Economic instruments for waste management

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Waste, to reduce its volume and dangerousness, is processed before its final disposal. The processes can include such options as incineration, composting, hydrolysis, and sorting, etc. These processes guarantee reaching the desired goals, but at the high economic, social, and environmental costs. Technology has yet to provide the ultimate answer to the problem of waste; presently, it can only reduce its magnitude. Technical solutions to the problem of waste are typical examples of "end of the pipe technologies." Realizing that "the pipe" does start somewhere, however, it is useful to examine how we can affect behavior at the front end of the "waste production line."

The concept of sustainable development for solid waste management requires this waste handling hierarchy:

- avoidance
- minimization
- reuse
- recycling
- treatment with energy recovery
- safe disposal

This approach is reflected in international documents such as the Rio Declaration in which one chapter is devoted to solid waste problems, and the European Union directive for 1989 which also uses the same philosophy.

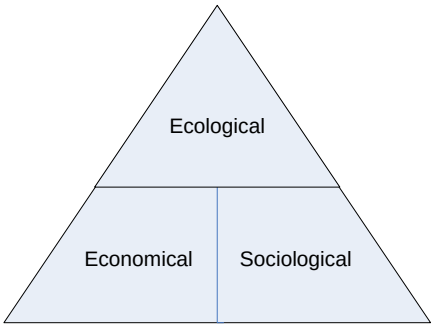

Chart. Hierarchy of the sustainable development values

As economic analysis indicates, this hierarchical approach should be seen far more as a rule of thumb than a binding standard. Nevertheless, it requires and puts the highest pressure on the avoidance and minimization of waste generation. This cannot be achieved by any of the techniques of waste disposal. To obtain these goals the governments must use administrative and economic tools that address the problem at its source, at the point where waste is generated. Generally, these tools are based on the Polluter Pays Principle (PPP), and their goal is to encourage or enforce the potential waste producers to develop and implement procedures that will result in the generation of a smaller amount of or higher quality waste.

According to the PPP definition by OECD "the polluter should bear the expenses of carrying out the measures which encourage rational use of scarce environmental resources and to avoid distortion in the international trade." If the polluter (waste generator) must pay the full price for the waste disposal, such a price must be proportional to the amount of generated waste, and nuisance it causes. Unfortunately, it is very seldom that residents' payments for waste disposal depend on these factors. Payments almost never depend on waste type, and are often made in the form of a constant fee; sometimes waste disposal is even free of charge. In such cases where waste disposal is free, the cost of disposals hidden in the local tax system, providing residents with absolutely no incentive to reduce the volume of waste they generate.

Introduction of the "pay by bag" system is in line with the PPP. This system requires that residents buy special garbage bins, or buy stickers to place on their own bags. An analysis of this system in 29 US cities showed that the amount of waste generated per capita in the towns with this system was less then half the amount of wastes that other towns discarded. The management costs of "pay by bag" systems are also found to be lower. The drawback of this scheme is that it provides an incentive for midnight dumping or backyard trash burning, phenomena observed in towns where the pay by bag system was introduced. Because the introduction of the" pay by bag" system is not always compensated by tax cuts, it is seen by communities as a cryptic way of increasing taxes, affecting mainly poor communities. The same concept, but on far more technologically advanced level, was tested in the region of Hoyersweda, in Germany. The residents there needed magnetic cards to access their own containers. Such locks were installed to prevent the use of a third party. An even more technologically advanced version of this system uses an identification chip on the magnetic card, which both open the container and identifies the amount of waste

disposed by each household. In this scheme every household pays for its own waste on a volume basis (Warmer 1999).

Another important element of the "pay by bag" system is that the fee charged should cover the full cost of disposal; this includes operating cost, plus the cost of building the disposal facility, post-closure maintenance, risk to water and air, soil contamination, and compensation for land degradation, etc.

Under the "pay by bag" system polluters pays for waste volume, not weight, which leads to waste compacting at the source. Such compacting can easily be obtained in a garbage truck, so the environmental profit from such behavior is minimal. To avoid this problem, and to promote waste avoidance instead of compaction, some communities (Seattle, Durham, N.C., Farmington, MN, USA) started exploring weight-based systems. In this system the garbage truck weights garbage at the kerb and records the amount discarded by each household. The cost of the equipment is 5 000 to 10 000 USD per truck, but expected to decrease if such systems become widespread.

The "pay by bag" scheme is only one example of one group (disposal charges) of economic instruments. The full spectrum includes levies, taxes, deposits, refunds, and charges.

A material levy is an example of an input tax, and would be imposed on the raw materials used to manufacture packaging, with due account being taken of existing rates of recycling and reuse. The size of the levy needs to be related directly to the environmental damage done by the production and consumption of the packaging, plus any scarcity premium, if relevant. However, where existing legislation covers environmental impacts from earlier stages of the life-cycle, a levy may need to reflect only the MSW environmental costs. "The carbon tax" levied on fuels proportionally to its carbon content aims to rationalize its use and reduce the emissions causing the global warming effect.

A product tax is, contrary to the material levy, an output tax. The tax would be related to the potential waste disposal and pollution impact. Green tax levied on gas is the example of this tool.

Waste disposal charge is based on the assumption that each consumer pays all of the social costs of disposal of each item. This system, if fully implemented, would require an extensive monitoring and enforcement system. In reality, the communities that introduce this system charge the clients proportionally to the volume of waste, and more seldom proportionally to the weight. They also apply different charges depending of the waste type (e.g. sorted, not sorted, construction material, with or without organic compound, etc.)

A deposit-refund system (DRS) is essentially a combination of a tax and subsidy. The consumer of package/container is given a right to a refund if the waste product is returned to the seller or authorized recycling/reuse point. To gain the right the consumer may have to pay a formal deposit at the time of the purchase, or pay a higher price. The deposits can cover a whole spectrum of commodities, from disposable cameras, to car batteries, to entire car bodies. The most common deposit system is for beverage containers (glass and plastic bottles, and aluminum cans). The system is very efficient particularly in case of the cans due to the high value of the material. The return rate in the States is between 72 and 98 percent.

Tax credits and financial bonuses. Literature discusses the possibility of giving tax credits or bonuses that take steps to reduce waste at the source. The credits can be given for investing in the equipment needed to switch from disposables to reusable such as dishwashers and washing machines. Credit can be given to businesses that buy waste-reducing equipment such as double-sided copy machines, reusable tableware in cafeterias, and plain paper fax machines. Bonuses to the communities that reduce the amount of waste they bring to dispose is also discussed. For example state of Montana gives 25% income tax credit and tax deduction for purchasing recycling goods. Table presents the example of application of the use of economic instruments in the management of packaging waste.

Table. Economic instruments in management of packaging waste

Country	**Type of economic instrument**	**Application: in use (u) under study/proposed (p)**
Austria	deposit/refund	refillable plastic beverage containers subject to mandatory deposit of OS 4(u)
Belgium	waste charges (incentives)	MSW (u)
Canada	deposit/refund waste charge	beer and soft drink containers non-refillable containers
Denmark	deposit/refund	refillable beer and soft drink containers, beverage containers, pesticides in small containers (u)
Finland	product charges	non-returnable beverage (carbonated) containers (u)
France	waste charges (incentives)	MSW (p)
Germany	deposit/refund	plastic beverage containers (u) extension to other packaging
Italy	product charge	non-biodegradable plastic bags (u)
Norway	product charge	disposable carbonated drinks containers (u) refillable beverage containers (u)
Poland	waste charge (incentive) deposit/refund	MSW (u) refillable plastic/glass containers (u)
Portugal	deposit/refund	metal (p)
Sweden	product charge deposit/refund waste charge (incentive)	beverage containers (u) aluminium cans (u) not-specified

Switzerland	product charge	disposable beverage containers (p)
UK	recycling credits	MSW (u)
USA	deposit/refund marketable permits waste charges	beverage containers (u) newsprint (p) unseparated waste (u)