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WATER AND SOLID WASTE MANAGEMENT**

***ECONOMIC INSTRUMENTS FOR SOLID WASTE MANAGEMENT IN LATIN AMERICA  
AND THE CARIBBEAN***

ISSUE BRIEFING

*Econ. Jorge Ducci, Soluciones Integrales, S.A. Santiago, Chile*  
*Econ. Michael Toman, Inter-American Development Bank, USA*

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## ECONOMIC INSTRUMENTS FOR SOLID WASTE MANAGEMENT

### BASIC CONCEPTS

The use of economic instruments has drawn increased attention as a tool for both lessening the size of the solid waste management problem and improving upon the delivery of solid waste collection and disposal services. In the environmental economics and policy literatures, the term *economic instrument* generally is understood to refer to a policy, tool or action which has the purpose of affecting economic agents' behavior by changing their financial incentives in order to improve the cost-effectiveness of environmental protection efforts (pollution control and avoidance).

As pointed out for example in Professor Seroa's general overview of environmental policy instruments, any instrument alters behavior. Economic instruments can be contrasted with "command and control" actions that more directly act through norms, regulations, and sanctions to prescribe both the standards to be followed by economic agents and their decisions of what, how, when, where and how much to produce, consume, emit, and clean up. The key features of economic instruments highlighted in the environmental economics and policy literatures are (a) their more flexible and non-prescriptive nature as the actions required, which may allow for reduced costs to meet environmental norms; and (b) their dynamic incentives to cost-effectively reduce the creation of environmental harms through technical innovation in pollution control and avoidance.

A number of taxonomies can be proposed for categorizing economic instruments in the solid waste area. The international and regional experiences so ably summarized by the expert consultants' contributions to this policy dialogues suggest the following approach:

#### Revenue Raising Instruments

1. Various kinds of *user charges* for the provision of collection, transportation and final disposal services, including taxes levied for these purposes by different levels of government, are the most basic economic instrument for this activity.
2. Various kinds of *taxes directed at "internalizing" the externalities* associated with the production and disposal of wastes are a second form of instrument in this category. Unit taxes on final products and inputs (virgin or hazardous materials) may compensate for a difficulty in setting direct user charges and provide funds for the financing of waste collection and disposal services. Other examples in this category include taxes reflecting residual pollution of air, water and soil at disposal sites.
3. *Subsidy reductions* that lower incentives to create or improperly dispose of wastes have a similar impact (and in practice also increase revenue flows).

#### Revenue Providing Instruments

4. *Subsidies* of different kinds are the generic policy in this category. They seek to directly reward desired behavior (waste reduction, improved management, or recycling) rather than to penalize the behavior to be discouraged. Subsidies can be direct payments, reductions in taxes or other charges, preferential access to credit, or in-kind transfers like

the provision of land or other resources. Obviously these instruments tend to reduce revenues otherwise available to the authorities.

### **Non-Revenue Instruments**

5. *Deposit-refund programs* combine the incentive effects of charges (when a good is purchased and the deposit is made) and subsidies (when the good is returned or otherwise handled properly and the deposit is refunded) for the management of solid waste.
6. *Other incentive-creating policies* can include *liability laws and performance bonds* (which increase the financial cost of irresponsible waste handling or disposal); *performance disclosure* (in which information about the performance of a waste producer or handler affects their financial condition by affecting their public standing); and *general public education* (to alter the demand for environmentally improved waste management).
7. *Creation or facilitation of markets* is a measure relevant to all parts of the product and waste cycle. Policies to promote more competitive markets in waste management services, instead of the usual direct public administration of waste management, can alter the incentives for participation in the provision of the services; the incentives of the public to rely upon the services; and the fiscal condition of the public authorities. Experience with bidding long-term contracts to private service providers illustrates this type of economic instrument.

When one moves beyond the conceptualization of economic instruments for solid waste management to consider their practical application, three interrelated challenges quickly come to the fore. The first is that much of the solid waste problem involves what is referred to in the environmental economics literature as “non point sources.” It may be possible to closely monitor and regulate or apply economic instruments to wastes generated by large industrial sources or the conduct of large landfill operators. But much of the solid waste that is generated comes from individual households and small enterprises, and much of the collection activity and a reasonable percentage of the disposal likewise involves smaller actors. By their very nature these sources are harder to monitor and therefore harder to regulate with economic instruments or command and control.

This implies, for example, that we cannot expect a textbook system of waste disposal charges to be that effective when illegal disposal or other creative ways around the charges are a real possibility. The limited international experience to date with unit-based charges bears out this caution. (Another practical problem with this system is the sheer complexity of its implementation, and the question of how to combine volume and weight for measuring the charges to be assessed.) The lack of unit-based user charges implies an excess production of wastes from an economic efficiency perspective. In practice, as noted below, user charges often are fixed periodic payments, unrelated to the volume, weight or type of wastes involved. In this setting, user charges is a tool for cost recovery and financing of waste services. But even without unit-based pricing, charges that provide for financially sustainable waste management and thereby increase public confidence in the provision of these services will have salutary environmental effects.

The second challenge is that waste management services in most developed and developing countries typically have been offered as public services and treated like public utilities. As experience with other public utilities as shown, there may well be scope for increased private sector participation and competitive provision of services (for example, collection). In other cases (landfill management), there may be stronger economies of scale that argue in favor of

limiting the number of participants (public or private). Even where there is a potential for private participation and increased competition, experience with public utility reform in developed and developing countries cautions us that the constraints imposed by past investment experience and existing institutional capabilities must be considered for the potential benefits of more competition to be realized in practice.

The third interrelated challenge is specific to solid waste management in developing countries, including Latin America and the Caribbean. Modest incomes condition the practicability of different policies. Even if very high user charges to reduce waste generation or to deposit wastes in state-of-the-art landfills were technically feasible, the resulting costs could be too high a percentage of income to be politically acceptable. Institutional reforms and industrial organization policies that increase efficiency of waste management and therefore lower costs represent a win-win solution in this context. On the other hand, policies that lead to higher costs because of the removal of public subsidies may be economically and fiscally sound but politically painful.

Sandra Cointreau's review of international experience with various economic instruments for solid waste management includes the following list of criteria for evaluating options:

- ~~///~~ Environmental effectiveness – i.e., does the instrument lead to the desired environmental improvements, such as reduction in waste generation, increased waste recycling, reduced emissions from transport and disposal.
- ~~///~~ Economic cost-effectiveness – i.e., does the instrument create incentives for investment and innovation toward reduction of pollution control costs.
- ~~///~~ Administrative cost-effectiveness – i.e., does the instrument require affordable and available levels of skill and effort to implement and monitor.
- ~~///~~ Revenue usefulness – i.e., are revenues generated able to be applied to address the environmental objectives of the instrument and adequate to create measurable improvement.
- ~~///~~ Ease of implementation and replicability – i.e., are the relative costs and benefits relatively easy to assess and the legal requirements for introducing the new instrument reasonable.
- ~~///~~ Acceptance – i.e., does the general public and the affected industries accept the instrument as a viable means of cost-effectively achieving environmental improvement without adversely affecting competitiveness, employment, income distribution, and trade.
- ~~///~~ Distributional effects – i.e., is there distributional disparity or inequity in the application or impact of the instrument, particularly regarding effects on lower income households, small businesses, and disadvantaged parties.
- ~~///~~ Short-term results – i.e., does the instrument have the potential to result in sufficient short-term improvement to motivate political administrators to undertake commitment to the costs associated with the instrument under their political term.
- ~~///~~ Waste type applicability -- i.e., does the instrument address a wide range of waste types and have significant impact on overall urban waste quantities, or does the instrument address only a limited number of unique and important waste types.

This list can be kept in mind while considering the experience of the region with different economic instruments.

## **USE OF ECONOMIC INSTRUMENTS FOR SOLID WASTE MANAGEMENT IN THE REGION**

A bibliographic review of the application of economic instruments for solid waste management in the region shows that while some of these instruments are being widely and significantly used, for others only some isolated experiences are found.

User charges are a frequently used instrument for the collection, transfer and disposal of solid wastes. Bolivia, Brasil, Chile, Colombia, Ecuador, Jamaica, Mexico and Venezuela have experience with this instrument.

Usually, however, for residential wastes these charges are fixed and paid periodically. These charges are unrelated to the volume, weight or type of the wastes being disposed of. In this case, the economic instrument is being directed exclusively to the achievement of cost recovery and not directly towards the reduction of generated wastes. For example, in the urban municipalities in Greater Santiago, where this instrument has been used for many years and is considered a successful case, recovery is about 55% of service cost. The essential problem with user charges is that it is not possible to exclude from service those who do not pay, which makes it impossible to recover the total cost. The use of charges through territorial taxes has the inconvenience that collection costs are high, as it usually involves the use of legal mechanisms and, therefore, has a high non-payment rate.

A simple and cheap method for increasing recovery is to add this charge to the bill of some other utility. In Colombia, this unified utility bill is the usual practice in many cities, and it has been used recently also in Guayaquil, Ecuador and La Paz, Bolivia, where it is applied as a surcharge on the electricity bill. This policy allows a higher level of recovery, and some degree of progressiveness (higher income families consume more electricity and, therefore, pay more for solid waste services), although it generates a distortion in the electricity market, without increasing the efficiency in the solid waste market.

It seems that there are no experiences in Latin America of residential user charges based on volume, weight or type of waste. The controls needed for an effective application of this type of charge, and to avoid fraud or abuses, substantially exceed the institutional capacity of local governments.

It is possible to highlight experience in Chile, Colombia and Rio de Janeiro, where non-residential user charges are directly related to the weight of the wastes being collected. In Santiago, Chile, for example, these users freely agree on the service conditions with the many existing private collection companies. Under this concept, users internalize at least the private costs of providing the service in their marginal consumption and production decisions, achieving a more efficient social solution.

It is important to note that user charges should ideally distinguish the costs related to providing the service in each and every one of the stages involved, i.e., collection, transport, transfer, and final disposal. In this manner, a final user might opt, for example, to transport his wastes by his own means to a final disposal site, which would charge a fee related to that stage of the service.

Differentiated charges by stage exist in countries such as Ecuador, Colombia, Venezuela and Chile.

A second economic instrument extensively used in the region is the deposit and refund system for recyclable wastes. In countries such as Barbados, Brasil, Bolivia, Chile, Colombia, Ecuador, Jamaica, Mexico and Venezuela these systems exist for products like paper and cardboard, glass bottles, aluminum cans, tires and others. Under this system, when buying an affected good, a consumer pays an amount that is reimbursed when the consumer returns the recyclable waste. An interesting characteristic of this activity is that in most countries it is voluntary, due to the interest that many producers have in reusing the recyclable materials. Mexico is the only known exception to this rule, as used car batteries must be returned to acquire new ones.

Related initiatives have been taken by some local governments to develop a recycling industry. In many cases in Brazil and Chile, municipalities have organized and “formalized” waste collectors, so that they contribute in a better way to the collection and separation of recyclables, reducing the social problem associated with these collectors.

In the case study of the Municipality of La Reina, in Santiago, Chile, the authorities were able to create an organization in which a private company organized the informal waste collectors, providing them with uniforms, containers, training and a market in which to sell recyclables. This company would finance its activities with the reselling of recyclables to final manufacturers. However, given the high price volatility for recyclable wastes, the financing scheme was additionally supported with the authorization for the selling of publicity on containers, with an exemption of the payment of municipal rights for this publicity. The company operated for about eight years under this setting, up to 2001 in which the country’s economic downturn made the scheme financially unfeasible. The municipality achieved one of its main objectives, which was to reduce the social problem related to informal collectors. The total amount of wastes collected and recycled was only about 2% of the total wastes generated, so that there were not significant cost savings for waste disposal to the municipality.

A related case study is provided by the recent experience of recycling PET bottles in the city of Rio de Janeiro. A plant was set up in 2000 by a private company, with a capacity of about 5 tons/day of PET bottles to produce mainly flakes and laminated products. It is estimated that this capacity is only about 5% of the market potential. Individual collectors as well as some cooperatives collect PET bottles throughout the city. The community participates in separating these bottles at the source. A cash flow analysis indicates that the internal rate of return has been of about 6% over 18 months, without the use of any subsidy, except for the free use of municipal land. This example shows that the recycling of PET bottles is technically feasible, with a positive environmental impact, and that there is some feasibility of developing a more commercial-like operation for the recycling of wastes. Full financial feasibility would require better market conditions or changes in project design to achieve a return compatible with the risks involved.

The broader rationale for involving the private sector in the collection, transfer and disposal of wastes has been the low levels of observed coverage from public service provision, the high inefficiencies of municipal operators, their lack of financial resources, and the extensive number of illegal dumping sites. To date private operators, under direct contract, service 40% to 50% of cities in Latin America. Studies indicate that there have been important cost reductions (50% in 5 cities studied) due to larger labor and vehicle productivity. Contract duration is about 5 to 8 years, with periodic re-bidding so that there is competition for the market.

A specific case study was developed for Santiago, Chile. Most municipalities in the city bid independently for contracts for the collection and transportation of their residential wastes. Tender documents establish the parties' mutual obligations, including aspects such as: exclusiveness of the collection area, 5 year contract duration, standards for the quality of the service (timetables, use of uniforms by employees, new and technically adequate vehicles, etc.), as well as the price to be paid by the municipalities, which is generally a fixed monthly payment. A large number of companies participate in these bids, inducing significant cost savings. Even though only three companies control 60% of the market, current costs are only from US\$ 7.7/ton to US\$ 26.7/ton. This compares to other significantly higher prices in the region, which vary between US\$ 15/ton. and US\$ 40/ton.

The rationality of this approach is based on the fact that there are no significant economies of scale at the residential waste collection stage. That is, average costs do not vary with the volume of wastes collected. Available data for Santiago, Chile allow us to corroborate this situation. Under these conditions, it does not make sense to integrate the collection service in wider geographical areas. The presence of a high number of service providers (11), and some other 30 potential entrants, assure that there is sufficient competition to maintain minimum possible costs.

In relation to final disposal services, the Santiago case study exemplifies a situation in which municipalities associate for the bidding of these services, so that scale economies can be exploited. Currently, 3 sanitary disposal sites coexist, under 20 year contracts, with some competition among them. Current disposal prices in Santiago are about US\$ 4/ton and US\$ 7/ton, which are below the costs observed in other cities in the region, of about US\$4-12/ton.

A related initiative has been the liberalization of markets to provide services for non-residential users, as has been done in Chile and Brazil. A specific case study is available for the city of Rio de Janeiro. Up to 1990 COMLURB (the municipal company for the clean up of Rio) had the monopoly for collection, transportation and disposal services. Service was of low quality (irregular), expensive, and with a low cost recovery rate. Due to the many complaints, in 1990 a municipal decree ended COMLURB's exclusivity and in 1993 it withdrew from the market. To date there are 12 certified companies providing service to some 6,100 establishments. These companies collect about 12% of total solid wastes collected in the city. Prices average about US\$ 0.04/kg., representing a substantial reduction from pre-deregulation prices. Clients' satisfaction is high. Deregulation was supported by the issuing of various norms related to the conditions that have to be met by the parties (types of wastes to be disposed, mode for "presentation", technical requirements for trucks, etc.) and fines and sanctions for infractions. The experience is considered highly successful from an environmental point of view, as there is less illegal dumping, better transport vehicles, and has stimulated a recycling industry. Financially, the operators are all making reasonable profits, and there are considerable savings for COMLURB, which formerly had losses in providing this service.

Lessons acquired in these privatization processes are the following: (i) There is the need to develop a global framework for private sector participation. (ii) There have been some justified increases in costs compared to the previous direct administration systems. (iii) Cost recovery from residential users continues to be a problem. (iv) Municipal labor issues need to be resolved previous to the process. (v) Municipal institutions for contract regulation need to be strengthened, and the improvement of contract characteristics is needed (well defined standards, payment against results and regular monitoring).

Lastly, various initiatives have been developed for integrated solid waste management, which involve some form or other of economic incentives. A case study for the small municipality of Montebello in Colombia indicates that through the strong involvement of the community and the local government, plus some outside support, it was possible to establish an environmentally interesting management system. In this town, most of the 2,000 inhabitants separate organic, sanitary and recyclable wastes at home. These are transported to a collection and separation center, at which a women's association separates the recyclables. These are sold in the nearby city of Medellin. Organic wastes are used in compost and worm culture, from which humus and worms are sold to the Municipal Farmers' Technical Assistance Unit for its use as fertilizer. The balance of wastes is incinerated. Annual costs, including depreciation, are about US\$19,000, with revenues from the sale of products reaching 25% of these costs. Some 62% of the costs are financed from differentiated user charges (residential by socioeconomic level, and non-residential). The municipality provides the balance of funds.

With this scheme it was possible to solve the environmental problems related to the dumping of wastes in an inappropriate landfill. The initiative involved a very high degree of community participation and education. External support came from the local coffee growers' association, as well as the regional development corporation. These provided advisory services at project design stage, and continue to do so for the operation of the system. The regional development corporation donated the incineration equipment. Although these supports constitute a subsidy, they are judged to be justified because of the positive impact on the environment achieved by the project.

## **CONCLUSIONS AND RECOMMENDATIONS**

The traditional approach for solid waste management used in the region has been that local governments, through their own companies or services, are directly in charge of the collection, transportation and final disposal of these wastes. Coupled with this action, numerous norms and regulations of "control and command" type are applied in order to eliminate or mitigate the externalities associated with the generation and disposal of these residues.

The option of using various economic instruments has emerged as an alternative to this approach, in order to improve the efficiency and efficacy of waste management. The main economic instrument used in the region has been the involvement of private operators for the collection, transportation and final disposal of wastes. This experience has shown that such a scheme for industrial organization is feasible, and in general, has been successful, as an option for the management of solid wastes, if the central aim is to minimize the costs of providing the services. Its use could be increased throughout the region. Some experience with the deregulation of services to non-residential users is also of high interest.

Although the results from these experiences are favorable, the lessons learned indicate that there are many aspects that must be of special concern in their utilization. These aspects are related mainly to assuring that the service provision is carried out in an effective competitive framework, with clear and transparent rules, and with adequate policing mechanisms.

Another type of instrument that has developed in many countries is deposit and refund systems for recyclable wastes, especially paper, cardboard, glass, aluminum cans and plastic. In this case, the companies that demand this type of materials have generated a significant market for the recycling of wastes, including their importation and exportation. In those countries where such



systems have not been well developed, a more detailed analysis is needed to identify the measurements that would allow the stimulation of such markets.

The issue of recycling is related to the social problem of informal collectors. There are experiences in which municipalities have organized these collectors in order to face this matter, trying to “formalize” their activity, thus improving their living conditions. The case study of La Reina in Santiago shows that it is feasible to develop this type of scheme, although it required a significant subsidy to maintain its financial feasibility for over eight years. Promoting recycling as a business is another question. As the case study of the recycling of PET bottles in Rio de Janeiro shows, an interesting market for this product exists, and with minimal financial support it can be made financially feasible.

User charges are in principle a key economic instrument to encourage waste minimization and proper waste management throughout the product and waste cycle. In order for this instrument to be most useful it is necessary that charges be directly related to the volume, weight and type of waste, and that these charges are actually collectable. In most cases, however, the necessary conditions for such a charge system are not met. Instead, user charges tend to be periodically fixed values, unrelated to waste generation and, in most cases collection is low. Initiatives to incorporate this charge in other public service’s bill have helped to increase collection significantly (cases of many cities in Colombia, Guayaquil and La Paz), targeting at least an increase in the financing of this activity. There are charges by weight only in Chile, Colombia and Rio de Janeiro, applicable mainly to non-residential wastes.

In addition to the above, it is necessary to highlight the potentially relevant use of taxes at the final disposal stage, taking into account the residual air, water and soil pollution that its normally caused at this stage. The internalization of this cost along the waste production chain would allow for the correction of an important externality of this activity. There is no experience in the use of this type of taxes in the region, partly due to the financial weaknesses of the municipalities, which are not in the position for paying a tax of this type, either directly or indirectly. Its application should be tied to the strengthening of user charges, as indicated. It would also require stringent control of illegal dumping sites.

Ultimately, the study shows that there are some important economic instruments in use in the region and that their greater dissemination could be of interest for other countries and cities. However, there is still a lack of experience in some instruments that may have a large potential for increasing the efficiency of solid waste management.

Sandra Cointreau’s study contains a number of recommendations for further progress in the use of economic instruments to manage solid waste in Latin America and the Caribbean. Drawing from her report and the findings of the regional review and case studies, we conclude with the following further suggestions from an economic perspective:

- ~~///~~ Economic instruments need to complement rather than conflict with existing regulatory goals and institutions. Instruments that target areas of significant pollution loadings and environmental consequences should be given priority.
- ~~///~~ Instruments that focus on long-term behavior modification need to be implemented. But new instruments should be introduced in steps.
- ~~///~~ Instruments should be in tune with broader economic development objectives in terms of use of labor, energy and capital.

- ✍ Consideration should be given to how revenues from economic instruments will be used: for specific waste management investments, general improvement in waste management services, waste-related environmental remediation, or other applications.
- ✍ Revenue-providing instruments, such as tax credits, low-interest credit lines, accelerated depreciation and relief from customs duties, can provide financial incentives for the private sector to invest in production changes that reduce hazardous substances, increase recyclability, and generate less wastes. Such instruments also could encourage the private sector to invest and participate in solid waste service delivery, including resource recovery. But the use of such instruments needs to be carefully weighed against other considerations, including scarcity of revenue and the possibility that benefits will end up poorly targeted in terms of efficiency. Where possible, the application of charges and market-strengthening activities have advantages.
- ✍ Non-revenue instruments that strengthen liability for damage to the environment or public health also could be useful, assuming the legal system can make such instruments operative.