmental control, it identifies the principal economic instruments used in developed countries today, it considers the influence of existing political, social, administrative and economic conditions on the adoption of economic instruments, and examines the scope for their wider use in the future.

2. Background and the Policy Context

2.1 The Regulatory Environment.

Traditionally, regulatory instruments have been used as the basis for implementing environmental policy, with governments typically resorting to these policy measures coupled with systems for monitoring and sanctioning non-compliance. This is often referred to as a 'command and control' philosophy.

Regulatory instruments are institutional measures aimed at *directly* influencing the environmental performance of producers by regulating processes or products used, by proscribing or limiting the discharge of certain pollutants, and/or by restricting activities to certain times, areas etc., through licensing, setting of standards, zoning etc. They leave no choice: compliance is mandatory and sanctions for non-compliance often exist. The basis for this control is found in legislation and accompanying regulations.

This approach, which was founded on the urban sewerage and other public hygiene programmes of the 19th century, is dominant in environmental decision-making today. Its most obvious advantage is the control authorities can exert over the behaviour of producers, combined with a more-or-less certain outcome in terms of environmental effectiveness.

Direct regulations have nevertheless been criticised for being static, inflexible and sub-optimal in terms of environmental and economic efficiency. For example, it is argued that fixed-term pollution licences provide no incentive for producers to respond to improvements in pollution abatement technology. As a result, governments have shown increasing interest in the scope for using economic instruments more broadly in environmental policy.

Other reasons for this growing interest might include:

- o an endeavour by governments confronted with economic stagnation and budget deficits to seek out more cost-effective and self-financing approaches to environmental control based upon market mechanisms;
- o a broad policy stance which favours greater deregulation;
- o a concern that direct regulation may have reached its effectiveness frontier.
- o a recognition of the important contribution made by charges towards financing environmental policy; and
- o a gradual transition from curative to preventive environmental policies.

The following section considers the claims made in support of economic instruments and briefly considers the underlying economic rationale for them.

2.2 Economic Rationale

Economic instruments are generally held to be superior to direct regulations for the following reasons:

- o they are expected to generate an efficient cost-minimising approach to achieving acceptable pollution levels.
- o they are expected to provide a permanent incentive to improvements in the level of abatement as more cost-effective abatement technology is introduced; and
- o they are perceived to induce more efficient application of technology in the preventive phase of environmental control.

The economic rationale for economic instruments as an environmental management tool is that the environmental inputs and/or outputs of economic processes, and their wider social consequences, are not fully translated into costs and benefits that bear on the polluter. As a result, the pricing signals received by private decision-makers do not reflect fully the costs of their operations to society. Economic instruments are designed to influence private decision-making behaviour by explicitly translating environmental costs into economic values.

Economic policy instruments are therefore those which affect estimates of the costs and benefits of alternative actions open to producers and which, by influencing decision-making behaviour, lead to a better environmental outcome than would otherwise be the case. Theoretically, economic instruments differ from direct regulations in that they allow producers the freedom and flexibility to meet environmental requirements in a manner which is most cost-effective to them. The extent to which this is achieved in practice is considered later in the paper.

The case for economic instruments rests, as indicated above, on the view that developers should be required to factor part of the external costs imposed on society by their operations into their overall decision making process. The free 'market' for environmental services used by the producer is modified by a central agency determining the value of those services and by ensuring that these values are properly reflected in the prices of goods and services produced.

This is referred to as establishing 'market-based incentives'. Economic theory can be used to demonstrate that a market-based system (of regulation) is more efficient than one based on the 'command and control' approach of setting and enforcing environmental standards in the absence of market-based incentives.

This theory rests, however, upon assumptions which diverge markedly from reality and upon the formulation of various measures which are in practice incapable of calculation (eg, marginal economic costs, and optimal pollution levels).

Nevertheless, a divergence commonly exists between private and social costs of production. Once this is recognised, it follows that the 'proper' price for products and services should be one which reflects more closely the wider social costs of production, inclusive of any 'environmental services'.

Thus a more representative price is given by:

$$P = MC + MEC = MSC$$

where P is the 'true' price, MC is the marginal private cost of production, and MEC is the marginal pollution damage expressed in monetary terms, or the "marginal external cost". Price then equates to marginal social cost (MSC).

The argument that polluters should contribute towards the external costs imposed on society by their activities is rarely questioned today. What is questioned is the practicality of employing policy measures derived from an economic theory subject to a high level of uncertainty. In this regard, it is somewhat inconsistent for economists to dismiss measures of direct regulation because they will "create further distortions in the allocation of resources", when economic models supporting price incentives only operate by ignoring the "distortions" and "imperfections" which already exist in the economic system (Rees, 1990).

Apart from the uneasiness with which those charged with formulating public policy generally approach it, there are many sound practical reasons why economic theory alone is an inappropriate basis upon which to establish environmental policy (in addition to the inherent limitations of the theory itself). These are considered in section 4.

Also the distinction between economic and regulatory instruments is not clear cut. For example, regulatory instruments often have a monetary component attached to them: the outcome (in terms of pollution discharge) then depends on both technical and *monetary* considerations. Some regulations may be accompanied by charges that have no intended impact on behaviour, but which in reality can affect it drastically.

For this, and for other reasons mentioned later, determining appropriate environmental policy is not a question of selecting between regulatory or economic instruments. A policy prescription formulated to achieve desirable environmental objectives is likely to integrate elements of both in a manner consistent with the political, economic and social conditions of the particular country or region concerned. Although this may reflect a bias towards direct regulation or towards a more explicit recognition of market mechanisms, the final choice is more likely to reflect political and administrative pragmatism than economic theory.

The political and social setting is considered below.

2.3 The Policy Setting

The choice of policy instruments is liable to be influenced by a range of considerations, some entirely rational but others reflecting more the ideologies and traditions of particular countries concerned. Nevertheless the criteria applied (either explicitly or implicitly) are likely to be based on 'conformity' and 'optimality' considerations. This section briefly considers the conformity criterion.

Approaches towards environmental problems frequently differ between (and even within) countries. For example, the basic philosophy of the United Kingdom environmental policy has been to work towards ambient concentrations and quality objectives, as has United States air pollution policy. Germany and other continental European countries have had a more source-oriented approach. Such differences are likely to lead to differences in the instruments preferred.

Apart from the environmental philosophy, differences in political and administrative cultures will inevitably lead to differences in the choice of instruments. For example, the United States has generally seen significant

shifts away from price control in recent years, a philosophy reflected in its preference for marketable permits over charges.

Also, policy contexts may differ in terms of the relative power of the various organisations involved. For example, the United States EPA has substantial enforcement powers, whereas the German Federal Environmental Agency functions are mainly advisory, with power resting with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, and with the Laender (States). Similarly, the relative power balances between environmental and industry lobby groups are likely to influence the final selection of policy measures.

3. Types and Applications of Economic Instruments.

As has been noted, the distinction between economic and regulatory instruments is not always clear, and the confusion about what to regard as an economic instrument can be substantial. The notion of an economic instrument has come to mean different things in different contexts and is perceived from different views of what economics is about. The approach followed here is based heavily on the treatment presented in OECD (1969), in which elements common to economic instruments are taken to be:

- o The existence of financial stimuli;
- o The possibility of voluntary action;
- o The involvement of government (related) authorities;
- o The intention (directly or indirectly) of maintaining or improving environmental quality by applying the instrument.

The following types of instrument are considered:

- o charges
- o subsidies
- o deposit-refund systems
- o market creation

3.1 Charges

Charges can be regarded as the 'price' paid by polluters for their implicit claim on environmental 'services' and which will influence private cost-benefit calculations. Charges can have an incentive impact and a redistributive impact. The incentive impact depends on the cost and price changes brought about by the charge. In the majority of cases, charges are low and their effect will principally be redistributive, with revenues being earmarked for collective treatment, for research into new abatement technologies, or for subsidising new abatement investment.

There are various types of charges:

Effluent charges

These are charges based on the quantity and/or quality of pollutants discharged into the environment.

Their role has been limited principally to water pollution control policy, although they are also imposed in a number of countries in relation to aircraft noise.

The water effluent charging system in Germany has achieved its intended incentive impact as a result of a long anticipation period, initially increasing charge levels and charge reductions on better-than-required performance. The Dutch effluent charge, with a revenue-raising function only, has also had incentive impacts on account of the high charge rates necessary to fulfil the revenue raising function. Most other effluent charges are set at too low a rate to have any significant incentive effects.

If effluent charges are to be effective in affecting environmental outcomes and to be effective economically, then higher rates are required. The available evidence points to a marked reluctance on the part of governments to do this.

In principle, effluent charges are compatible with the 'polluter pays principle' although in practice the degree of compatibility depends upon the charge base, the charge rate and the portion of target groups affected. Compatibility can be taken to be greater the more pollutants covered in the charge base, the higher the rates, and the fewer arrangements for exemption.

User charges

These are payments for the costs of collective or public treatment of effluents, and are common with respect to the collection and treatment of municipal solid waste and wastewater discharged into sewers.

User charges operate where societies consider a collective action to be more desirable than diffuse private actions, which suggests that they have been introduced implicitly for reasons of environmental effectiveness and economic efficiency. Since they are considered normal payments for public services, they are rarely intended to act as economic incentives.

As a consequence of their solely financial function, the economic and administrative efficiency of user charges is more important than their effectiveness with respect to polluter behaviour. The trend is towards greater administrative efficiency and simplified charge rates. They are compatible with the Polluter Pays Principle if the intended environmental programmes are funded from revenues raised.

Product charges

These are charges laid upon the price of products which are polluting in their manufacturing or consumption phase, or for which a disposal system has been organised. The majority of charges are applied to cover environmental expenditures relating to the potentially harmful products involved, and their environmental effectiveness depends upon the extent to which such expenditures are covered.

A common feature of these charges is their lack of incentive impact. This is because charge rates are too low to affect purchasing behaviour significantly. Exceptions are the Finnish charge on beverage containers and the Swedish charge on food containers.

The compatibility of product charges with the polluter pays principle is good, insofar as those who use products on which charges are laid pay for the damage or for preventive measures. In general, charge rates are low, implying that only a part of the costs is covered by the charge revenues.

Administrative charges

These are mainly intended to finance direct regulatory measures, such as licensing and control activities or agencies, and thus have a redistributive effect. By placing part of the financial burden of control on the polluter, these charges are clearly in line with the polluter pays principle. They can be environmentally effective if revenues are used for funding directly agency functions, but these more commonly become part of the central budget.

Tax differentiation

Tax differentiation as an instrument of environmental policy has found limited application so far, being largely confined to differential fuel pricing and, in some instances, to favouring the sales of 'cleaner' cars.

Such systems tend to be administratively simple and efficient, and are in line with the polluter pays principle. On the whole, tax differentiation appears to be one of the more successful economic instruments.

3.2 Subsidies

Many countries have established a practice of applying subsidies as instruments in realising their environmental policy objectives. In general, the acceptability of financial assistance is greater the more severe the environmental problem. Examples are water pollution treatment, restoration of hazardous waste sites and control of sulphur dioxide emissions from fuel combustion.

Financial assistance appears to serve mainly towards achieving an economic goal, principally in supporting firms severely affected by direct regulations. The extent to which it is an environmentally effective measure depends, therefore, upon the extent to which the availability of financial support influences the imposition of stricter regulations.

Subsidy systems are generally considered to have a low compatibility with the polluter pays principle, but are widely applied, nonetheless, as an important tool of environmental policy. Subsidies tend to speed up old plant renewal and to contribute to the development and introduction of clean technologies.

3.3 Deposit-refund Systems

These are systems under which a surcharge is laid on the price of potentially polluting products. When pollution is avoided by the return of these products to a collection system (for subsequent recycling or controlled disposal), a refund of the surcharge follows. They are widely applied with respect to beverage bottles.

The environmental effectiveness of deposit-refund systems depends on the percentage of returns which, on the whole, is reported to be high. By having an element of reward they are more attractive than charges, which are characterised by the concept of a penalty.

Deposit-refund systems are generally considered compatible with the polluter pays principle; consumers are charged a certain amount of money as an ex ante payment for the pollution they might cause.

3.4 Market Creation

Artificial markets are created whereby 'rights' are bought and sold to permit actual or potential pollution. Two important forms are:

- o Emissions trading

This is an alternative to, and in many ways a substitute for, the use of pollution charges. Under this approach, dischargers have the same type of emission limits as under normal pollution control programmes. However, if a discharger releases less pollution than its limit allows, the firm can trade the difference to another firm which then has the right to emit more than its limit allows.

Only in the United States has emissions trading in the field of air pollution been widely applied. Minor applications are found in Germany.

Emissions trading as applied in the US in the fields of air pollution and water pollution control has clearly been introduced for reasons of economic efficiency. Applying for emissions trading transactions is a voluntary act, practised when direct regulations force firms to search for cost-effective solutions. Evidence suggests that the system is working.

The main feature of emissions trading policy in the US is a partial shift of decision-making about design and location of control equipment from authorities to plant operators.

Administrative costs of implementing emissions trading in the US are high. Since emissions trading requires an adjustment of complex regulations, it is complex in itself.

Compatibility with the polluter pays principle is partly secured in principle. If a firm wishes to extend its plant, emission rights must be bought, or money must be spent on emissions reductions elsewhere.

o Liability insurance

Legally establishing the liability of polluters for environmental damage or clean-up costs associated with emissions or of wastes generated, can lead to the creation of a market in which risks of incurring damage penalties are transferred to insurance companies. Premiums reflect the probable damage (penalty) or clean-up costs and the likelihood that damage will occur. The incentive is the possibility of lower premiums following improvements resulting in the probability of reduced environmental risk.

4. The Scope for Economic Instruments

Despite the lack of precision regarding the practical application of economic theory, there are clearly grounds for basing environmental policy on the most practical and beneficial elements of both the traditional regulatory approach and on a more market-based one. Grounds for combining the two include the need for revenue for financing environmental policy expenditure, the incentive provided by economic instruments towards achieving the objectives of regulation, and as a possible catalyst for technological change.

Only a small proportion of economic instruments currently applied throughout OECD countries are geared towards environmentally effective and economically efficient solutions. The OECD attributes this to two circumstances.

Firstly, most countries have a firm tradition of environmental policy based upon a 'command and control' approach. Bureaucratic procedures and inertia may

result in economic instruments encountering resistance. In addition, economic instruments implemented in addition to direct regulations are likely to meet with strong opposition from producers. On the other hand, economic instruments as alternatives to direct regulations imply deregulation, leading authorities and environmentalists to fear a diminution of environmental control.

Secondly, there are a number of practical objections to the theory of economic instruments. Whereas standard environmental analysis is based on fairly simple models, in which pollution abatement costs and societal damage through pollution are assumed to be 'well behaved' and clearly perceived, the reality is quite different. These aspects are extraordinarily difficult to quantify even in specific case studies; when there is a requirement for these to be measured continuously within a dynamic and complex economic and environmental system the task becomes impossible.

For these reasons the OECD has observed as follows:

- o Economic efficiency is seldom a stated goal of economic instruments;
- o The financial function of charge predominates and is likely to remain important in the future;
- o Economic instruments with complex modes of operation meet with resistance;
- o Almost all economic instruments operate as adjuncts to direct regulations;
- o Trends towards policy integration are reflected by adjustments of direct regulations, but are seldom accompanied by appropriate economic instruments.

Rees (1990) has also set out a number of practical reasons in relation to waste water discharges why price can never be used alone as an instrument of environmental policy:

- o a significant number of dischargers (25 to 30%) do not understand even relatively simple pricing systems, in the sense that they do not perceive how significantly different levels of payment could arise if they altered

the strength/volume composition of their effluent. Moreover, many of those firms which did understand the system did not have the knowledge about alternative treatment methods and costs, recycling opportunities or about the potential for product, process or input changes.

They therefore failed to perceive ways in which they could respond to the charges. Rarely, then, is it valid to consider pricing as a least-costly and self-administering form of control. In fact, it will require all the monitoring and information services provided under discretionary standards and will incur the additional costs of billing.

- o No pricing arrangement can capture all the essence of the pollution problem. Not only would some polluting substances have to be omitted from any comprehensive price schedule or permit, but also standards do not only aim to influence the quantity and quality of discharge. Regulations may seek to affect the location of the waste storage and outlet points, control the timing and rate of output, and reduce the risks of accidental and highly polluting discharges. Standards may also be required for highly pollutive or dangerous substances where discharges must be avoided at all costs.

All these suggest that some form of consent conditions and monitoring would still be required.

- o Recent studies have shown that, unless accompanied by standards and subsidies, a unit charging system may be inappropriate if the objective is to improve environmental quality quickly.

This arises because technical and capital constraints within firms are significant response-inhibiting factors, at least in the short to medium terms, and because charges cannot give any guaranteed finely-tuned response. Responses to charges may also be particularly slow where previous direct regulations have already encouraged producers to adopt the most obvious and least expensive abatement measures.

In conclusion, then, it is well to recall that the relevant control objective is generally to reduce pollution discharges as much as is 'practicable' or to some politically bargained/administratively determined standard. This reflects current

practice and recognises the practical inability to calculate the 'damage functions' and to establish the 'optimal' discharge levels found in contemporary economic theory.

Nevertheless, the appropriate application of economic incentives should promote innovation in both 'cleaner' technologies and disposal methods; moreover, variants which rely on taxes/charges rather than subsidies should lead to a readjustment of relative product prices and thus to a shift in demand patterns in favour of products involving lower environmental costs.

However, although many forms of direct regulation are essentially reactive in nature, there is considerable evidence to suggest that standard setting has also stimulated innovative technological change.

Similarly, the existence of more conciliatory forms of direct regulation, which necessarily involve persuasion and information as measures to alter polluter behaviour, may also help to change business attitudes towards the environment. Such attitudes are not only vital to the acceptance of pollution control as a legitimate policy goal, but also to its incorporation into the set of factors considered when process, product and locational decisions are made, thus allowing preventive rather than reactive policies to come into play (Rees, 1990).