Effective Pollution Charges: Lessons of Worldwide Experience

Pollution charges are becoming an increasingly popular instrument for environmental policy. Currently, they are widely applied in OECD countries, play a key role among environmental policy instruments in most transitional economies, and have started to be introduced in developing countries, particularly in Latin America and East Asia. Many recent World Bank environmental projects propose using pollution charges. The theoretical advantage of economic instruments over uniform command-and-control (CAC) regulations is in greater flexibility and cost-effectiveness. However, the performance of poorly designed pollution charge programs may not demonstrate measurable economic and environmental benefits. The lessons from worldwide experience with pollution charges thus far could help developing countries design effective programs.

Background

Pollution charges exist in various forms. They can be imposed on emissions or products; they can be levied as a fee for service (user charges) or as a fine for non-compliance; they can be collected as separate payment or as part of a broader levy, such as a locally-defined water use tariff or national energy tax.

Pollution charges can be levied on actual source emissions (direct emission charge), estimated emissions (presumptive emission charge), or products whose use or disposal is linked to pollution (product charge or tax). While the direct charge is most straightforward, the difficulty of systematically measuring discharges limits its possible application and may give a comparative advantage to indirect instruments, such as fuel taxes or water charges. At the same time, the latter can very closely approximate the direct pollution charge when supplemented with rebates in accordance with actual source emissions.

The experience of implementing pollution charges worldwide demonstrates a wide range of trade-offs between advantages and shortcomings of both direct and indirect instruments, as well as between incentive-creating and revenue-raising objectives (Box 1). This experience also presents mixed results that differ considerably across countries and programs. What are the main factors that affect the applicability of pollution charges and the choice of a particular design?

Emission Charges in Practice: Key Observations

In theory, emission charges, set at the level of marginal environmental damages or abatement costs, are the best way to internalize the social costs of pollution and change the behavior of economic agents. Realities of implementation, however, impose significant constraints on the effective use of this instrument. Cross-country experience shows that emission charges are more applicable to water effluents than to air emissions, largely due to monitoring difficulties. Applying these charges to solid waste is least common, except for user charges (waste collection fees). While water effluent charges, especially user charges for wastewater treatment, tend to be a long-term instrument in environmental policy, air emission charges are often more appropriate as a temporary program to tackle a particular problem.

When do emission charges have an advantage in practice?

- Emission charges have an advantage when they are set at a high, incentive-based level for a limited number of pollutants and sources rather than at a low level for a great number of pollutants and sources. Charges can be increased gradually, with rate increases scheduled in advance, to allow industries to make timely adjustments.

Low emission charges, which are introduced with the primary purpose of raising funds, do not prove to...
have a comparative advantage in relation to other charges or taxes, given the higher administrative complexity and costs. This is especially relevant for air emissions.

- Emission charges have an advantage when they are applied to a very limited number of standard pollutants which are:
  
  (i) emitted by many different sources with different costs of abatement; (ii) controlled by commonly available technologies; and (iii) relatively easy to measure by conventional methods. Examples are BOD, phosphates for water, and TSP, SO, or NO for air. In contrast, CO, which is affected by a change in fuel rather than a change in burning technology, is addressed by a carbon tax on fuel.

- The most significant benefits of emission charges are achieved if they are imposed on a relatively limited number of the most significant sources. Criteria for selecting sources include: (i) feasibility of systematic monitoring and/or inspection, (ii) potential for technical innovation, and (iii) financial viability (to be able to respond by adopting new technologies and/or improving operation and maintenance).

  This is of greatest relevance to air emission charges which are most suited for large stationary sources. OECD examples of air emission charges -- in France and Sweden -- deal with a limited category of the largest polluters. In the case of significant air pollution from diffuse small sources, such as vehicles or households using coal for space heating, product charges may be a good proxy, e.g. motor fuel or heating fuel taxes (as discussed below).

- Upper bound presumptive charges that are adjusted for those polluters which demonstrate a lower level of actual emissions can reduce monitoring and enforcement requirements. Under this scheme, polluters are motivated to monitor and report their emissions while an implementing agency supervises self-reporting practice with random inspections and stiff penalties for false emission reports.

**Are emissions charges applicable to small sources?**

- A very careful approach is required when designing emission charges that would apply to small industries and households, especially in developing countries where environmental objectives compete with the needs of industrial growth and poverty alleviation. While air emission charges are typically not applicable for these two groups, water effluent charges are. At the same time, households generate a very significant input to water pollution in urban areas. User charge for municipal and/or collective wastewater treatment with differentiated tariffs for the industry and households is one instrument in these cases. Where water usage is metered, a pollution surcharge may be added to the regular user charge for those polluters whose discharge (i.e. water consumption) is higher than average within a given group of users. However, the distribution effect on large-size, low-income households has to be assessed and mitigated.

- User charges serve the purpose to recover the costs of municipal or collective treatment plants and are appropriate in all cases where such treatment takes place.

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**Box 1. Examples of Application: What Works and Why**

**Water Pollution Charge in the Netherlands.** The rate of the Dutch water pollution charge is determined by revenue required for sewage treatment and for maintaining and improving water quality in general. The charge is implemented by the “Water Boards” - self governing bodies of surface water users responsible for water management. The charge is based on pollution load of BOD and (in some cases) heavy metals. It is levied on all direct and indirect discharges. Households and small firms pay a fixed amount. According to the research done on this issue, there has been an incentive effect for large firms that are actually metered, including the agricultural sector, especially livestock production. why does it work?

- The level of the charge is rather high and aimed at providing full cost-recovery of sewage treatment.
- The charge base is directly linked to pollution load (for large firms).
- The charge program is decentralized and transparent for water users.

**Sulfur Tax in Sweden.** The Swedish tax is levied on heat the sulfur content of diesel fuel and heating oil which exceeds a threshold of 0.1 percent S-content and on coal, coke and peat. The tax, which is a product charge, approximates an emission charge and is repayable if a taxpayer can demonstrate an actual reduction of SO emissions. An official evaluation indicates that sulfur content of oil decreased nearly 30 percent between 1990 and 1992 as a result of the tax. Emissions of burning coal and peat also considerably decreased. The tax promoted cleaning flue gases to a larger degree than before, but emissions have also been reduced by substituting fossil fuels. The CO tax provides an additional incentive for that. Administrative costs are somewhat less than 1 percent of revenue.

why does it work?

- The tax level is high.
- A transparent rebate scheme strengthens the incentive effect of the tax.
- The design of the program provides for easy implementation and low administrative costs. The burden of proving the actual emission level is imposed on polluters.

*Source: Opschoor et al., 1994.*
Tariffs should be linked to pollution load or water usage for large industries and other consumers where metering is economically justified, and on average provide full recovery of investment and operating costs. Full cost recovery may not be possible in cases where the size of the public/collective treatment plant and the level of treatment adopted are not defined on the basis of an economic analysis as part of a cost-effective wastewater treatment strategy for a watershed. In this case, user charges may be excessively high so that those industries which have lower-cost individual treatment options will not connect to the collective facility.

Emission charges often tend to be earmarked. When is the earmarking of revenues justified?
- If revenues from charges are earmarked for environmental expenditure, it is important to have a coherent, transparent and accountable allocation system with clear financial objectives and priorities.

One example is user charges or, in a broader context, effluent and user charges implemented by a basin organization to support a well-defined water quality improvement program. A fiscally-neutral charge-rebate scheme, like the Swedish NO bottom charge, is another example of a transparent earmarked program that facilitates the incentive effect of the charges. All revenues from the Swedish charge, imposed on actual NO emissions of large power and heat producers, are rebated back to these producers on the basis of their final energy output. The incentive effect has been very significant. The charge-rebate scheme also can be implemented through the general budget, however.

Experience with Product Charges

Product charges are very common in OECD countries and most widely imposed on fuels, as a proxy for an air pollution charge, and on products that can be recycled or need to be safely disposed of. Unlike air emission charges, they can be used to control diffuse sources and are relatively easy to collect, given the possibility of using existing administrative and fiscal channels.

When is a product charge the preferred instrument?
- when there is a strong connection between the use or disposal of the product and the amount of pollution; and
- pollution occurs at the consumption or disposal phase (e.g. gasoline tax or charge on beverage containers or batteries); or
- pollution occurs at the manufacturing/power generating phase and the discharge of the targeted pollutant depends on input characteristics rather than on abatement or process technology (e.g. carbon tax).

Check-list for Designing and Implementing a Pollution Charge Program

Starting Point: Macroeconomic and Environmental Policy Issues

One of the key lessons from experience is that pollution charges have little chance to be successful unless an appropriate macroeconomic and environmental policy framework is in place.

- Necessary Macro-economic Conditions:
  - Competitive markets that make polluters responsive to price signals.
  - Well-developed market of environmental services providing availability of alternative options.
  - General economic and political stability (low inflation; reasonable real discount rates).

In a country where environmental regulations are not enforced and environmental agencies are weak, economic instruments are not of much help either. Introducing pollution charges should go along with improving the overall environmental policy framework and strengthening the institutional capacities of environmental agencies.

- Key environmental policy issues:
  - Political commitment to environmental improvement and the use of economic incentives;
  - Clear and consistent legal basis for implementing pollution charges;
  - Consensus among key stakeholders on environmental policy objectives and instruments;
  - Effective enforcement mechanisms, including broad political support and public pressure;
  - Sufficient institutional capacity of implementing agencies;
  - Built-in systematic program evaluation focusing on tangible results on the ground;
  - Explicitly estimate the full implementation costs and economic impact of the pollution charge program and compare with alternative instruments; keep the program accountable.

Designing a Program: What Should be Done?

- Analyze the scope and impact of pollution and identify targeted areas/watersheds. While economic instruments in general have an advantage where there is homogeneous pollution extending over a broad area, decentralized pollution charge programs focusing on certain water basins or saturated airsheds benefit from a simpler institutional arrangement, better accountability and transparency for stakeholders. In these cases, establishing water basin agencies and air quality councils responsible for media-specific management in targeted areas, including pollution charge programs, is generally recommended.
• Identify medium-specific priority pollutants that are of major concern in terms of ambient quality, and health and environmental damages. Sensitivity to abatement technologies, variation in abatement costs, availability of sampling techniques, correspondence between an easier measurable input and discharge, and environmental impact of certain pollutants are factors that determine applicability and design of an economic instrument including the need for supplementing charges with emission limits and/or other direct regulations.

• Identify major sources of pollution. Different approaches are needed to deal with different categories of polluters, such as industries, utilities, vehicles and households (see Table 1).

• Link the design and the level of pollution charges to a medium-specific environmental improvement program for a targeted area/watershed. The program should set clear ambient quality objectives and targets, and define a cost-effective strategy for pollution abatement, based on the analysis of available control options across all significant sources of pollution in the area.

• Examine the existing fiscal system in the area with respect to the targeted pollution sources and try to identify pollution charge programs that would best fit into this system, so that administrative and enforcement costs are minimized. If there is ongoing or forthcoming reform of the fiscal system in the relevant sectors (e.g. introducing water charges, modifying energy taxes, etc.), “mainstream” pollution charges into the broader reform process, i.e. try to design pollution charges in such a way that would allow to share institutional capacities and collection mechanisms with other new or modified fiscal instruments.

Implementation Sequence: What Can be Generally Recommended for Developing Countries?

• Water Pollution: (a) start with locally-imposed user charges, paying special attention to distribution effects on small consumers and metering of large industries, which ought to be charged on the basis of water usage or pollution load; and (b) examine and assess institutional and legal options for introducing presumptive effluent charges for other significant sources that are not connected to public treatment plants.

• Air pollution: (a) examine the possibilities of using existing fiscal channels for product charges; (b) consider designing focused programs tackling specific pollution problems that could be fiscally-neutral (tax differentiation or charge-rebate scheme); and (c) assess changes that would be required in legislation and give preference to programs that do not require major legislative changes, as these are often a bottleneck for implementation.

References and Suggested readings:

1. NAPA, 1994. Environment Goes to the Market: Implementation of Economic Incentives for Pollution Control; Washington DC.

Table 1: Typology of Pollution Charges Recommended for Different Sources and Pollutants

<table>
<thead>
<tr>
<th>Source</th>
<th>Air pollutants</th>
<th>Water pollutants</th>
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<td>fuel tax</td>
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