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THE COMPREHENSIVE MANAGEMENT OF WATER AND SOLID WASTES**

Executive Summary

SUSTAINABLE RECYCLING OF PET BOTTLES IN RIO DE JANEIRO

WORKING DOCUMENT

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SUSTAINABLE RECYCLING OF "PET" BOTTLES IN RIO DE JANEIRO

Executive Summary

This work presents a case study on solid waste management in the city of Rio de Janeiro. This privately-owned initiative involves the application of market instruments to boost the recycling of used plastic bottles. This, in turn, has promoted the growth of a new economic activity, creating a significant number of new jobs.

More specifically, this case study demonstrates the technical and economic viability of recycling used PET (Polyethylene Terephthalate) bottles taken from city trash collections. The project is a private venture, and the only indirect subsidy provided by the government was the public land donated by the municipality for the construction of the industrial recycling plant.

PET recycling process and markets

The study describes the “PET bottles” product and explains its characteristics and properties, the manufacturing technology adopted in recent years, the different uses made of the recycled material for making blankets, ropes and fiber fabrics, as well as utensils and products such as bottles, containers and packaging. PET soft drink bottles are the plastic containers most frequently manufactured and recycled today. At present, an average of 30% of all PET soft drink bottles are recycled. In North and South America, a total of 430,000 tons of PET bottles were collected in 1998, and in 2003 this figure will probably reach 740,000 tons. Although bottle collecting is growing in importance in other countries, the United States is, and will continue to be the region’s largest individual source of post-consumption bottles.

Brazil produced 360,000 tons of PET bottles in 2001 and the annual growth of that sector is estimated to be on the order of 10%. The consumption and recycling of PET bottles has grown heavily in Brazil. Consumption, which stood at 1.8 billion bottles in 1994, rose to 5.7 billion in 2000, while recycling increased from 290 million bottles in 1994 to 1.5 billion in 2000.

In 2001, the industrial markets for PET bottles were soft drinks (80%), mineral water (10%), edible oil (6%) and others (4%). Today, PET bottle manufacturers are interested in tapping the beer market with its sales of nearly 9 billion liters a year. Despite this big market, the industry is unable to guarantee PET bottles with a minimum durability of 180 days, required for other materials used in the industry, mainly glass and aluminum.

The analysis emphasizes the large potential for growth of the PET bottle industry and how its development is “friendly” to the environment and beneficial to the economy. Recycling this type of plastic bottle makes it possible to reuse the raw material to manufacture the same product – in other words “bottle to bottle recycling”—that will be of the same quality as the original bottles made from new material.

The data that has been collected about the PET recycling market by separating the trash into its components or through selective collection programs, reveals that the prices of the used PET bottles (unpressed and of different colors), which in 2000 amounted to 0.20-0.25 R\$/kg, by 2003 have risen to 0.35-0.40 R\$/kg.

The Recovery Plant in Rio de Janeiro

The PET recycling plant was built in 1994 on a 1,000 m² plot on the grounds of the COMLURB (Rio de Janeiro Municipal Urban Trash and Garbage Company) Recycling and Compost Plant in the Jacarepagua sector of Vargem Grande district in western Rio de Janeiro. A classifiers' cooperative was set up and operates with COMLURB infrastructure, presses, bottle storage spaces, etc. The classifiers' location side-by-side with the PET Recycling Plant minimizes the cost of transporting the used bottles to the Plant. The subsidy in the form of COMLURB's assistance to the cooperative for its operation has a cash value that is equivalent to the cost that the Trash and Garbage Company saves from not having to collect, transport and dispose of the bottles the classifiers separate and handle. Otherwise, these costs would be incorporated into household trash and garbage charges. The collectors' classification of the trash avoids what is known as undisciplined separation, in which street classifiers, who tear open the plastic household trash and garbage bags and remove articles that can be recycled, leave the remaining trash and garbage, organic and other wastes scattered in the streets, creating more work for the city trash and garbage service.

PET recycling is basically a three-stage process: first, the PET bottles are converted into PET flakes (by selecting, grinding and washing them); second, the PET flakes are used to produce PET (by rolling, crystallizing and melting them); and third, the final PET products are manufactured (by molding the products from PET film).

The economic analysis of the PET plant reveals that all three integrated stages of the industrial process (the production of flakes, rolled sheets and packaging from the laminates) yield a highly profitable gross return of 6%.

The study shows that the future of the market for used PET bottles in Rio de Janeiro will depend on whether more classifiers' cooperatives are established and whether the people cooperate by separating their used PET bottles at home. There are several important conditions to be met in regard to government regulation, tax aspects and the marketing of the products that are manufactured from recycled PET. In the area of government regulation, there are three basic mechanisms for increasing the collection of PET bottles (of which the case under study has adopted the first two): (a) the enforcement of legislation obliging the population to separate the materials that can be recycled in their own homes; (b) the organization of collectors into workers' cooperatives; and (c) the passing of laws that will require PET bottle manufacturers to take part in recycling projects by providing operational and financial assistance.

The paper analyzes the tax and fiscal aspects and shows that fiscal incentives are critically important for guaranteeing the economic viability of recycling plants by encouraging more

collectors to supply used bottles to the recycling industries and by making recycled materials more competitive with new raw materials.

From a marketing standpoint, it is important to carry out advertising campaigns that associate the products manufactured from recycled PET with environmental conservation. The people will then view all of the recycling initiatives, from the collection of the bottles to the marketing of the finished products, as favorable activities. A concrete example is a successful cooperative that has been operating for some time on the outskirts of Rio de Janeiro. It uses recycled PET bottles to manufacture the material for t-shirts that bear an emblem that is associated with environmental conservation.

The conclusions we can reach or the lessons we can learn from the case study of the Jacarepaguá recycling plant include:

a) From the general viewpoint of the recycling system:

- ✍ A self-sustaining recycling system depends on two basic elements: (a) a regular and sufficient supply of raw material, and (b) an industrial infrastructure that will use the raw materials to manufacture finished products for reentry into the market.
- ✍ The only sustainable system for collecting recycling materials that does not require government subsidies is the system of classifiers, organized into cooperatives. In an orderly way and following a preset schedule, these classifiers gather in the streets the materials that people have already separated at the source –in their homes.
- ✍ The success of the recyclers' cooperatives will depend on whether the government will support the effort by carrying out continuing programs to heighten people's awareness of the recycling effort, so that they all participate.
- ✍ Industrialization of urban waste recycling can be economically viable if government support is obtained (not necessarily in the form of direct financial subsidies) for the implementation of measures to reduce the transportation and processing costs of materials that can be recycled.
- ✍ The government should be responsible for carrying out and keeping up a consciousness-raising program that will lead people to separate materials that can be recycled. This will increase the supply of used bottles.

b) From the viewpoint of the recycling market:

- ✍ It is necessary for the raw material produced by waste recycling to have an added value that will justify its use for manufacturing and cover its transportation costs, which are high in comparison with the cost of moving new raw material.
- ✍ There will be no market for materials that can be recycled and no one will pay reasonable prices for them, unless industries can use them, thereby generating a

demand and, consequently, better prices for the classifiers. It is essential for the government to boost the development of simple technologies that require only small investments and have reduced operating costs, in order to give the material for recycling an added value.

c) From the more specific viewpoint of the Jacarepaguá PET recycling plant:

- ~~///~~ A large (and growing) amount of the urban trash in most Latin American cities consists of used PET bottles. A significant percentage of those bottles, even when good trash collection systems operate, end up in the rivers, oceans, canals and wasteland today, creating health problems among urban residents, widespread environmental damage, as well as substantial visual pollution.
- ~~///~~ The case study shows that the technology for recycling those bottles and turning them into raw material for the manufacture of other products is simple and safe. The process is also economically sustainable, so long as the government creates appropriate conditions. COMLURB's donation of an unused plot of land and an unoccupied shed helped make the project viable.
- ~~///~~ Long-term PET bottle recycling removes these materials from the trash and the environment, lessens soil contamination problems, and contributes to the creation of new jobs and the entry into the workforce of people with few or no professional skills.
- ~~///~~ The operation of the Jacarepaguá Plant has shown that economically sustainable recycling initiatives are possible, so long as the government encourages business, the people directly involved in the recycling, and the population at large to work together.