Part IV

Key Non-Technical Considerations

CHAPTER XV. REGULATORY AND ECONOMIC INSTRUMENTS FOR SOLID WASTE MANAGEMENT

A. Introduction

This section presents an overview of major strategies and policy methodologies employed in solid waste management in developing countries and in industrialised nations. The strategies and policies of concern are those that are designed to facilitate the control of pollution, especially those related to the improvement of solid waste management. Although the examples presented in this section deal with experience gained in industrialised countries, the message conveyed is applicable to developing countries with very minor modifications.

In industrialised countries, the strategy for protecting and enhancing the quality of the environment calls for direct regulation, reinforced by the "command-and-control" approach. In essence, the approach consists of the implementation of systems for monitoring and for the enforcement of the regulations. Usually, the implementation of the approach is by way of the application of regulatory instruments such as standards, permits, and licenses, and the control of land and water use. The approach more or less affords the regulators some degree of predictability regarding the achievable pollution reduction. Despite allegations regarding economic inefficiency and difficulty of enforcement, command-and-control strategies have been of significant assistance in the fulfilment of objectives of environmental policies.

In an attempt to endow control measures with increased flexibility, efficiency, and cost effectiveness, in some instances, industrialised countries are resorting to a mechanism that is based on economic motivation, i.e., economic incentive. The incentive is the empowerment of potential polluters to select the particular means of control that is economically favourable to the potential polluter. The rationale for the innovation is the assumption that if properly implemented, reliance upon economic incentives is attended by several advantages. Among the postulated advantages are the following:

1. promote the use of cost-effective means for achieving acceptable levels of pollution control;

2. encourage the development of pollution control expertise and technologies in the private sector;

3. provide a source of revenue to be applied by the government to pollution control programs; and

4. lighten the burden that otherwise would be placed upon the government with regard to the collection and analysis of the extensive data involved in determining the feasible and appropriate level of control for each and every facility or product.

Supposedly, the need for governmental involvement and regulation can be materially reduced through recourse to economic instruments, because those functions would be accomplished by the economic instruments according to market mechanisms. The reality is that, in practice, the need for conventional monitoring and enforcement, and other forms of direct government involvement, has not been materially lessened by economic instruments.

Thus far, applications of economic incentives have been quite limited and, as yet, there is no instance of a significant improvement in environmental quality that can be credited to economic incentives. Hesitancy to rely upon economic incentives is largely due to uncertainty regarding

ramifications and possible undesirable outcomes. Moreover, implementing a suitable application is a difficult and complex undertaking. Finally, economic instruments could be used to complement direct regulation.

B. Responsibility for regulatory and economic instruments

Nearly every governmental and non-governmental agency becomes involved in or is affected by ramifications traceable to the selection of regulatory and economic instruments designed to fulfil pollution control and waste management objectives. The responsible level of government, the type of institution, and the mechanisms for enforcement are determined by the nature of the selected instrument. Usually, agencies at the national government level are entrusted with instruments that involve activities characterised by a very high degree of political consensus, maximum complexity, and risk. On the other hand, responsibility for instruments concerned with natural resources shared by two or more municipalities generally is given to state and local agencies. Policy instruments that deal with wastewater collection and treatment, drainage control, air pollution from both mobile and fixed sources, solid waste management, and groundwater contamination generally are consigned to the local government level. At times, authorities managing a particular watershed, waste generation area, or air basin may be given responsibility for pollution control. Occasionally, non-governmental agencies strongly influence the development and enforcement of pollution control regulations.

B1. NECESSARY conditions

The authority of the agency assigned the responsibility for implementing pollution control or waste management policies must be clearly delineated. It follows that the selected agency be endowed with the expertise, human resources, equipment, and financial resources needed to carry out the policies. In many developing countries, doing this with respect to waste management, pollution control, and enforcement would involve a substantial strengthening of human and financial resources and of organisational structure. Frequently, it even may happen that a new environmental agency or environmental unit must be established.

Available reports of evaluations of the application of regulatory and economic instruments in developing countries are few in number. Reports that are available mostly deal with information on the existence or non-existence of standards or other regulatory or economic instruments. They focus attention on the weakness of current institutions and personnel regarding monitoring and enforcement activities. The literature contains few citations regarding the successful application of regulatory and economic instruments to environmental management.

In a developing country, the basic challenge regarding the makeup of environmental programs is to decide upon an appropriate combination of instruments. Among the factors to be considered are social, political, economic, and environmental issues. Accordingly, considerations that should be taken into account in the planning of environmental strategies and the selection of policy instruments should include the following: 1) the successful application of economic instruments pre-supposes appropriate standards, accompanied by adequate monitoring and enforcement capabilities; and 2) even with the establishment of effective monitoring and enforcement capabilities, it is unlikely that economic instruments will replace traditional regulatory instruments. Nevertheless, if adequate enforcement mechanisms are in force, a highly effective approach to the attainment of waste management objectives is the imposition of direct charges.

B2. NEEDED research

Additional research on environmental management strategies is needed. In-depth studies should be centred on the evaluation of the effectiveness of various regulatory and economic instruments

as, for example, practical aspects of initiating and operating an economic instrument and the circumstances essential to the success of the application. The scope of the study should be broad enough to include: 1) combinations of the most appropriate instruments, 2) approaches that take cross-media pollution effects into consideration, and 3) suitable minimum standards. Finally, research should be directed to the identification and establishment of monitoring and enforcement capabilities that would be appropriate in a developing country setting.

C. Useful regulatory and economic mechanisms

C1. REGULATORY mechanisms

C1.1. Standards

Most current standards were designed for and are used in industrialised countries. The development of standards is, as yet, in the early stages in non-industrialised countries. This disparity rapidly disappears during the transition from the developmental status to the industrialised status. Hence, the following presentation on standards deals mostly with those currently in vogue in industrialised countries. The variety of the standards in industrialised countries encompasses all phases of solid waste management. Thus, standards exist that are specific for each type of solid waste management activity (e.g., storage, collection, recycling, final disposition).

The rationale and the consequent objectives of all standards are: 1) protection of the public and of solid waste management workers, and 2) the maintenance and improvement of the quality of the environment. The scope of the standards includes all applicable technical and operational requirements. Additionally, the scope extends to all management, operation, and maintenance aspects of solid waste facilities. More recently, the scope of some standards has been expanded to involve waste minimisation, recycling, and resource recovery.

C1.1.1. Storage and collection

Technical and operational standards pertinent to storage and collection specify types and sizes of storage containers, locations for the containers, frequency of collection, and the amount and types of wastes to be collected. If the traditional manual mode of collection is replaced by the "automatic" or "semi-automatic" mode, the design of storage receptacles and the placement of the receptacles on the day of collection must be altered accordingly. Other applicable standards include specifications regarding the collection vehicle and the collection schedule. Standards pertaining to noise abatement during collection include noises associated with the collection vehicle and its operation. Examples are activation of the compaction mechanism and engine exhaust noise. A less frequently encountered specification is to the extent that the collection vehicle be covered, excepting during the loading and unloading operations. Another regulation calls for computerised air braking systems for trucks equipped with air brakes.

C1.1.2. Waste minimisation

A current trend is the reliance upon governmental regulation, legislation, and mandate as mechanisms for minimising the amount of waste destined for final disposal. The trend is prompted, in large part, by the rapid dwindling of available landfill capacity and, to a lesser extent, by an awareness of the need for resource conservation. Governments conserve the landfill capacity resource by specifying types and amounts of waste that are permitted to be landfilled [1,7]. Resource conservation is promoted through resource recycling and reuse, encouraged by way of government-backed incentives.

Regulatory measures related to storage and collection and intended for the promotion of recycling and reuse usually call for kerbside placement of storage receptacles on the day of collection. The measures also specify the number of containers and the types of materials that are placed in each container. The simplest configuration calls for two containers; one for recyclables and one for non-recyclables. Each of the other configurations has the following general arrangement: one container for non-recyclables and one container each for the separated components (e.g., ferrous metals, paper, glass, etc.).

One of the numerous strategies geared to resource conservation involves regulating the use of certain materials or energy resources such that the recovery of materials from the waste stream is facilitated. Applied in that manner, regulations can be designed to control and possibly prevent the use of certain materials, or discourage the use of a particular production method or treatment.

Governments may provide an incentive to recycle and reuse by way of requiring manufacturers and importers to use recycled materials. By so doing, the government advances the development of a market for recyclable materials and simultaneously may alleviate shortages of a particular material. However, application of these measures should be preceded by discussions with affected industries, and preferably with their cooperation.

C1.1.3. Final disposal regulations

All aspects pertinent to the final disposal of wastes are subject to regulatory control. Thus, a collection of technical and operational standards are in force that affect the siting, design, construction, operation, closure, and post-closure of solid waste disposal facilities. In the United States, these standards are covered in the Resource Conservation and Recovery Act (RCRA). RCRA exemplifies a regulatory course of action that, with suitable adaptation, can be successfully applied in most industrialised nations, as well as in developing countries. In other words, it is a useful model. A major feature of RCRA is its banning of the open dump -- open dumps must either be closed or be upgraded to the sanitary landfill level. In keeping with this directive, RCRA specifies a set of standards for sanitary landfills. Among the standards are some that affect the location of a landfill facility. Another standard calls for the installation of a leak detection system if the need for such a system exists. Other directives mandate the monitoring of groundwater, and the initiation of corrective action to remedy shortcomings that are revealed. Finally, RCRA gives legal standing to regulations that ban certain waste management practices and forbid the siting of certain types of facilities in sensitive environments.

In some countries in Europe, land disposal of solid waste is subject to the Landfill Directive of the European Union [7]. The directive sets forth the conditions under which solid waste can be disposed in landfills, including the biodegradable organic content of the waste, the maximum percentage of biodegradable waste that can be landfilled over the period 2006 to 2020, and other requirements.

C1.1.4. Permits and licenses

Safe processing, transfer, and disposal practices in solid waste management can be assured by way of the issuance of permits and licenses to the owners and operators of solid waste management enterprises. In industrialised countries, the permits and licenses address both design and operation of the solid waste facilities, and typically specify and are conditioned upon peak processing capacity; operating schedule; required controls of solid, gas, and liquid emissions from the facilities; as well as other requirements.

C1.1.5. Management programs

This aspect of solid waste management policy deals with the management plan or program that should be developed by solid waste management jurisdictions. Thus, each jurisdiction should be obligated to: 1) prepare a program for the storage, collection, treatment, and disposal of all household, commercial, and industrial waste expected to be generated within its confines; and 2) periodically update the program.

Examples of management programs include the following:

- Each province in the Netherlands is required to develop a solid waste management program that states the manner, location, and by whom wastes are to be deposited, treated, or recycled.

- In the United Kingdom, items covered in a program are: information on types and amount of waste expected to be generated or to be brought into the jurisdiction during the program, type of waste the authority will process, types of waste others are expected to process, method of disposal, sites and equipment being provided, and cost. Other programs may extend to measures for waste reduction and recycling.

- The French Environmental Protection Law passed in July of 1992 requires the development of departmental and regional plans for the management and disposal of waste [1].

C2. ECONOMIC mechanisms

An excellent stratagem for funding solid waste management systems is the imposition of fees or charges, the use of a deposit system, or the implementation of a subsidy program.

C2.1. Charges (fees)

Charges that may be levied to defray solid waste collection and disposal costs can be grouped into three categories -- user, disposal, and product.

C2.1.1. User charges

Charges in this category are those that are levied to defray costs associated with collection and treatment. Only rarely are they inflated sufficiently to serve as incentives. On the contrary, charges are assessed on the basis of total expenditures and ignore marginal social costs due to negative impact upon the quality of the environment.

Assessment of user fees can be modified such that they act as incentives to reduce the rate and amount of waste generation. The utility of such an approach is attested to by the extent of the reduction in waste generation that resulted from the implementation of a variable garbage can fee system in the State of Washington (Seattle) and in the State of California (San Jose and San Francisco), and the pay-per-bag systems in New Jersey, Pennsylvania, and Illinois. Experience in the United States demonstrates that combining programs for recycling newspaper and containers (glass, plastic, and metals) with the variable fee system markedly enhances the effectiveness of the latter in reducing the quantity of solid waste destined for collection or final disposal. However, attention must be paid to properly integrate the collection, processing, and disposal systems, structure the fees, and educate the public.

C2.1.2. Disposal charges

One of the typical forms of disposal charges is the “tipping fee”. The tipping fee is the charge levied at the disposal site. The amount of the tipping fee usually is a function of the weight of the waste to be disposed. For certain types of waste, the fee may be a function of volume. The magnitude of the charge also may depend upon the type of waste and the method of treatment prior to final disposal. In many cases, the landfill tipping fee for residues from composting facilities is lower than that for untreated waste. A charge is levied in Denmark on solid waste from households and industry; the charge is intended to serve as an incentive to recycle. In the United States, final disposition of certain troublesome wastes (e.g., tires, vehicle batteries, and used oil) may incur special charges. Another stratagem is the imposition of disposal surcharges to cover closure costs, or to finance pollution monitoring and control and/or resource recovery activities [2].

C2.1.3. Product charges

The rationale for product charges is largely anticipatory in nature in that they deal with future consequences rather than past or current consequences. As such, the rationale may be motivational, compensatory, or punitive.

The rationale is motivational when the fee is imposed to promote protection of public health and quality of the environment or to encourage conservation of resources.

The rationale becomes compensatory if the fees are designed to compensate for the loss that would attend the eventual disappearance of an essential resource. It also is compensatory if the imposed fees are to account for disposal cost over and above that of other wastes. In practice, product charges finance parts of the policy measure originally developed to deal with the negative environmental effects of the products on which the charges were imposed. The consumption of products will continue unless charge levels are raised considerably or regulations become more stringent.

The rationale assumes a punitive quality when the motivational and compensatory aspects fail to be effective or are not pertinent. Regarding the effectiveness of product charges or fees designed to serve a regulatory function, the general experience is that they have little impact in terms of incentive.

Among the categories of waste that have been and are being subjected to product fees are non-returnable containers, lubricant oils, plastic bags, automobile batteries, and fuels. The category of non-returnable beverage containers has been the major object of product fees. Usually, the collected fees are primarily used to finance the deposit-refund systems for containers (e.g., Finland and some states in the United States).

C2.2. Deposit systems

The utility of the deposit strategy as a regulatory device has been amply demonstrated. Traditionally, the deposit stratagem involved two steps: Step 1 is the imposition of special taxes, charges, or fees on certain consumer items (usually, returnable beverage containers). Step 2 is the recovery of the special fees, etc. by the purchaser when he or she returns the container for reuse or disposal. However, the scope of the strategy has been broadened considerably such that it currently includes not only containers but also several other types of items. The objectives of the deposit fee are the encouragement of recycling and the prevention of pollution.

Returnable beverage containers continue to be the items most frequently concerned. Thus, in the United States, several states mandate the application of deposit-refund systems to carbonated beverage containers (soft drinks and beer). These states report that of the total number of containers affected by the system, 80% to 95% are returned for recycling [6]. Apparently, the monetary incentive (US$0.05 to US$0.10 refund/container) is sufficient to induce the desired compliance. The application of the deposit-refund system is not confined to the United States. Deposit-refund systems have been very successful in Finland, in that about 90% of the containers are returned. Doubling the deposit charged for aluminium beer cans increased the quantity of cans returned from 70% to more than 80% in Sweden [3].

The deposit-refund concept has been expanded to include items other than reusable beverage containers. Suitably modified deposit-refund systems are being successfully applied to the recycling of automobiles and automobile batteries. For example, a deposit-refund system applicable to hulks of cars and vans was mandated in Norway in 1978. Under the system, the refundable fraction of the deposit is larger if the discarded hulk is returned to an officially designated site. The return rate in the mid-1990s was greater than 90%. Revenues are used for refunds and for financial assistance for collection, transportation, and dismantling facilities.

Mandatory deposit systems for automobile batteries have been implemented in some states in the United States (e.g., California). In these states, every battery sold or offered for sale must have a deposit paid at the time of sale. The deposit is waived or returned if a used automotive battery is brought to the store.

Experience tends to indicate that deposit-refund systems work well, and apparently are more effective than voluntary return systems. A probable reason is that deposit-refund systems provide a tangible reward for performance. Deposit-refund systems are efficient in terms of administration, in that monitoring or other involvement by authorities is usually not required.

Most industrialised countries have in effect some form of deposit-refund system applied to glass beverage containers.

In terms of the efficiency of deposit-refund systems, there is a lack of quantitative assessments in which the costs of deposit-refund systems are compared to the costs of alternatives that have an equally beneficial environmental impact. Nonetheless, it can be assumed that, in some cases, the costs of household waste collection, transport, and incineration or dumping exceed the costs of the deposit-refund system [3].

C2.3. Subsidies

Very frequently, subsidies can be used to advantage in most phases of solid waste management. At one time in the United States, federal grants were made to states to subsidise the development and implementation of solid waste management plans, resource conservation, and resource recovery. Currently, some grants are available for training, research, and demonstration projects for energy and materials recovery, and for solid waste disposal planning.

In Denmark, subsidies for the development or installation of technologies that produce less waste or reuse waste materials are authorised by an amendment to the Act on the Re-use and the Reduction of Waste (1974). The Waste Disposal and Treatment Law enacted by Japan stipulates that the state subsidise: 1) various categories of local expenditures in accordance with policy provisions, 2) necessary expenditures for maintenance and repair of refuse disposal facilities, and 3) expenditures for the disposal of wastes caused by natural hazards or other factors. The Ministry of Environment in Finland subsidises the reduction of interest on loans made for the purpose of financing waste recycling investments.

Subsidisation can be in the form of preferential tax treatment on bonds issued by state (provincial) and local governments for the construction of pollution control facilities or the development of plants capable of incinerating municipal solid waste for the generation of steam or electrical power. In the United States, earnings on municipal bonds issued for that purpose presently are exempt from payment of federal and state income tax. Preferential tax treatment may be used to encourage industry to practice resource recovery. This approach has been used periodically in the United States and in Poland [4]. Other incentives include tax credits to industries that use recycled materials as part of their feedstock.

The market for recyclable materials can be stabilised through: 1) price supports for the establishment of materials banks; 2) the guarantee of an income from a recycling plant or facility (e.g., tipping fees or quantity of incoming material above a defined minimum level); and 3) the institution of investment grants, accelerated depreciation, and soft loans designed to encourage private enterprises to implement resource recovery activities [5]. The guaranteed income may be in the form of tipping fees, or of a guaranteed quantity of incoming material.

D. References

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