



The Polluter Pays Principle

THE POLLUTER PAYS PRINCIPLE

DEFINITION
ANALYSIS
IMPLEMENTATION

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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FOREWORD

The recent meeting at the OECD of the Ministers in charge of the environment in Member countries (November 1974) provided further specification of the scope of application of the Polluter-Pays Principle. On this occasion the OECD Council issued a Recommendation on the implementation of the Principle.

The OECD has been pursuing important studies in this field for several years.

Shortly after its creation, the Environment Committees recognized the importance and merits of the Polluter-Pays Principle, not only as an efficiency principle for the implementation of national environmental policies, but also as a principle which promotes the international harmonization of these policies.

A first stage was marked by the OECD Council Recommendation on "Guiding Principles concerning the International Economic Aspects of Environmental Policies" of 26th May, 1972 which, among other things, recommended that Member countries apply the Polluter-Pays Principle.

A second stage, still under-way, consists of studying which instruments, at the practical level, are the most efficient for the implementation of this principle. Additional research is being carried out on the possible exceptions to this principle in conjunction with the dynamic aspects of its application. With respect to the latter, at the meeting of the Environment (Committee at Ministerial Level (13th-14th November, 1974), the Council issued a Recommendation limiting the exceptions to the Principle.

It was believed that a selection of relevant theoretical and practical analyses might usefully be brought to the attention of the public, now that the Polluter-Pays Principle must be regarded as a mainstay of Member countries' environmental policies.

It was felt no less useful at the same time to state the rules and definitions officially recognized by OECD bodies, since so many definitions, interpretations and misunderstandings of the Principle, now become a slogan, appear to prevail among the general public. The OECD has adopted precise definitions which were thought might best be included in the early part of the present collection.

The reader should therefore bear in mind that the first three documents alone are official texts. The rest of this volume contains analyses which do not necessarily reflect the views expressed in the first two papers and which may even, in some cases, differ from them.

As the Polluter-Pays Principle is a fundamental principle of cost allocation, its analysis covers a substantial part of the vast field of environmental resource allocation. While it would be idle to try to sum up all the subject matter of this collection in these pages, the main topics discussed can be briefly listed.

i) First, in the matter of definitions of the Polluter-Pays Principle, the definition officially adopted by the OECD will be found, together with an answer to the questions which consequently arise; for example, since the Polluter-Pays Principle means that the polluter should be charged with the cost of pollution prevention and control measures, then from the standpoint of the compliance with the Principle it matters little whether the polluter's prices reflect all or part of his environmental costs. The Polluter-Pays Principle is not violated if costs are passed on into prices. What matters, therefore, is that the polluter should be the first party to pay, so that he can give full weight in his decision-making process to the economic factor of overall environmental costs.

What should the polluter pay?

The Polluter-Pays Principle is not a principle of compensation for damage caused by pollution. Nor does it mean that the polluter should merely pay the cost of measures to prevent pollution. The Polluter-Pays Principle means that the polluter should be charged with the cost of whatever pollution prevention and control measures are determined by the public authorities, whether preventive measures, restoration, or a combination of both. If a country decides that, above and beyond the costs of controlling pollution, the polluters should compensate the polluted for the damage which would result from residual pollution (when the measures taken by the public authorities do not imply a total ban on pollution), this measure is not contrary to the Polluter-Pays Principle, but the Principle does not make this additional measure obligatory: in other words the Polluter-Pays Principle is not in itself a principle intended to internalize fully the costs of pollution.

An account will also be found of the circumstances in which the Polluter-Pays Principle may be subject to exceptions, such as in the form of subsidies paid to polluters. This problem of exceptions is important as it relates to the international aspect of the Polluter-Pays Principle. As an effective rule of cost allocation the Polluter-Pays Principle has international extensions: it is thus a matter of avoiding distortions in international trade. For this purpose it is important that the various countries should implement their policies according to common cost-allocation rules; if one country subsidizes its polluters while another makes them pay, producers in the first country will enjoy a competitive advantage over those in the second. In short, the comparative advantages in the different countries must be made fully

evident instead of being artificially concealed by various aids polluters may enjoy. For this reason possible exceptions to the Polluter-Pays Principle, which are sometimes necessary in order to prevent any too rigid approach, must be strictly defined. It is for this reason that the Council of the OECD issued a recommendation designed specially to define the limits of these exceptions and to provide a notification and consultation procedure at the OECD in order to prevent any kind of distortion in trade which could eventually result from the implementation of environmental policies.

ii) With regard to analysis of the Polluter-Pays Principle, one study deals in detail with the economic foundations of the Principle and possible effects of its application, such as on behaviour of the polluting firm.

iii) Lastly, the important problem of implementing the Polluter-Pays Principle is discussed at some length. What “instruments” are consistent with the Polluter-Pays Principle? What are the most effective instruments (pollution charges, direct controls, etc.) and are they applicable in all circumstances? With the sudden recent emergence of “environmental economics”, a large number of analyses have tackled the problem of designing and applying pollution charges: does this instrument, which is the most effective according to economic theory, lend itself to actual use and under what conditions?

At practical level, a series of case studies on water management endeavours to relate theory to practice.

In short, the present collection does not claim to cover all the questions, nor to answer them in full, since the OECD is still actively engaged in studying the problem of implementing the Polluter-Pays Principle for each type of pollution and environment as there is not single easy answer to the question of effectively implementing environmental policies.

Part One

DEFINITIONS AND RECOMMENDATIONS

**RECOMMENDATION OF THE COUNCIL
ON GUIDING PRINCIPLES CONCERNING INTERNATIONAL
ECONOMIC ASPECTS OF ENVIRONMENTAL POLICIES**

(Adopted by the Council at its 293rd Meeting on 26th May, 1972)

The Council,

Having regard to Article 5(b) of the Convention on the Organisation for Economic Co-operation and Development of 14th December, 1960;

Having regard to the Resolution of the Council of 22nd July, 1970 Establishing an Environment Committee;

Having regard to the Report by the Environment Committee on Guiding Principles Concerning the International Economic Aspects of Environmental Policies;

Having regard to the views expressed by interested committees;

Having regard to the Note by the Secretary-General;

I. RECOMMENDS that the Governments of Member countries should, in determining environmental control policies and measures, observe the "Guiding Principles Concerning the International Economic Aspects of Environmental Policies" set forth in the Annex to this Recommendation.

II. INSTRUCTS the Environment Committee to review as it deems appropriate the implementation of this Recommendation,

III. INSTRUCTS the Environment Committee to recommend as soon as possible the adoption of appropriate mechanisms for notification and/or consultation or some other appropriate form of action.

Annex

GUIDING PRINCIPLES CONCERNING THE INTERNATIONAL ECONOMIC ASPECTS OF ENVIRONMENTAL POLICIES

Introduction

1. The guiding principles described below concern mainly the international aspects of environmental policies with particular reference to their economic and trade implications. These principles do not cover for instance, the particular problems which may arise during the transitional periods following the implementation of the principles, instruments for the implementation of the so-called “Polluter-Pays Principle”, exceptions to this principle, trans-frontier pollution, or possible problems related to developing countries.

A. GUIDING PRINCIPLES

a) Cost Allocation; the Polluter-Pays Principle

2. Environmental resources are in general limited and their use in production and consumption activities may lead to their deterioration. When the cost of this deterioration is not adequately taken into account in the price system, the market fails to reflect the scarcity of such resources both at the national and international levels. Public measures are thus necessary to reduce pollution and to reach a better allocation of resources by ensuring that prices of goods depending on the quality and/or quantity of environmental resources reflect more closely their relative scarcity and that economic agents concerned react accordingly.

3. In many circumstances, in order to ensure that the environment is in an acceptable state, the reduction of pollution beyond a certain level will not be practical or even necessary in view of the costs involved.

4. The principle to be used for allocating costs of pollution prevention and control measures to encourage rational use of scarce environmental resources and to avoid distortions in international trade and investment is the so-called “Polluter-Pays Principle”. The Principle means that the polluter should bear the expenses of carrying out the above mentioned measures decided by public authorities to

ensure that the environment is in an acceptable state. In other words, the cost of these measures should be reflected in the cost of goods and services which cause pollution in production and/or consumption. Such measures should not be accompanied by subsidies that would create significant distortions in international trade and investment.

5. This Principle should be an objective of Member countries; however, there may be exceptions or special arrangements, particularly for the transitional periods, provided that they do not lead to significant distortions in international trade and investment.

b) Environmental Standards

6. Differing national environmental policies, for example with regard to the tolerable amount of pollution and to quality and emission standards, are justified by a variety of factors including, among other things, different pollution assimilative capacities of the environment in its present state, different social objectives and priorities attached to environmental protection and different degrees of industrialization and population density.

7. In view of this, a very high degree of harmonization of environmental policies which would be otherwise desirable may be difficult to achieve in practice; however it is desirable to strive towards more stringent standards in order to strengthen environmental protection, particularly in cases where less stringent standards would not be fully justified by the above-mentioned factors.

8. Where valid reasons for differences do not exist, Governments should seek harmonization of environmental policies, for instance with respect to timing and the general scope of regulation for particular industries to avoid the unjustified disruption of international trade patterns and of the international allocation of resources which may arise from diversity of national environmental standards.

9. Measures taken to protect the environment should be framed, as far as possible, in such a manner as to avoid the creation of non-tariff barriers to trade.

10. Where products are traded internationally and where there could be significant obstacles to Trade, Governments should seek common standards for polluting products and agree on the timing and general scope of regulations for particular products.

National Treatment and Non-Discrimination

11. In conformity with the provisions of the GATT, measures taken within an environmental policy regarding polluting products should be applied in accordance with the principle of national treatment (i. e. identical treatment for imported products and similar domestic products) and with the principle of non-discrimination (identical treatment for imported products regardless of their national origin).

Procedures of Control

12. It is highly desirable to define in common, as rapidly as possible, procedures for checking conformity to product standards established for the purpose of environmental control. Procedures for checking conformity to standards should be mutually agreed so as to be applied by an exporting country to the satisfaction of the importing country.

Compensating Import Levies and Export Rebates

13. In accordance with the provisions of the GATT, differences in environmental policies should not lead to the introduction of compensating import levies or export rebates, or measures having an equivalent effect, designed to offset the consequences of these differences on prices. Effective implementation of the guiding principles set forth herewith will make it unnecessary and undesirable to resort to such measures.

B. CONSULTATIONS

14. Consultations on the above-mentioned principles should be pursued. In connection with the application of these guiding principles, a specific mechanism of consultation and/or notification, or some other appropriate form of action, should be determined as soon as possible, taking into account the work done by other international organisations.

NOTE ON THE IMPLEMENTATION OF THE POLLUTER-PAYS PRINCIPLE

Introduction

Within the framework of the “Guiding Principles concerning International Economic Aspects of Environmental Policies”, the Polluter-Pays Principle contributes to the avoidance of distortions in international trade and investment.

This paper is intended to offer clarifications for the practical implementation of the Polluter-Pays Principle. It should however be noted that:

- such implementation must be considered in connection with that of the other parts of the Guiding Principles;
- the dynamic aspects of the implementation of the Polluter-Pays Principle have not been fully considered here.

A. DEFINITION

1. The Polluter-Pays Principle (applying to transitional periods with possible exceptions and in the long term) implies that in general it is for the polluter to meet the costs of pollution control and prevention measures, irrespective of whether these costs are incurred as the result of the imposition or some charge on pollution emission, or are debited through some other suitable economic mechanism, or are in response to some direct regulation leading to some enforced reduction in pollution.

2. The Polluter-Pays Principle, as defined in paragraph 4 of the “Guiding Principles”, states that the polluter should bear the expenses of preventing and controlling pollution “to ensure that the environment is in an acceptable state”. The notion of an “acceptable state” decided by public authorities, implies that through a collective choice and with respect to the limited information available, the advantage of a further reduction in the residual social damage involved is considered as being smaller than the social cost of further prevention and control. In fact, the Polluter-Pays Principle is no more than an efficiency principle for allocating costs and does not involve bringing pollution down to an optimum level of any type, although it does not exclude the possibility of doing so.

3. To reach a better allocation of resources in line with paragraph 2 of the Guiding Principles, it is desirable that the private costs of goods and services should reflect the relative scarcity of environmental resources used in their production. If this is the case, consumers and producers would adjust themselves to the total social costs for the goods and services they are buying and selling. The Polluter-Pays Principle is a means of moving towards this end. From the point of view of conformity with the Polluter-Pays Principle, it does not matter whether the polluter passes on to his prices some or all of the environment costs or absorbs them.

B. INSTRUMENTS FOR APPLYING THE POLLUTER-PAYS PRINCIPLE

4. The Polluter-Pays principle may be implemented by various means ranging from process and product standards, individual regulation and prohibitions to levying various kinds of pollution charges. Two or more of these instruments can be used together. The choice of instruments is particularly important as the effectiveness of a policy depends on it. This choice can only be made by public authorities at central or regional level, in the light of a number of factors such as the amount of information required for the efficient use of these various instruments, their administrative cost, etc.

5. Direct regulations could be of exceptional value in achieving immediate or speedy pollution reduction needed to safeguard public health or abate unacceptable nuisance. They would also be more appropriate in cases where the kind of pollutant or the structure of the group of polluters (because of their number or of their composition) make the charge system less effective.

6. In other cases, pollution prevention and control measures may achieve a desired improvement of the quality of the environment to least social costs when they are based on the levying of charges. When charges are applied they should be put in the framework of a comprehensive policy. Such a policy will make explicit the function of charges in relation to environmental policy objectives and to other instruments. When a charge is levied, it induces polluters to treat their effluents as long as the treatment costs remain lower than the amount of the charge they would otherwise be compelled to pay in the absence of pollution abatement. A charging policy may thus achieve an objective at least social cost to society as it would induce each of these polluters to abate pollution to the point where they each incur the same additional cost for the same reduction of pollution emission.

Another advantage of charges is that they can provide a continuing incentive for improved pollution abatement.

Charges may also be levied for example by regional bodies as a means of achieving an efficient cost allocation. In such a system some

firms may treat more waste and this service can be financed through the charges levied. Charges may also be used in order to cover the costs of collective waste treatment plants. These charges will correspond to a purchase of services financed by all the polluters who are using the services and will thus be in line with the Polluter-Pays Principle.

C. EXCEPTIONS TO THE POLLUTER-PAYS PRINCIPLE

7. An environmental policy will normally be put into effect gradually. In certain circumstances such as a speedy or a sudden and very extensive implementation of environmental policy, environmental improvements may be helped and even speeded up if existing polluters are given aid in their initial or transitional efforts to reduce their emissions. Aid payments for such purposes will only be a valid exception to the Polluter-Pays Principle if they form part of transitional arrangements whose duration has been laid down in advance and do not lead to significant distortions in international trade and investment. Such transitional arrangements can also include a time-table for progressively tightening up emission standards and raising the scale of charges to the levels required to reach the quality targets.

8. Exceptions to the Polluter-Pays Principle may also be justified when steps to protect the environment would jeopardize the social and economic policy objectives of a country or region. This would be the case, for example, when the additional expenditure incurred by polluting industries would result in holding back regional development or adversely affecting the labour market. However, in the spirit of the general principle approved, it is recommended that such exceptions are kept at the level and for the time strictly necessary to reach the specific socio-economic objectives. Aid to promote research and development in line with other aspects of government policy is not inconsistent with the Polluter-Pays Principle.

**RECOMMENDATION OF THE COUNCIL
ON THE IMPLEMENTATION OF THE
POLLUTER-PAYS PRINCIPLE**

(Adopted by the Council at its 372nd Meeting on 14th November, 1974)

The Council,

Having regard to Article 5(b) of the Convention on the Organisation for Economic Co-operation and Development of 14th December, 1960;

Having regard to the provisions of the General Agreement on Tariffs and Trade;

Having regard to the Recommendation of the Council of 26th May, 1972 on Guiding Principles Concerning International Economic Aspects of Environmental Policies;

Having regard to the Note by the Environment Committee on Implementation of the Polluter-Pays Principle;

Having regard to the possibility, approved by the Council, of holding informal consultations on the Guiding Principles within the OECD;

On the proposal of the Environment Committee;

I. REAFFIRMS that:

1. The Polluter-Pays Principle constitutes for Member countries a fundamental principle for allocating costs of pollution prevention and control measures introduced by the public authorities in Member countries.

2. The Polluter-Pays Principle, as defined by the Guiding Principles concerning International Economic Aspects of Environmental Policies, which take account of particular problems possibly arising for developing countries, means that the polluter should bear the expenses of carrying out the measures, as specified in the previous paragraph, to ensure that the environment is in an acceptable state. In other words, the cost of these measures should be reflected in the cost of goods and services which cause pollution in production and/or consumption.

3. Uniform application of this principle, through the adoption of a common basis for Member countries' environmental policies, would

encourage the rational use and the better allocation of scarce environmental resources and prevent the appearance of distortions in international trade and investment.

II. NOTES that:

1. There is a close relationship between a country's environmental policy and its overall socio-economic policy;
2. In exceptional circumstances, such as the rapid implementation of a compelling and especially stringent pollution control regime, socio-economic problems may develop of such significance as to justify consideration of the granting of governmental assistance if the environmental policy objectives of a Member country are to be realized within a prescribed and specified time;
3. Aid given for the purpose of stimulating experimentation with new pollution-control technologies and development of new pollution-abatement equipment is not necessarily incompatible with the Polluter-Pays Principle;
4. Where measures taken to promote a country's specific socio-economic objectives, such as the reduction of serious inter-regional imbalances, would have the incidental effect of constituting aid for pollution-control purposes, the granting of such aid would not be inconsistent with the Polluter-Pays Principle.

III. RECOMMENDS that:

1. Member countries continue to collaborate and work closely together in striving for uniform observance of the Polluter-Pays Principle, and therefore that as a general rule they should not assist the polluters in bearing the costs of pollution control whether by means of subsidies, tax advantages or other measures;
2. The granting of any such assistance for pollution control be strictly limited, and in particular comply with every one of the following conditions:
 - a) It should be selective and restricted to those parts of the economy, such as industries, areas or plants, where severe difficulties would otherwise occur;
 - b) it should be limited to well-defined transitional periods, laid down in advance and adapted to the specific socio-economic problems associated with the implementation of a country's environmental programme;
 - c) it should not create significant distortions in international trade and investment;
3. That if a Member country, in cases of exceptional difficulty, gives assistance to new plants, the conditions be even stricter than those applicable to existing plants and that criteria on which to base this differentiation be developed;

4. In accordance with appropriate procedures to be worked out, all systems to provide assistance be notified to Member countries through the OECD Secretariat. Wherever practicable these notifications would occur prior to implementation of such systems;

5. regardless of whether notification has taken place, consultations, as mentioned in the Guiding Principles, on the implementation of such systems, will take place at the request of any Member State.

IV. INVITES the Environment Committee to report to the Council on action taken pursuant to this Recommendation.

Part Two
ANALYSES

THE “POLLUTER-PAYS” PRINCIPLE AND THE INSTRUMENTS FOR ALLOCATING ENVIRONMENTAL COSTS

Introduction

In order to avoid the distortions in international trade which might result from failure to harmonize the environment policies pursued in Member countries and to facilitate co-operation in this field, the Environment Committee and the Sub-Committee of Economic Experts have emphasized the importance of research into the economic principles which might provide a basis for framing environment policies in Member countries.

Part of this task consists in research into the principles governing the statement of the objectives of environment policies, more particularly in economic terms, having regard to the difficulties of making definitions and assessments (social welfare accounting, social indicators and environmental indicators).

Another part of the task, closely connected with the first, consists in analysing the economic instruments with which the policies can be effectively applied.

The problem of allocating environmental costs has thus come to be recognized as a key problem, bringing together the statement of objectives, the quest for efficiency, and, in the international sphere, the harmonization project.

At its first Session (15th and 16th June, 1971), the Sub-Committee of Economic Experts pointed out: (1) that the internalization of external effects connected with the environment obeyed an economic efficiency principle which provided a basis for a pollution control policy;* (2) that such internalization should be based as far as possible on the overriding principle that “the polluters should be the payers”; and (3) that exceptions may have to be made to this principle which ought to be defined and analysed.

The purpose of the present Note is to systematize the initial findings of this study, stressing the need to analyse the Polluter-Pays Principle.

* An environment policy covers a very wide range of measures, including the prevention of damage, the restoration of delapidation, the conservation of resources and the creation of new resources. But in this report it will be taken as referring primarily to the problem of pollution control.

I. THE PROBLEM OF ALLOCATING COSTS

A. Economic background

Economics being among others, the science of combating scarcity, as long as environmental goods, including natural resources, were regarded as “free goods” available in unlimited quantities and, therefore, free of charge, economics excluded them from its field of study. * Now that it is recognized that we are living in a finite world where all the resources are limited in quantity, the problem of how to manage them efficiently has arisen. Accordingly it is henceforth a function of economics to deal with the management of the scarce resource of the environment. In other words, environmental effects have to be integrated with the economic mechanisms so that natural resources may be efficiently managed by allocating costs rationally.

1. The principle of internalizing external effects

It is agreed unanimously that the problems we face today arise essentially from the “market failures”, i. e. that the market mechanisms for allocating resources are only partially operative. This is why, when an environmental (or other) effect is not automatically taken into account by the price mechanism because it remains “outside”, it is called an “external effect”.

Classical economic theory states that every economic agent seeks to maximize his profit by some socially useful activity; for example, a producer maximizes his profit by producing goods useful to the community, so that there is a harmony of interest between him and the community, nay, identity between private cost and social cost. At the same time it may happen that this producer activity is accompanied by certain disutilities affecting one or more economic agents. In this case, a discrepancy arises between the private cost of the activity in question and the corresponding social cost. The effect which causes this discrepancy is called an “external diseconomy” or negative external effect. ** Misallocation of resources results from the existence of such effects. The only way to correct the misallocation and at the same time ensure rational management of resources is to include the effects in the economic calculation (internalization of external effects).

Since very many externalities involve degradation of the environment (in particular, multiple pollutions), internalizing external effects implies (1) ensuring better management of natural resources, and (2) maximizing welfare by optimum cost allocation (closing the gap between private costs and social costs). Thus internalizing external effects involves a principle of efficiency.

* Barring a few exceptions (Ricardo - Stagnationists).

** It is also possible for external economies or positive external effects to occur.

2. Internalization methods*

Once the principle has been stated, the next step is to determine the methods for putting it into effect.

a) One could imagine that the polluting agent and the victim(s) might negotiate in order to fix the best cost allocation between them. This would mean creating, as it were, a market for external effects.

b) One could also levy a tax on the polluter equal to the value of the damage caused and pay over the proceeds to the victims. ** This would offset the original discrepancy between private cost and social cost.

c) Generally speaking, one can imagine a whole range of instruments which, in one way or another, would ensure the internalization of an external effect (various taxes, payments, subsidies). Economic theory states that in this case, whatever the instruments used, the optimum is attained at the point where the gap between social cost and private cost is closed.

This economically ideal situation, however, makes certain assumptions which are far from being properly satisfied in real life, so that it is desirable to enquire whether the Pareto optimum is an operational criterion for environment policies.

B. Option criteria: Optimality and efficiency

1. Optimality

The Pareto optimum, as defined above, requires the fulfilment of certain assumptions: (a) a state of pure and perfect competition, and (b) a complete knowledge of the “damage function” with which to enable the discrepancy between private costs and social costs to be exactly offset. Viewed less statically, an environment policy will attain the optimum at the point where its marginal social cost and marginal social benefit meet, and this assumes a knowledge of the two functions. In such a case, the economic management of natural resources is perfectly rational.

It is clear that such assumptions are not realistic, either as regards bringing about a state of perfect competition, or as regards an accurate knowledge of the damage function. Furthermore, it does not seem that the Pareto optimum can really provide an operational options criterion for an environment policy and it is hard to see how the attainment of this optimum could be the objective of such a policy. *** In other words, the Pareto optimum is nothing more than a guideline, a

* See detailed study in document “Problems and Instruments Relating to the Allocation of Environment Costs” OECD, Paris, 1972.

** Or levy the tax on the beneficiary of an external economy, and pay over the proceeds to the agent who provides this benefit (Pigou).

*** The more so as the assumption of perfect economic efficiency in managing natural resources does not imply ipso facto the attainment of satisfactory environmental aims, i.e. a good environmental quality.

point of reference, to remind us that there are distortions to be corrected in the cost-allocation mechanisms, and that corrective action must be taken with full regard for economic logic. This point of reference should lead us to seek economic efficiency in achieving environmental objectives.

2. Efficiency

An environmental objective is not only an economic objective; while it certainly aims at reaching a higher standard of welfare, the criteria for determining it are provided, not only by economic considerations, but also by ecological, sociological and geographical requirements, etc. As a result, the economist has a role to play at two levels: (a) in taking part in defining the objectives and making sure that they are compatible with the other economic objectives of the country (or region), and (b) in applying effective instruments for achieving those objectives.

It is essentially at the latter level that the problem of environmental cost allocation takes concrete shape; how to achieve a given quality standard at least cost and how to distribute that cost. It should be noted that the problem of cost sharing calls for equity as well as efficiency; everyone must assume responsibility for the damage he causes and, if an environment policy redistributes incomes unfairly, corrective measures may have to be taken; although the demands of equity are not economic in themselves, they have to be given consideration and it seems to be generally agreed that they are also a decision criterion.

The question is now whether there is a principle permitting the dual requirements of efficiency and equity to be satisfied together. The Sub-Committee of Economic Experts has agreed that the Polluter-Pays Principle seems capable of meeting these requirements, so it is desirable to enquire in what conditions it could be applied.

II. SEEKING A GENERAL PRINCIPLE

As generally stated, the Polluter-Pays Principle combines efficiency requirements (internalization of external effects) with equity (charging the cost to the responsible party). The principle also has the advantage of stating the exact point at which action to be taken should be applied, namely, the initial polluter. The principle can thus be described as a rule of economic, juridical and political good sense.

Nevertheless this analysis raises many problems:

- A. Who pays for what?
- B. What economic instruments should be used?
- C. Are there any exceptions to the principle?

A. Who pays for what?

1. Pollution and responsibility

A leading problem is how to fix correctly the point of application of the principle. Who is the polluter? Is he always responsible? If a motor vehicle is polluting and noisy, there is no doubt that the polluter is the person using it, but it does not follow that he should be made directly responsible for the damage or should be the target of preventive measures. Here the consumer is a passive agent without responsibility for the pollution, since he does no more than use a product whose characteristics do not depend on him (at least he is not individually responsible although his collective responsibility may be involved). In other words, the polluter is not always responsible for the pollution he causes.

Again, the polluter may be only partially responsible; a motorist should no doubt not make improper use of his vehicle. In the case of soil pollution by chemical fertilizer and pesticides, responsibility is shared between bad agricultural practice and the manufacturers of fertilizer and pesticides who put dangerous substances on the market. In the case of water pollution by domestic users, is the user of the water really responsible, or is it the local authorities who do not treat the waste water adequately?

Without labouing this point, and notwithstanding the cases where the coincidence between physical pollution and economic responsibility is quite clear (industrial pollution, air pollution from domestic heating, etc.), it should be pointed out that determining who is the polluter may be a delicate matter and that in some cases it would be wrong to charge the cost merely to the physical polluters.

2. Pollution and power

Apart from the responsibility, one must find out who has effectively the economic and technical power to combat pollution. In the case of motor vehicles one can of course imagine making the user pay a tax such that it induces him to fit an anti-pollution device to his vehicle; but it would certainly be more effective and more rational to make manufacturers produce less-polluting vehicles, whether by fitting such devices or by actually modifying the engines. Action should therefore be taken against the agent who has effective power to abate pollution most, so that it may lead to a prevention of the disutility, rather than seeking merely to compensate the “victims”.

Generally speaking, the Polluter-Pays Principle will have very different results, depending on whether it is applied to the producer or the consumer.

3. Actual polluters and potential polluters

In some cases it may prove desirable to tax the potential polluter in order to provide a fund for restoring damage. This is why a compensation fund has been set up in Canada for use in cases of sea

pollution, financed by a tax on oil imported or transported between Canadian ports by sea. The fund is for compensating victims of sea pollution when the responsible party cannot be identified.

This being so, what should the polluter be made to pay for?

4. What should he pay for?

a) If a polluter causes damage, it is logical to make him pay for it. However, this solution is unsatisfactory and even dangerous for several reasons: (1) restoration of damage is meaningless in the case of serious irreversible effects which do not admit of true compensation; (2) the assessment of damage is beset with well-known difficulties (ignorance of the long-term effects, tracing indirect effects); (3) one usually has to make do with approximating the money cost of damage to the cost of restoring it; (4) restoring damage is often economically wasteful; prevention is better than cure.

b) Thus making the polluter pay amounts essentially to charging him with the cost of the operations needed to prevent pollution, whether they take the form of incentive levies equal to the cost of waste treatment operations, or whether they simply lay down a mandatory standard which makes him take preventive measures.

But, apart from these particular measures, pollution control involves other costs such as the administrative cost of implementing an anti-pollution policy, the cost of the measuring and checking arrangements, the cost of research and development in anti-pollution technology (and even of basic research), grants for modernizing out-of-date plant, etc.

If one applied the Polluter-Pays Principle thoroughly, the polluter would have to meet the total cost of pollution control (in proportion to his responsibility), but this hypothesis is not quite realistic and it is likely that a large part of the administrative cost would be charged to the taxpayer and not to the polluter. Some costs, such as those of research and development, could be shared, although industry has given sample proof of its great capacity for innovating in order to sell more and produce at less cost.*

If, then, the polluter should be the payer, it still remains to determine exactly what he should pay for.

c) The last problem concerns the eventual impact of the cost of pollution control. Depending on the market structure (monopoly, oligopoly, free competition) and on the price elasticity of demand, the repercussion of the cost on the consumer will be nil, partial or total. To say that the polluter shall be the payer is, in fact, to stipulate that he shall be the first payer, or that he is the stage at which external effects are internalized. Be that as it may, passing on the cost to the consumer does not invalidate the principle.

* In the absence of any official intervention, research and development would be the subject of an economic transaction (a service offered on the market).

Finally, each case in which the principle is applied requires to be thoroughly studied, but this does not detract from its merits, rather the reverse. There remains the need to determine how to make the polluter pay, i. e. to analyse the different economic instruments available for an environment policy.

B. How to pay: A review of the instruments

In environment policy a number of economic instruments are available, each one heaving relative merits in respect of the sector concerned, the objectives, and the efficiency and equity criteria. Negotiation and compensation, which are very global instruments, have been mentioned above. Without embarking on an exhaustive study, one should analyse the various instruments in order to list their possibilities and determine to what extent they meet the requirements of the Polluter-Pays Principle.

The following instruments will be dealt with in succession:

1. Direct controls;
2. Taxes;
3. Payments;
4. Subsidies;
5. Various incentives (tax benefits, accelerated amortization, credit facilities!;
6. The auction of pollution rights;
7. Charges.

1. Direct controls

Direct controls are based on the principle of an absolute obligation to comply with standards fixed by law at national, regional or local level. This means that all polluting activity must comply with regulations directly enforceable by means of legal measures and not through the operation of economic instruments. The standards may concern rates of effluent emission, the average quality of the receptor body or the characteristics of the finished product.

This method is of definite advantage to the environment, since it clearly determines the objectives and means without being dependent on the play of economic mechanisms. It gives precedence to the environmental objective over the economic efficiency criterion. Direct controls are certainly the surest means of preventing irreversible effects or unacceptable pollution (mercury, cadmium, etc.).

However, the method has certain drawbacks:

- It is cumbersome to administer and the arrangements for checking, sanctions and measuring are expensive. Generally speaking, the cost of obtaining the information required to implement the controls can be particularly high;
- economic efficiency is reduced, since no economic mechanism operates to enable the standards to be attained at least cost. In

the case of waste discharge standards economic efficiency would be achieved if one succeeded in establishing a series of differentiated standards suited to the special conditions of each agent (according to the branch of industry and pollution concerned); but this would involve obtaining comprehensive objective information on the costs of the different agents, which would mean incurring considerable administrative expenditure;

– in addition, direct controls are hardly incentives, since each transactor is content to do neither more nor less than comply with the regulations, having no incentive to surpass the standard, such as he might have if he were actuated by economic stimuli.

It is clear that direct controls may be quite consistent with the Polluter-Pays Principle if each transactor affected by the controls has to meet the cost of the operations necessary for complying with the standards (waste treatment arrangements, modifications to production processes, etc.).

The effectiveness of the controls depends mainly on good administrative organisation, on which efficient environmental management would no doubt also depend; however, the economic efficiency achieved could hardly be satisfactory and would in any case not be a decisive criterion for the direct controls method.

It should be noted that direct controls are often preferred by government authorities and industrialists; to the former they are a clear-cut concept within an already existing administrative and legislative framework; to the latter they open the way to bargaining and compromise over the fixing of differentiated waste discharge standards; furthermore, once the polluter has complied with the regulations, he has no further charges to pay.

2. Taxes

Taxation is an almost universal instrument applicable to innumerable cases. In addition to the specific taxation of wastes, termed charges, some of the other possibilities of protecting the environment by taxation should be mentioned.

a) One important case is the taxation of users of resources; for example, an entrance fee for a reserve or national park, or a tax on the inhabitants of an area which benefits from an expanse of water developed and protected for recreational use. Here the Polluter-Pays Principle is inverted, since it is the beneficiaries of an environmental resource who are taxed, but it is no less true that account is taken of equity and efficiency, as the sums required for managing the environment are levied on the very people who benefit from it.

Indeed, the burden could often be shared between polluters and beneficiaries; in the case of a lake or river one would tax the polluters on the pollution discharged and the beneficiaries on the development schemes made necessary.

b) At consumer level, putting a tax on products which have a negative effect on the environment is conceivable; for example, a tax on waste packaging materials (non-return bottles), on motor vehicles (tax proportional to horsepower), on non-biodegradable detergents, etc. One would hope thus to steer consumption towards less-polluting substitute goods. Actually, one would then be acting both on the consumer and on the producer, since the latter would be tempted to react to the shift in demand by making his products conform more closely to the required standards.

This might well give rise to some ambiguity, especially as regards the responsibility of the consumer, who is often an unwilling polluter because he has no choice of product (see above).

At producer level one could tax materials and semi-finished products entering into the production process so as to induce the producer to use less-polluting substitute inputs. The rate of tax could be varied according to the difficulty of eliminating substances when they had been discharged (plastics, glass, sulphur in fuels, phosphates in detergents, etc.).

3. Payments

This system consists in radically inverting the Polluter-Pays Principle by granting the polluter a payment in exchange for which he undertakes to abate his pollution (or a bonus per unit of pollution not discharged). A. V. Kneese has argued that a payment is an effective instrument to the extent that it enables external effects to be internalized in the same way as pollution charges do. But actually payments have many drawbacks, including:

- Inequity, since the community has to meet the cost of the polluter's anti-pollution measures (the equity criterion being based on a judgement of values);
- Inefficiency, because they can lead to paradoxical situations, e. g. where the polluter decides to transfer to another area and the payment must still be paid to him as an incentive not to pollute. A payment is here an invitation to corrupt practices. Moreover, the cost of production does not reflect the cost of pollution and one arrives at a wrong allocation of costs, since the structure of relative prices does not correspond to the optimum distribution of the social cost. Finally it would be extremely difficult and costly to obtain the information required to determine the optimum payment, i. e. to find out the exact amount of pollution which would be discharged in the absence of the payment.

4. Subsidies

While a payment, at defined above, is really a bargaining instrument for buying from the polluter his right to pollute, a subsidy is not an incentive, but an aid to relieve the polluter of all or part of the cost of the anti-pollution measures with which he is obliged to comply.

Generally speaking, subsidies are criticized as lacking incentive and as being inefficient and unfair.

a) They lack incentive, because they do not induce the polluter to abate pollution, rather the reverse, nor to try to make his waste-treatment processes more efficient. Moreover, when subsidies are linked with the installation of plant for treating waste, they are no incentive to reduce pollution by modifying production processes. Lastly, subsidies are never high enough to make pollution control profitable; they only reduce the loss which the polluter suffers from extra costs. Thus they never provide a real incentive.

b) Subsidies are inefficient, because they are not an incentive to rationalize, and so do not tend to minimize costs to the community. In extreme cases subsidies are an incentive to inflate pollution control costs so as to obtain more aid; they can even encourage the production of goods manufactured by polluting processes or the operation and retention of polluting factories.

c) For obvious reasons subsidies are unfair, because they transfer the burden of combating disutilities from the polluter to the taxpayer. It is precisely to this extent that the Polluter-Pays Principle is again inverted.

Despite these drawbacks, subsidies are often employed in environment policy. They may, in fact, be of advantage in facilitating and speeding up the implementation of an environment policy during a transitional period of adaptation and consolidation.

In addition, instead of burdening the taxpayer with the full cost of pollution control, one can conceive of sharing it with the polluter, especially the “overheads” (administrative expenses, research costs, etc. – see above). Again, if it turns out that certain activities or areas cannot comply with the new regulations, subsidies are the only available expedient, as can happen when for reasons of social policy or regional development, it is decided not to let economic life be re-structured as it would be by the mechanisms which an environment policy would bring into play.

5. Various incentives

Various incentives, such as tax benefits, accelerated amortization, or credit facilities, are broadly similar to subsidies and have the same drawbacks.

a) It may be a delicate matter to apply tax benefits and depreciation allowances when it proves difficult to determine what actual part of an investment will serve to combat pollution, especially in the case of modifications to production processes.

Moreover, tax reliefs are unfair, as they penalize the firms who have already invested in pollution control. In addition, they create distortions in the tax system and redistribute income in favour of polluters.

b) Credit facilities (low interest or interest-free loans) have the same drawbacks, although their redistributive effects are less, since the loans will be repaid.

6. Auction of pollution rights

This instrument was proposed by John Dales* and is based on the principle that, since environment policy cannot be grounded on equalizing the marginal social cost of pollution with the marginal social benefit of abating pollution (these functions being almost impossible to ascertain), standards of environmental quality are decided on by the government authorities. A quality standard can be defined with reference to the degree of accepted pollution corresponding to a given quantity of pollutant discharged per unit of time (for example, one year). One can then imagine this annual total quantity of pollutant being represented by bonds which would really be pollution rights. The bonds could be put on sale by the public sector in an actual market for pollution rights.

These rights would be negotiable and sold at prices determined by supply and demand. Once in circulation they could be exchanged between polluters and pollutees, and the latter could abate pollution by “freezing” the bonds. Meanwhile the public sector could abate pollution by an open market policy (purchase or resale of bonds).

This method offers not inconsiderable advantages. First, the standards is reached automatically, being determined a priori, so avoiding trial and error in reaching the standard empirically and a posteriori. Secondly, the difficulty of calculating the damage function is avoided.

As for the Polluter-Pays Principle, it continues to be applied to the extent that polluters buy their rights to pollute. The problem is to know exactly what this right represents: the approximate value of the damage corresponding to the pollution “bought”, or the cost of the operations undertaken by the authorities to keep pollution down to a given level? In each case the cost of the pollution control measures is borne by the polluters proportionally to the rights they have not bought; a polluter who has taken up bonds entitling him to 40% of his pollution must take the necessary steps to stop the remaining 60%. Here the question arises whether the trade in bonds would not tend to stagnate, each person’s behaviour depending on his installed waste-treatment capacity, which economic and technological limitations make it impossible to change rapidly.

The supervisory authority should always know the amount of bonds in the hands of each transactor, so as to be able to check whether a polluter exceeds his rights, a task not without its problems, especially if the bonds change hands briskly. Apart from this, to the extent that the environment is a collective good, putting it up for auction in this

* J. Dales. Pollution property and prices. University of Toronto Press. Toronto, 1968.

way, i. e. selling to a minority the right to harm the majority, may appear shocking.

7. Pollution charges

The charge consists in making the polluter pay a sum proportional to the amount of pollution discharged, e. g. per kilogram of BOD* in the case of water pollution.

If the charge is linked to the function of the damage caused by the pollution, i. e. the marginal damage function, the polluter pays for the exact amount of damage he caused and the level of the charge is at its optimum.

In practice, however, it would be extremely difficult to achieve this optimum, mainly because of the problems involved in ascertaining the damage function, including identifying the victims, tracing the ecological consequences and the interlocking effects in relation to the economic interlocking effects, and the non-linearity of some kinds of damage (synergies).

This is why the levying of charges is usually linked with a pre-existing body of regulations on environmental quality. In other words, charges are an economic incentive enabling a standard to be reached with maximum efficiency. The charge is then a function of the polluter's waste treatment costs and is fixed at a level such that it elicits a certain level of waste treatment determined by equalizing the rate of the charge with the marginal cost of treatment.**

Pollution charges are an instrument which offers many advantages and seems to enjoy very wide support among economists:

a) These charges oblige the polluter to include in his production costs the cost of the waste treatment he is induced to carry out and/or the cost of the damage caused by unretained or residual pollution. This re-establishes correct pricing, so that the gap is bridged between private cost and social cost;

b) The charges are flexible and effective. Being applied at decentralized decision-making centres, they enable each polluting agent to choose the arrangement of measures which will be the most effective in his particular situation (paying the charges, modifying his production processes, carrying out full or partial waste treatment, etc.);

c) The charges are an incentive, because they prompt the polluter to choose the best solution and constantly to improve his waste-treatment processes so as to reduce his costs. In particular they induce agents who enjoy low waste-treatment costs to carry out more treatment than agents whose costs are high, thereby combining rationality, efficiency and optimum cost allocation between polluters;

* Biochemical Oxygen Demand.

** The charges can be differentiated or uniform, and their rate can be fixed or variable.

d) Finally, the charges enable financial resources to be made available for restoring damage and/or financing pollution control plant for joint use.*

As for the drawbacks to the system, these are mainly a result of administrative requirements:

a) The administrative cost of setting up arrangements for supervising and measuring but that is a universal problem, since all instruments involve this cost;

b) The main problem is rather how to determine the level of the charges. This has to be done by trial and error, which can prove costly, both for the authorities and for the private sector, which is disturbed by successive adjustments;

c) The inveterate opponents of every economic solution to environmental problems object that pollution charges involve purchasing the right to pollute. In form, the argument is sound and the charges can certainly be dangerous if they are fixed too low, in which case their incentive effect will be weak and the polluter will buy the right to pollute at a cheap price. What matters is therefore the level of the charges: if they are very high, they will be tantamount to a fine; if too low, their impact will be weak; so the question is how to determine the optimum level giving the desired result. It is not a matter of buying or selling the right to pollute, but of bringing a flexible and effective instrument to bear so as to achieve given objectives (standards). This is why the charges should be combined with a system of standards.

Meanwhile the Polluter-Pays Principle is fully satisfied by the levying of charges, whether the polluter assumes the cost of the damage he causes or the cost of waste treatment.

It emerges from this brief review of instruments that, apart from their respective advantages and drawbacks, it would be desirable to establish whether certain instruments are especially suited to particular circumstances. Indeed, one might enquire whether the use of some instruments would not depend on given factors such as the particular geographical and regional limitations, the types of disutility and receiving body, the categories of economic agents concerned, the state of technology, the structure and age of the industries, international competition and trade agreements, etc.

One should likewise enquire whether it is desirable or possible in all cases to apply the Polluter-Pays Principle, which is not obeyed by all the instruments.

This problem of special circumstances raises the question whether exceptions can be made to the principle.

C. The problem of exceptions to the Polluter-Pays Principle

At its first Session (15th–16th June, 1971) the Sub-Committee of Economic Experts, while agreeing on the Polluter-Pays Principle,

* See “Les Agences françaises de Bassin”.

raised the question whether any exceptions should or could be made to it.

1. Determining whether exceptions should be made to the principle must in many cases be based on judgements of values, unless one can define actual cases where the application of the principle would be materially impossible or wholly unjustified.

Only by analysing concrete cases is it possible to provide examples of situations in which polluters really cannot be made to pay; such cases would probably stem from the difficulties mentioned above in identifying the polluter, the responsible party, or the agent who has the power to abate the pollution.

As for the question whether, in a given situation, making the polluter pay is wholly unjustified, one is constantly on the verge of making judgements of values, even if these judgements are generally accepted. What is clear is that the taxation of users of resources (taxation of beneficiaries) and similar measures seem entirely justified, but that, as already mentioned, it would be logical to share the burden of preventing pollution and restoring damage between the polluters and the beneficiaries. In this connection cases of partial application of the principle will be found more often than outright exceptions to it.

2. This being so, it is certain that all manner of exceptions can be made to the principle when there are special circumstances which the authorities regard as justifying them. It is then a political decision, a collective choice, which gives birth to the exception.

Such situations could well arise when it was considered that application of the principle would hinder the achievement of one or more regional or national economic objectives. Apart from economic constraints, the political trade-off between objectives would sway the decision.

This line of argument applies most commonly to the strategy for implementing an environment policy. The brutal enforcement of regulations can create difficulties for certain enterprises, industrial sectors or regions. In such cases a transitional policy can be adopted to facilitate adjustment, including the grant of aid to the polluter in such forms as subsidies for plant, tax benefits, low interest loans, etc. These forms of aid are so many exceptions to the Polluter-Pays Principle and are a burden on the taxpayer.

Aid can also be given by putting the policy only partially into force, e. g. by making the polluter pay only a fraction of the pollution charges, to be increased progressively up to the desired level.

Lastly, apart from the problem of adjustment, the object of giving aid may simply be to speed up the implementation of a policy.

It seems then that the general problems of adjustment and policy implementation require exceptions to be made to the principle in many special cases concerning regional development, out-of-date factories, employment, international competition, etc.

However, it is less a case of exceptions to the principle than of applying it partially, with one part of the cost being borne by the polluter and the other part by the community, unless the entire expenditure is financed by subsidies, which is very unlikely.

With an eye to the project for the international harmonization of environment policies. Member countries could act in agreement in defining their implementation strategies for policies admitting exceptions to the general Polluter-Pays Principle, as well as in drafting escape clauses to be invoked when application of the principle would jeopardize national objectives.

Harmonization could likewise be extended to cover the duration of the transitional periods, so that there would not be too great a difference between one country and another, with consequent distortion (one country having, for example, an adjustment period of five years and another of ten years). Account should of course be taken of the particular structures and problems in each country when harmonizing these periods.

THE POLLUTER-PAYS PRINCIPLE
INTERPRETATION AND PRINCIPLES OF APPLICATION

by

Wilfred Beckerman

Summary

The following paper sets out in some detail various problems that have emerged in connection with the interpretation of the principle that the polluter must pay for pollution abatement and with the choice of policy instruments for applying this principle. The main conclusions of the paper are as follows:

1. The Polluter-Pays Principle does not imply that the polluter necessarily hands over any payment to anybody – either to victims of pollution or to some State agency. It implies merely that the costs of pollution abatement are in the first place incurred by the firm, irrespective of whether these costs are incurred as a result of the imposition of some charge on pollution or in response to some direct regulation leading to some enforced reduction in pollution. It is also irrelevant whether the polluter passes on some or all of the costs in the form of higher prices, in the same way as the fact that producers normally try to cover their labour and capital costs in the prices they charge does not mean that they do not pay for their labour and capital inputs.

2. Three main forms of price mechanism instrument for inducing the optimum amount of pollution are discussed, namely a pollution charge (tax); a payment (“bribe”) to producers, based on the amount by which they abate pollution; and the sale of a given quantity of pollution “rights”. It is pointed out that, at least in the short run, all three methods have the same resource allocation effects and the same effects on the prices of the products responsible for the pollution, so that none involves any distortion of the pattern of production or international trade. In the longer run, however, the “bribe” method would be undesirable unless it were limited to the abatement of the pollution existing at the time the method was introduced (which would anyway be appropriate on equity grounds).

3. In deciding on the optimum amount by which private industry should reduce its pollution and, where appropriate, the pollution charge that would correspond to this degree of abatement, account should be taken of the scope for collective treatment of pollution (or collective

restoration of a polluted medium) as if this were just a further additional source of supply of the clean medium (e. g. clean water) which it is required to preserve. The price to be paid to (or imputed to) such a collective facility should be the same as that to be charged to firms for the amount of residual pollution they continue to produce, since in this way they will allocate their pollution abatement efforts optimally between their own treatment facilities and the collective facilities.

4. Where the supply of a clean medium can be privately appropriated and measured, as with the piped supply to domestic or industrial users of clean water, the users should be charged the marginal cost of these supplies, which would hence equal the appropriate charge to be made to polluters for their pollution. In some cases however, the provision of a clean medium, or the restoration of a polluted medium, may confer benefits on the consuming public that are in the nature of a “public good” (such as defence or lighthouse services) and that hence cannot be subject of a charge.

5. In any case, the extent to which the public authorities should provide collective purification, restoration, or pollution treatment facilities is nothing to do with the size of the revenues that would be obtained from polluters in the form of pollution charges (even if these were optimal). The optimum amount of collective facilities depends on the relative supply curves of collective and private pollution abatement, and not on the means of financing the former. There may, however, be a case on equity grounds for using the revenues from pollution charges to compensate the victims for, in effect, their sacrifice of property rights in the clean medium that is still being polluted, to some extent, even after pollution has been reduced to the optimum amount.

6. One of the most important practical policy issues appears to be the choice between some form of price mechanism instrument and direct control or regulation. It is argued that not only is the former cheaper, but that the usual objections to the price mechanism, such as that it is impossible to know exactly the optimum charge, or to monitor the pollution precisely, and so on, apply equally well to any direct regulation. Furthermore, it is likely that a charge scheme would lead to more systematic and regular verification than a direct regulation, which often is, in effect, nothing but a tax (on excess pollution) that is levied late, after legal delays and uncertainties, and is usually too small. Also, there is no substance in the commonly used argument that a pollution charge is inadequate since it is just a licence to pollute.

7. Finally, in addition to the problem arising out of data limitations and monitoring difficulties, it must be recognized that pollution abatement policy, like any other policy designed to improve resource allocation (e. g. tariff reductions, monopoly policies, etc.) may have effects on income distribution and/or employment that, insofar as they are heavily concentrated on particular regions or industries, will give rise to strong political pressures or will, anyway, raise questions of the trade-off between different policy objectives. Three different

classes of response are considered, namely, (i) the resort to sub-optimal policies to deal with pollution (such as subsidies to firms to introduce anti-pollution equipment), (ii) the use of transitional arrangements (as is usually the case when tariffs are reduced) or (iii) the use of additional and more appropriate instruments of policy to mitigate the effects on employment, etc. Whilst, in general, the third response is preferable, it is recognized that the appropriate additional instruments may not always be at hand, and that political and social pressures may mean that the authorities will often have to resort to some combination of the above responses. But, on the whole, a reduction in pollution does not mean any reduction in employment; it means only a change in the pattern of output and hence of employment, with more resources used to combat pollution and less resources used to produce final output as conventionally defined and measured.

THE POLLUTER-PAYS PRINCIPLE AS A GUIDE TO POLLUTION POLICY

1. INTRODUCTION

In this paper an attempt will be made to survey some of the problems that arise in the interpretation and application of the Polluter-Pays Principle that the Sub-Committee has proposed should guide policy with respect to pollution abatement. The issues covered here are as follows:

- i) The sense in which various instruments of policy do, or do not, make the polluter pays;
- ii) The differences between alternative forms of the price mechanism as a regulator of pollution, such as pollution charges, "bribes" to reduce pollution, and the marketing of pollution "rights";
- iii) The manner in which the collective provision of facilities to improve or restore the environment (including, say, sewage works or water purification works) should be allowed for when deciding on the optimum pollution charge or other anti-pollution measure;
- iv) Whether the beneficiaries of pollution abatement should be charged rather than the polluters;
- v) The relevance of the use made of the proceeds of any pollution charges;
- vi) The relative merits of the price mechanism form of control and direct controls;
- vii) The relevance of data limitations or administrative difficulties (e. g. monitoring difficulties) etc. for the choice between different instruments of control;
- viii) The relationship between the resource allocation aspects of any control instruments and other objectives of policy (e. g. local employment).

The treatment in this paper is largely theoretical, since this is a paper about the general principles to be observed, not about the detailed manner in which each country should apply these principles to its particular circumstances. At a later stage in the work of the Environment Committee it may well be necessary to derive practical conclusions of common interest from detailed studies of concrete pollution problems, such as those in hand on the pulp and paper industry and the automobile, and so on. But it is always better to proceed to the particular from the general, and there is a need for some fairly detailed discussion of the

general principles that should guide environmental policy. This is hardly surprising given that the field of pollution policy has only recently attracted attention from economists, so that principles, such as that the polluter must pay, will, when first introduced, give rise to some difference of opinion as to their interpretation and the circumstances in which they are valid. Unfortunately, statements of general principle must have a theoretical character, but we think that this is a price worth paying at this stage since, as the Environment Committee has stated "The identification of these general principles will be useful in the solution of some domestic and international problems. Also, conflicting policies within and between countries could be avoided and conflicts might be more easily and quickly settled, if some measure of agreement could be reached on basic concepts and principles."

This paper begins with a section setting forth one particular, though very orthodox, model of the manner in which the facility to pollute the environment enters into the decision-making process of the firm. One way or another, some view as to the way that the firm takes certain kinds of decision must lie behind any policy designed to influence the amount of pollution, and must hence be fundamental to all the subsequent argument of this paper. Nevertheless, much of the subsequent argument of the paper can probably be followed without reference to this initial step, so the latter is treated in as summary manner as possible. Of course, we are aware that, in the real world, firms may not behave exactly as assumed in the model set out here. But that only vitiates our conclusions if it is demonstrated that other, and more plausible, explicit assumptions lead to different conclusions, and we are not aware of any such demonstrations.

2. POLLUTION AS A FACTOR OF PRODUCTION

Insofar as a producer pollutes the environment in the course of his productive activity this: "facility to pollute" should be regarded as a factor of production, or input, used by him in his productive process. The "problem of pollution" arises because this factor of production is usually free to him. Hence, he has no incentive to economize in its use in the same way as he does for other factors of production such as labour or capital or raw materials. He will use this particular factors of production up to the point where further pollution contributes nothing to his output (in the economics jargon, this is where its marginal product is zero),* which is not surprising given that its price is zero, and economic theory and simple common sense teach us that the most economical

* It should be noted that this assumes a production function that permits the marginal product of this factor of production to fall to zero, which rules out, for example, a Cobb-Douglas production function. Otherwise an infinite amount of pollution would be engendered.

combination of factors of production is where the marginal contributions to output of the factors are proportional to their prices. But if pollution is defined as something that adversely affects the rest of society one way or another (health-wise, amenity-wise, or straight economic loss such as through corrosion or reduced agricultural output, and so on) then it must have a positive marginal cost to society. At the same time, its marginal benefit to society is its marginal product to the firm, which we have seen will be zero. Hence, the marginal social benefits of the pollution will be less than its cost; so that there is excessive pollution. This is just another way of saying that pollution tends to be excessive from the social point of view because it is generally an external diseconomy, so that it adversely affects agents external to the polluting firm, but this effect will not generally be included by the firm in its costs of production.

If the firm is induced, by some means or other, to make less use of this particular factor of production (the facility to pollute), he must clearly do so by increasing his use of the other factors of production. That is, in order to reduce his pollution he will have to use more labour, or capital or raw materials or reduce his output, or some combination of all these responses. Since these other factors of production all have a price, his costs of production must inevitably rise. It will be noted that this conclusion holds irrespective of the manner in which he is induced to reduce his pollution.

Various conclusions emerge from this. First, the polluter must, in the first instance, bear the costs of his reduction in pollution irrespective of whether this reduction is induced by some price mechanism instrument, such as imposing a tax on pollution, or whether the reduction results from some administrative decree to the effect that he should reduce his pollution by some specified amount or should install anti-pollution devices of some specified kind. Hence, as various national submissions to the Sub-Committee have pointed out, most of the measures adopted in their countries, including direct regulation or control, have not departed from the principle that the polluter must pay. Thus, the Polluter-Pays Principle does not necessarily mean that the polluter must actually hand over some payment to anybody in the form of a tax or a compensation to the victim.

The second conclusion is that the form in which he must pay for the input "facility to pollute" is of little importance in this context. For example, as the Danish submission points out, the payment by an industrial enterprise to some collective installation to "remove" his pollution (if only by restoration or purification) is equivalent to making the polluter pay. (Whether he pays the "correct" amount or not is another matter which we shall come to later.)

Thirdly, the Polluter-Pays Principle is respected, whether or not the polluter can pass on the higher costs in the form of higher prices. Producers normally do pass on all their costs in their prices; if they didn't, they would soon go out of business. One does not, however, say

that they are not paying for their labour or capital inputs. Thus Polluter-Pays Principle is not violated even where the demand for the product is very inelastic and most of the higher costs can be passed on in higher prices. * As the Secretariat working paper pointed out “The meaning of the Polluter-Pays Principle is that the polluter is the point where the external diseconomies of which he primarily bears the cost are internalized. The extent to which this cost will be borne by the consumer depends on the market structure”. How adequately the external costs of pollution are internalized depends, however, on various factors, some of which we shall now consider.

3. THE PRICE MECHANISM AND THE OPTIMUM DEGREE OF POLLUTION ABATEMENT

We have seen that the producer will use the facility to pollute, like any other input, up to the point where its marginal product is equal to its cost to him. ** If, therefore, this cost to him is made equal to the cost to society of the marginal unit of pollution, it follows that the marginal product of the pollution in the firm will just equal its marginal cost to society. In cruder terms, the pollution will be pushed only to the point where what society gets out of it (the marginal product to the firm) is just offset by what it costs society. This is obviously the optimum level of pollution, or, what comes to the same thing, the optimum level of pollution abatement. Thus, to achieve the optimum degree of pollution abatement what is needed is some way of making the polluter use the pollution input up to the point where it would cost him more to use more of it than society would gain in terms of higher output.

Now there may be various ways of achieving this result. The most obvious method - and the one first proposed by Pigou fifty years ago - is to impose a tax on the producer equal to the “price” at which the marginal social costs of pollution abatement equal the marginal social damage from pollution. Suppose that this optimum tax is known to be £x per unit of pollution. If it is imposed the polluter will now reduce pollution input up to the point where a further reduction in this input (i. e. a further reduction in his pollution) will cost him more, per unit, than £x, since he would obviously prefer to pay the tax beyond this point.

But it should be noted that exactly the same result is achieved if, instead of paying a tax per unit of pollution, he is paid £x for every unit by which he reduces pollution. This method, which is generally

* How great is the resulting fall in producers' profits depends also, of course, on the elasticity of supply.

** To simplify the exposition we shall ignore the complications arising out of possible imperfections in the markets for either the output of the polluter or the factors of production that he will use more intensively to reduce pollution, since these do not detract from the basic principles discussed here.

known by the pejorative term “bribe”, also induces the polluter to reduce pollution up to the point where the marginal cost to him of doing so is greater than the bribe he receives for each unit by which he reduces pollution. For, “in the case of pollution abatement subsidies, the ‘price’ paid by the polluter is the subsidy he forgoes”. * Thus the Polluter-Pays Principle is not violated at all with this method.

With either method the producer has exactly the same incentive to reduce pollution by the same amount. The point is that what matters for resource allocation and optimizing behaviour is the opportunity cost of any activity - i. e. how much is sacrificed by engaging in any activity. The opportunity cost to the polluter, and hence the amount he “pays” to pollute, is £x per unit, whether this is the amount he has to pay in tax, or the amount of revenue (bribe) he sacrifices for every unit of pollution that he uses. In the former case he will reduce pollution up to the point where the cost of further reductions would exceed the tax and in the latter case he reduces it up to the point where the cost of further reduction would exceed the bribe he would receive for further reduction. The equilibrium point must be the same in both cases since the opportunity cost of pollution is the same in both cases. In terms of his production function, the pollution input now has an opportunity cost to him (the same in either case) so he will re-arrange the pattern of his resource use in order to satisfy the usual profit maximization conditions, namely that the value of the marginal products of all the factors be equal to their opportunity costs.

It should also be noted that both methods involve the same rise in the price of his product. For in both cases profit maximization implies the same increase in the other factors of production in the interests of reducing pollution input. So the inputs of other factors of production into his productive process will rise by the same amounts so that, given their prices, their costs per unit output must rise by the same amount. And, as we have shown, the opportunity cost of the pollution input has risen (from zero) by the same amount.

Hence, since the supply curves of the polluting product will rise (i. e. supply will be less at any given price) by the same amount, the price of the product will also rise by the same amount (given that there is no reason to believe that the demand curves will behave differently). It is for this reason that the widespread view to the effect that this particular instrument distorts international trade and constitutes a subsidy to the output of the polluting product happens to be mistaken, at least in the context of a static analysis. And this conclusion does not depend on any assumption to the effect that the prices of the other factors of production must rise. It follows from the fact that the opportunity cost of pollution will have risen and that inputs of the other factors, per unit of output of the polluting product, must also rise and that they have positive prices.

* 1971 Annual Report of Council of Economic Advisers (USA), page 118.

Of course, how far the supply curves of the polluting product will depend on the elasticity of substitution of the other factors for the pollution input. If this is very high and they are relatively cheap, pollution will be greatly reduced per unit of output and the supply curves will not shift upwards (to the left) very much, so that output will not fall much and the price of the product will not rise much (this will be optimal, of course, given our assumptions). But the nature of the production function is the same, irrespective of which of the two methods discussed here is applied.

As the above result may appear to be somewhat surprising, another way of looking at it is as follows. When the polluter is paid a “bribe” for reducing pollution he is, in effect, paid a price to produce a new product, namely clean air or clean water, which he hitherto had no incentive to produce. From the point of view of welfare maximization, inputs and negative outputs are equivalent. Hence, if he reduces his pollution input, he is increasing his output of the corresponding clean medium, and profit maximization leads him to change his output “mix” in the direction of less of the old output and some more of the new product (clean air or water or whatever it was that he had previously been destroying with his pollution input). The price at which he could have sold more units of the new product, clean air, must, of course, be treated by him as a cost of production in producing the old product, insofar as he still uses some pollution facility. And the reason why this does not involve any distortion in resource allocation, or provide any unfair subsidy to international trade and so on, is that, in effect, this particular method of making the polluter pay is equivalent to imposing an indirect tax on him equal to the pollution damage in the normal way but to offset its effect on his income by means of a lump-sum subsidy. * Lump-sum subsidies are, by definition, subsidies that are not related to any variable (such as the amount of pollution input, or the amount of any product produced, or the amount of labour or capital employed), so that they cannot have resource allocation - or misallocation - effects. The resource allocation effect, in this case, is identical to the imposition of a tax on pollution, since it creates an opportunity cost of pollution. The fact that this is reimbursed to the polluter in the form of a lump-sum subsidy which comes out equal to the tax does not detract from the fact that pollution is given a positive opportunity cost per unit, and so operates like a tax.

Of course, all this is a purely static and short-period analysis. The pure lump-sum taxes and subsidies that are dear to the economist’s heart are probably non-existent in practice, and some resource allocation effect on the agents concerned is likely to be felt, if only in the longer run. For example, if the bribe method were not restricted to existing polluters (and their existing levels of pollution), there would

* See A. P. Lerner “The 1971 Report of the President’s Council of Economic Advisers. Priorities and Efficiency”, American Economic Review, Sept. 1971, page 530.

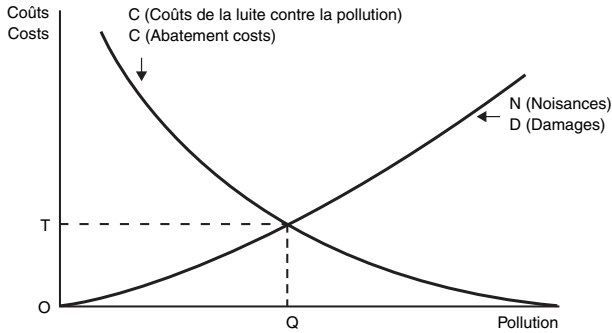
be an obvious danger that new firms would be tempted to set up in business, with a highly polluting activity, in order to qualify for the bribe to reduce their pollution. In effect, they are artificially creating a new “need” for cleanliness and a new market demand for the product clean air that would not have existed, had not the new pollution threat emerged. It is like the gangster who operates a protection racket in which he creates clients for the product “protection” by the threat of the damage they will incur if they do not buy it.

Such deliberate incentive to introduce a new pollution threat can be regarded as a resource misallocation since the demand for the “good” clean medium only arises because of the increased output of the “bad” pollution. Hence, without the need for any judgements of equity, it can be argued that the particular “bribe” system of pollution abatement should only be used for existing pollution. And, indeed, it is plausible that equity considerations also would only indicate the use of this method for existing pollution, on the grounds that it provides a means of obtaining optimum pollution abatement whilst not penalizing those firms that had taken decisions as to their location and productive processes before pollution abatement became necessary or became an object of policy. Hence, on both equity grounds and resource allocation grounds in the longer run, it would seem desirable, insofar as the bribe method has to be used at all, to limit it to existing pollution.

A further possible price mechanism instrument for reducing pollution to the optimum amount is a marketing system for what have been called “pollution rights”. To begin with, the optimum amount of pollution is, as already indicated above, that at which the marginal social damage from the pollution equals the marginal costs of abatement. If the authorities then issue, on the market, “rights” to that amount of pollution, and let their equilibrium price be settled on the market, the firms that need pollution as an input into their productive process will be obliged to bid for the rights. Market imperfections apart, the price at which the rights will eventually tend to settle will be the same as the optimum tax (or bribe). This is because firms, total demand curve for pollution rights is, in effect, identical to the curve representing their marginal costs of pollution abatement. For firms will be prepared to buy pollution rights up to the point where the cost to them of doing without further pollution would be greater than the price at which they could buy the right to pollute further. If the optimum supply of pollution rights is issued, the (vertical) supply curve of pollution rights must intersect the demand curve for the rights at the same point as the social damage curve, and hence lead to the same price. This may be clearer in the following diagram (see fig. 1).

In this diagram, the optimum amount of pollution is, as usual, where the curve of abatement costs (C) intersects the curve of social damages (D), i. e. at the level of pollution OQ. This level would also have been achieved if a pollution tax or bribe had been fixed equal to OT, since this would have provided sufficient incentive to reduce pollution

Figure 1



to the point where the marginal costs of further pollution exceeded the tax or bribe. Since the curve (C) corresponds to the demand curve for pollution rights for the reason given above, if the quantity of rights equal to OQ is put on the market, it is clear that the equilibrium price must also be at OT .

Thus, the three instruments for inducing the optimum degree of pollution abatement discussed so far all have in common the feature that the marginal cost to the polluter of using some pollution input will be the same for all polluters and will equal the (assumed) optimum price of pollution. All three methods, therefore, will lead to the satisfaction of the usual marginal conditions for optimization of resource allocation, and all three will imply that the social cost of pollution is internalized in the optimum manner, and that, in the relevant sense, therefore, the Polluter-Pays Principle is respected.

But this does not mean that there are no differences between the three methods. Clearly the choice between the different methods raises various problems which are beyond the scope of this paper, but which would have to be taken into account in concrete cases. For example, as noted above, the justification of the “bribe” method would presumably be rooted in income distribution or equity grounds, which is part of the general problem of how to reconcile resource allocation objectives with other objectives of economic policy to which we shall turn later. We have also noted resource allocation reasons for limiting the bribe method to cases of existing pollution. The market rights method raises different problems, notably concerning the degree of public acceptance of the institutions and instruments involved, which might be far less forthcoming than the acceptance of a more familiar and conventional tax. But none of these considerations detract from our basic point here, namely that these are alternative instruments for making the polluter pay which, in the short-run at least, do not necessarily involve any departure from optimum resource allocation.

4. THE ROLE OF COLLECTIVE FACILITIES

One question that has arisen in the course of the Sub-Committee's discussions of the Polluter-Pays Principle is the extent to which, instead of making the polluter pay either in the form of a tax or in the form of some obligation to reduce his own pollution, it would be more economical to arrange for him to pay for some collective facility, such as a municipal sewage works or water purification works. For example, economies of scale might be such that a given total amount of pollution abatement could be provided "cheaper" by some collective installation than by the sum of individual plants. Furthermore, it might be cheaper not to reduce pollution near its source at all, but to restore or purify the polluted medium concerned nearer to the point of consumption,* and thereby take full advantage of the pollution removal capacity of the river or air concerned. This is perfectly true, and as long as the notion "cheaper" is used in its correct economic sense - i. e. relating to a specific quantity supplied - there are no difficulties in introducing this concept into the Polluter-Pays Principle.

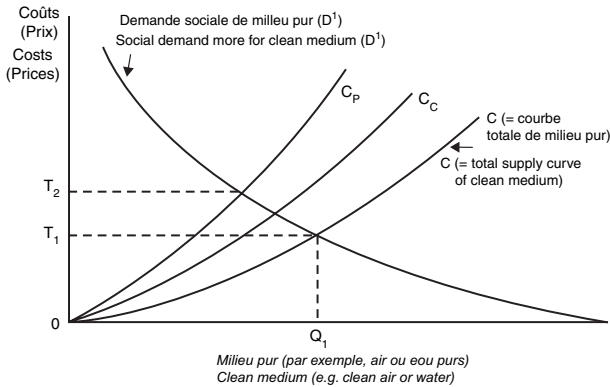
The simplest procedure, perhaps, is to avoid looking at pollution as some "bad" (input) that should be minimized, but to regard the corresponding clean medium (clean air or water and so on) as some "good" that should be maximized. The less the pollution, the greater the supply of this clean medium. The "C" curve in figure 1 above can then be regarded not as the costs of abating pollution, but as the cost curve of supplying the clean medium. Similarly, the damage function (the "D" curve) can be transposed into the demand curve for the clean medium. Thus, the mirror image of figure 1 above is simply a conventional demand-and-supply curve diagram.

Optimum output is now defined in terms of the optimum amount of clean medium, and the optimum price of this output will equal the hitherto optimum tax on the pollutant. All that needs to be done now is to recognize that the aggregate supply curve of cleanliness should be decomposed into (i) a collective supply curve and (ii) a supply curve representing the sum of the individual firms' supply curves (of cleanliness), as in any elementary model in which more than one supply curve needs to be identified. In figure 2, for example, a collective supply curve of clean medium (which can be a water purification works, for example) is shown (C_c), as well as the private firms' supply curve (C_p the mirror image of their aggregate abatement cost curves) to match the aggregate supply curve, C , so that optimum total pollution abatement is that which gives total clean medium of OQ_1 , and the optimum charge/tax/bribe is now, at OT_1 , lower than it would be if there had been no

* A particularly well-documented illustration of this is the Frankel study showing that, in the particular river area concerned, for every dollar spent on sewage works only about 3 cents were saved in water purification charges downstream nearer the point of use. Of course, this would not necessarily rule out the sewage works if sufficient amenity value could be attributed to the clean river en route to the water purification works. See Richard Frankel "Water Quality Management. Engineering-Economic Factors in Municipal Waste Disposal", Water Resource Research, Vol. 1, No. 2, 1965.

collective facility to be taken into account, since it would have been OT_2 in the absence of the collective facility. Furthermore, at “price” OT_1 , the total amount of pollution abatement is distributed optimally between private and collective facilities, according to the respective contributions that each makes to OQ_1 as indicated by their respective supplies at price OT_1 , which depend on their respective supply curves. For this is the distribution of pollution abatement at which the marginal costs of further abatement are equal for all abators. Clearly, at this point, no economies can be made by any change in the relative shares of the different abators in total abatement.

Figure 2



If the optimum price for the collective facility as set out above is charged to industry (e. g. where this facility takes the form of a collective effluent treatment plant), and polluters are also charged the optimum price (or bribe) for their residual pollution, they will have an economic incentive to allocate their resources optimally between treating their own effluent or having it treated collectively according to their relative costs, and, of course, of abstaining from further treatment where the costs of either would be greater than the charge they would pay for pollution. In short, the existence of collective facilities does not detract in any way from the Polluter-Pays Principle provided that the optimum price and charge are incorporated into the policy measures adopted in the manner indicated above.

5. SHOULD THE BENEFICIARIES PAY?

There are two fairly distinct ways in which this question may arise. First, from a purely theoretical point of view, there has been some

discussion in the literature of the possible resource misallocation that might result from taxing the polluter instead of the victim, on the grounds that, in certain circumstances, it might be cheaper, in resource terms, for the victim to avoid the pollution than for the polluter to reduce it. Secondly, practical policy makers are naturally confronted with the possibility, in some cases, of economizing in the use of some medium, such as clean water, by charging the consumers, and thereby reducing demand, instead of spending more money in order to eliminate pollution from a greater volume of water.

The first of these approaches, which became prominent in the classic Coase article in 1960,* need not detain us much here, although it does have a considerable bearing on the question of whether there may be valid exceptions to the Polluter-Pays Principle. The major weakness of the Coase argument is that, if the optimum tax is charged, it must be equal to the marginal social damage of the remaining pollution as well as the marginal cost of pollution abatement, so that it could not be possible for it to be cheaper, at the margin, for the victims to avoid the damage than for the polluter to do less damage. For the marginal damage to the victims cannot exceed how much it would cost them to avoid the damage otherwise they would already have avoided it. In theory, consumers optimum adjustment in the presence of pollution must be such that the marginal disutility of pollution is equal to the marginal utility of the means of avoiding or eliminating pollution (i. e. the “pollution-remover”) which, in turn, must be equal to the price of this pollution-remover.

But another way of looking at the Coase point, which may be useful in connection with the second, and more practical, approach, mentioned above, is in terms of the “public good” character of much pollution abatement. “Public goods” is a technical term that denotes goods satisfying certain criteria that make it impossible for a market mechanism to provide an optimum supply. One of these criteria is that the consumption of a public good by one consumer does not detract from the amount of consumption of it that another consumer could enjoy. The classic examples are national defence, or the light from a lighthouse, or broadcasting. Hence, there is no marginal cost to society of one consumer’s use of the good in question. In that case it would be sub-optimal to charge him for it, since such a charge would merely reduce his consumption and hence his welfare without adding to the possible consumption level of anybody else. At the same time, there is a need for such goods to be supplied, so that some positive price must be received (or imputed to) the producers of the public good (usually, but not necessarily, a public authority).

Now most forms of pollution are “public bads”. That is to say, the fact that, for example, one individual may breathe some polluted

* R. H. Coase “The Problem of Social Cost”, Journal of Law and Economics, October 1960.

air or smell some polluted river does not usually reduce the amount of polluted air or smell available for other people.* Hence, in the same way that optimum public goods policy requires a zero price for consumers and a positive price for producers, optimum “public bad” policy might appear to require a zero price for consumers and a negative price for producers. This corresponds to a zero price for consumers and a tax on producers.**

But, as we have seen above, it is often useful in this area of policy to think of the mirror image of the pollution, namely the “good” that is destroyed by the pollutant, such as clean water. Now in some cases, this may have the character of a public good for which no charge can be made since no market can be established, but this is not always the case. For example, it is true that, insofar as the public authorities were to reduce air pollution for one person living in a city, they would automatically have to reduce it for everybody else living there, so that it would be difficult to charge individuals for their particular quantum of clean air. Similarly, the smell of a grossly polluted river is a public bad, and transforming it into a sweetly perfumed stretch of water may be a corresponding public good (though charges for walking along the banks may be made).

But the supply of water of a specified quality to houses or factories, through pipes or other means, is not a public good since (i) individuals can appropriate their own particular quantum in a way that they cannot do for, say, clean ambient air in towns, and (ii) greater use of clean water to one user means that, other things being equal, less is available for other users. In such cases, there is no reason on public good grounds not to charge the user, who is, in a sense, the beneficiary of any programme to provide clean water. Indeed, in the same way that we have seen that the firm will waste the pollution “input” if it is free, so the consumer will waste clean water if it is free. In fact, it is this, more than any other consideration which justifies charging consumers for some de-polluted medium where this can be done. For although the optimum supply could be achieved if the public authorities regarded themselves as being in receipt of a “shadow price” of clean medium corresponding to OT_1 in figure 2 above, unless they charged for it there would be an excess of demand over the optimum supply on account of wastage, a possibility that cannot exist in the case of the pure public good, such as national defence.

Does this conflict with the Polluter-Pays Principle? The answer is “No”. In the cases where the clean medium is not a public good, a charge is desirable in order to prevent the user of the clean medium from using it wastefully (i. e. beyond the point where its marginal utility

* This point is made by William Baumol in “On Taxation and the Control of Externalities”, Special Lecture given at the LSE, 1971; forthcoming in the American Economic Review. Baumol is probably over-simplifying somewhat in writing as if all pollution has a “public bad” character.

** The congestion possibility, which has to be taken into account in the public good analysis, probably does not apply to the counterpart public bad problem.

equals the marginal cost of producing it). But this is exactly the same as the reason for charging the polluter in order to prevent his wasteful use of the pollution facility. Both need to be done; and one does not exclude the other or make it unnecessary. There is little point in one without the other. Optimization requires that the marginal conditions be satisfied as widely as possible. Hence, although water consumers may be expected to pay for the provision of some collective water purification facility, water polluters should also be charged or be induced to pay by some other means, the marginal costs of providing the optimum amount of that facility, and the charge should be such as to reduce their load on that facility to the optimum point in the sense of figure 2 above.

Of course, there may be no need, or opportunity, for the provision of a public facility to enter the picture at all. For example, optimum pollution would be obtained if the beneficiaries were able to purchase clean water direct from some private supplier or, what amounts to exactly the same thing, were able to bribe the polluter to reduce his pollution. In such cases the opportunity costs to the polluter are the same as with the optimum bribe discussed above and will tend to produce the same optimum reduction in pollution. The effect on income distribution will be different, as with the case of the bribe system, but that is another matter. As long as the polluter faces the same (and correct) opportunity cost of pollution he is "paying" for pollution in the sense in which we understand the Polluter-Pays Principle, namely in the sense that the cost of pollution is internalized since it will be correctly reflected, one way or another, in the data that should enter into the firm's decision-making process and determine its allocation of resources.

Thus, there may well be instances where the beneficiaries of measures to reduce pollution might legitimately be expected to pay, either in the interests of resource allocation (as with the charges for the private appropriation of clean water) or in the interests of equity. But there is no reason why, in such instances, the polluter should not also be made to face the opportunity cost of his pollution, so that the imposition of a charge on the beneficiary of the abatement does not necessarily rule out the Polluter-Pays Principle or conflict with it. Apart from the case of the pure public good, everybody should pay for the use of a scarce, clean medium, whether they use it as final consumers or by means of destroying it through their pollution. There is no significant analytical distinction between the different ways in which individuals or firms may use up some scarce resource as far as the principles of resource allocation are concerned.

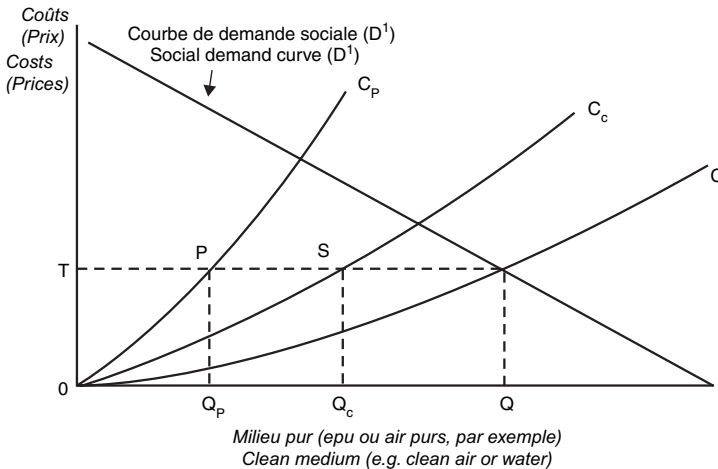
6. THE RELEVANCE OF THE USE MADE OF POLLUTION CHARGES

One minor point that has come up in the course of the Sub-Committee's discussions of the Polluter-Pays Principle is the question of the

principles determining the use to be made of the revenues obtained by the public bodies from pollution charges (to firms) or charges to consumers for clean water, etc. The main point to be made in this connection is that any attempt to relate the size of these revenues to the amount of supplementary purification facilities provided, for example, by the State or by local authorities, is more likely to lead to resource misallocation than not.

As shown in figure 2 above, the optimum amount of public provision of some restoration, or purification, facility depends on the relative position and slopes of the two supply curves indicated. From this, it follows that the optimum degree of public provision does not depend on the extent to which finance is available from the imposition of the optimum charge on the private polluters. For example, suppose that the private supply curve of “cleanliness” (i. e. the mirror image of the abatement cost curve) was C_p in figure 3 below, and that the clean “good” provided by the public facility was of the nature of a public good so that no charge could be made. Now it is obvious from the diagram that, in the case illustrated, the revenue from the optimum charge on polluters (equal to the rectangle $OTRQ_p$) will not cover the total costs of providing the public facility (equal to the area under the collective supply curve between O and S). Since no charge can be made for the collective “good” supplied, the collective facility must operate at a deficit even if all the revenues from the pollution charge were transferred to the collective facility. But this does not detract from the

Figure 3



fact that the optimum collective output is still OQ and that this is the amount that should be supplied. How the deficit is to be financed, however, is a matter of income distribution and equity.

Conversely, if the private supply curve of “cleanliness” had been, say, close to \bar{C}_c in figure 3, the revenues from the optimum charge would be far greater than needed to provide the optimum collective restoration facility. If, therefore, the authorities believed that all the revenues should be spent on restoration facilities, the collective facility would greatly exceed the optimum. Thus, if the revenues from the pollution charges are linked to the degree to which public provision is made the latter will be either too small or too great (apart from the extraordinary coincidence where the area of the rectangle $OTRQ_p$ happens to equal the area under the collective supply curve over the relevant range). * The correct policy for the provision of public purification, or restoration, facilities is to identify the optimum supply in terms of figure 3 above or, where there is no relevant private activity, in terms of a standard cost-benefit analysis approach, and to provide that amount of supply. How it is to be financed is a matter of income distribution and the like and not a matter of optimum resource allocation proper.

Of course, there may be a case on equity grounds for using the proceeds of any pollution charge to compensate the victims, but this has nothing to do with the optimum amount of collective purification or restoration facilities, or with the resource allocation principles. It arises because of the fact that the equitable arrangements depend, to a large extent, on what happens to be the property rights situation. For if the social costs of pollution were to be regarded as the reduction in somebody else’s right to clean air or water, the owner of these rights might be expected to be able to extract a price for them, so that, in addition to achieving the optimum amount of pollution, the persons adversely affected by the residual pollution would be compensated. For example, the labour costs of a firm are payments to the owners of the labour rights but, in a slave economy, a benevolent despot might impose a tax on producers equal to the price that, in his opinion, would just equate the marginal disutility of work to the slaves with their marginal product. This would ensure that only the socially optimum amount of work was done by the slaves, so that resource allocation is optimized. But the slaves are likely to feel worse off with this system whereby the despot collects the tax, than if they collected the wage! Thus, the issue of whether the victims of pollution are compensated, or collect the payments for pollution made by polluters, is essentially an equity issue involving the question of the equitable distribution of property rights.

* All this section is based on standard theory of public enterprise supply, going back to Dupuit’s classic article “De l’Utilité des Travaux Publics” (in *Annales des Ponts et Chaussées*, 1844). See also E. Malinvaud “Leçons de Théorie Micro-économique” (Paris, 1969), Chapter IX.

It has little bearing on the question of whether the polluter should pay; it concerns to whom the polluter makes his payment - to the victim or the State or some other agency.

7. THE RELATIVE MERITS OF PRICE MECHANISM INSTRUMENTS AND DIRECT QUANTITATIVE CONTROL OR REGULATION

One of the most important practical questions that arise in pollution policy, and one which the Sub-Committee has discussed at some length, is whether there are circumstances in which it is preferable to use some direct regulation or control of pollution rather than some form of price mechanism incentive. Whilst this paper is not intended to be a full-scale review of alternative policies in this area, this issue is the one that is most frequently encountered among administrators,* and serious attention must be given to the possibility that some general circumstances can be defined in which direct controls or regulations would be the appropriate policy instrument rather than some form of price mechanism. But whilst there is little doubt that it will usually be impossible to operate a price mechanism scheme based on a truly optimum charge, further examination usually shows that this does not necessarily mean that direct control, or any other instrument for that matter, would be more likely to lead to the optimum amount of pollution abatement. It is not, strictly speaking, necessary to go into this issue in detail, since direct control usually involves a payment by the polluter as much as does some charging scheme. Hence, even were direct control to be found to be preferable, it would not constitute an exception to the Polluter-Pays Principle. Nevertheless, the choice between a price mechanism instrument and direct control is of great importance, for it is our view that, in the vast majority of cases, some price mechanism instrument will enable any given amount of pollution to be obtained at less cost than direct regulation. Hence it might be worthwhile summarizing briefly the main reasons why the former is generally preferable to the latter.

i) The “licence to pollute” argument. One of the first objections to pollution charges that is usually encountered is that they merely constitute a licence to pollute, the implication being that firms will pay the charge and then pollute as much as they did before, or that if they reduce pollution it will be by an inadequate amount. But there is no reason to believe that firms are prepared to employ indiscriminately infinite amounts of labour and capital, which are also inputs into their productive processes. They tend to employ these factors only insofar

* As is correctly pointed out in Chapter on “The Polluter-Pays Principle and the Instruments for Allocating Environmental Costs” (see page 29). “direct controls are often preferred by government authorities and industrialists: to the former they are a clear-cut concept within an already existing legislative framework; ...”

as the resulting gains cover their costs. Presumably they would act in the same way for any other input for which they have to pay, including the facility to pollute if a charge is levied on their use of this input. After all, it is not necessary to reduce pollution to zero; only to the optimum point as defined earlier; which, if the appropriate pollution charge is levied and firms can be assumed to try to minimize their costs of production, will be achieved. If firms cannot be assumed to act in this way, then we are in big trouble anyway, quite apart from pollution. If the imposition of a charge fails to reduce pollution to the optimum amount, then this means that the charge was not high enough. The same possibility exists quite as much with direct regulation as with charges, of course.

ii) Cost-minimization. As already mentioned, direct controls or regulations to reduce pollution do not constitute departures from the principle that the polluter must pay; indeed, the main objection to this method of pollution control is that polluters, (and society in total), will pay too much for any given reduction in pollution. This is because direct regulation is an economically inefficient method of reducing pollution. As pointed out in the Chapter referred to above, in connection with direct controls, “economic efficiency is reduced, since no economic mechanism operates to enable these standards to be attained at least cost”.* How inefficient is the direct regulation method depends on various circumstances and also on the precise control instrument used. One obviously uneconomical form of control instrument will be the imposition of some specified technique of pollution abatement, such as that chimney stacks should be of a certain minimum height, since this does not even leave producers the opportunity of adopting the cheapest method to reduce their pollution. By contrast, a system of direct control which specified that each polluter must reduce pollution by x%, does at least allow polluters to adopt whichever method is least costly - e.g. to use taller chimney stacks, scrubbers, different fuels, change their location, and so on.

However, even this possibility will still make direct controls more expensive for a given amount of pollution abatement than the use of the price mechanism in some form or other, such as the pollution charge. For suppose all polluters are asked to abate their pollution by x%; some polluters will have to do so even if their costs of abatement are very high, whereas other polluters, who could have abated at low cost, have no incentive to abate more than x%. As is correctly pointed out in the same Chapter, “direct controls are hardly incentives, since each transactor is content to do neither more nor less than comply with the regulations, having no incentive to surpass the standard, such as he might have if he were actuated by economic “stimuli” (page 29). With direct controls, the marginal costs of further abatement will differ from one polluter to another at the point where they have each abated

* Page 28; see. also page 29.

by $x\%$. But without changing the total amount of abatement obtained (also $x\%$) it is obvious that it could have been obtained at lower cost by shifting some of the abatement burden from those whose marginal abatement costs are high towards those whose marginal abatement costs are low. Clearly, costs can be reduced in this way, for the same total amount of abatement, up to the point where the marginal costs of abatement for each polluter are equal. This is, of course, the point which would have been reached if the price mechanism had been used, for, as set out in detail on page 43 above, if a uniform pollution charge had been imposed on polluters equal to the “price” at which the $x\%$ reduction in pollution is obtained, all firms should abate up to the point where their marginal costs of further abatement are equal to this charge, and hence equal to each other.*

As this paper is not intended to be a treatise on the subject, this is not the place to go into details if actual illustrations of the above results, but such practical applications are not difficult to find. The proposition that charges are cheaper than direct controls are by no means an economist’s fantasy, dreamt up by theoreticians with little contact with the real world. Numerous examples are available of the cost advantage of the charge method, such as those quoted in the 2nd Annual Report of the Council in Environmental Quality,** or the well-known study by Johnson of the Delaware Estuary.*** For example, the CEQ Report mentions a study of air pollution in Kansas city according to which a given reduction imposed equally on all polluters would cost \$16 million per year, whereas the same reduction spread according to the relative cost abatement schedules of the various firms would cost, in total, only \$7.5 million. Similarly, a given target of dissolved oxygen in The Delaware Estuary study was shown to cost about twice as much if obtained by uniform treatment in each plant than if based on a least-cost method corresponding to the differences between prices with respect to their abatement costs and hence corresponding to the sort of pattern of abatement that would be obtained by a pollution charge.

None of these results is really surprising. After all, even if the pure theory of cost minimization in terms of equality of marginal costs everywhere is not easily digested by everybody, it should be obvious common sense that if society wants an increased amount of some product (namely “clean air” or “clean water”, etc.) to be produced,

* For a rigorous proof of the proposition that direct controls must be less efficient than pollution charges that does not even require restrictive assumptions of a profit maximization character see Baumol and Oates. *The Use of Standards and Prices for Protection of the Environment* in the *Swedish Journal of Economics*, Vol 73, No. 1, March 1971.

** See 2nd Annual Report of the Council on Environmental Quality, Washington DC August, 1971, pages 120–121 and 136–139.

*** E.L. Johnson “A study in the Economics of Water Quality Management” *Water Resources Research*, Vol. 3, 1967, No. 1.

it would be very uneconomical to achieve this by ordering all firms to produce stipulated amounts of it, by comparison with providing a market price for it (whether a tax or a bribe) and allowing the firms best placed to produce it to contribute the most to its production.

Of course, the degree to which direct controls would be a more expensive way of achieving a given amount of abatement than would pollution charges depends, to some extent, on the degree to which pollution abatement costs differ from one polluter to another. Where there are no significant differences between the pollution abatement cost schedules of different polluters, a direct control stipulating uniform quantitative reductions in pollution obviously would not lead to significant differences in costs of abatement at the margin, among various polluters, so that total costs of abatement would not be much higher than with the pollution charge method. For example, the latest report of the Council of Economic Advisers, whilst generally sympathetic to the superiority of charges over direct controls, argues that use of the latter to reduce automobile emissions has probably not involved significant misallocation of resources because the "common" technology of the internal combustion engine limited these (abatement cost) differences and seemed to justify the application of common standards to all cars.*

Another possibility raised in the latter report is that the appropriate choice of method may depend on whether it is the damage function or the abatement cost function that is best known, and what the relative slopes of these two curves happens to be. The rule proposed in the CEA report has been the subject of some modifications in the literature, which may not be entirely justified. But the idea is a novel one and its practical application would require further consideration of the theory involved.**

iii) Regularity of Implementation.*** One of the advantages of the pollution charge method is that, with virtually all other taxes, an administrative machine is set up which has the full-time task of seeing that the appropriate taxes are paid, and which is usually vigilant in pursuit of its task. By contrast, when a pollution regulation is imposed its implementation is often at the mercy of passing whims and fashions or the enthusiasm and competence of the local regulatory bodies. In the first flush of enthusiasm after some regulation is introduced to control pollution there may be a drive to ensure its application, but when other matters distract the attention of the regulatory bodies, or the fashion passes (perhaps as a result of the success of the initial measures), the polluters will gradually be able to increase their pollution. In any case, if, as is usually the case, failure to comply with the

* Annual Report of Council of Economic Advisers, Washington DC, 1971. page 117.

** See A. P. Lerner, op. cit., American Economic Review, Sept 1971.

*** This paragraph largely follows the discussion of this point in W. Baumol "On international Problems of the Environment" (Wicksell Lectures 1971), forthcoming.

regulation means that the polluter is liable to a fine, what this means is that, in effect, he is subject to a tax on the amount of pollution he causes over and above some specified amount, but that the payment of the tax is usually very late and subject to possible legal disputes. Most ordinary taxes, by contrast, are paid without legal disputes and this would be the case with a pollution tax. When direct controls are used but not respected, the regulatory authorities have to mount a special ad hoc effort to trace the excess pollutant and its source, to prove the offence and, often, to prosecute and fight a doubtful legal action. And, finally, even after all this, the fine is usually so low as to constitute very little deterrent.

In short, direct regulation, in most cases, is equivalent to a tax which is uncertain, late and usually too small anyway.

iv) Equity. Strictly speaking, this paper is not directed at the equity aspects of the choice between different instruments of pollution abatement, but the equity issue is often raised in discussions of the choice between one instrument and another, and not always correctly, so it may be worth while mentioning one equity aspect of the choice between direct controls and some price mechanism instrument. This is that, when direct controls are introduced, such as a regulation stipulating a uniform reduction in pollution, those firms that had previously done nothing to reduce pollution will escape lightly relative to those that had already incurred costs in order to cut pollution. Insofar as the latter have operated out of concern for social welfare, therefore, direct controls would represent a penalty on virtue and a premium on vice. Even if the firms that had already abated pollution had done so purely out of enlightened self-interest, this is a characteristic that should, perhaps, be encouraged rather than penalized. In a situation in which policy is becoming increasingly aware of the need to reduce pollution to the optimum amount, the advantage to polluters in doing as little as possible until they are directed to is greater the more reason they have to believe that the policy measures adopted will take the form of uniform direct controls.

8. THE RELEVANCE OF ADMINISTRATIVE PROBLEMS OR DATA LIMITATIONS

It is often believed that the main objection to the use of some form of price mechanism for pollution abatement is that (i) it is impossible to know the optimum tax or charge to impose and/or (ii) it is extremely difficult, in practice, to monitor and measure the amount of pollution to which the tax should be related. However, these objections seem to be unfounded.

As regards the first point, the optimum amount of pollution is, as indicated in figure 1 above and in all the conventional diagrams used in this context, given by the intersection of the social (marginal) damage

curve and the curve of (marginal) abatement costs. In order to know this optimum abatement precisely it is necessary to know the precise position of both these curves. But this applies irrespective of what policy is then to be used to achieve this optimum. For example, even if it were decided that the optimum abatement would be achieved by imposing uniform standards that oblige polluters to reduce pollution to the optimum point, this does not add to anybody's knowledge of where this optimum point lies.

Apart, therefore for the possibility mentioned above to the effect that choice of one price mechanism rather than another might depend on which curve was best known and what its relative slope was, data imperfections are just as much an obstacle to achieving the optimum abatement by means of direct regulation as to the use of price mechanism. Indeed, it is arguable that more information is needed if direct control is to be used than if a pollution charge is to be used. For, as long as the pollution charge can be varied, it would be possible to find the optimum by variations in the charge until it was found that the marginal social damage at any actual point reached was equal to the charge, since polluters can be left to do their own arithmetic and arrange their pollution so that the charge is also equal to their marginal abatement costs.*

In practice, of course, the technical information needed to identify the optimum degree of pollution abatement is usually grossly inadequate. Standards are usually set in a quite arbitrary manner. It is not known with any degree of certainty, for example, what is the maximum safe level of lead or mercury intake by humans, or even whether DDT is dangerous to humans, or whether the accumulation of carbon dioxide in the atmosphere will make the Earth boil over or freeze over, or at what level SO_2 is really bad for health, or whether eutrophication is, after all, not the result of phosphates but of nitrates, and so on. The general use of direct control has not prevented the target level of abatement from being as much a hit-or-miss affair as if pollution charges were used instead. The only case where it might be said that a charge is a waste of time is where the pollutant concerned is to be banned completely. In this case it might appear to be ridiculous to set a tax so high as to cut out all pollution, so that nobody will actually pay the tax. In theory, of course, zero pollution can never be optimal since this implies that damage is substantial even for infinitely small levels of pollution, but it would still be simpler to ban the product entirely than to charge a very high tax to be paid, perhaps, on a minute quantity of pollutant.

In the same way, the practical difficulties of monitoring apply as much to the surveillance of direct regulation as to the administrative

* For a more detailed treatment of this possibility see W. Beckerman "Environmental Policy Issues: Real and Fictitious" in Problems of Environmental Economics, OECD Paris, 1972. A similar suggestion has been made by Baumol, *op. cit.*

steps required to collect the appropriate tax. For example, the great difficulties involved even in carrying out a representative and accurate monitoring of the more common forms of water pollution have meant that there can be frequent evasion of direct control. If anything, one might expect that tax inspectors would be more vigilant in checking for any tax evasion (through discharging more pollution than the amount on which tax is being paid) than are some of the authorities responsible for preserving environmental quality.

In practice, of course, data limitations and technical monitoring difficulties mean that, very often, the object of the regulation or of the charging scheme is not the pollutant, proper but some proxy variable which is thought easier to check. For example, since it is impossible to measure the precise amount of ground-level smoke caused by the emissions from a factory chimney it is impossible to charge firms accordingly, but it is equally impossible to subject them to a direct control on the amount of such smoke. In such cases, it might be found feasible to regulate the height of the chimney stacks. But, in that case, this could have been the subject of a tax just as well. In other cases, it might be relevant to reduce SO₂ on account of the resulting corrosion, but given the impossibility of measuring the corrosion attributable to SO₂ emissions from chimneys, it might be thought desirable to control the next best measurable proxy variable, namely, the sulphur content of the fuel used. But if this can be measured well enough for purposes of direct control, it could equally well be subject to a tax.

The whole point is that quantitative control implies that quantities - of something or other - can be checked. In that case, it can also be taxed.

Obviously, lack of data, difficulty of monitoring, proliferation of parameters determining the amount of social damage done by any particular pollutant according to all sorts of circumstances (such as wind speed, temperature, proximity of buildings, and so on in the case of air pollution), all make it usually impossible to impose any optimum control, whether by means of direct regulation or by means of the price mechanism. The preference for the former among technicians and administrators is natural, given that at least they know what is meant by the particular form of the regulation imposed, whereas they would feel that they don't know what quantitative result will emerge from some tax. This is true, but if, after the imposition of the tax, it is found that pollution is still thought to be too high (by comparison with what is assumed to be the optimum), this merely means that the tax imposed was too low, so that it should be raised.

It cannot be objected to this that it is impossible, or undesirable, to vary the pollution charge from time to time. For, apart from the point already made to the effect that many other taxes are frequently changed, some flexibility is required in the interests of optimum policy whatever instrument is used. For the optimum degree of abatement

does not, of course, depend on which instrument is used, it depends on the point of intersection of the damage function and the abatement cost function. Since the damages done by pollution and also the costs of abatement constantly change over time, partly on account of rapid technological developments in pollution control devices as soon as any pollution abatement policy is effectively introduced, the optimum degree of pollution must constantly change. Hence, even if direct regulation is used, it would be desirable to change the regulations from time to time. This would impose the same sort of real costs on industry as a change from time to time in the pollution charge. Naturally, it would be foolish to try to vary the charge as often as might be necessary in order to obtain exactly the desired level of pollution in a very short time period, since it must be recognized that even the desired level of pollution may not be very close to the "true" optimum. Hence, it would be misplaced perfectionism to try rapidly to hit a moving target which is known to be probably the wrong one. Given a sensible acceptance of the theoretical and administrative objections to very frequent changes in tax rates, therefore, it does not seem likely that the desirability of varying them from time to time, in the interests of approaching the desired degree of abatement, is likely to impose greater burdens on industry than the similar need to vary direct controls from time to time.

9. CONFLICTS BETWEEN ENVIRONMENTAL AND OTHER OBJECTIVES OF POLICY

Up to this point we have been concerned only with the principles that should be respected in order to obtain the optimum degree of pollution abatement from the point of view of the optimum allocation of resources. We have examined the way in which these principles would be served by means of policy instruments that, in one form or another, make the polluter bear the costs of the pollution for which he is responsible. However, it must be recognized that economic policy is designed to serve more than one economic objective - though perhaps not quite as many as is often believed - and also that economics and politics overlap considerably, and rightly so. One of the most important objectives of economic policy during the last two decades or so has been the maintenance of high employment, both nationally and regionally, and all Member countries of the OECD have explicitly accepted full employment as one of the major goals of policy. Governments are also very concerned with the impact of any policies on income distribution, though this is often closely bound up with the impact of policies on local employment situations, or on specific industries or sectors of the economy.

This is usually a reflection of the political constraints on all governmental policies, rather than any concern with the effect on overall economic welfare. For example, it is not obvious why, other

things being equal (including duration of unemployment etc.), total economic welfare is reduced if a given total number of unemployed tend to be concentrated in one region or one industry rather than spread over the country. But in the former case the political pressures on governments are likely to be far greater. Hence, as many of the national submissions to the Sub-Committee have made clear, there may often be instances where the pollution abatement policy that appears to be desirable in the interests of resource allocation objectives appear to conflict with other objectives in that they would have a particularly damaging effect on employment in a locality or a particular industry, or would hit old and/or small firms.

Broadly speaking, there seem to be three types of solution to adopt in the face of such a conflict of policy objectives. First, the measures that would be appropriate on resource allocation grounds can be modified or relaxed; secondly, they can be maintained but with a time lag to allow for a transitional period of adjustment; thirdly, they can be implemented without any qualification, but accompanied by additional policy measures designed to prevent any departure from the extent to which other policy objectives are attained.

For example, consider the case where the appropriate policy for pollution abatement meant that considerable extra costs were imposed on some firms or industry in a certain area with the result that their competitive position would be badly threatened (nationally or internationally) and considerable local unemployment would ensue. In such a situation many authorities would be under pressure to abstain from the appropriate anti-pollution instrument and replace it by some measure that would be less efficient, from the resource allocation point of view, such as a subsidy to the industry concerned to install less-polluting techniques of production. This would be the first type of response to the conflict of objectives. It is open to the usual objection to any resource misallocation policy conducted on income distribution grounds, namely that, insofar as resources are misallocated, total national output is less than potential output, so that if output were maximized by optimum resource allocation it would, at least in principle, be possible for the losers from the anti-pollution policy to be compensated, or more than compensated, whilst the rest of the community was better off. In other words, there must be some distribution of the total cake that would make everybody better off, or somebody better off and nobody worse off, if the total cake is bigger rather than smaller. Whether the losers would, in practice, be compensated, however, is another matter and depends on the social and political circumstances. Whilst economists may have no expert knowledge of these circumstances, it is important that they draw attention to this aspect of the problem, rather than give the impression that there is absolutely no reason known to economic science why the resource allocation objective should ever be sacrificed in the interests of income distribution.

The second reaction to the conflict of objectives is to permit some transitional period during which firms have time to take appropriate measures in response to the introduction of policies to reduce pollution. This is the very common practice whenever tariffs on internationally traded goods are reduced. For example, the various internationally agreed rounds of tariff reductions and also the arrangements for the establishment of customs' unions of one kind or another (such as the EEC) invariably allowed transitional periods. The rationale of this is usually - apart from political pressures - that it is inequitable suddenly to remove some protection from domestic firms, in the interests of resource allocation, since the growth of the industries concerned, the investment of capital therein and the acquisition of skills and other ties by the labour force therein, have been developed in a situation in which tariffs did exist. Hence, they must be given time to find other outlets, other job opportunities, or other ways of adapting to the changed market conditions which have been brought about through deliberate governmental policy rather than the normal uncertainties of economic life which have to be accepted.*

A third reaction is to implement the full resource allocation policy to restrict pollution to the (assumed) optimum and to deal with the other problems that may then arise by entirely different instruments. For example, it might be thought that the best procedure would be to implement the pollution abatement policy that seems indicated on resource allocation grounds and to accompany this by measures to improve labour mobility, or re-training, or the entry into the region of alternative sources of employment that can be justified on resource allocation grounds. Of course, in some of these cases the accompanying measures might involve even more resource misallocation of a new form than did the initial excessive pollution. For example, measures artificially to stimulate the entry into a region of new industries that did not, otherwise, find it economical to go there will often involve resource misallocation, unless they can be justified in terms of longer-run dynamic effects, or extra economies of scale, and so forth. On the other hand, some instruments to minimize the local employment effects of anti-pollution policies might only involve improvements in information, at little cost, which thereby increase the efficiency of national resource allocation.

In principle, this third means of reconciling conflicts in policy objectives is the most attractive one. It corresponds to the well-known principle of economic policy to the effect that it is impossible to pursue several objectives without an equal number of policy instruments (that independently affect the different objectives). Hence, if the resource allocation objective, in the form of pollution abatement policy,

* Whilst profit receivers might be expected to bear the risks of uncertainty on the grounds that this is what profits are the reward for, it is more difficult to justify labour having to bear any of these risks.

conflicts with the employment objective, it is generally preferable to persist with the most appropriate resource allocation instrument, but to accompany this by an additional instrument, such as a fiscal or monetary or institutional instrument designed to bear on the level of employment.

But, apart from recognizing that, in principle, the third response to the conflict of objectives is preferable, it must also be recognized that, in practice, the appropriate instrument may not be at hand, particularly when it is local employment that is affected. In cases where pollution abatement means a loss of jobs, and where the only alternative for some time is unemployment, it can be argued that the shadow price of labour in such a situation is below its wage. In that case, the resource misallocation that would result from excessive pollution, in the short run, might not be as great as would appear to be the case if the social costs of the goods responsible for the pollution were valued on the basis of the nominal market price of labour. In such a situation, the second response to the conflict of objectives might be appropriate, namely, the use of a transitional period accompanied, as far as possible, by some measures to minimize the transitional difficulties, provided these did not tend to perpetuate the resource misallocation.

On the whole, this procedure would appear to be preferable to the first response, such as the introduction of subsidies to firms to introduce pollution abatement equipment. In general, this procedure is not likely to be very effective, except where accompanied by other measures to enforce or stimulate pollution abatement, and will anyway not lead to the most economical means of pollution abatement, as would be the case with the pollution charge. It is also likely to be very difficult to prevent such subsidies from being diverted partly to subsidize investment in general though this side effect may not always be entirely undesirable. But it may well be that particular circumstances and political pressures will lead to such measures, in certain circumstances. And given the fact that some basic value judgments lie behind any propositions about the manner in which resource allocation is "better" or "worse" (including value judgments about the prevailing income distribution and institutional arrangements in society which impinge on relative prices and costs) it is impossible for economists to say that such measures must always be undesirable.

But the economic experts are justified in drawing attention to some of the fallacies that are behind many of the arguments used in opposition to optimum pollution abatement policies. For example, the fact that it might mean a loss of jobs does not necessarily mean that the policy should not be adopted; for, as pointed out above, it is at least necessary to be sure first that no other instruments can be adopted to reconcile the national resource allocation objective with the other objectives, with which it is believed to conflict. If the facts are that no supplementary policy can be adopted to lead to this result, and that a chronic, quasi-permanent, increase in local unemployment

would result, that is another matter. But the relevant facts must be established in the first place. Otherwise, similar arguments could have been used throughout the ages - and no doubt were used - to oppose all sorts of measures to reduce international tariff barriers, to introduce safety regulations in factories, or other improvements in working conditions, or abolish child labour, and so on. But these measures have been taken, some short-run local effects on employment may have been felt in some cases (and in some cases the effects were acute and permanent), but this has not led to increasing unemployment overall; and, in the longer run, standards of living have risen.

Thus, apart from short-run adjustment problems or problems arising out of longer-run structural rigidities in the economy, which should be tackled by appropriate instruments for increasing the flexibility of the economy, there is no reason to believe that there is any fundamental choice to be made between jobs and pollution abatement. Insofar as policies lead to a reduction in pollution, they imply a shift in the pattern of resource use in the economy, not a change in the overall level of resource use. The former corresponds to an increase in use of resources as intermediate inputs in place of the pollution input, and hence a fall in the proportion of resources available for final output. The latter is a matter of demand management policy, which governments continuously need to bear in mind anyway, since in addition to continuous changes in the pattern of demand and output, the variables determining the overall pressure of demand are constantly changing.

In the same way, many firms and industries have argued that the introduction of pollution-abatement measures will put them at a competitive disadvantage *vis-à-vis* other countries, in that they will have to raise their export prices. The Sub-Committee has commented elsewhere on the implications of the Polluter-Pays Principle for international trade and the arguments need not be repeated here. Suffice it to say that a country's real income does not benefit by exporting goods that do not reflect its true social comparative cost of production (including the appropriate pollution abatement costs) and if, when these costs are included, there is a balance of payments problem, then the appropriate instrument to deal with this lies elsewhere, not in the field of pollution policy.

THE POLLUTER-PAYS PRINCIPLES
SCOPE AND RECOMMENDATIONS
FOR PUTTING IT INTO FORCE

(Note by the Delegation of the Federal Republic of Germany)

This working paper explains the comments on the Polluter-Pays Principle made in the Federal Government's environmental programme, and officially states the Government's position for purposes of domestic policy.

The Polluter-Pays Principle has in practice not yet been incorporated in environmental policy and the considerations set out here regarding the allocation of costs and fixing of standards for a meaningful application of the principle contain no proposals for using any particular instruments for implementing any particular environmental protection schemes. Domestic environmental policy will have to set targets for environmental quality, i. e. the selection and combination of the various instruments for implementing the Polluter-Pays Principle will be a task for domestic legislation.

1. The Polluter-Pays Principle means that the cost of avoiding, eliminating and compensating for environmental pollution must be included in the costs met by the economic transactors concerned (internalization), insofar as it has not yet been borne by the polluter (external cost). This cost includes any present and future expenditure and loss of profit, even if not directly assessable in money terms (e. g. reduced recreational value of the countryside). The internalization of this external cost means that it will not be imposed on third persons or on the public, so relieving public funds of the burden of financing measures for environmental protection. The question whether and how far it will be passed on in prices, like the cost of the other factors of production, is passed over in silence.

In this way environmental pollution can be reduced over a period to a level which will no longer endanger human beings, animals, vegetation and the inanimate world, or place an unreasonable burden on them.

Environmental policy measures likewise determine economic data such as infrastructure, labour costs and many other things.

2. As a rule, however, it will not be possible to internalize after the event the cost of making good damage which had already been caused

earlier (and is already written off) by applying the Polluter-Pays Principle in its right economic context. In order to deprive polluters of the cost advantages they enjoy and create incentives for introducing products and methods and production which do not harm the environment, it is not so important to assess damage which has already been written off as to keep track of present and future environmental damage.

3. The Polluter-Pays Principle does not affect claims under private and public law, especially claims for compensation. It contains no ruling on who is responsible for preventing or making good environmental damage but it means in practice that the cost of preventing or making good such damage will be charged to the polluter even in cases in which it is not the polluter, but someone else, who is responsible for preventing or removing the pollution (e. g. refuse disposal by local authorities).

4. A polluter is someone who directly degrades the environment or creates conditions which lead to its degradation. Here the only thing which is relevant to the application of the Polluter-Pays Principle is the ecological change which gives, or may not give, rise to external costs.

Environmental pollution may result from several conditions occurring simultaneously (cumulative) or successively (chain of polluters). When, for instance, the environment is polluted by motor vehicle exhaust gases, not only the user of the motor vehicle, but also those who manufacture it and produce its fuel, are creating conditions leading to air pollution.

5. In any given case, the nature of the measures which will serve to maintain the highest possible environmental quality, and the point in the chain of polluters which appears most likely to provide the best economic and administrative solution, should determine at what point in the chain the costs are internalized. It may be the point where the smallest possible and most easily controllable number of economic transactors is found, or where there is the best guarantee that market forces will determine the price-effectiveness of these costs. Internalization should not, however, make the parties affected by it switch to other forms of environmental pollution. For these reasons, it will often be desirable to choose a stage in the production process, because this would also create incentives to use new processes or products which do not pollute the environment.

6. The Polluter-Pays Principle could be applied in its pure form if the costs arising from environmental pollution were charged in full to the polluters, but there are only limited possibilities of ascertaining the external costs and allocating them individually.

As a starting point for quantifying and evaluating environmental pollution one can take, among other things, the efforts which have to be made in order to eliminate or avoid the disutilities caused by

polluting environmental resources (air, water, soil, etc.). Here it is essential to develop the requisite underlying principles and criteria and make it possible to quantify, evaluate and weigh up the advantages and disadvantages involved. This means that one should try to achieve an environmental quality (or standard of environmental quality) which costs less to maintain than making good the damage which would otherwise be caused. The polluters have to bear the cost of achieving the prescribed environmental quality, but this does not preclude their meeting the remaining external costs also (see paragraphs 13 and 16 and following).

In allocating external costs, it will be necessary to obtain the data most likely to provide allocation formulas which correctly reflect the relative responsibility of each polluter for degrading the environment. These formulas will be based on the proportion which each individual polluter contributes to the total emission, unless ecological information on the effect of individual emissions is available.

7. Standards for environmental quality are to be fixed with reference to the ecological facts and to the objections of regional planning, which can allow for differing local conditions. Accordingly, the standards set for certain emissions, for instance noise, can differ from place to place, and this will affect people's choice of a site. It will give regional structural policy new impulses, but must not be allowed to lead to lowering environmental quality in relatively unpolluted areas as long as all the means of preventing emissions have not been exhausted.

Instruments for implementing the Polluter-Pays Principle

8. The following instruments have to be considered:
- Processing Standards;
 - Product Standards;
 - Individual regulations and prohibitions;
 - Levying charges.

The standards of environmental quality which are laid down will provide the yardstick for rating them, but even without such standards the use of these instruments will, in fact, result in a certain environmental quality, although it will not be known in advance. If there is a danger that the standard of environmental quality will not be met because of increased emissions, either the charges levied will have to be raised in good time, or processing and product standards will have to be tightened up so that the standard of environmental quality will be maintained, in spite of the difficulty of altering waste treatment plants.

9. When processing and product standards have been laid down and individual regulations and prohibitions issued, the Polluter-Pays Principle will operate to the extent that the polluter reduces pollution and thereby avoids external costs by complying with the standards or by cutting down production or converting, resiting or closing down his plant.

Standards and prohibitions

10. Processing standards include:
- a) emission standards which set limit values for pollution and disamenities which must not be exceeded in emissions from stationary sources;
 - b) design standards for stationary plant prescribing the requirements to be observed with regard to environmental protection when planning and constructing stationary plants;
 - c) operational standards stipulating the requirements to be met with regard to environmental protection when operating stationary plants.

Production standards are:

- a) for fixing limit values for the quantities of harmful substances or disamenities which must not be exceeded in the composition of, or emissions from, a product;
- b) for determining the specifications and properties of a product;
- c) for prescribing the method and conditions of use of a product.

These standards are laid down in government regulations. They should consolidate the level of technological development reached at any given time and, in the light of development trends, should fix long-term targets for industry (e. g. the Act on the Lead Content in Gasoline).

11. Processing standards can either be the same for the whole economic area, or can vary from place to place in accordance with local differences in standards of environmental quality and the use made of them, but they must in any case be strict enough to ensure that the standard of environmental quality will be complied with.

12. Product standards should be the same for the entire economic area, in order to ensure that the products will be marketable everywhere in it. They should normally apply to the final product, since it is usually the latter and its intended end-use which determine the pollution. It is only when some or all of the final products manufactured from the same primary product cause comparable pollution that product standards can be fixed for the primary products or the raw materials.

13. Processing and product standards are based on the state of technology or on its expected trends and therefore allow as a rule for a certain amount of pollution. This may give rise to external costs, which can be met by other means (see para. 17 and following).

14. A ban may be placed on production in general, or in certain places, or on marketing of products, either permanently or for limited periods.

15. Individual regulations lay down how these rules and prohibitions apply in particular cases.

Levying charges

16. Charges are levied in order to deprive the polluter of the cost advantages he derives from polluting the environment. The external costs are internalized because the emitter either reduces pollution by taking certain measures, e. g. making investments, and so pays less in charges, or he pays the charges in full and thereby offsets the external costs.

Basis for levying charges

17. Reliance on the self-cleansing power of environmental resources reaches its limit when external costs arise, which is why a charge should be planned for every emission liable to cause external costs now or in the future, no matter whether the pollution can or cannot be avoided in the current state of technology.

As a matter of principle, the charge should also be payable while the measures for abating pollution are being carried out, for instance during the construction of waste treatment plants, and also on the residual pollution after a waste treatment plant has begun to operate (paras. 21 and 28).

18. Compliance with a standard of environmental quality may be achieved by levying a charge on every unit of emission. The polluters will then treat their emissions to the point where the cost of treatment and the charges levied balance out. The level of the charge will depend on the standard of environmental quality and the average self-cleansing capacity of the environmental resources; the higher the environmental quality demanded and the greater the total emissions, the higher the charges must be in order to achieve the required treatment of individual emissions.

Costs will only be completely internalized by this means, however, if the standard of environmental quality is fixed in such a manner that pollution will be avoided to the extent that it will be cheaper to avoid it than to repair the damage it would cause. The remaining external costs will be met from the charges levied on the remaining environmental pollution, but the costs will then only be completely internalized if the revenue from the charges is not used to subsidize the polluters.

19. External costs caused by using certain products may also be internalized by levying charges. The charges must be fixed at the level of the cost of repairing the damage caused by the pollution involved and they must be the same for all products, since, as has already been explained in connection with product standards, the products will mainly be movable commodities which are marketable throughout the whole economic area.

The question whether the charges should be levied on the end-product or the primary product arises in the same way here as in the case of product standards.

20. A system of charges will be an inducement to invest in environmental quality as well as to convert to processes and products which do not harm the environment. The rate of charge can either be uniform or vary from district to district.

The principles described in paragraph 18 for calculating the charges can also be used for calculating charges at different levels according to the locality. Under this system, and with a planned standard of environmental quality, the amount of the charge will be determined by the expenditure required in each locality for maintaining the standard, and it would be pure coincidence if the calculation for this purpose gave the same result for each locality.

The rate of charge cannot be uniform if one carries the Polluter-Pays Principle to its logical conclusion, but it may be desirable to make it uniform for other reasons of environmental policy and for administrative convenience.

If there is a uniform rate of charge within a uniform economic area, the result will be that polluters will have no chance to move to areas where the charges are lower, but will have to concentrate on reducing the amounts of pollution they emit and/or the specific damage they cause.

If different regions are treated differently, allowance can be made for local differences in ability to pay and in actual levels of pollution, and an incentive can be given to deconcentrate by weakening the centripetal force of the areas of industrial concentration.

If the rate of charge varies according to the region, there may be the danger that, when the upper limit for pollution is reached, the charge will not be increased and that regions with low rates of charge will exert an attraction on entrepreneurs even when pollution limits are exceeded. There may also be the danger that, when the rate of charge is fixed for a region, allowance may not be made for pollution caused outside it. These dangers can be avoided if rates of charge are fixed in accordance with the country-wide principles in paragraph 18, and regional decision-making bodies are prevented from exercising influence.

A policy of "neutrality in competition" will not necessarily involve having a uniform rate of charge throughout a homogeneous economic area. The principles stated in paragraph 18 for calculating charges enable different rates to be fixed for different regions and, if different levels of external cost could be associated with different localities, a uniform rate of charge would not result in "neutrality in competition".

Use of revenue from charges

21. The principle of internalizing external costs demands that the environmental damage suffered by the public or by third parties should be compensated by the revenue from the charges levied.

In order to prevent pollution quickly and effectively, however, it is advisable to earmark this revenue for financing measures for preventing pollution and eliminating residual pollution (para. 17), giving projects which do not afterwards result in relieving individual polluters of costs. That is to say, no assistance should be given to polluters who are already being encouraged by the charges to carry out waste treatment on their own.

The Polluter-Pays Principle will also be observed even if the charge is paid while a waste treatment plant is being built. The polluter will then be burdened with the cost of building the plant and with having to pay the charge. This is the only way to make a polluter finance all the factors involved and to arrive at a price for his product which truly reflects its scarcity value. For the same reason the Polluter-Pays Principle will be infringed if a fund is set up for financing investment by polluters in environmental protection. If deferred payment of the charge is allowed during construction, or if it can be paid out of a fund fed by the proceeds of the charge, the result is tantamount to postponing payment of the charge and therefore to a derogation of the Polluter-Pays Principle.

Selecting the instrument for giving effect to the Polluter-Pays Principle

22. Apart from its possibly higher administrative cost, the levying of charges offers a way of achieving and maintaining a certain environmental quality at less cost than by imposing uniform processing standards on all polluters.

Of course, the extent of the cost reduction made possible by levying charges will depend on the diversity of the waste treatment costs of the individual polluters. Where there are no major differences, the saving achieved by levying charges will be unimportant and in this case one may be justified in laying down processing standards, but one will then have to accept the fact that there will be no inducement to treat wastes beyond the required level. The payment of charges, on the other hand, is a continual spur to polluters to try to emit less pollution.

It is only possible, however, to achieve an overall reduction in costs, while maintaining the same level of waste treatment, by levying charges instead of laying down processing standards, if the overall cost reductions shown in the model are not offset or exceeded by higher administrative expenses (whether incurred by public funds or by the polluters).

23. From the plain administrative point of view, there are two main objections to levying charges: First, it is said to be impossible to calculate the optimum rate of charge, and secondly, it is very difficult to measure and monitor the pollution on which the charges are levied.

It is true that, in the absence of accurate information, the damage caused by pollution and on the waste treatment costs of the polluters,

optimum waste treatment cannot be achieved, but this problem exists irrespective of whether one seeks to obtain the optimum by laying down processing standards by levying charges, so it is not an argument against the levying of charges.

Similarly, difficulties in measuring and monitoring are involved both in enforcing processing standards and in calculating and levying charges. The temptation for polluters to evade processing standards is very strong, and they will try hard to have emission standards fixed at the lowest possible level. Experience shows that infringements of processing standards are as a rule punished by fines which are too low, when they are punished at all, but, when a charge is levied per unit of pollution emitted, these problems do not arise to the same extent.

It is easier to establish strict processing standards or enforce pollution limits if one combines them with a system for levying charges.

24. Individual regulations should only be issued if regulations for general application are impossible.

25. Prohibitions are indicated when emissions lead to unavoidable risks for human being, animals, vegetation and inanimate objects. This applies, too, if the risks could only be avoided at a cost which would be economically unjustifiable, but prohibitions on particular products or operations are not indicated if for the great majority of the economic transactors concerned the cost of abating the pollution caused by these products or operations to the required extent is less than the cost of substitution products or alternative operations.

Combinations of instruments for giving effect to the Polluter-Pays Principle

26. Combinations may also be used of processing and product standards, individual regulations prohibitions, and levying charges. Whereas processing and product standards as a rule still allow some pollution to be emitted, any charges levied will also be levied on this residual pollution, so that the financial burden on a polluter may vary according to whether he only has to comply with standards or only has to pay charges. This difference in the burden on polluters can be removed by combining the two systems. The use of processing and product standards, combined with the levying of charges, could prove specially desirable when technology is not far enough advanced for abating pollution sufficiently.

Exceptions to the Polluter-Pays Principle

27. The public sector should, in principle, only have to bear the cost of making good environmental damage if (a) the polluter has not been identified, or (b) acute emergencies have to be dealt with and this cannot be done quickly enough with the instruments described above (i. e. in exceptional cases).

28. Methods for dealing with such exceptional cases are the following:
1. By temporarily postponing the application and enforcement of the Polluter-Pays Principle (e. g. step-by-step enforcement of standards of environmental quality, grace periods, and exemption from paying charges while waste treatment plants are being built);
 2. By providing financial incentives to invest in environmental protection by:

underwriting:	}	normally by the Land
granting loans:	}	governments;
granting financial aid	}	by the finance authorities.
(open subsidies):		
granting reliefs:	}	

These facilities would have to be very strictly controlled, since the financing of investment in environmental protection is not a government responsibility which has to be paid for out of public funds.

It is not yet clear from practical experience so far which of the above facilities is the most effective for financing investments in environmental protection.

The question of tax reliefs cannot be separated from tax reforms, the overall use of public funds and the total burden on the budget.

Effects on international trade

29. Different processing and product standards, individual regulations, prohibitions and rates of charge in different countries result in different production costs for industry which may influence international trade. They may create new barriers to commodity trade, both between industrial countries and between industrial and developing countries.

30. The aim should therefore be to secure international recognition and enforcement of the Polluter-Pays Principle in order to prevent impediments to international trade. If, in all countries, the cost of measures for protecting and managing the environment was borne by the polluters and so was included in their production costs, the reason for obstructing international trade and applying special border adjustment measures would disappear.

Equality of costs for measures of environmental protection cannot be achieved by a world-wide application of the Polluter-Pays Principle. The costs of the necessary investments alone would presumably differ, but, more important, the prevailing environmental situation in each country is different. It is possible that the levels of environmental quality adopted as standards might vary from country to country, just as they might vary between different parts of the same country. Accordingly, different processing standards might be laid down by individual countries in order to achieve or maintain a generally accepted level of environmental quality. If environmental conditions were different, and costs were therefore also different, it would be right to levy charges at different rates in each country.

These differences are due to differing natural advantages in the environment of each country and can be of special importance in the industrialization of developing countries.

31. It will presumably be a long time before the use of the Polluter-Pays Principle becomes widespread internationally. Even if there were world-wide harmonization, divergencies would occur owing to differing policy objectives; but even so, new impediments to trade should, as far as possible be avoided by applying the rules of the GATT and the Treaty of Rome.

32. Differences in processing standards should not normally require compensatory measures to be taken, even in a transitional period, but in extreme individual cases, the question would have to be examined whether and on what conditions temporary compensatory measures should be taken (in order to prevent economically unjustified resiting of production facilities). Such measures, however, would have to comply with GATT rules. For the present it may be assumed that this problem is not yet of practical importance, because such sharp international differences in pollution situations have not appeared.

33. It follows from what has been said that a producer will be induced to avoid polluting, or to make good the damage his pollution causes, even if the commodity he makes is exported; but, if the pollution emanates from the product themselves, there will be no reason to make a domestic producer pay for damage he causes abroad. Product standards need not apply to exported goods and charges levied on products which pollute could be refunded when they are exported. On the other hand, when polluting products are imported, the appropriate domestic charges should be levied, no matter whether the pollution occurs after the product has been used (e. g. disposal of refuse such as waste oil, motor car types, motor vehicles) or during use (motor vehicle exhaust gases).

34. Different product standards in the importing country have to be taken into consideration by the exporting country, and nowadays this is often done. In such cases, however, the imported products should be treated in the same way as home-produced commodities, i. e. discrimination should be avoided.

35. Technical trade barriers which arise from applying different product standards can be avoided if a charge is levied instead (paras. 18 and 32). A commodity which does not comply with the product standard will be excluded from the market, even if it falls only slightly short of the requirements or satisfies them by using a technology other than the one prescribed. Levying a charge, on the other hand, merely raises the price of the product by the extent to which it fails to come up to the importing country's standard of quality and does not exclude it outright from the market.

A NOTE ON SOME ASPECTS OF THE
“POLLUTER-PAYS” PRINCIPLE
AND ITS IMPLEMENTATION*

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1. This note which is analytical rather than prescriptive is offered as a contribution towards clarifying some of the questions associated with the Polluter-Pays Principle and its implementation.
2. After a brief account of what we understand to be implied by the adoption of the Polluter-Pays Principle, the note and its annex consider some of the ambiguities of the concept of environmental pricing. Many of the present disagreements seem to derive from these ambiguities. The term “environmental pricing” has been used on occasion to embrace charges ranging from, for example, those which a public authority imposes on a firm for treating the effluent which the firm discharges into the public authority’s sewers, to charges which are best described as a tax by means of which the polluter pays society for the benefits which he draws from his use of the scarce resource “environment”. Accordingly, here we consider some of the different forms of environmental pricing. One main respect in which they differ is in the extent and economic nature of the revenue which they yield and it is with these aspects that the annex to this note is concerned.
3. The discussion covers:
 - the interpretation of the Polluter-Pays Principle (paras. 4–10);
 - the implementation of the Polluter-Pays Principle (paras. 11–19), of which:
 - charges for clearing up pollution (para. 14 and Annex, paras. 2–8);
 - charges intended to induce abatement, especially where control cost curves differ between polluters (para. 15 and Annex, paras. 9–18);

* This note is a contribution to the discussion on the Polluter-Pays Principle and its implementation. It represents a personal view and is not a statement of United Kingdom policy.

- the relationship between charges to induce abatement, charges viewed as the purchase of rights to the environment and charges as a tax on an economic rent (paras. 16–18 and Annex, paras. 19–27);
- exceptions to the Polluter-Pays Principle (para. 19);
- conclusions (paras. 20–22).

THE INTERPRETATION OF THE POLLUTER-PAYS PRINCIPLE

4. We regard the Polluter-Pays Principle as a principle for the allocation of the costs associated with abating pollution to that level which has been deemed acceptable by the relevant authorities, and as such we interpret it as a no-subsidy principle. The principle requires the polluter to be solely responsible for the costs of controlling pollution to the “acceptable” level. It does not require the polluter to be financially responsible for any residual damage.

5. For the Polluter-Pays Principle to be fully implemented, it is necessary not only that the control costs be incurred by the dischargers but also that the pollution be controlled to an “acceptable” level. Thus in interpreting the Polluter-Pays Principle as a no-subsidy principle, the term “subsidy” should be defined broadly so that it includes the situation where the polluter is not given a sufficient incentive to abate his pollution and the situation where the implementation of controls is delayed.

6. Although the abatement of pollution to an “acceptable” level is a necessary condition for the full implementation of the Polluter-Pays Principle, the principle itself says nothing about what the acceptable level ought to be. The decision as to the level is a decision to be taken by individual member states, based upon their evaluation of the use to which their environmental resources are best put. In defining the level to which pollution is to be abated member states may wish to follow the guidance given in the Guiding Principles and make the closest feasible approximation to the economists’ estimate of the optimum level, namely the point where the marginal control costs equal the marginal benefits from control. There is however no obligation upon governments to employ such economic criteria in their decision making.

7. Although the Polluter-Pays Principle does not require the polluter to be responsible for any residual damage costs, it does not exclude individual member countries from imposing such costs on the discharger. But, as with the definition of the acceptable pollution level, this is a decision that can only be taken by each country and will be taken in the light of its own environmental philosophy and general taxation policy.

8. The Polluter-Pays Principle is an efficiency principle only in the sense that it ensures that the discharger will seek out the least cost

methods of controlling the quality of what he discharges: if the authorities were to subsidize control, there would be no incentive for the discharger to expend any energy on working out ways of reducing his costs. But its implementation does not necessarily result in the attainment of an economic optimum; it is not an efficiency principle in this stronger sense.

9. As a no subsidy principle, the Polluter-Pays Principle only excludes aid that is financed from general State revenue. It does not exclude aid that is financed from funds collected from other dischargers, since such payments would represent the purchase by one discharger of clean-up services from another discharger, and in this sense is no different from any market transaction.

10. The Polluter-Pays Principle makes polluters bear the costs of pollution abatement; it makes them internalize some proportion of the external costs which they impose on society. Whether it is the production process which gives rise to the pollution, or the consumption of the final good or service produced, the costs of the pollution abatement should be borne at whatever point is most effective and most (administratively) convenient in the chain of production and consumption services. In the case of controls that are levied on the producer, it does not matter as far as the Polluter-Pays Principle is concerned whether the costs are absorbed by the producer or whether they are passed on, wholly or partially, in higher prices for the good or service produced.

IMPLEMENTATION OF THE POLLUTER-PAYS PRINCIPLE

11. The Polluter-Pays Principle is implemented in a number of ways. The main ones are the imposition of standards, or the imposition of charges of one kind or another.

12. The problems involved in the imposition of standards mainly concern the difficulty of deciding what standards to set. Once this decision is taken, provided the producer has to bear the costs of meeting a given standard himself, without subsidy for this purpose, the Polluter-Pays Principle operates and in general gives rise to no further complications.

13. However, the imposition of charges is much less straightforward. Charges may take any of a number of forms – some of the more important of these are discussed in the Annex. In particular, charges may be of several kinds:

- charges to pay for the services of a clearing-up agency;
- charges on polluters to induce them to abate pollution to a desired level;

– charges which are a tax on the economic rents arising out of the scarcity of the environment, which may to some extent be true taxes unrelated to any considerations of environmental policy.

14. Charges to pay for the services of a clearing-up agency are in general not the subject of any contention and there is no suggestion that the revenue should in general go anywhere but to the clearing-up agency.

15. If a member country does not wish to allocate rights in the environment to any one group of users without concern for the costs imposed on the others and if it also considers it necessary that the cost to industry of attaining the desired pollution level be kept to a minimum, then no element of taxation is allowed. Apart from charges for collective abatement services, only those charges outlined in the Annex (paras. 14–16), where there is no net charge on industry in the long run, are permissible. If however the redistribution of the charges collected from dischargers along the lines indicated in the Annex is not practicable then some degree of taxation on economic rent becomes unavoidable (Annex, para. 17). The cost to industry is kept to the minimum which is practicable and it cannot be said that environmental rights are being allocated exclusively to any group of users to any extent greater than the minimum compatible with the desired degree of pollution abatement.

16. The argument in the Annex, paras. 18–27, indicates that charges levied on polluters to induce them to abate pollution to a desired level have at least two components under any charging system except that mentioned in paragraph fifteen above. Any charge levied on units of pollution below the average level to which pollution is to be abated is a tax which has no connection with the Polluter-Pays Principle. To the extent that it is related to the damage associated with the pollution, it may sometimes be hypothecated to environmental purposes, but this depends on the allocation of rights in the environment adopted by an individual country. Most systems of charging will include a certain element of such a tax. Some charges levied on pollution above the level to which pollution will ultimately be abated are transitional only. These may be used in order to speed the process of transition (by additional expenditure on pollution abatement equipment, or on research, for example) or they may simply go into general revenue. In addition to any transitional portions of a charge, there will usually be a permanent portion. This may be a charge used to finance an abatement agency – in which case the charge is used to clear up the pollution – or it may be simply the amount paid by firms which prefer to pay a charge rather than abate their pollution. Such payments may be regarded as payments for the right to emit a certain amount of pollution; they are not transitional payments because the firms which pay

them do not find that they provide sufficient incentive to induce additional abatement. There is no reason why the revenue from such charges should be hypothecated to pollution abatement expenditure.

17. To the extent that a charge is unrelated to the damage caused, it can only be regarded as a part of general taxation. The revenue should not be hypothecated. But it is extremely difficult in practice to disentangle that proportion of a charge which is related to the damage from that which is entirely unrelated. Hence it is not surprising that the imposition of charges which are not related directly to clearing-up should often be contentious, and that there should be disagreement over the extent to which such revenue should be hypothecated to various anti-pollution purposes.

18. Where charges associated with environmental objectives ought to be regarded as taxes, because the extent of damage is unknown it is often very difficult to disentangle the tax element from the element which may have an environmental function in any given charge. Except in the context of specific international agreements, and except where there is a presumption that a tax (or more often, a subsidy) constitutes an unfair impediment to trade, taxation is a matter for national (and sometimes regional) governments.

EXCEPTION TO THE POLLUTER-PAYS PRINCIPLE

19. The Polluter-Pays Principle should only be regarded as inviolable to the extent that the implementation of this principle does not conflict with other national economic and social goals. For example, if as a result of the imposition of controls firms are forced to cease operations the authorities will, in their efforts to solve one social economic problem (pollution), have generated another (unemployed resources). To prevent the generation of such social costs state subsidization should be permitted. Another example of conflict is where there is already an active regional or industrial policy – pollution control costs should in such a situation be treated no differently from any other production costs and subsidization of this nature should be treated as a valid exception to the Polluter-Pays Principle. There are doubtless other examples that can be produced and the subject of exceptions should be given a detailed examination by the Sub-Committee

CONCLUSIONS

20. However, all that it is reasonable to except from broad international discussion is acceptance of a series of general propositions, which might concern:

- the desirability of internalizing at least some proportion of the externalities (damages) associated with pollution;
- the undesirability of subsidies as a general means of achieving this end;
- the relationship between environmental policies which use the Polluter-Pays Principle and other policies such as regional policies and social policies.

21. The Secretariat note of 20th March, 1973 adopts this approach and as such, appears to us to provide an appropriate basis for discussion. It would not appear sensible to attempt to cover any wider ground or to attempt any more specific interpretation of the means of implementing the Polluter-Pays Principle than is attempted there.

22. It would seem that it is only appropriate to try to reach further international agreement by reference to particular products, particular processes, or particular regions which happen to lie within more than one country.

Annex

TYPES OF ENVIRONMENTAL PRICING AND THE ASSOCIATED REVENUES

1. Much of the controversy surrounding environmental pricing arises because environmental pricing policies can take a number of different forms, and yield revenues of a number of different kinds. Accordingly, this annex considers:

- i) charges to cover the costs of clearing-up (paras. 2–8);
- ii) charges intended to induce abatement by the polluter himself (paras. 9–18);
- iii) charges as a tax on an economic rent (paras. 19–27).

TYPES OF ENVIRONMENTAL CHARGES AND TAXES

2. The first distinction which it is necessary to draw is between charges which are imposed to cover the costs of clearing up by some collective or other agency, and charges which are intended to induce abatement of pollution by the polluter himself.

i) Charges to cover the costs of clearing-up

3. Consider first the case where the pollution charge is used for the provision of collective services to clear up some of the pollution. In diagram 1, perfect knowledge is assumed so that it is possible to set the norm ON or the charge OC to achieve the optimum allocation of resources, reducing pollution from the present amount A to amount N, where the marginal damage costs equal the marginal control costs. In diagram 2, knowledge of damages is no longer perfect, so that a precise marginal damage cost curve cannot be drawn. But it is assumed that enough is known so that the intersection of the norm N, or the charge C, with the marginal control cost curve will lie within the band where the possible marginal damage cost functions cut the marginal control cost curve.

4. It must be noted that even in diagram 2 the concept which underlies the setting of the charge is that of cost-benefit analysis. The benefit is known imprecisely, so that the appropriate charge or norm is also subject to a certain margin of imprecision, but the intention is to

approximate as closely as possible to the position where marginal control costs would equal marginal damage costs, if known. In general this implies abating pollution from the present level, but not as far as the minimum which is technically feasible – only as far as the minimum which appears worthwhile in view of the competing claims on scarce resources.

5. In both diagrams, the marginal control cost curve for the collective facilities is shown with an unbroken line; the marginal control cost curve for a firm when it abates its own pollution is shown with a dotted line. (If the firm's own abatement costs lie entirely below the collective abatement charges, it will not make use of the collective facilities at all but will prefer to undertake its own abatement entirely as far as the point where its marginal control costs equal the charge which is imposed. Hence we do not need to show this case on a diagram concerned with collective abatement facilities.) In both cases, if the collective agency imposes a charge OC on all units of pollution, or on all the units above N , which it is intended should be abated, then the firm will minimize the costs of abatement to itself by abating its own pollution as far as B , where its marginal control costs reach the level OC , and by paying the collective agency the amount shown by hatching in the diagrams so as to abate pollution from OB to ON .

6. However, the costs to society of abating pollution as far as ON would be minimized if the firm simply paid the clearing-up agency to abate pollution from OA to ON , since the clearing-up agency in the cases shown can clear up at lower marginal cost than the polluter. The minimum payment which the firm would need to make to the clearing-up agency to cover its costs is shown shaded in diagram 3; any charge by the agency ranging from that shown shaded in diagram 3 to that shown shaded plus that shown hatched should in principle achieve the desired result of allowing the clearing-up agency to undertake all the abatement. Clearly, the pricing policy of the clearing-up agency will determine how much of the (shaded plus hatched) area it receives as revenue. Strictly, the shaded area can be regarded as what is required to cover the agency's costs, and the hatched area as producer's surplus. It is formally identical with any surplus arising out of the operation of a nationalized industry; it would in general be very odd to consider this as a tax, or as something which should be paid to central government as a part of general revenue.

7. If a charge is applied only to pollution above the level to which the pollution is to be abated, the revenue from it should be regarded simply as a consequence of the price which the collective facility charges for its services. If this is all which is charged to the polluters, then the service of clearing up their pollution is like any other service for which a charge is made. The optimum size of this charge requires detailed

discussion; e. g., should marginal cost-pricing be used? How should the clearing-up agency raise the capital which it requires? But this is a discussion common to the conduct of all nationalized industries. Alternatively if the clearing-up agency were in private hands, the way in which it conducted its business would be no different from that of other companies. But in either case, there would seem to be no conceptual difficulty in allowing that whatever revenue is raised on the units of pollution which are to be abated, this revenue should go to the clearing-up agency.

8. However, if a charge is levied not on that amount of pollution which it is intended that either the firm or the collective agency should abate, but on a greater proportion or even on all the pollution which the firm produces, then the revenue from the charge will include not only areas to the right of N in the diagram, but also some or all of the area between O and N , shaded in diagrams 1 and 2. This shaded area does not in any sense represent costs incurred by the collective clearing-up agency; it is a tax on an economic rent arising out of the scarcity of the environment. Hence the question of whether the charge should be levied on the total amount of pollution, or simply of that amount above the level to which pollution is to be abated, is an extremely important one. If the charge is levied on all pollution, that revenue arising from pollution below the level which pollution is to be abated must be regarded as the revenue from a form of tax, which will be discussed in paragraphs 19–27 below.

ii) Charges intended to induce abatement by the polluter himself

9. Now consider the case where the pollution charge is simply intended to induce the polluter to abate his own pollution. This case is shown in diagrams 4, 5 and 6. As in diagrams 1 and 2 respectively, diagram 4 sets a norm N at the point where the (aggregate) marginal damage cost curve cuts the (aggregate) marginal control cost curve; in diagram 5, a norm is set directly for the aggregate of polluters. Again, the two cases differ only in that in 5 no precise damage function is known, and so no damage function is shown. Once the aggregate norm N and charge OC are set, we can examine the behaviour of the individual firm (i) in response to the charge. $N_{(i)}$ for the individual firm is such that $\sum N_{(i)} = N$; it is subject to no other constraint. $N_{(i)}$ will differ from firm to firm, since different firms have different marginal control cost curves. Where firms have identical marginal control cost curves and face identical demand curves for their products, there is no need to consider adopting a charging policy; the imposition of a uniform norm will be equally effective. It is precisely because firms have differing control costs and hence will abate differently that charging can lead to a more cost-effective abatement of pollution than the imposition of a norm. Diagram 6 shows the response of firm (i) to the imposition of charge OC .

10. As in cases 1 and 2, if a charge is imposed on all pollution there is revenue shown by the shaded area. This revenue is a form of economic rent, arising out of the scarcity of the environment. The scarcity itself arises out of the extent of society's demands upon the absorptive capacity of the environment. Just as in paragraph 8, if the state decides to cream off the economic rent, this must be discussed as part of taxation policy. Just as in paragraphs 6 and 7, if the state is not taxing the economic rent, the charging policy still requires detailed examination, since an allocation of resources which minimizes the burden on polluters would make dischargers incur only their control costs.

11. Again, consider first the proceeds of a charge levied on that pollution which it is intended should be abated. One possibility is that the proceeds of such a charge be used in the transitional period to subsidize the purchase of abatement equipment by polluters as a way of making inefficient producers respond rationally to the charge in the short run. If they were efficient, they would have avoided the charge by installing the abatement equipment themselves. Alternatively, the long-term provision of the services of pollution abatement equipment could be regarded as the provision of an abatement service just as much as a sewage works or a communal refuse disposal service. But, just as in these cases, these remarks do not apply to any tax on an "economic rent" (see diagrams 1 and 2).

12. But whilst the proceeds of a charge on that pollution above the level to which it is hoped pollution will be abated may be used to help reach this level more quickly, there is no reason why they must be used in this way. The imposition of the charge itself should in theory be sufficient to ensure that the desired level is reached in the end. Anyway, once it is reached much of the proceeds from the charge will vanish. Any further proceeds from the charge are of two kinds: they have the nature either of a price paid by the polluter for the right to a certain portion of the assimilative capacity of the environment or they are simply a tax on an economic rent.

13. Consider first the remaining charges as the price paid by the polluter for the use of some of the assimilative capacity of the environment. If all polluters are identical, there is no need for any such revenue. Refer to diagram 5 and take it to represent each and every polluter; once the charge OC is imposed on units of pollution above \bar{N} and polluters have adopted their behaviour accordingly, pollution is abated to ON (equal to $ON_{(i)}$) and there is no revenue from the charge.

14. But polluters are not usually identical. Consider the diagrams 7, 8 and 9. The imposition of charge OC causes some firms to abate more than the average and others to abate less, till on average $O\bar{N}$ units of pollution (diagram 7) are produced. But the question arises of the number of units of pollution on which the charge should be levied.

For all firms to abate sufficiently to achieve the aggregate norm \bar{N} , the charge will have to be levied at least on all pollution above $N_{(\min)}$, where $N_{(\min)}$ is the least amount of pollution which any firm chooses at charge OC. (See diagram 8). But then the average firm (diagram 7) or indeed any firm j with a cost curve lying to the right of that of the firm in diagram 8 at the point $N_{(\min)}$ (diagram 9) is still paying the charges represented by the shaded area.

15. At this point it can be argued with correct logic, that firms collectively are paying higher charges than are strictly necessary to cause pollution to be abated to \bar{N} on average. If the charge were instead levied simply on units of pollution above $O\bar{N}$, some firms (j) would still pay a charge even after they had abated this pollution to \bar{N} . But if the charge raised from the (j) firms were paid to the other firms as a subsidy per unit below \bar{N} by which they reduced their pollution, then these firms would abate their pollution as in diagram 6 (para, 9), so that, on average, each firm would produce pollution $O\bar{N}$.

16. This approach is in conformity with the Polluter-Pays Principle. Those who pollute by more than the average to which pollution is to be abated bear all the costs of the abatement by the industry. There is no net subsidy from the state to the industry to abate pollution although there is a payment within the industry from one firm to another; the high-control cost dischargers pay the low-control cost dischargers to do their clearing-up for them.

17. The redistribution of charges between discharges may be fraught with administrative difficulties. However, it is only if the constraint that no surplus accrue (to any firm or agency or to government) from charges levied on industry is regarded as inviolable that any problem need arise. If the long-term element in any charge related to that pollution which is not abated can be regarded as a permissible tax on an economic rent, then it is no longer necessary to ensure that industry pays only the minimum which is logically necessary to attain the desired amount of abatement.

18. $N_{(\min)}$, if attained by all firms, would not imply the complete abolition of the emission of potentially polluting substances, nor even the reduction of such emissions to the minimum which is technically feasible. $N_{(\min)}$ is simply the level which it is judged necessary to choose in order to ensure that pollution on average is abated to \bar{N} . Polluters can be regarded as bidding for rights in the assimilative capacity of the environment over and above those represented by $N_{(\min)}$, that is, for shares in the assimilative capacity required by the quantity of pollution $\Sigma(\bar{N} - N_{(\min)})$. The charges accruing to the relevant authority are a charge on the economic rents accruing to the polluter from his use of the scarce resource, environment.

iii) Charges as a tax on an economic rent

19. It is of course possible to tax, (rather than charge) some of the economic rents that accrue to polluters because of the scarcity of the environment by amounts greater than that indicated in diagrams 7–9 at $N_{(\min)}$. Any such tax will induce abatement of pollution to the point where the tax per unit equals marginal control costs, and the revenue which remains in the long run, after such abatement, can be regarded as a tax on an economic rent, regardless of whether the pollution has been abated to an optimum point, to a minimum point dictated by technical considerations, or to any other point.

20. Some explanation is required of the sense in which it is appropriate to regard economic rent as a return which accrues to some part of society as a result of the scarcity of “environment”. If economic rent is defined as a payment to a unit of a factor of production in an equilibrium situation in excess of the minimum required to keep that factor in its present occupation, then it would seem that “environment” resembles “land” both in that it is in fixed supply and in that its users derive positive benefit from its use. This positive benefit is indicated by the opportunity costs shown by the area under the marginal control cost curve. The damage inflicted on all those who use environment in ways other than as a disposal medium is shown by the area under the marginal damage cost curve. To the extent that rights in the environment are vested in society as a whole, it could levy some “rent” regarded as a form of compensation to the extent of the damage which polluters impose upon other environmental users (including the polluters themselves in other roles) or it could levy “rent”, in the stricter economic sense of what the market would bear, to the extent of the area under the marginal control cost curve. We will consider the latter concept first and then that of a tax on the use of the environment simply as a payment by polluters to society (representing other environmental users) for the damage caused by their pollution.

21. But a straightforward tax on economic rents related to what the market will bear is rather different from a charge to be used for environmental purposes and related to damage costs. Such a tax on the economic rents arising out of the scarcity of the environment is an indirect tax little different in essentials from certain indirect taxes which we have already. If imposed, it should be regarded as a way of raising revenue, to be used for whatever purpose the Government thinks fit; regional policy, social policy, defence expenditure, income redistribution, etc. Expenditure of such revenue should be governed by the same restrictions as those on other types of revenue, no more and no less. Certainly we should not accept any tying of such revenue to the sector from which it was raised.

22. By contract, a charge to be used for environmental purposes and related to damage costs could be levied on all or on only some of a particular kind of pollution. It is the charge per unit, not the number of units charged, together with the shape and position of the marginal

control cost curve which determine how far pollution is abated and how much revenue remains in the long run, once polluters have adjusted to the charge. The revenue from such a pollution charge thus bears no direct relationship to the damage which the pollution is causing. This damage is shown in diagrams 10 and 11 by the shaded area under the marginal damage cost curve. It is only this area which represents the damage which polluters are imposing on other environmental users, and it is only this area which environmental considerations suggest might properly be charged in the context of a policy of compensating those who suffer damage. If the charge is set high and is levied on all or most pollution of a given kind, it is possible that the revenue from it will exceed the damage which the pollution causes (diagram 10). If the charge is set lower than what is required to reach the desired level, no matter on what proportion of the pollution it is levied, it will not induce abatement as far as the norm or desired level (see diagram 11). But provided the charge is levied at no more than a certain rate, which may well be lower than that required to achieve the desired abatement, or else levied at a higher rate but only on a restricted proportion of the pollution, it can be regarded simply as a repayment by polluters to other environmental users of some of the damage which they have caused by their use of the scarce resource "environment".

23. Such charges may be proper, provided it is considered that the rights to environment reside in other environmental users rather than polluters and hence that they, rather than individuals or individual firms, should receive the benefits (or be repaid the damage) which is created by the competing demands which different members of society make on the scarce environment. Because such charges can be regarded as a form of compensation, to the extent that the victims of the pollution can be identified, it is proper to use the proceeds of such a charge to compensate them, or indeed to use the proceeds for environmental purposes to prevent the recurrence of the damage which was the occasion of the charge. Strictly, such expenditures are either transitional and hence analogous to those discussed in paragraph 11, or they are on a continuing basis (e. g., to finance the running costs of a pumping station to prevent certain forms of seepage or overflow), in which case they are analogous to other payments to a clearing-up agency, as in paragraphs 3–7. But, except in these special circumstances, such charges have nothing to do with the Polluter-Pays Principle.

24. Mention may be made of circumstances under which a range of products, some of which are pollutants to a greater or lesser extent, already bears a tax, for reasons connected with the raising of revenue rather than because of any effects which the products may have on the environment. Where environmental considerations suggest that the rates of tax on such products be varied to encourage substitution of the less polluting for the more polluting, then there would appear to be no

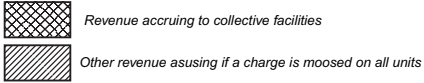
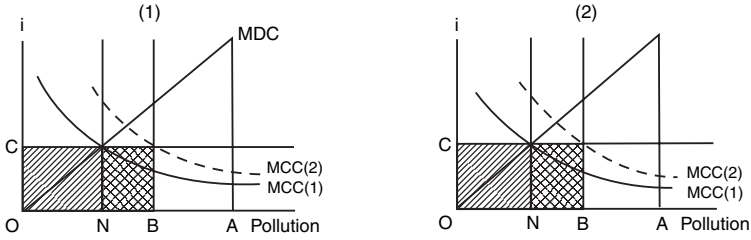
relevant a priori considerations to prevent such a differentiation. (It is assumed that the differentiation would be carried out in such a way that the total yield from the tax is unaffected.) The differential charge would be the only environmental element on such a tax.

25. More generally, it may be noted that economic rents have been regarded as a proper subject for taxation, at least since the days of Ricardo; whether particular taxes on such rents are imposed would appear to depend firstly upon the assignment of rights (which can be altered by legislation) in the resource to be taxed; secondly upon the views of the Government of the day concerning incidence; and thirdly upon any constraints imposed by membership of international organisations. Fourthly, attention must be paid to the consequences for trade of such taxes upon polluters.

26. It must be noted that taxation of economic rents is conceptually distinct from the question of charging in order to induce polluters to abate; there is overlap only to the extent of the problems discussed in paragraphs 14–17 and 22–23. Only to the extent of some of this overlap does the question of taxation related to damage costs have any necessary connection with the application of the Polluter-Pays Principle. In general, taxation of economic rents is a matter for individual governments; it is not implicit in any international endorsement of the Polluter-Pays Principle.

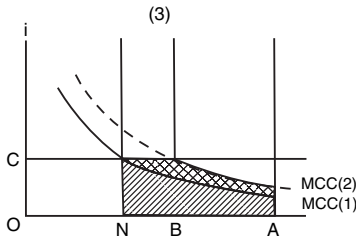
27. All the different types of charges discussed above are in conformity with the Polluter-Pays Principle, since they all oblige the polluter to incur the costs of controlling pollution to an “acceptable” level. The problems that arise in the discussion of charges and especially in distinguishing charges from taxes arise not so much from the interpretation of the Polluter-Pays Principle, but rather out of the allocation of rights in the environment and the relationships with general taxation policies.

Diagrams

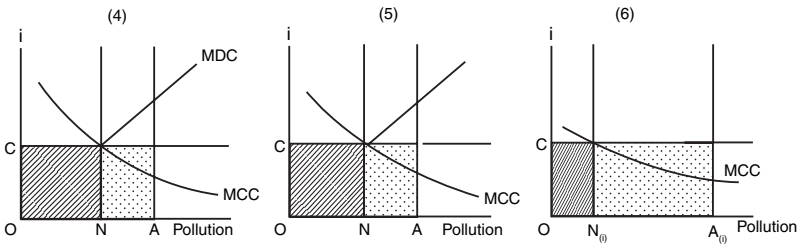
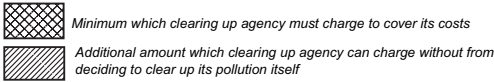


MCC(1) = marginal control cost curve for collective abatement facilities
 MCC(2) = marginal control cost curve if the firm abates its own pollution
 MDC = marginal damage cost curve
 OC = charge per unit of pollution

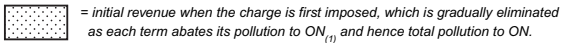
CA = initial amount of pollution
 ON = final amount of pollution when norm (or optimum) is achieved
 AB = abatement under taken by firm
 BN = abatement under taken by collective facilities



Notation as for diagrams (1) and (2) except that:

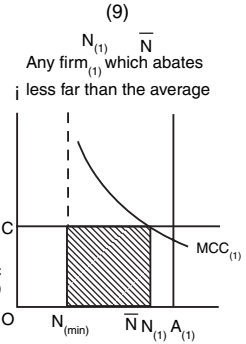
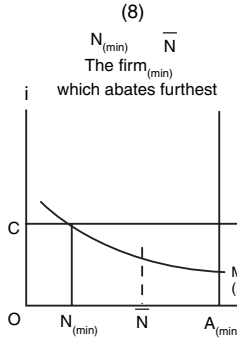
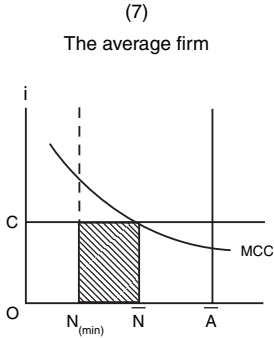



Notation is as for diagrams (1) and (2), except that:

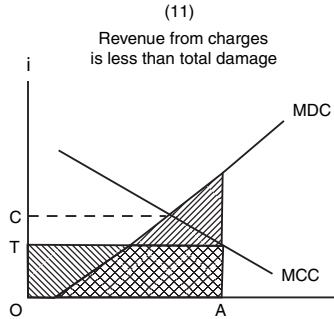
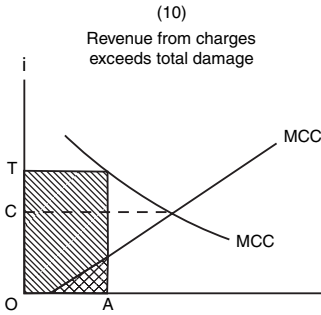




The subscript refers to term (1). Terms without subscript refer to the whole industry.

Diagrams



 Notation as for previous diagrams, except that diagram (7) represents the 'average' firm diagram (8) represents the firm which abates pollution to the lowest level, given charge OC , and diagram (9) represents any other firm. The shaded area shows the charge payable by each firm except that which abates pollution to the lowest level, if the charge is levied on all units of pollution above this level, which is what is required to abate pollution on average to ON .



 Tax revenue
 Total damage from pollution OA .

$OT = Tax$
 $OC = Charge\ required\ for\ optimal\ abatement.$

AN EXAMINATION OF THE POLLUTER-PAYS PRINCIPLE BASED ON CASE STUDIES*

INTRODUCTION

The Polluter-Pays Principle

1. The misallocation of resources is a main cause of environmental problems and it is essential to correct “market failures” by internalizing external effects. In practice, this means finding a method of internalizing which is both efficient and equitable.

The efficiency target is reached as soon as the gap between the private cost and the social cost of an operation is closed by one means or another. It does not matter whether the polluter meets the social cost of his operations himself or whether the victims of pollution (the community) pay the polluter to nullify their damaging effects, but the latter solution would hardly seem to be fair, since one of the pillars of the law is the principle of civil responsibility whereby everyone must avoid causing damage to others and must make good any damage caused.

Accordingly, it is both efficient (in internalizing external effects) and fair (by charging the responsible party with the cost) to make the polluter bear the expense, and this is why the principle whereby the polluters must be the payers has been generally recognized as fundamental to environmental policies.

2. Environmental problems, however, also have an international dimension which calls for harmonization in addition to the requirements of efficiency and equity. Products cross frontiers in the course of international trade, so that environmental policies could give rise to various obstacles, e. g. non-tariff obstacles, if discriminatory standards were prescribed, and distortion of competition, if a country subsidized its polluters instead of making them pay. Therefore, the first step towards harmonizing the policies of different countries is to adopt a uniform basis for allocating environmental costs.

* This paper, written by Mr. Jean-Phillipe Barde, was presented at the Seminar on the problems of implementing the Polluter-Pays Principle in the field of water management, which was organised by the German authorities and held in Karlsruhe on 20th and 21st November, 1972.

The opinions expressed in this paper are the author's own and do not necessarily reflect the views of the OECD.

It was for this purpose that the Council of the OECD adopted in May 1972, a “Recommendation on Guiding Principles concerning International Economic Aspects of Environmental Policies”^{**} to the effect that:

“The principle to be used for allocating costs of pollution prevention and control measures to encourage rational use of scarce environmental resources and to avoid distortions in international trade and investment is the so-called “Polluter-Pays Principle”. This principle means that the polluter should bear the expenses of carrying out the above-mentioned measures decided by public authorities to ensure that the environment is in an acceptable state. In other words, the cost of these measures should be reflected in the cost of goods and services which cause pollution in production and/or consumption. Such measures should not be accompanied by subsidies that would create significant distortions in international trade and investment.” (para. 4).

“This Principle should be an objective of Member countries; however, there may be exceptions or special arrangements, particularly for the transitional periods, provided that they do not lead to significant distortions in international trade and investment” (para, 5).

3. The Polluter-Pays Principle can be interpreted in different ways, but the significant points in the Recommendation of the Council of the OECD are the following:

- a) the Polluter-Pays Principle adopted by the OECD makes no reference to the notion of damage caused by pollution, as a result of which it does not provide for compensating the victims or restoring damage. Moreover, owing to the extreme difficulty of calculating the damage function, the Polluter-Pays Principle does not provide explicitly for the optimum degree of pollution control which would result from equalizing the marginal costs and benefits of the policies adopted. The Polluter-Pays Principle simply means that the polluter is responsible for all the pollution control operations required to achieve the objectives set by the authorities whatever they may be. Thus, it is an efficiency principle designed to achieve objectives at least cost to the community.
- b) As the Polluter-Pays Principle is a general unifying principle for allocating costs, the suggestion that people who treat wastes should necessarily be given aid does not follow from it, as has sometimes been maintained, but conflicts with it, unless the transfer payments correspond to the purchase of a service from users who treat wastes more thoroughly than usual due to their greater efficiency. But aid flatly contradicts the principle.^{**}

* See page 11.

** Notwithstanding the grant of exceptional aid under the exceptions allowed when previously defined and limited in time (see below).

c) The fact that the cost of pollution control measures may be passed on in prices in no way detracts from the principle. Depending on the structure of the market (monopoly, oligopoly, free competition, etc.) and on demand price elasticity, prices may reflect this cost either in full or partially or not at all, and the statement that the polluter is the payer means in fact that he must be the first payer, i. e. that he is the point where the external dis-economies are internalized.*

d) The principle can be applied in different ways and the instruments for putting it into effect! (direct controls, levying charges, etc.) are neutral with respect to the principle as such (although some instruments may be more effective than others).

4. At first sight, the basic problem would appear to be simple: either the polluter pays or he does not. In practice, however, the situation is more complex. First, one must find out whether the polluter pays enough, i. e. a large enough sum to enable the objectives to be achieved. Apart from that, one usually finds that different cost-allocation instruments are combined so that the principle is only partially applied. As a rule, a partial application is justified by the fact that the introduction of an environmental policy can only take place gradually and will therefore be facilitated and even speeded up if one assists polluters in their initial efforts. This is the position in the transitional periods mentioned in paragraph 5 of the Guiding Principles (see above). It will be all the more justifiable to employ such a strategy if social policy, the employment situation or regional development make it necessary. However, such transitional periods will only be valid exceptions if their scope is strictly defined and their duration limited. To make a practical assessment of the Polluter-Pays Principle it is now necessary to look at some case studies.

5. In dealing with the Polluter-Pays Principle in connection with water management this paper examines the instruments and policies made use of in France, Finland and the Netherlands. These countries have been chosen because France and the Netherlands are two examples of levying pollution charges combined with granting aids, but on distinctly different terms in the two cases, while Finland is an example of applying direct controls under a transitional aid programme.

The important thing about direct controls is the way in which they are applied, which is why this paper concentrates on analysing systems of levying charges and the various aid schemes.

It will accordingly deal in turn with:

- A. Levying pollution charges and the Polluter-Pays Principle;
- B. The grant of aids and the Polluter-Pays Principle.

* It can happen, moreover, that the payer is not the physical polluter (e. g. a motor car manufacturer).

A. LEVYING POLLUTION CHARGES AND THE POLLUTER-PAYS PRINCIPLE

Water management is probably the only environmental policy activity in which some experience of levying pollution charges can be found.

Pollution charges are an instrument which offers many advantages and enjoys wide support among economists. Above all, they comply with the Polluter-Pays Principle, since they oblige the polluter to include in his production costs the cost of the waste treatment he is induced to carry out.*

The charges are flexible and effective. As they are levied at decentralized decision-making centres, they allow each polluter to choose and combine the course of action which enable him to maximize his profit within the limits they impose (paying the charge, treating wastes to a given standard, resiting plant, etc.). This incentive effect of the charges has the advantage of minimizing total treatment costs by inducing producers whose treatment costs are low to treat their wastes more thoroughly than the others.

Economic theory tells us that the optimum rate for a pollution charge should make it equal to the marginal social cost of the corresponding pollution, but in face of the difficulty and expense of calculating damage functions some economists have proposed that the quest for optimality should temporarily be given up in favour of seeking maximum efficiency. This should be done by fixing a rate of charge such that a given objective may be achieved at minimum cost by equating the rate of charge with the marginal costs of treatment.**

At all events, whether one aims at the “optimum” solution or at the “efficiency” solution (reaching the objective at minimum cost), levying the charge is sufficient in itself to ensure that a given objective is reached. The economic transactors react in such a way that pollution is abated to the desired level, whatever is done with the proceeds from the charge.

In other words, economic theory states that what is done with the funds raised by levying charges has no bearing on their effectiveness as an instrument.*** From the point of view of economics, as the charges are not in themselves a means of financing subsidies and as they enable an objective to be reached at minimum cost, they comply with the Polluter-Pays Principle. What is the situation in practice?

Drawing on practical experience in France and the Netherlands, we shall try to see how charges are levied and how they fit the Polluter-Pays Principle.

* The charges may also oblige the polluter to internalize the cost of the damage which corresponds to the pollution discharged, but this possibility is not covered by the Polluter-Pays Principle.

** Kneese, Baumol and Oates.

*** This does not exclude possible effects on income distribution.

Two points can be made:

1. Levying charges is part of the machinery for applying direct controls;
2. The charges are an instrument for re-allocating costs among polluters.

1. Levying charges as part of the machinery for applying direct controls

Direct controls, consisting in laying down discharge standards for each polluter, are a universal instrument of water management. Both in France and in the Netherlands each case of pollution has to be dealt with individually. The polluter applies for a licence to the competent authorities, who either issue it to him stipulating conditions as to the quality and quantity of waste he may discharge, or else refuse it. This direct control is the basic instrument for enforcing the law. The Polluter-Pays Principle is followed to the extent that the polluter assumes responsibility for taking all the measures required for complying with the standards. In France, licences are issued by the Préfecture after a public enquiry and consultation with the competent departments. In the Netherlands, licences are issued by the Ministry of Transport, Water Control and Public Works (Verkeer en Waterstaat) for discharges into “State waters”, or by the Water boards (by delegation from the Provincial authorities) for other waterways.

Thus, the introduction of a system of levying charges was mainly designed to make it easier to enforce controls which are often cumbersome and difficult. It is true that the charges could give useful help in strengthening the controls, i. e. in inducing polluters to do better than the prescribed standard, but charges can only be incentive if their rates are high enough to make them effective. To the extent that the rates are not effective, the charges can only be used as a means of re-allocating the cost of financing aid payments to polluters.

2. Charges as an instrument for re-allocating costs

Both in France and in the Netherlands the charges levied act as an instrument for spreading the burden of expenditure among polluters. They may be used, for example to finance subsidies for helping polluters to invest in treatment plant or in changing their production process, or they may also be used for directly financing collective treatment plants.

In analysing the Polluter-Pays Principle we should first find out what the polluter pays, i. e. the basis of the charges and their rate. Then, having discovered how the charges in the Netherlands and France are calculated, we shall attempt an assessment of these schemes in the light of the Polluter-Pays Principle.

2. 1. In the Netherlands, the arrangements for evening out the burden of expenditure operate differently at national level and at regional level.

At national level a charge is levied on discharges of oxydizable matter into State waters.*

2. 1. 1. Tile basis of the charges depends on the type of pollution discharged;

- i) For raw (untreated) pollution, the basis is calculated with reference to the chemical oxygen demand (COD) and to the “Kjeldahl” index, i. e.:

$$\frac{\text{g. COD/day} + 4.57 \text{ g. N(Kjeldahl)/day}}{180}$$

- ii) Pollution remaining after biological treatment is calculated using the formula:

$$\frac{2.5 \text{ g. BOD/day} + 4.57 \text{ g. N(Kjeldahl)/day}}{180}$$

whore BOD = Biochemical Oxygen Demand.

2. 1. 2. The rates of charge are applied to the pollution discharged as measured in population-equivalents (p. e.), using the two above formulae. One population-equivalent corresponds to 180 g of oxygen demand.

The pollution currently discharged into State waters is estimated to be 10 million p. e. Since the proceeds from the charges should on the average cover 60% of the capital expenditure necessary for treating this pollution (1972), the rate per p. e. is therefore given by the formula:

$$\frac{C \times 60\%}{10,000,000 \text{ p. e.}}$$

where C is the capital expenditure needed to treat the effluent.

The target is to treat 10 million p. e. by 1985.

The rate was fixed at 2 florins per p. e. in 1971, 5 florins in 1972, 8 florins in 1973 and 11 florins in 1974. By 1985, the rate will probably be 15 or 20 florins. This sharp rise reflects the need to catch up on existing pollution before reaching a stage of pure flows where the incremental cost is exactly equivalent to the pollution created.

The rate does not vary according to area.

Proceeds from the charges are directly re-invested in controlling pollution in State surface waters.

During the 15-year (1970–1985) catching-up period, grants are being paid to users (local authorities and industries) as an aid to investment in treatment processes.

* State waters comprise the major rivers (mainly the Rhine and the Meuse), the Ijsselmeer, the sea inlets, coastal waters and ports. They are managed by the Ministry of Transport, Water Control and Public Works (Verkeer en Waterstaat).

For 1972–1973, the average rate of grant amounted to 60% and the proceeds from the charges to 20 million florins. The government neither owns nor manages the treatment plants to which it has contributed financially.

At regional level, surface waters which are not State-controlled come under the jurisdiction of the Provinces or, by delegation, under that of the Water boards (Hoogheemraadschap). There are eleven provinces in the Netherlands. Of the 1,400 existing Water boards, six are at present delegated to manage water quality, the others being responsible for the quantitative management of resources.

Thus, pollution control of non-government waters is highly decentralized. Apart from a few differences, management is based upon the same principle of combining the licence and the charge.

Just as for State waters, the charges are based on the amounts of oxidizable matter discharged.

The rates are determined by the cost of the Board's programmes of action and depend only on the cost of running the treatment plants and the operating costs of the Board. Unlike the French "Agences de Bassin", the revenue from charges is not disbursed as grants, but goes to cover the management costs of the Board and treatment plants under its control. Another important feature is that the Board directly finances anti-pollution investment from lending sources. It also owns and manages the local authority installations. Industries are given no direct aid, but they can have themselves connected to a local authority water treatment system.

Thus, the revenue from charges is used to cover the running costs of the Board, the cost of operating local authority plants, and annual repayments of loans used to finance investment.

The system accordingly serves rather to finance local authority treatment plants than to redistribute costs, and the charges help to reduce the cost of pollution control, thanks to economies of scale. If the rate of charge is high enough to cover the total running expenses of the local authority plants, the Polluter-Pays Principle is complied with.

2. 2. In France, the charges are levied on a purely regional basis.

The Law of 16th December 1964, in dividing France into six river basins covering the whole country (Artois-Picardie, Seine-Normandie, Rhin-Meuse, Loire-Bretagne, Rhône-Méditerranée-Corse, Adour-Garonne), was intended to supplement the specific controls on each individual consumer of water resources by adding an organisation adapted to the natural environment as a whole and designed for economic planning. To this end, each river bassin was planned as a separate hydrographic area, more or less independent of the other basins and admitting of a homogeneous form of management suited to its particular characteristics and to the economic requirements of the area.

Each basin is managed by a “Comité de bassin”, an advisory body on which the water users and the local and central government authorities have equal representation.

An important function of the Comité is to give its opinion on the basis for calculating the charges proposed by the Agence de bassin and the level of such charges, so that the charges are a matter for negotiation; but the executive authority for water management is the Agence financière de bassin,

Its technical functions include preparing a multi-year programme of action, and carrying out studies and research in the public interest. It also acts as a consultant in the public interest. It also acts as a consultant in designing, carrying out and operating community or individual schemes which help to improve water resources.

Its economic functions include levying charges, i. e. distributing costs between the economic transactors who have made its intervention necessary or benefit from it. The funds thus raised are used to finance community projects and also to grant subsidies and loans.

It should be noted that the Agence neither commissions nor constructs projects. Its functions are strictly technical and financial and consist in financing its programme of action and in making the best use of the economic incentives at its disposal.

It should also be noted that the Agence has no regulatory powers to lay down or enforce standards of pollution, these functions being the preserves of the *Préfets* (see above).

The Agences are responsible for the economic management of water resources at river basin level, both from the quantity and quality standpoints.

There is no doubt that the Agences financières de bassin are the keystone of the system, but one cannot fail to be struck by the motley array of arrangements for issuing licences and of technicals and economic controls. On the one hand, users are faced with a plethora of complicated regulations, while on the other hand efforts are being made to remedy the defects by means of more modern arrangements which include shadow programming on the lines of the French Economic Plan and depend on economic incentives involving financial loss for those who cause pollution in defiance of the regulations.

It is true that in an ideal economic situation the system of controls could be replaced entirely and with advantage by an effective scale of charges, but it is a long way from hard reality to this ideal situation which economists dream about. The fact of the matter is that discharge standards also must be defined and compliance with them must be ensured, while the rate if the charge must be set high enough to make up for lost time and maintained until it becomes an effective incentive to meet targets and in some cases to achieve above-standard performance.

The situation is very different in the Netherlands Water Boards, which have powers of control (issuing licences) and do their own.

building. The French Agencies, having no powers of control, merely exact payment for pollution discharged without being responsible for seeing that standards are complied with. This question of how to combine controls with the levying of charges is an important one.

2. 2. 1. Determining the base for the charge

The base now adopted for pollution charges is the weight of the pollution discharged instead of the volume discharged or relative pollutant content. The charge is therefore based on:

- the weight of suspended materials (SM);
- the weight of the oxygen needed for oxidizable materials (OM) to decompose. The OMs are decomposed through chemical oxygen demand (COD) and biochemical oxygen demand (BOD, bacterial action), which have respectively been assigned weighting coefficients of 1/3 and 2/3. The pollution weight P is hence determined by the formula:

$$P = \frac{\text{COD} + 2\text{BOD}_5}{3} + \text{SM}$$

To these parameters some basin agencies or zones add salinity of the water.

As the problem of thermal pollution is steadily becoming more acute, heat of the water should be included as an additional component of the base; this might be measured in k. cal. In this regard certain difficulties have yet to be solved, as the damage caused by the heating of water is not an independent variable, but already depends on the amount of pollution which already exists. The heavier the pollution, the greater the lack of oxygen due to heat; an increase of x degrees will thus mean a decrease in self-treating capacity of $-f(x)$ and an additional quantity of residual pollution.

Finally, as the discharge of toxic substances is still inadequately controlled, a broadening of the base to take account of this factor is under study. The parameter proposed would be a life-inhibiting factor, measured by testing toxicity for the water flea (daphnid). This type of water flea offers many advantages found in nearly every type of water habitat in France, it is easier to breed and deal with and is particularly sensitive to toxic substances moreover, the daphnid is resistant to water with a low dissolved oxygen content, with the result that tests can be made so selective as to isolate the oxygen factor from the toxicity factor.

In any case the relevant authorities urge the need for a base which is simple to calculate and formulate. While closely reflecting the facts, the parameters adopted must also be easy to measure and be founded on concepts which can be universally grasped and matters thus be talked over with the users, since the base and rate of the charges are fixed through negotiation. In the final account, the addition of the two straightforward parameters covering temperature and toxicity should but little complicate determination of the base;

Once the base is known, a rate must also be applied:

2. 2. 2. Determination of rates for the charge; Objectives

As part of economic planning, and in line with planning goals, the Agences de bassin prepare pluri-annual action programmes describing the steps which must be taken for developing water resources and for controlling pollution.

The Agences de bassin were set up during the Fifth Plan (1966–70) and their first action programmes were terminated in 1972–73. In order to match the length of the Sixth Plan, the 1971–76 programmes hence take effect in 1972.

The planning authorities (the General Commissariat and appropriate commissions), national and local government authorities, and basin organisations (the Comités and Agences) closely co-operate in determining objectives. It should be noted that these are based on pollution trends and needed action over a long period (20 years). Hence, goals are determined in terms of a minimum objective, which is to maintain pollution at its present level, i. e. to eliminate any fresh pollution; and of a desirable objective, which is to treat 80% of all effluent so that 80% of all gross pollution can be wiped out by 1985 or 1990. Under the Sixth Plan, a desirable target has been set and the amount of effort needed to meet it during the five-year period has been calculated.

Since the action programmes are financed by the charges, the rates of these must be determined.

Rates of the charges*

The question is how to determine, in the light of desirable objectives and of time constraints, how much polluters can contribute to achieving the objectives.

Maximum contributive capacity can be assessed on the basis of effluent-treatment techniques now available; the cost of the most advanced technique will thus show the maximum amount to be expended. Information can also be obtained from users of water who on their own initiative have shown the most enterprising and progressive attitude towards pollution control, since the amounts they have expended may be regarded as maximal.**

The highest rate, expressed in terms of francs per kilogram of pollution, will enable an ideal programme of action by the Agence to be drawn up.

Minimum contributive capacity will then have to be determined. Here not only flows of newly-created pollution but emissions from

* We are indebted to P.F. Tenière-Buchot for the following analysis, namely his study entitled "L'évaluation technologique des effets externes: le cas de la pollution des eaux" (Le Progrès Scientifique, July–August, 1972).

** These assumptions, however, are based on a given treatment technique and make no allowance for technological advance. An effective rate of charge should stimulate users to do research and adopt less expensive techniques.

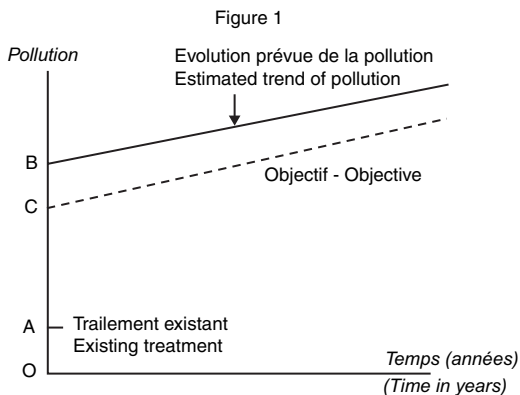
earlier sources must be taken into account. In determining minimum contributive capacity, a concept which must primarily be considered is the retrieval of accumulated lags.

Fixing the rate of the charge will depend on these constraints:

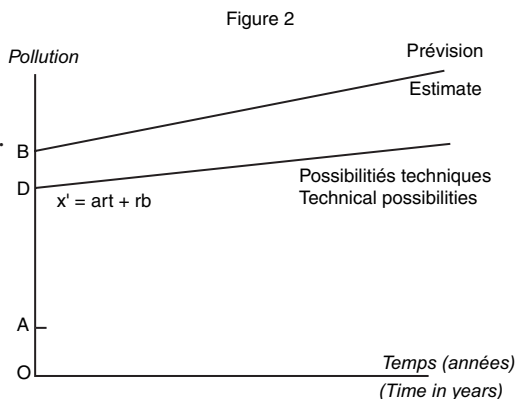
i) Planning for long-term retrieval

In figures 1 to 4, gross pollution (expressed in terms of weight or population equivalents) has been shown as ordinates and time as abscissae. Line $x = at + b$ plots the estimated trend of pollution; allowing for treatment which has already spontaneously occurred (OA), the residual pollution will be $AB = OB - OA$.

Unless pollution is completely eliminated, the object will be to reduce it to a fraction of AB, i.e. CB; the trend shown by the residual pollution will therefore be parallel to line $x = at + b$ (fig. 1).



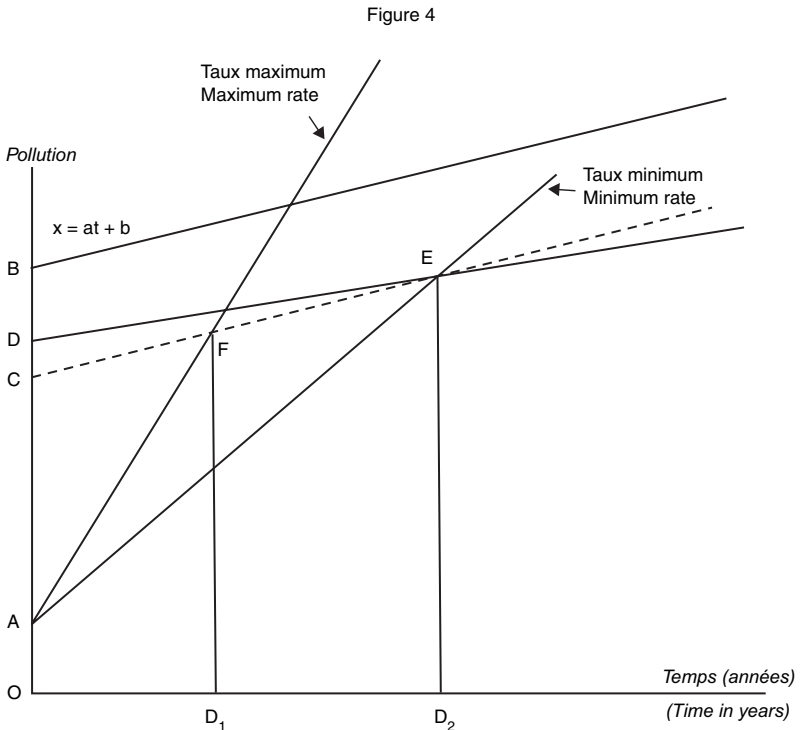
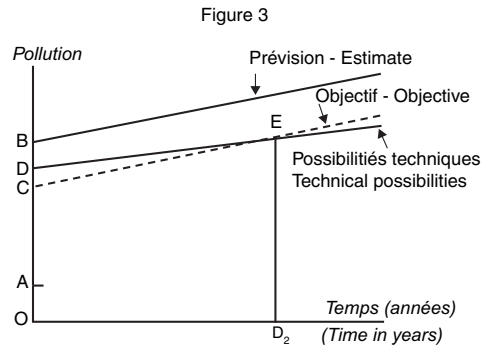
This being granted, the technique of treatment, whose efficiency rate is measured by r , can only process rx units. Treatment will therefore fail to meet the objective and will amount to $x' = art + rb$ (fig. 2).



A point E can thus be plotted, beyond which present technology prevents the objective from being attained (fig. 3). Beyond a duration D₂, the goal can no longer be achieved.

The long-term retrieval plan is thus determined by "retrieval lines" AE and AF, by means of which the lower and upper limits D₁ and D₂ can be plotted.

In figure 4, line AE defines the lower threshold of long-term retrieval, one dependent on the present state of technology. Line AF defines the higher threshold, corresponding to the maximum funds which users can contribute. The length of time required for retrieval



can then be selected within the area located between D1 and D2; according to the time selected, the rate of the charge, one proportional to the slope of the lines between AF and AE, can then be determined.

ii) Calculating the rate

The amount of long-term investment having thus been reckoned, a rate must be fixed for the charge such that, in relation to some given objective, it will make no difference to the user whether he pays the charge or reduces his pollution (incentive rate). Rate t per unit of pollution will thus be obtained by the formula:

$$t = \frac{A + M + O}{r}$$

where A = amortization; M = maintenance costs; O = operational costs; r = efficiency rate.

Calculating the charge

Like the action programmes, the rates of charge are approved by the Comité de bassin, i. e. negotiated with users' representatives on the Agency's recommendation.

Once the base and rate of the charge have been settled, pollution flows caused by industry are measured by taking the daily average for the month during which the greatest amount of pollution occurs in a particular industry. Thus, if for example, some industry discharges 3,600 kg of pollutant matter in September as against only 2,400 kg during the other months, then the annual rate for the charge will be applied to such an average day:

$$\frac{3,600}{30} = 120 \text{ kg per day}$$

(e. g. $120 \times 30 =$ Frs. 3,600 = annual charge).

To avoid measuring all discharges, flat-rate schedules covering pollution by type of industry have been drawn up in conjunction with users. Should some industry consider that the flat rate discriminates against it, it can request that the amount of pollution discharged be measured.*

In communities, the rate is applied in terms of a community's population (one resident = 147 grams per day on average)** and to industries connected to municipal plant. The municipality pays the full amount and obtains payment from industries for their share.

Owing to the fact that the amount of pollution discharged does not vary in ratio to the size of the community (disamenities in rural communities, for example, being negligible compared with those in large

* The industry pays for the measurement if the cost of pollution is higher than the flat rate; otherwise it is the Agence which pays.

** 74 g per day for communities of more than 500 population, and 176 g per day for communities of more than 50,000 population.

towns), community coefficients (coefficients d'agglomération) are applied to the basic rate charged per unit of population. Furthermore:

- a) Charges are collected annually;
- b) A straight-line rate is charged, meaning that the scale does not vary in terms of the weight of pollution discharged;
- c) Rates are applicable to the net amount of pollution discharged = gross pollution \times treatment-premium coefficient;
- d) The charges are calculated without reference to standards of discharge or of quality (as by payment of the charge so long as a standard fails to be reached). The threshold for the collection of charges is, however, set at 30 kg per day per polluter.

3. Expenditure Apportionment Charges and the Polluter-Pays Principle

In the light of these two test cases, can one say that the Polluter-Pays Principle is being applied?

The Polluter-Pays Principle is being applied to the extent that the charges are a means of financing collective plants for treating the effluents of those who pay them, but the question becomes more difficult when they are only a means of financing aids. It is then necessary to examine the problem from two angles, viz. (1) expenditure apportionment charges are not incentive, and (2) expenditure apportionment charges are a means for financing subsidies.

3. 1. Expenditure apportionment charges are not incentive

The very fact that the charges are part of a system of controls which prove difficult to enforce shows that the objectives have not yet been achieved. Moreover, if they were levied at an "effective" rate so that it was to the advantage of the polluter to treat his wastes instead of paying for them, the controls would be unnecessary. In addition, the charges are in most cases not directly connected with the pollution discharged, but are based on a flat rate representing an estimate of the average quantity of effluent. In France, it is clearly more advantageous for polluters to be taxed according to a flat-rate schedule than on the pollution actually discharged.* The fact is that, in the Seine-Normandie Basin, less than 1% of the polluters ask for their actual discharges to be measured. Is the polluter then really the payer?

At first sight someone who complies with the discharge standards and receives no subsidies is indeed the payer, but it may be asked whether a "concessionary" standard fixed at a low level is not an exception to the Polluter-Pays Principle, since it does not impose any

* It is no doubt necessary to allow for the cost of action taken to measure pollution. This will tend to bear on the major polluters, whereas a flat rate would mainly hit small plants. For example, Electricité del France calculates that maximum returns are obtained by applying a strict and complex system of marginal cost pricing to the 80,000 major industrial consumers of high-voltage current, but it would be too costly to apply such a system to household consumption.

real restraint on the polluter. Some might argue that the standards are the result of a political choice and that their very nature excludes them from the scope of the Polluter-Pays Principle, so that as soon as the polluter complies with them the Polluter-Pays Principle is being observed, whatever they be. Indeed, discharge standards only have a meaning in relation to a quality target. If they lead to it being achieved, they prove “effective” and the Polluter-Pays Principle is complied with, but if they do not lead to it being achieved, the Polluter-Pays Principle is infringed, since the polluter is not assuming responsibility for taking the measures required to comply with it, while the social cost of pollution is being borne by the community.

Moreover, someone who pays a charge at an ineffective rate is paying a levy which is simply buying the right to pollute; he admittedly pays something, but the only result is to finance aids granted to others. Thus, the Polluter-Pays Principle is only meaningful if it answers the question what the polluter pays for, since he may be paying for anything including the right to pollute. This ambiguity is due to the fact that the levying of charges combined with direct controls does not lead to a very clear situation. Either the controls are complied with and the targets are reached, in which case the charge is unnecessary,* or else the targets are not reached, in which case the levying of effective charges may be considered desirable.

If it is agreed that the Polluter-Pays Principle is an efficiency principle, the levying of ineffective charges is at variance with it. The payments are then not so much charges as ordinary taxes which do no more than add to the polluter’s costs.

The constraints in a transitional period for putting policies into effect are the only justification for a situation in which disregarded standards are found together with ineffective charges. Such situations are explained by the fact that rates of charge are rising rapidly. The subsidies then assist the charges in redistributing the burden.

3. 2. Expenditure apportionment charges as a means of financing subsidies

These charges, as they are understood in the Netherlands (for State waters) and in France, serve to finance transfers of funds paid to polluters who make the effort to treat wastes, so that they are an arrangement for redistributing the incomes of those who pollute in favour of those who treat wastes.

From the point of view of the Polluter-Pays Principle this arrangement can be examined from two angles:

For the community, the strategy can be interpreted as a means of re-allocation expenditure throughout the community in line with an objective fixed at regional or basin level, in which case a controlling

* Unless it acts as an incentive to raise the treatment of wastes above the standard.

authority will co-ordinate waste treatment operations so that the total pollution discharged into the basin will not exceed a given level. The aim is not so much to find out whether this or that polluter is or is not complying with an individual standard as to have the costs of waste treatment allocated compulsorily on lines laid down by the competent authority. If 500 polluters discharge a pollution of 500x and the target is a waste treatment of 400x, the authority might choose to have the treatment carried out by the 100 polluters who treat wastes most efficiently and to pay them for this service with the proceeds from a charge levied on the other 400.

If this system with its differentiated discharge standards were effective, it would actually amount to the same as levying effective charges, but it would involve considerable administrative expense, mainly owing to the vast amount of information required on treatment costs and the whereabouts of the various polluters.

It may also be mentioned that this arrangement differs little from the arrangements for financing community treatment plants, the community plant in our example being represented by the 100 polluters who treat the wastes of the others.

In relation to the overall objective, the 400 polluters who do no more than pay the charge can be considered, not as polluters, but simply as dischargers of effluent having no great effect on the quality of the receptor medium. The fact that the 100 others receive transfer payments does not conflict with the Polluter-Pays Principle, since the target is reached and financed by the entire group of polluters. We should remember that these transfer payments which redistribute costs are not a subsidy, but the purchase of a service.

Consequently, to the extent that the redistributive mechanism works logically, i. e. obeys the principle of minimizing costs and pursues a definite objective, one may say that the Polluter-Pays Principle is being applied. An effective system using differentiated standards is of course much more difficult and expensive to operate than a system of charges which automatically tends to even out the marginal costs of treatment, but the advantage of standards is that they focus action better on the targets.

For the individual, this pollution control strategy can be interpreted as a summation of the targets (discharge standards) set for each individual polluter. Viewed in this way, the charges levied on polluters who do not comply with the standards serve to finance the aid payments to those who do. One can then say that the Polluter-Pays Principle is disregarded, to the extent that nobody meets his total treatment costs, neither those who pay charges at an ineffective rate nor those who receive subsidies. In this case the transfer payments are genuine aid payments and not purchases of a service.

As regards international trade, the question is whether the industries which benefit from transfer payments turn out to be those which find it difficult to compete, but again, if the basis is sound, the impact

of the arrangements will not automatically lead to helping those industries rather than others, the more so as the basis of distribution can vary from one basin to another. Within the same industry, some producers could be given transfer payments in one basin and not in another.

The point is that transfer payments should only be made in cases where they purchase a service from producers who treat wastes more thoroughly so as to offset the under-treatment carried out by others, and should leave them to pay for the amount of treatment they would have had to carry out under a system of equal shares. If someone who treats wastes is to benefit from a re-allocation of costs, he should only do so to the extent that he treats wastes for others. If this rule is followed, there need be no fear of distorting international trade; but if it is not followed, aid payments to polluters will in no case be in line with the Polluter-Pays Principle, but will conflict with it.

What remains to be done, then, is to examine the various types of aids in the light of the Polluter-Pays Principle.

B. AIDS AND THE POLLUTER-PAYS PRINCIPLE

It is generally agreed that subsidies are at variance with the Polluter-Pays Principle, but they appear to be widely used as an instrument of water management. A distinction should be drawn between subsidies financed by levying charges and subsidies paid by the State from the national budget.

1. Aids financed by levying charges in France

In analysing a system of charges, economic theory does not concern itself with how the proceeds of the charges are used. Actually the ultimate goal would be to determine such an effective rate for the charge as would equate the marginal cost of water management with the corresponding marginal benefit. Under such conditions, an optimum allocation of costs could be ensured.

However, as our investigation of pollution charges has shown, the conditions for attaining such an optimum situation are in practice far from being satisfied, particularly owing to the difficulty of determining the damage function and the lack of “pure flow” conditions (i. e. lags must be retrieved). It is thus seen that the charges are fixed with reference to the Agences’ action programmes, which they finance while at the same time spreading the burden of expenditure. Hence, far from being a minor question, the use of the funds yielded by the charges is at the very root of the system. Indeed, it is not the charge which is the incentive, but the subsidy which it serves to finance.

In any event, until a “pure flow” situation is achieved, and as long as transfer payments do not lead to the optimum allocation of costs, the incentive role of the charges will remain secondary or non-existent as compared with their role in financing the action programmes. Thus,

the main function of the charges is to finance the aids granted by the Agences de basin.*

Hence, while the function of the Agences is to facilitate action in the common interest, their role is an indirect one and not that of a construction agency. They neither build, own, nor manage any installations.

As a general rule an Agence undertakes any engineering studies which are needed to prepare and implement its action programmes, e. g. by inventorying water resources, forecasting utilization, and preparing pollution control programmes,

However, the main job of an Agence is to provide users of water resources with aid, which may take the form of capital grants, loans and advances, and efficiency aids.

1. 1. Aid for local authorities

Capital grants. The aids awarded to municipalities are for financing community treatment plant. In the case of sewers, aids may only ordinarily apply to intermunicipal collectors.

The grant is awarded following examination of a file for the allocation of State grants drawn up in close conjunction with the Préfet.

Depending on the Agency or area, the rate of the aid may vary between 15 and 40%, the average being 25%. Variations in the amount of aid according to area follow the same pattern as those of the charges – the less polluted the area, the higher the rate of the charge and hence of the aid. A ceiling is set as shown in the following example (Seine-Normandie basin):**

Area 1 (slight pollution)	:	Frs. 200 per treated population equivalent
Area 2 (average pollution)	:	Frs. 150 per treated population equivalent
Area 3 (heavy pollution)	:	Frs. 115 per treated population equivalent.

The technical conditions also vary in each area. Again taking the Seine-Normandie basin, in order to promote massive water treatment in highly polluted Area 3, plant must cater for a minimum population of 5,000 as against 2,000 in Area 2.

The grant lastly depends on efficiency of treatment: e. g. in the Seine-Normandie basin, the ceiling for primary treatment plant has

* Cf. the Water Management Act of 16th December, 1964, Section 14 of which reads: “The Agence shall contribute, by means of funds jointly provided by the Agence and the State budget, to studies, research and installations in the common interest of the basins and towards its operating costs. The Agence shall allocate grants and loans to corporate bodies and private persons for carrying out any work in the common interest of the basins or group of basins which they directly perform, whenever such work is of a kind which will reduce the financial costs of the Agence”.

** The ceilings refer to biological treatment.

been lowered by 55%. The payment of grants thus depends on efficiency criteria.

Loans and advances. Local authorities are also entitled to loans from the Agence or the State.

At the present time only the Agence Seine-Normandie grants Loans, which may extend to 10% of the cost of operations, to which an advance of 10% is added at 0.5% interest in priority areas.*

1. 2. Aids for industry

Aids for industry are used for building treatment plant and by certain Agences for altering the production process to the extent possible; for this purpose the policy is to provide the greatest incentive to make the alterations. In the Seine-Normandie basin, aids are used in 30% of the cases to channel technology towards non-polluting processes, and the goal is to reach 50% (particularly in the paper-making and sugar industries). The ceiling for aids designed to change technology is determined by comparing the cost of the treatment plant which would otherwise have become necessary. The incentive character of the grants is thus reinforced by the search for new techniques.

The aids are awarded on the basis of an application file submitted by the industry and on a survey by the Agence, which weighs the usefulness of the proposed action and negotiates the technical conditions required for obtaining the aid,

Grants. Grants range from 30 to 50% (and in exceptional cases beyond), depending on the particular basin and area. While the rate of aid granted to industry is higher than to municipalities, in absolute terms the amount of aid is smaller (Fr. 343 million as against 689 million for the period 1971-1976).

Loans and advances. a) At the request of recipients, grants may be transformed into loans (coefficients from 1.4 to 1.5) or advances (coefficient from 1.2 to 1.4). A grant of Frs. 100 may thus become an advance amounting to Frs. 120 or a Loan of Frs. 140, which increases the funds available to the industry.

b) In addition to grants, the industry may be given loans or advances, whose rates vary as between the Agences and areas. In the Agence Seine-Normandie, the rate for loans amounts to 20%, and an additional advance of 10% may be granted in priority areas; the total rate for aids (grant, plus loan, plus advance) therefore ranges between 50 and 60% (30+20+10).

Efficiency aids. Whether run by local authorities or by industries, plant which has been built may function poorly or not at all. In the Seine-Normandie basin 50% of treatment plant is believed not to operate.

This state of affairs may be due to incompetence and unwillingness on the part of users as much as to their financial situation.

* The Caisse des Dépôts et Consignations may also grant loans of between 10 and 15%, which are guaranteed by the State.

For this reason, under the Sixth Plan, aid to promote efficiency of operation may be granted to certain users. This type of aid, which will invariably be of limited duration, will take two forms:

a) 50% aid towards the expenses of technical assistance services, training operational staff, and testing the proper operation of installations;

b) bearing a share of operational expenditure.

The amount of the aid will be linked to the efficiency of the treatment. The Agence Seine-Normandie defines three classes of efficiency as follows:

TYPE OF PLANT	EFFICIENCY RATE ^(r)	CLASS	RATE OF AID
Complete plant	Less than 70%	A	0
Primary plant	Less than 30%		
Complete plant	Over 70% to 85%	B	15%
Primary plant	Over 30% to 40%		
Complete plant	Over 85%	C	25%
Primary plant	Over 40%		

The rate of the aid will apply to operating costs calculated on a flat-rate basis.

2. Aids financed by the state

By subsidies financed by the State, we mean aids paid for out of the State budget, as opposed to those which are financed by levying specific charges.

2. 1. In France, aids granted by the Agences de bassin are supplemented by aid payments by the State,* which enable local authorities to obtain finance from the State for up to 40% of their investments. The principal aid, however, is the so-called “écêtement” (tax ceiling) scheme, which at present limits the burden of the pollution charge to 2. 5% of the value added by the industry concerned, while the State pays the Agence the balance of the charge. This scheme, however, is automatically limited in its effect. The polluters are given priority aid and, once the water treatment is in operation, the amount of the charge levied on net pollution goes down correspondingly, the ceiling being no longer required once the charge stays below 2. 5% of the value added. Moreover, a polluter must pay back what he saves by the tax ceiling scheme, if he does not achieve the standard of treatment expected in spite of the aid he receives.

For the most polluting sectors, the State provides exceptional transitional assistance in the form of “contrats de branches” (individual industry contracts) concluded with the industries concerned. The first of these was concluded in July, 1972 with the paper-pulp industry, which not only accounts for 20% of all pollution discharged, but is the biggest paper-pulp industry in the Common Market. The objective of

* But their total must not exceed 80%.

the contract is to abate the pollution discharged by this sector by about 80% in five years. Of the Frs. 300 million worth of investments planned 50% will be financed by the Agences de bassin, 20% from the proceeds of a quasi-tax, and 10% by a special government grant, leaving some 20% to be found by the industry. It is intended to extend the use of such contracts to a dozen industries including starch works, distilleries, breweries and sugar refineries.

2. 2. In Finland, water pollution control is partly financed by the local authorities by means of subsidies and low-interest loans.

Current estimates suggest that 10% of surface waters are polluted. The pulp and paper industry is responsible for 84% of the total BOD and 22% of the phosphorus, while the food industries and fertilizer manufacturers are each responsible for 9% of the phosphorus. However, while the output of the pulp and paper industry has doubled, pollution by this sector has remained constant.

In 1970, 2,343,000 people (53% of the total population) were connected to local authority waterworks. For 52% of these people (1,260,000 persons) the water was treated biologically, and to some extent chemically, in 327 works.

About 25% of the cost is covered by local taxes and connection charges. The remaining funds come from bank loans and, since 1969, from low interest loans made available by the Post Office Bank, subject to approval of the project by the National Water Board. The difference between the interest rate on the loan and the usual rate charged by the Post Office Bank is made up to the latter by the State.

In 1969, loans to rural communities were broken down as follows:*

LENDING ORGANISATIONS	AMOUNTS OF LOANS IN THOUSANDS OF MARKS	PERCENTAGE OF TOTAL
National Department of Agriculture . . .	41,089	26.4
Post Office Bank (low interest)	11,079	7.1
Local authorities	1,979	1.3
Local banks	37,860	24.3
Post Office Bank (loans at usual rate of interest)	9,063	5.8
National Pension Fund	25,635	16.4
Insurance companies	9,910	6.4
Pension funds	2,398	1.5
Other government loans	6,006	3.9
Other loans	10,808	6.9
Total	155,827	100.0

* 50% of these loans is allocated to pollution control and 50% is used for water supply facilities.

By way of illustration, the current rate of interest on long-term loans granted by the Post Office Bank is 7.75%, and by the National Pension Fund 8.50%.

The ceiling for low-interest loans granted by the Post Office Bank has increased as follows:

1969: 18,000,000 marks	}	Interest 3%
1970: 18,000,000 marks		
1971: 35,000,000 marks	}	Interest 4%
1972: 35,000,000 marks		

Repayments are spread over 10 years for local authorities and over 24 years for other borrowers.

Capital expenditure financed from loans was:

Year 1970–71:	56,900,000 marks investments for loans of 19,900,000 marks,
Year 1971–72:	88,500,000 marks investments for loans of 30,800,000 marks.

The capital expenditure in the year 1971–72 concerned 49 stations, which were 40% financed from loans, viz. a mechanical treatment plant, 3 filtering stations, 34 biological treatment stations, 9 chemical treatment stations and 2 chemical treatment stations with precipitation.

Objectives for the period 1971–1981

The target of a pollution level 50% below the current level calls for purification of 95% of waste water by 1981 and chemical treatment of 90% of sewage.

Local authorities

To attain this objective, a total investment of 3,400 million marks will be needed for water treatment and for water mains, 1,000 million of this total being devoted to treatment and sewerage. This programme is equivalent to connecting 350,000 people per year to the system.

Pulp and paper industry

Water consumption by the pulp and paper industry is eight times greater than that of the local authorities and industries connected to the drainage system. The target is to reduce organic pollution by 50%, and pollution due to suspended matter by 20%. The industry estimates that the capital expenditure involved will be 400 million marks.

Other industries

As regards other industries, an investment of 100 million marks is planned.

New forms of financing

Direct investment by the State. A government decision of 16th February 1971 stipulates that the State may directly finance,

wholly or in part, projects aimed at preventing pollution, maintaining water quality or restoring it.

Financing of this type may be provided only for long-term projects in the public interest. The work must be carried out in co-operation with the users under an agreement concluded with the National Water Board and with the approval of the Ministry of Agriculture and Forests. A ceiling of 100 million marks over ten years has been proposed.

Measures proposed. The Council of the State Finance Board for the protection and distribution of water has drawn up proposals for new types of financing, which are to be put before Parliament before the end of 1972.

The Board proposes:

i) The payment of subsidies to local authorities for treatment plants treating water above a certain standard and for drainage systems. The rate of subsidy could vary between 15 and 25% according to the degree of purification. A ceiling of 80 million marks over ten years is proposed. In any event, the total amount of subsidies and low-interest loans could not exceed 60% of the total investment.*

ii) The payment of subsidies to old-established industries. These grants would be exceptional and would not exceed 25% of the cost. Ceiling: 30 million marks over ten years.

iii) Loans to industry from the State budget at 5% interest, repayable over 10 years, for improving the existing water treatment system. The loan would not cover more than 50% of the capital expenditure. The cumulative total of these loans and subsidies should not exceed 60% of the cost of the project. Ceiling: 200 million marks over ten years.

iv) State guarantees for loans obtained by industry for financing water treatment. The guarantees would cover total borrowing of 150 million marks over ten years. **

v) The establishment of a system of pollution charges to be levied by local authorities on users connected to a purification plant. The charges would depend on water consumption and the proceeds would go towards covering the operating costs of the treatment plant. A fixed charge of 10 pennia per square metre of dwelling space is proposed. The purpose of this system of charges is to arrange that the polluters should be the payers and that the cost of treatment, so far covered from taxes, should no longer be borne entirely by the local authorities.

vi) Other measures would include tax relief, the use of the Capital Fund for combatting pollution, loans from the Agricultural Development Fund, and a specific tax for the control of water pollution.

* Subsidies of 3 million marks granted in 1973.

** In 1972 loans totalling 10 million marks were granted. The same amount was granted in 1973.

All these measures would involve expenditure by the State of 480 million marks for the period 1971–1980, out of a total expenditure of 750 million marks (loans plus grants).

The financing of the investments planned by the Board would be broken down as follows (millions of marks):

<u>Local authorities:</u>	
Local authorities	3,000
Low-interest loans	320
Grants	80
	<hr/>
Total	3,400
<u>Industries:</u>	
Water distribution	100
Treatment	270
Loans front State budget	200
Grants	30
	<hr/>
Total	600

3. Aids in the light of the Polluter-Pays Principle

Strictly speaking, the grant of aids flatly contradicts the Polluter-Pays Principle, but it is agreed that in some circumstances aids may be justifiable provided that their duration is limited.

Such circumstances would exist if the demands of the employment situation or of regional development made the task of pollution control temporarily too burdensome. If aids were then granted, would they really be subsidizing pollution control? Would they not rather be subsidies to combat unemployment?

When aids are granted because factors other than the environment make water treatment economically difficult, the notion of subsidy is charged with ambiguity,

The current argument in favour of granting aids is based on the notion of a transitional period, i. e. a period for getting pollution control under way and making up accumulated lags. Financial aid of limited duration may be of value owing to the size of initial investments and the fact that industries and local authorities are assuming new burdens, but if it is to be a valid exception to the Polluter-Pays Principle, the scope or duration of the transitional period must be clearly defined.

In the case of the State aids mentioned in the example given, this condition would seem to be met. In France, the individual industry programmes are limited to five years, while in Finland the overall financial limits and the duration of aids are laid down in advance.

In the case of aids financed by expenditure apportionment charges the situation does not seem to be so clear. To the extent that these

aids become unnecessary once the charges are levied at effective rates, it may be supposed that their duration will be limited, but it is not known when a charge will become really incentive and, accordingly, no time limit is put on subsidies paid by the Agences. At all events it is nowhere laid down whether these aids have to cease on this or that date, and the French system would seem rather to be based on a principle of re-allocating costs so as to help those polluters who obey the law.

Lastly, it is the subsidy rather than the charge which acts as the incentive, since someone who decides to invest in pollution control is induced to do so by the aid payments he will receive from the Agence and not by the charge, which it is actually more profitable to pay.

Thus it would seem in this case that the concept of the transitional period is somewhat hazy.

Be that as it may, the scope and duration of aids should be clearly laid down if the exceptions allowed in applying the Polluter-Pays Principle are to be free from ambiguity, and it is in any case clear that water management in the countries considered relies not only on the instruments for applying the Polluter-Pays Principle (direct controls and levying charges), but also on instruments for applying it only partially, since aid payments are an essential feature of present-day strategies.

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