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POLICY OPTIONS FOR PACKAGING WASTE

a final report to

United Nations International Development Organization
Project number SF/MEX/94/001

Lifecycle Analysis and Legislation for Packaging Materials in Mexico
Contract number 94/030

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I. Framework and Objectives

The framework for Mexico's environmental laws and regulations is established in the General Law of Ecological Equilibrium and Environmental Protection (LGEEPA - *Ley General del Equilibrio Ecológico y la Protección del Ambiente*). Solid waste management, in particular, is the responsibility of municipal governments. The role of the federal government is both to provide support and to set technical standards for local governments, and to develop policy and standards for environmental issues that are nationwide in scope. The office of the Secretary for Social Development (Sedesol - *Secretaría de Desarrollo Social*) and its National Institute for Ecology (INE - *Instituto Nacional de Ecología*) have indicated their interest in developing general standards for the regulation of solid waste management.

Beginning in 1989, a series of UNIDO-supported studies by the federal government have addressed the issues of environmental planning, solid waste management, and packaging. In 1991-92, Sedesol carried out a study of "Managing and Recycling of Containers and Packaging Waste."¹ That study contained a broad range of institutional and technical recommendations for improvements in waste management practices, and called for the present study.

Following the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, INE/Sedesol adapted the conference's "Agenda 21" recommendations to Mexican conditions in a "Draft Program for Mexico 21" (*Borrador 1 del Programa México XXI*). The draft program calls for improved regulation and standards for solid waste, and for the application of economic policy instruments to solid waste management, among many other objectives.

The participants in the present study -- IIR, SFI, Franklin Associates, and Tellus Institute -- have examined the environmental impacts of packaging production in detail, and have analyzed and modeled the waste management system of the Federal District, focusing on its treatment of packaging waste. The results of that research are presented in other reports. In this report, we review relevant international experience with packaging regulation, and make recommendations for packaging policy in Mexico based on our research.

In making our recommendations, we recognize that packaging is a complex process with both positive and negative social and environmental effects. The benefits of packaging include prevention of spoilage and preservation of hygiene, nutrition, and flavor during the distribution of food; increases in the choices available to consumers in the marketplace; economic value added in packing production and use; and increased convenience of packaged products. The problems associated with packaging include the increased volume of solid waste, environmental impacts of both production and disposal, and increases in littering and improper disposal. The

¹ Sedesol Monograph No. 4, *Manejo y Reciclaje de los Residuos de Envases y Embalajes*, by Dr. Juan Antonio Careaga, published December 1993.

objective of our recommendations is to minimize the problems, and to maximize the recovery of discarded packaging materials, while preserving the benefits that packaging provides to society.

II. Policy Options -- International Experience

Our survey of packaging policy in other countries begins with an examination of Europe and Canada, where versions of the approach called "product stewardship" have been enacted or proposed. Product stewardship assumes that the manufacturer or importer of a product (the "brand owner", in the Canadian formulation) retains some responsibility for the product after it is sold, and should bear some or all of the burden of ensuring maximum recycling and/or proper disposal of the package. We then look at the United States, where product stewardship has not yet been accepted, but where numerous state policies address aspects of packaging waste management. Finally, we mention several other policy options for waste reduction that are often discussed, but do not appear to be relevant for use in Mexico.

A. Europe

Germany has the world's most ambitious and controversial packaging policies. In 1991 the government set recycling targets: by January 1993, 10% to 40% recovery was required for most materials; and by January 1995, 72% for glass and metals, 64% for paper and plastics. If industry fails to meet these targets, each manufacturer will be required to take back its own packaging for recycling.

For beverages, if industry does not maintain 17% refillable usage for milk, and 72% for other beverages -- or 1991 levels of refillable usage by beverage type, whichever is greater -- the government will impose a deposit of DM 0.50 (N\$1.00) on containers up to 1.5 liters, and DM 1.00 on larger ones.²

In response, industry established a consortium, Duales System Deutschland (DSD), to collect and recycle packaging materials. DSD sets fees for use of the "Green Dot" symbol, identifying the packaging that DSD will accept. In effect, DSD has the authority to set packaging taxes and use the revenues to meet the government's recycling targets.

DSD had a difficult time initially. After less than two years of operation, in 1993, DSD was near insolvency and facing nearly DM 860 million in debts. The costs of the DSD recycling operation, especially for collecting packaging materials, were much higher than the license fees received from green dot users. Fee revenues were low both because of underpayment by some manufacturers, and because the fee schedules did not fully cover collection and handling costs for some materials.

² Note that in this area, Germany's law is not the most strict in Europe. Belgium, Finland, and Norway impose taxes (not refundable deposits) on nonrefillable beer and soda containers, while Denmark simply requires the use of 100% refillable bottles in its beer and soft drink industries.

In response, the DSD convened emergency meetings between industry members, government, and waste treatment firms. Hauling firms agreed to a cap on their rates for collection of green dot materials. Industry members instituted more stringent payment and enforcement mechanisms to address green dot licensing payment problems.

The initial license fee structure, which was based strictly on the number and volume of packages produced, regardless of material type, was modified to take into account differential costs associated with collecting and sorting each packaging material. Thus companies who use packaging materials that are more costly to recycle and sort must pay a higher licensing fee for use of the green dot. The old and new fee structures are shown below in Table 1.

Original schedule: Volume-based fees		New schedule: Weight- and material-based fees	
Packaging Volume	DM per Package	Material	DM per kg of package
0 - 50 ml	0.00	Plastic	3.00
50 - 200 ml	0.01	Composites	1.66
200 ml - 3 liters	0.02	Aluminum	1.00
3 - 30 liters	0.05	Tinplate (steel)	0.56
30+ liters	0.20	Paper/cardboard	0.33
		Glass	0.16

Source: Bette Fishbein, 1994. *Germany, Garbage, and the Green Dot: Challenging the Throwaway Society*. INFORM, New York, New York.

DSD's recovery of some materials, particularly plastics, has exceeded Germany's recycling targets and processing capacity. This led at first to huge exports of plastics and other recovered materials; in some well-publicized cases, these exported materials ended up in disposal sites in developing countries. In other cases, Germany's neighbors complained about "dumping" of secondary materials, undermining their own recycling efforts. More recently there have been efforts to revise Germany's recycling targets, and to expand the capacity of the country's recycling industry.

France has instituted a more moderate variant on the German system. In 1993 the French government promulgated a decree which requires manufacturers and importers to take responsibility for recovery of packaging through industry-run organizations, in a manner that is similar but not identical to the German approach. Industries that choose not to participate in government-approved collection organizations must either introduce a deposit system or establish their own government-approved collection systems.

There are some key variations in the French legislation which distinguish it from the German approach. First, the definition of recovery includes incineration, as well as reuse, recycling, and composting. Thus, unlike the German ordinance, the primary intent of the decree is to reduce landfilling, not just to increase recycling. By providing industries with a wider range of alternatives, the decree will allow French industries to avoid some of the problems that the German DSD has faced in finding markets for recyclable materials.

Second, though the French decree does require monitoring and reporting of progress, no specific targets are established for recovery. Government-approved collection organizations must specify the packaging to be disposed of, the volume of packaging to be taken back, fees to be paid by industries for collecting and sorting materials, technical specifications of sorted materials, and the fees payable to local authorities for compensation for extra sorting costs.

Eco-Emballages, the organization established by French industry to comply with the law, has established a recovery goal of 75% for all packaging materials, with no material recovered at a rate less than 60%, to be achieved by 2003. The organization will provide financial assistance to localities who will be responsible for recovering specified recyclable materials including: glass, steel, mixed packaging, dry paper and board, plastics, and aluminum.

In order to obtain financial assistance from Eco-Emballages, localities will have to submit plans for recovering targeted materials, and demonstrate how materials will be recovered. Eco-Emballages will provide subsidies for each ton of materials recovered for recycling which meet minimum quality specification as follows: FF 150/ton of glass and steel, FF 480/ton of mixed packaging, FF 750/ton of dry paper and board, and FF 1500/ton of plastics and aluminum. (The approximate exchange rate is FF 1.00 = N\$ 0.60.) Eco-Emballages will offer a take-back guarantee to localities, but localities will also be allowed to independently sell sorted materials.

Most of these funds will be raised through a French green dot licensing system similar to Germany's. Initial proposals for the fee system were volume based, except for flexible packaging, as follows: 0.5 centime (ct) for volumes of 51-200cc, 1 ct for 201-3,000cc, 2.5 ct for 3,001-30,000cc, 10 ct above 30,000cc. The weight and material based fee system is: 10 ct/kg steel, 30 ct/kg paper and board, 50 ct/kg aluminum or plastics. Multi-material packages are charged the rate for the material forming the highest percentage of the package.

Spain is moving toward introduction of a packaging law patterned on the French approach. Under the proposed Spanish system, an organization similar to Eco-Emballages would be set up to channel recovered and sorted packaging waste from local authorities to reprocessors, who would guarantee acceptance of used package material provided it met certain specifications and as long as "conditions are economically favorable". Funding would be collected through a per unit levy on packaging, paid by packers and fillers. Packaging covered under the system would be identified through a special logo, likely the same green dot used under the German and French systems.

The role of the Spanish Government under the new system would require that it set up mechanisms to ensure that: 1) all packaging is covered by an officially authorized recovery and reuse system; 2) landfill charges reflect the necessity for alternative waste management options; 3) selective collection and sorting systems for packaging waste are developed (while the organization would provide the technical and financial support); 4) collection and treatment of refuse is extended to all municipalities such that there is no illegal landfilling; and 5) landfill sites and incinerators are modified in order to meet requirements set forth by European Union directives.

B. Canada

In Canada, a broad coalition of industry groups has created the Canadian Industry Packaging Stewardship Initiative (CIPSI), a proposal designed to provide industry support for recycling. Although an earlier version of this initiative failed in the province of Manitoba, the CIPSI proposal is now (as of late 1994) under active consideration in Ontario, Canada's largest province.

The CIPSI proposal in Ontario is designed to support that province's goal of 50 percent diversion of packaging waste from landfills by the year 2000. Industries that use packaging would accept "stewardship", or responsibility for promoting reduction, reuse, or recycling of their packages. Each industry would either create its own recycling program to achieve 50% diversion -- allowing the beer industry to continue its successful deposit/refund system -- or join the Canadian Industry Product Stewardship Organization (CIPSO) and pay CIPSO fees to support local recycling. The initiative focuses on support for local recycling programs in part because they are so widespread: Ontario was one of the first jurisdictions to promote residential recycling; today, more than 80% of Ontario households are served by the province's 540 municipal recycling programs.

The eventual goal is to levy fees based on the cost of municipal recycling of packaging materials. However, for the first two years, the CIPSI proposal calls for each industry to pay C\$24 (N\$60) per tonne of its packages sold in Ontario; CIPSO would then pay municipalities C\$64 per tonne of packaging materials that they recycle. During those two years, studies will be performed to establish standard recycling costs for each packaging material. After the first two years, industry will pay two-thirds of the gross cost of recycling its materials, minus any revenues received from sale of the recycled material. For example, if the standard cost of recycling a material is \$240 per ton, and the revenue from sale of the material is \$90 per ton, then industry pays \$160 - \$90, or \$70 per ton, to CIPSO.

If the scrap revenues cover two-thirds or more of the cost of recycling, as in the case of aluminum, for example, then no payment is required. Thus industry has a clear incentive to promote markets for secondary materials (higher secondary material prices will reduce CIPSO fee payments), as well as to reduce the use of packaging (since the fees are based on packaging weights).

CIPSO would distribute the fee revenues to local recycling programs, based on the tonnage of recyclable materials they collect. Payments per ton are based on standard costs, rather than each program's actual costs, giving local programs an incentive to become more efficient.

C. United States

In the U.S., packaging policy is largely set at the state level, so there are 50 different policies. Ten of the 50 states have deposit/refund systems ("bottle bills") for beer and soda containers. The bottle bill states have much higher container recycling rates than the rest of the country. Most of the bottle bill states, and a few others, also use refillable beer bottles in bars and restaurants; for most other uses, refillable bottles have vanished in the U.S.

Most states have waste reduction and recycling targets, set at 50% of the waste stream in several cases, and lower in others. Enforcement mechanisms vary, and are absent in many states. None of the states have systems of industry responsibility and involvement such as CIPSO or Eco-Emballages. One state, Florida, collects a disposal fee on a wide range of containers.

As examples of U.S. policies and approaches, three states will be discussed further: Minnesota, Oregon, and Florida.³

Minnesota has one of the most successful state recycling programs. The state sets recycling goals, which have increased over time to 45% in the major metropolitan area (including half the state population, and more than half of the solid waste) and 30% in the nonmetropolitan area by 1996. Further regulations govern many specific wastes; for example, all yard waste is banned from disposal facilities, and must be separately composted. Yard waste composting is not counted toward the 1996 recycling goals.

State packaging regulations call for a 25% reduction in the per capita weight of packaging reaching disposal facilities by the end of 1995, compared to 1992 levels. Minnesota also bans the intentional use of four toxic metals -- lead, cadmium, mercury, and hexavalent chromium -- in packaging, and requires that the total concentration of these four metals must not exceed 100 parts per million in packaging by 1995.

Minnesota regulations make the state's 87 county governments responsible for establishing waste reduction and recycling programs to meeting these targets. "Flow control" legislation allows the counties to direct portions of the waste stream to specific, designated facilities. The state provides up to 80% funding of county recycling programs, using the revenues from a statewide tax on waste collection and disposal. However, some communities and waste haulers have sought to use cheaper disposal facilities in neighboring states, which

³ Only one of the three, Oregon, is a bottle bill state. The discussion here focuses on other aspects of state packaging and recycling policy.

are not subject to Minnesota taxes and regulations; this reduces the state revenues available for recycling. A recent U.S. Supreme Court decision seems to prevent solid waste "flow control" as practiced in Minnesota, and will allow increased waste exports to lower-cost states.

Oregon has adopted regulations, taking effect in 1995, affecting glass and plastic containers. Beginning in 1995, all glass containers must have 35% recycled content; by 2000 they must have 50% recycled content. The rules for plastics are more complex. In 1995, every rigid plastic container must meet one of the following standards:

- at least 25% recycled content; or
- made of a plastic whose Oregon recycling rate is at least 25%; or
- reusable, averaging at least 5 uses; or
- demonstrated weight reduction of at least 10% in the last 5 years.

Oregon's plastics regulation is based on the work of the Coalition of Northeastern Governors (CONEG), which has attracted widespread attention in U.S. recycling circles. CONEG sponsored an extensive series of joint government-industry committee meetings, in which developed the multiple standards used by Oregon. The CONEG standards have been proposed, but not yet adopted, in several other states.

Oregon's regulations may have only modest impact on packaging use and recycling. Since it is a bottle bill state, Oregon has ample supplies of recycled glass from returned beer bottles. The bottles produced by the state's major bottling companies are already close to the 35% recycled content standard, and some already exceed the 50% standard. For plastics, the bottle bill ensures a PET recycling rate well above 25%, so all PET containers already satisfy the standard. Questions have also been raised about Oregon's ability to enforce its regulatory standards on out-of-state manufacturers, who produce most plastic containers sold in the state.

Florida, alone among U.S. states, has enacted an advance disposal fee, imposed at the wholesale level, on a wide range of containers. Beginning in October 1993, the fee was 1¢ (U.S.\$0.01, or N\$0.03) per container, rising to 2¢ in July 1995. Exemptions are available for containers recycled at a 50% rate in Florida, or made with 50% recycled content; aluminum and steel cans both qualified (in the case of steel, based on high rates of magnetic recovery of steel at Florida incinerators). In July 1994, exemptions also became available for individual manufacturers who reach specified levels of recycled content in their containers, or who reach specified levels of recycling; the required levels differ by material. Exemptions have been granted to glass containers, and to plastic-coated paper containers, based on reported recycling rates of 35%-36%; many individual company requests for exemptions have also been granted.

The fee was initially expected to raise \$40 million or more in the first year, but estimates have dropped rapidly as the number of exemptions has increased. Revenues will be used to support recycling programs, strengthening recycling markets, and improving water quality. Despite the low fee per package, many companies have applied for and obtained exemptions, perhaps because the exemption seems like a state seal of environmental approval.

Early reports suggest that the fee is resulting in noticeable increases in the recycled content of containers manufactured in Florida. In view of the number of exemptions already granted, it seems possible that use of higher recycling targets could have been even more effective.

D. Other policy options and issues

A number of other policy options for waste reduction, often discussed in the United States and elsewhere, do not appear to be priorities for adoption in Mexico at this time. These include quantity-based disposal fees, virgin material taxes, and transferable credits for secondary content.

Quantity-based fees for waste collection or disposal provide direct economic incentives for waste reduction and recycling. Hundreds of U.S. communities have adopted such fees, most within the last few years. While often reported effective in the U.S., quantity-based fees have three limitations that would be obstacles to success in Mexico. First, they are most effective when combined with convenient, free recycling options, usually including curbside recycling collection; such options are not generally available in Mexico. Second, they are often thought to promote illegal dumping, by making legal disposal more expensive; illegal dumping is already a problem in Mexico. Finally, some U.S. cities have complained that quantity-based fees require substantial administrative costs, for only modest gains in waste reduction.

Virgin material taxes provide incentives for manufacturers to use recycled material, or reduce material use; this directly addresses the concern about nonrenewable resource use mentioned above. However, the cost of raw materials makes up only a small part of the cost of many packages, so the ultimate effect on packaging decisions will be small. An additional problem in Mexico is that many packages are imported, or made from imported materials, raising administrative obstacles to virgin material taxes.

Transferable credits have been proposed in the U.S. as a way to boost recycled content in manufacturing. Newsprint producers, for example, might be required to reach a certain level of recycled content. Those who exceed the standard can sell credits for the excess, while those who do not reach the standard can buy credits to make up the difference. Such a system is most effective if there are many producers of the same material using differing equipment and technologies (which may be less often true in Mexico than in the U.S.); even then, it is only effective in increasing recycled content, not in meeting other objectives. As with virgin material taxes, transferable credits may be difficult to apply to imported packaging.

III. Recommendations for Packaging Policy in Mexico

Our recommendations fall into five broad areas:

1. minimizing the environmental effects of packaging production
2. maximizing the potential for recycling
3. minimizing the environmental effects of landfilling
4. controlling litter and improper disposal
5. developing industry's role in packaging policy

A. Environmental effects of packaging production

A separate Tellus report, *Evaluation of the Environmental Impact of Packaging Production for Mexico*, presents our analysis of the emissions from the production of packaging used in Mexico. That report shows that more of the environmental impacts of packaging production are due to the emissions from Mexican electricity generation than to manufacturing process emissions. The high levels of sulfur oxides (SO_x) and other emissions from power plants are well-known environmental problems, with causes and consequences extending far beyond the realm of packaging. To a large extent, the reason that the packaging industry causes pollution is that it uses the existing electricity system. As a result, improvement in the environmental impacts of packaging will depend on improvements in the electricity sector.

In a few cases, however, packaging production processes themselves cause significant emissions. Two processes deserve particular attention: the production of PVC and glass.

In our study of packaging in the U.S., we found that PVC producers caused by far the greatest environmental impact of any packaging industry, due to emissions of highly carcinogenic vinyl chloride (VC) monomer and other chlorinated organics. The Vinyl Institute, representing PVC producers in the U.S., has reported lower, but still significant, emissions. Even if the Vinyl Institute figures are accepted, PVC production causes the worst toxic emissions in the U.S. packaging industry.

In this study, Mexican PVC producers have reported VC emissions of twice the Tellus estimate for the U.S. -- and seven times as high as the Vinyl Institute's estimate of the U.S. emissions level. The VC emissions from PVC production are the most serious toxic emissions from Mexico's packaging industry. Measures to reduce these emissions should be investigated; if sharp reductions in emissions cannot be achieved, restrictions on the production and use of PVC should be considered. In packaging, it is easy to substitute other materials for PVC.

Another surprising finding is the very high level of particulate emissions in the one glass mill which provided data for this study. It is more than 100 times the level of particulates emitted by U.S. glass mills. Under our evaluation method, Mexican glass bottles cause a huge environmental burden -- comparable, on a per-liter basis, to our evaluation of

PVC bottles. In the U.S., a similar evaluation of glass bottles leads to an environmental burden of only a small fraction of the PVC level.

The glass particulate emission figure is so high that it may indicate an error in data collection. The first priority is to recheck the data at the same glass mill, and at other Mexican glass mills if possible. If the data is correct, then remedial action should be taken. Techniques for control of particulate emissions from glass production are well known and available at reasonable cost, and should be applied to any glass mills that generate the levels of particulates reported in this study.

B. The potential for recycling

Another Tellus report, *Management of Packaging Waste in Mexico City*, presents our analysis of the Federal District's waste management system and the potential for recycling of packaging materials. Despite anecdotal accounts of the high levels of scavenging, we found that large quantities of valuable materials -- most of them packaging materials -- are being landfilled. Paper products, which are often unusable after contact with wet food waste, are recovered at very low rates. Even glass, metal, and plastic containers, which can be efficiently separated from wet waste, are far from completely recovered. As the population and waste stream of the Federal District grow, the three new waste selection plants will capture a declining fraction of the containers in the waste stream.

Our first recommendation in this area is to support and encourage increased separation and recovery of paper from households and businesses, before it is mixed with wet waste. Many techniques are potentially useful, ranging from development of formal collection routes to support for the informal network of paper collectors who already recover paper in some neighborhoods. Recovered waste paper from Mexico's cities can be used in place of imported scrap in the paper industry, improving the balance of trade as well as the environment.

Our second recommendation is to expand the recovery of recycled materials at the Federal District's waste selection plants. This could occur either by redesigning the three plants to increase the amount they recover, or by building additional plants. The three plants, currently designed to recover just over 200 tons per day each, are not large enough to capture all the recyclables reaching them today. The lack of capacity will only worsen, with 50% growth in the population and waste stream projected by the year 2000. The three plants will be recovering less than half of the valuable recyclables in the Federal District's trash at the end of the decade.

As explained in our report on the Federal District waste stream, additional waste selection plants could usefully be built in the near future, even if a paper recycling program is initiated. Similar conclusions will apply to the other municipalities in the Mexico City area, the metropolitan areas of Guadalajara and Monterey, and other growing urban areas.

C. Environmental impacts of disposal

Undoubtedly the most serious environmental impact of waste management in Mexico is its effect on the health of the landfill scavengers. The prevalence of landfill scavenging shows that there is a market for recycled materials, and that valuable materials (most of which are packaging) remain in the garbage when it arrives at landfills. In other words, the scavengers are playing a valued economic role, primarily consisting of recovery of used packaging. But they are doing so at terrible cost to their own health and safety.

A humane, environmentally sound alternative has been adopted in Ciudad Juarez, and is now being introduced in the Federal District: banning scavenging at landfills while giving former scavengers jobs in new recycling facilities. This approach should be applied wherever landfill scavenging takes place. Plans should be made for eliminating scavenging and opening new waste selection plants at major landfills throughout the country.

Other environmental impacts of landfilling are modest by comparison, but should also be addressed. The principal danger to the larger community is the potential contamination of water supplies by landfill leachate. This should be controlled by requiring new landfills to use liners and leachate collection systems, as in current U.S. regulations. To limit the toxicity of landfill leachate, it may be desirable to restrict the use of heavy metals in packaging, as in the Minnesota legislation mentioned above. Other targeted programs, such as separate recovery of batteries, will have a greater impact on the toxicity of landfilled waste than any packaging regulation.

D. Litter and improper disposal

Although litter, consisting largely of packaging wastes, is often mentioned as a problem in Mexico today, the biggest problem may lie in the future -- perhaps the near future. Nonrefillable beer and soda bottles and cans are just beginning to come into use in Mexico. Thus the current situation in Mexico is roughly comparable to that in the U.S. around 1960, when nonrefillables first gained a significant share of the market. If the beverage industry follows the same path in Mexico as in the U.S., refillable bottles will largely vanish over the next 10 to 20 years, replaced by a huge volume of single-use bottles and cans. Even with large-scale recycling efforts, the recovery rates will be lower than at present; some containers will end up as litter (especially broken bottles) and some will arrive at the landfill, further encouraging scavenging.

Responses to this problem in northern Europe have been stronger than in the U.S. and Canada. Denmark bans all nonrefillable beer containers; Germany requires the industry to maintain its past level of refillable bottle usage, or face punitively high government-imposed deposit levels. In contrast, one-third of the U.S. (by population) and most of Canada have state or provincial deposit/refund legislation, or "bottle bills". Retailers of beer, soda, and mineral water are required to collect deposits when containers are sold, and to refund them when empty containers are returned. Bottlers are required to pick up the empty containers from retailers.

The bottle bill has proved to be a very effective method of achieving high return rates and reducing litter.⁴

One recommendation regarding litter is to develop a deposit/refund system or other response to the rise of nonrefillable beverage containers. For Mexico, the appropriate deposit system may not be a copy of U.S. or Canadian models, but should be designed to reflect Mexico's economic situation, consumer preferences, and transportation and bottling infrastructure. But some response is needed to halt the future flood of beverage container litter.

In addition, a survey should be conducted of existing litter, to identify the types of packaging that are frequently littered. Policy can then be developed for promoting the recovery of those particular packaging types. Finally, anti-littering educational programs should be promoted in schools and elsewhere, to broaden the understanding of the issue.

E. The role of industry in packaging policy

Implementation of the recommendations made here will require time and money. Involvement of industry is essential, not only to reduce the environmental impact of packaging production, but also to expand the recycling of paper and other products, to build more waste selection plants as alternatives to landfill scavenging, and to address the present and future problems of littering and improper disposal.

The concept of product stewardship, as introduced in Canada and in Europe, is an important one to consider. The "brand owner", the company that makes the decision to produce or import a package, should share in the responsibility for ensuring ecologically sound treatment of the package after it is used. An industry association, perhaps modeled on the French Eco-Emballages, should be formed to develop and lead the private sector's role in packaging waste management.

At this time we are not recommending a particular fee structure for such an industry association. We had intended to propose fees based on the environmental impact of packaging production; however, we found that such fees would largely reflect the impacts of Mexico's electricity sector, which are not under the control of packaging industries. Another approach, setting fees based on recycling costs, has been proposed in Canada, and adopted in some European countries. This is not appropriate for Mexico, since formal recycling programs handle so little of packaging waste at present.

Thus the industry association should negotiate its own financial arrangements, in order to support an expanded industry role in addressing the many environmental effects of packaging. The result will be not only an improvement in environmental quality, but also an expanded supply of secondary materials for use in Mexican industry.

⁴ These and many other questions about deposit legislation are addressed in Tellus Institute's draft report to U.S. EPA, *Costs and Benefits of a National Bottle Bill*, December 1994.