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**Solid Waste Recycling in Costa Rica:
New Bottles for an Old Wine?**

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I. INTRODUCTION

1. General Elements

Solid waste has become a hot issue in Costa Rica. The landfills are not handled adequately, much solid waste is not being disposed properly, and people are becoming impatient with the problem. Many communities are desperate to find new solutions. Politicians are searching to privatize the operation not only in search for efficiency or effectiveness, but in order to avoid the "political dangers" of solid waste problems.

As elsewhere, to confront the solid waste crisis will require of multiple solutions. Recycling is an important part of any package. It is not a new practice... it is in fact an old wine, but changes within the country and international realities are forcing to use "new bottles" for some old and new solutions.

This paper is a first step in the understanding of the macroeconomic impact of recycling researching the microeconomic facts as a tool. The results presented are preliminary, but give good clues about the essentials of solid waste recycling in Costa Rica.

A. Basic Costa Rican realities

Costa Rica is a very small country (51000 km²) with a population of more than 3 million. It is very centralized spatially and institutionally. The capital city San José and other smaller cities conform the only metropolitan region of the country, the Great Metropolitan Region of San José (GMRSJ) with more than 1 million inhabitants.

The medium per capita income was equivalent to US\$ 1780 dollars in 1989. Costa Rica has narrowed effective social differences through the existence of public services and infrastructure. The country has reached high levels of social development: education, health, electrification, and running water supply.

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The Costa Rican economy is based in tourism and the agro-industry: banana and coffee in particular. Other export products are flowers, fruits, shrimps, and garments. All these activities generate solid wastes and need packaging materials. The growing importance of eco-tourism has made the proper management of solid wastes even more important.

Heavy industry is very weak. As a consequence the generation of hazardous waste within the country is limited. Two factories use recycled materials in the production of toilet paper and glass containers, and very soon will open a kraft paper mill.

B. BASIC ELEMENTS OF THE SOLID WASTE SITUATION IN COSTA RICA

The solid waste situation in Costa Rica is characterized by dangerous empiricism in the handling of solid waste. Most solid waste comes from agriculture and agro-industry. The handling of hazardous materials is not careful enough. Recycling and reuse are common. Despite that the main landfill does operate with some problems, the most serious issue is the domestic, commercial and industrial waste that does not go to any landfill. Most of the non-accounted waste ends up in Costa Rican rivers.

Government officials have gone through several cycles of indifference and emergency declarations. But many local politicians would like to eliminate the problem from their agendas completely and that has been a very powerful factor in the rush to privatize as much as possible in the next months.

A very good overall diagnostic about waste management problems in Costa Rica is the National Waste Management Plan (Plan Nacional de Manejo de Desechos-PNMD) developed by a group of Costa Rican professionals with the help of the German Agency GTZ during 1991. Among many other things the PNMD recommends to increase recycling.

On the other hand, there is some information about quantities and composition of solid waste in Costa Rica. Both reveal differences respect to develop countries. Generation of residential waste is lower (see Table 2), and the composition is quite different with much higher proportion of food residues (see Table 3).

Some conclusions about recycling and waste flows in Costa Rica

Table 4 presents a brief calculation of how much materials go into the waste stream in Costa Rica in order to determine upper boundaries to any recycling effort. Costa Rican is recycling approximately a 18.5% of the glass and 25% of the paper entering into the solid waste stream. It is obvious that total recovery is impossible but that there are a lot of possibilities to increase recovery rates.

These figure do not reveal the essential component of the Costa Rican recycling tradition, reusing and fixing all kinds of products, fact that motivates the low figures for plastic, paper, textiles in the Costa Rican composition analysis of municipal solid waste.

II. THE COSTA RICAN RECYCLING REALITY

This section analyses this phenomena in particular paper and glass recycling.

A. ESSENTIAL ELEMENTS OF PAPER AND PLASTIC RECYCLING

1. Paper and cardboard

The Scott Paper Company is the only paper producer in Costa Rica. Only 30% of its raw materials are virgin pulp. It recycles 1200 tones of paper per month collected in Costa Rica, which represent 60% of its recycled paper needs. The rest comes from the United States. Table 1 indicates quantities and prices pay for different recycled paper qualities within Costa Rica. Table 5 indicates the economic impact of these efforts.

The paper is bought directly to factories, which generate some waste, and from six major consolidators. The market prices for the street collectors or scavengers at the Río Azul landfill are much lower than the price paid by the Scott Paper. The paper company does not buy directly from street collectors or even big paper end-users (institutions). Additionally, it seems that the Scott Paper provides capital to the consolidators. In consequence, it could be questioned the real meaning of the price paid to the consolidators and their independence from the Scott Paper Company.

The economics of cheaper local recycled paper and continuous importation from the United States does not seem consistent with a non-aggressive attitude for more local paper recovery by the Scott Paper, which is not buying directly from collectors. Direct purchases would stimulate a higher rate of recovery from the waste flow, especially because some of the intermediaries are rejecting paper.

Some of the potential explanations for this lack of aggressiveness are: a) to increase their recycled paper storage capabilities is too expensive; b) they do not want to deal with small informal collectors; c) they want to buy only first class paper; d) they do not want to get their local price closer to the stated imports price.

Additional explanations are the existence of "inflated invoices" from products coming from the USA; lack of management interest in this issue or more likely effective use of their monopsony power, in order to keep local prices low.

Very shortly a new kraft paper factory will open in the Santa Ana area using among other sources all the cardboard that can recover in the Metropolitan Region of San José. The new paper mill will not compete directly with the Scott Paper because the latter stop recently purchases of cardboard and shift to "manila" paper. The new kraft paper mill plans to create a network of collecting centers, which will acquire used cardboard boxes directly from the street collectors.

Environmental considerations

Any recycling effort should be seen as part of a large chain of processes, which in some cases have negative impacts. The Scott Paper Plant generates contaminated water outflows and solid waste.

The Scott Paper plant has a primary treatment for its 10000 m³ of daily outflows. It removes most of the contamination but still the water thrown into the river has an oxygen chemical demand of 427 (mg/liter) and a oxygen biochemical demand of 149 (mg/liter). These values, even though are far from ideal are not bad for Costa Rica, where many industries behave much worse. No problems with ink residues have been reported by the Health Ministry.

The paper plant generates 15 tones of paper residues, which are disposed of in a private landfill. Research is being made at the University of Costa Rica in order to use them as raw material for construction products.

The Costa Rican Health Ministry has been preoccupied with the use of dioxin in the plant. And the problem is not completely solved yet. On the other hand, the company for many years has promoted with considerable success the non-dyed "Natural brand". Its success is related mostly to its cheaper price, and not to its "greener character" because in fact, the population has not been educated about the terrible impacts of dioxins.

2. Glass

Glass is a very common bottling and packing material in Costa Rica. However, there has been a rapid transition away from glass toward plastic and paper in different industries among them milk, marmalades, sauces, and vinegar. Non-reusable glass beer containers are not very popular despite that they have been around for a long time.

However, many small producers of wine, vinegar, honey, and sauces continue reusing glass bottles. Glass has been traditionally recovered by informal collectors, which buy it directly from homes. More recently two non-profit charitable organizations (for the blind and youth recovering from drug addiction) have started asking for paper and glass donations.

VICESA is the only glass producer in Costa Rica. It competes in Central America with Guatemalan and Panamanian factories. VICESA buys separated and mixed glass, some of it broken and some bottles. In 1990 VICESA bought 5,230 tones recycled glass, which is 9.6% of its production. The main suppliers to VICESA are: Oscar Estrada, a consolidator that provides 7 tones per day, and the Coca Cola bottling company (5 tones/day). Similar amounts are supply by the beer Company and the Children's Foundation, which has collection deposits close to most Costa Rican churches and some supermarkets and crowded places.

B. COMPLEMENTARY ELEMENTS

1. OTHER MATERIALS RECYCLING

Plastics

The plastic materials market is almost non-existent. The main problem is that virgin plastic is cheaper than most recycled material. Many street collectors are selling the used plastic containers (1 gallon) to small factories, which reuse them again. However it does not seem to exist any market for used 2 liters soft drinks bottles that have inundated the country recently.

In the past several firms were recycling plastic bags collected by scavengers from the Río Azul landfill, but there is only one small company buying some plastics and pelletizing them.

Iron and Steel

Old equipment is the main source of scrap steel in Costa Rica. Especially important are cars and other transportation vehicles. This recycled products used to represent approximately the 25% of raw material used in the production of construction steel. That practice has been abandoned probably due to the low international price of steel and the manufacturing complications involved. However, there is a successful scrap steel collector, which exports scrap metals.

Aluminum

Beer and soft drinks aluminum cans were recently introduced in Costa Rica. The beer company is paying 1 colon, i.e. an equivalent US\$.75 cents for each recovered can. The program can be considered a success. Most of the cans are effectively being recycled, and many kids around the country are helping in that effort. The Children's foundation has located deposits all around the country and seems to be successful in the effort. The price set by the company is low enough to have generated competition from local aluminum users, which are also buying at similar prices.

2. SOME SETBACKS AND NEW EFFORTS

Some setbacks

Solid waste issues are very related to local conditions (social, economic, technological) and they determine the institutional and social structure of the recycling activities.

However, the policies generated outside of the country have also great impact: two cases illustrated this point the lower steel price in the international markets is one motivation for stopping metal scrap recycling in Costa Rica, the bottling practices of soft drinks corporations (Coca Cola and others) has meant great increases in the solid waste stream in Costa Rica.

Other recent efforts

Local efforts on recycling like in Goicoechea County, part of the San Jose Metropolitan Area have concentrated on two upper-middle class neighborhoods. The efforts have been self-sustaining, but there is not enough information to determine its marginal impact above the traditional recycling occurring there and in the rest of the metropolitan area before. The support of the local authorities is motivated partially by their desire to quit solid waste collection activities. These collection efforts can have contradictory impacts: a) destroy the way of living of many poor street collectors or b) lower the price of recyclables at the homes. The most optimistic view that recycling efforts could improve the markets for recyclable materials (more vendors and purchasers) is not guaranteed at all.

C. EVALUATION OF THE SOCIAL AND ECONOMIC STRUCTURE OF THE RECYCLING ACTIVITIES

Great Costa Rican traditions

Many good traditions, which diminish considerably, the solid waste streams through waste reduction and are not included in recovery rates analysis. Among these practices is important to take notice of the following:

- Reuse and repair of many products such as clothes, shoes, furniture
- Constant repair of old cars, household appliances, and industrial machinery because the relatively low cost ratio labor/equipment
- Supermarket plastic bags are used to deposit domestic waste
- Organic waste is thrown into flower or vegetable gardens
- Different products refills save packaging materials

All these practices help considerably to keep generation of domestic and commercial rates below the levels of industrialized countries.

Recycling is a pervasive reality

The municipal crews that collect solid wastes operate their own recycling activities. Besides, informal recycling within government institutions is performed by janitors. In consequence, it is not clear that additional recycling effort by government and public institutions will improve recovery rates.

Poverty is a big motivator

The social stigma still attach to solid waste collection; the difficult conditions in which street collectors work and live; and the small income that they get imply that only very poor people, with little education, but with independent spirit and attitude will work on this job.

Any non-governmental organization desiring to improve the conditions of the "poor street collectors" and/or create small cooperatives will have to deal with this reality and confront the

market power of final users and consolidators.

Intermediaries fulfill an important role

The intermediaries appear to be earning very big profit margins (see Table 1), but it is important to indicate that they fulfill an important social role of facilitating the recyclables acquisition for the industrial user. The real issue is if their big mark-ups are justified and necessary. Now, it is unclear if they are more obstacles than help to recycling.

Very imperfect markets

There are not real markets for recycling materials, monopsonies control the system. Most street collectors lack of capital, knowledge and minimum income necessary to fight for better prices. There are no organizations that so far have promoted collective effort by the street collectors to improve their bargaining power.

Better markets will promote both use and collection of products. Lower end-user prices will promote recycling. Higher prices at the collection side would promote much more intensive recycling and social improvement for the street collectors.

III. SOME FINAL COMMENTS

- Recycling is an established tradition in Costa Rica, and recovers at least 18.5% of the glass and 25% of the paper waste flows within the country. This is not enough and there are great needs and opportunities for improvements.
- The use of local recovered materials is increasing both in the paper and glass industry, but there is a much bigger potential demand for recycled glass and paper.
- There is a clearly structured system of handling recyclable materials, with an informal collection system, an intermediary layer of formal consolidators, which hold monopoly power within part of the metropolitan region. And one company has monopsony buying power for each material.
- Economic and social disparities promote the existence of street collectors and scavengers despite the collected products' very low price.
- The markets for recyclable products are not working properly and there is a chance that outside interventions from the government or non-governmental organizations could improve the competition in those markets.
- Education of the population on additional reuse, recycling, and solid waste separation is extremely important specially if per-capita income increases and social conditions of collectors improve.
- The intermediaries for paper-recycled products are getting extremely big profit margins, but they are acting as temporal waste handlers for the Scott Paper so it is hard to compute their effective margins.
- The new bottling practices of many multinationals, --in particular soft drinks, away from reusable glass bottles into plastic non-easily recyclable containers, represent a serious

problem, to solid waste streams reduction efforts.

- The possibility of recyclables exports plays a big role in eventually breaking down the monopsony power hold by the final users of paper and glass.
- This preliminary analysis has identified key challenges for the recycling effort in Costa Rica
 - How to increase the recyclables recovery rates?
 - How to provide higher prices to the collector and lower prices to the final user to create growing markets?
 - How to create new markets for plastics?
 - How to create social structures (cooperatives or non-governmental organizations) that will act as consolidators of recycled materials
 - How to improve the standard of living of the street collectors?
- There are also important research questions which our research team is pursuing:
 - Why there are some contradictions on the economics and actions on paper recycling?
 - What is the impact of charitable institutions recycling efforts on the traditional street collectors and scavengers?

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TABLES

TABLE 1. MARKET PRICES FOR RECYCLABLES MATERIALS.

| MATERIAL | PRICE OFFERED BY FINAL USERS OF RECYCLABLES MATERIALS (A) | PRICE OFFERED BY CONSOLIDATORS (B) | GROSS PROFIT MARGIN (A-B)/B |
|---|---|------------------------------------|-----------------------------|
| 1. PAPER | | | |
| 1.1. Computer | \$190/ton | \$110/ton | 73% |
| 1.2. Without ink | \$190/ton | \$ 73/ton | 60% |
| 1.3. One side printed | \$154/ton | \$ 73/ton | 111% |
| 1.4. Newspaper | \$ 95/ton | \$ 73/ton | 30% |
| 1.5. Both sides printed | \$ 81/ton | \$ 73/ton | 11% |
| 1.6. Mixed | - | \$ 18/ton | - |
| 2. GLASS | | | |
| 2.1 Class A: clean and classified with 10% of impurities | \$30/ton | \$7/ton | 329% |
| 2.2 Class B: Color classified with more than 10% of impurities | \$24/ton | \$3/ton | 700% |
| 2.3 Class C: Mixed | \$14.5/ton | \$3/ton | 383% |
| 2.4 Class D: Window glass | \$24/ton | \$7/ton | 243% |
| 3. PLASTICS | | | |
| 3.1. Mixed and clean | \$0.07/kg-\$0.18/kg | There are not | |
| 4. METALS | | | |
| 4.1. Steel | A consolidator export the collected materials | \$275/ton | |
| 4.2. Copper | | \$900/ton | |
| 4.3. Aluminum | | \$350/ton-\$470/ton | |
| 4.4. Bronze | | \$630/ton-\$745/ton | |
| 4.5. Lead (Batteries) | | \$390/ton-\$470/ton | |

TABLE 2. SOLID WASTE GENERATION IN COSTA RICA (1990).

| AREA | PER CAPITA GENERATION (KG PER CAPITA PER DAY) | | POPULATION | | ESTIMATED TOTAL QUANTITY (TONS PER DAY) |
|---|---|-------|------------|----------|---|
| | URBAN | RURAL | URBAN | RURAL | |
| FOUR MEAN CITIES WITHIN THE GREAT METROPOLITAN REGION | 0.8 | 0.5 | 431 239 | 191 367 | 440.7 (31.6%) |
| REST OF THE GREAT METROPOLITAN REGION OF SAN JOSE | 0.5 | 0.4 | 607 865 | 427 299 | 474.8 (34.0%) |
| OTHER TOWNS | 0.4 | 0.4 | 202 977 | 527 745 | 292.3 (20.9%) |
| REST OF THE COUNTRY | 0.3 | 0.3 | 107 494 | 518 610 | 187.8(13.5%) |
| TOTALS | - | - | 1349 576 | 1665 020 | 1395.6 (100%) |

TABLE 3. RESIDENTIAL SOLID WASTE COMPOSITION IN COSTA RICA (BY WEIGHT).

| MATERIAL | IN THE RIO AZUL LANDFILL (1). COMPOSITION FOR THE GREAT METROPOLITAN REGION | IN THE RURAL COASTAL TOWN OF QUEPOS (2). COMPOSITION FOR THE REST OF THE COUNTRY. |
|----------------------------------|---|---|
| ORGANICS | 62.1 | 70.2 |
| PAPER AND KRAFT PAPER | 17.9 | 7.7 |
| WOOD | 1.3 | -- |
| PLASTIC | 5.6 | 8.5 |
| METAL | 1.4 | 2.4 |
| GLASS | 7.0 | 2.9 |
| INERT MATERIALS: DEBRIS AND SOIL | 4.7 | -- |
| OTHERS | | 8.3 |
| TOTAL | 100.0 | 100.0 |

(1) Instituto Costarricense de Electricidad y Electrowatt Eng. Services Ltd. "Non conventional Energy Sources, Vol. III, Incineration and Biomass", December 1983.

(2) Asociación pro Conservación Acuática. "Proyecto de manejo de desechos sólidos en el Cantón de Aguirre", September 1992. Quepos is the main town and important tourism attractor.

TABLE 4. SOLID WASTE TOTAL QUANTITIES BY MATERIAL (TONS PER DAY)

| MATERIAL | GREAT METROPOLITAN REGION | REST OF THE COUNTRY | TOTAL GENERATED | TOTAL RECOVERED FROM WASTE STREAM |
|-----------------|---------------------------|---------------------|-----------------|-----------------------------------|
| ORGANICS | 568.5 (62.1%) | 337 (70.2%) | 905.5 | |
| PAPER AND KRAFT | 163.9 (17.9%) | 37.0 (7.7%) | 200.9 | 50 |
| WOOD | 11.9 (1.3%) | --- | 11.9 | |
| PLASTIC | 51.3 (5.6%) | 40.8 (8.5%) | 92.1 | |
| METALS | 12.8 (1.4%) | 11.5 (2.4%) | 24.3 | |
| GLASS | 64.1 (7.0%) | 13.9 (2.9%) | 78.0 | 14.5 |
| INERT MATERIALS | 43.0 (4.7%) | ---- | 43.0 | |
| OTHERS | | 39.8 (8.3%) | 39.8 | |
| TOTAL | 915.5 | 480.1 | 1395.6 | |

TABLE 5. ECONOMIC VALUE OF RECOVERED MATERIALS (\$ PER YEAR)

| MATERIAL | GENERATED | RECOVERED FROM WASTE STREAM | % RECOVERED |
|--------------------------|---|--------------------------------------|-------------|
| 1. PAPER AND KRAFT PAPER | 200.9 TON/DAY * 365 * \$150/TON \$ 11,000,000 /YEAR | 50 *365 *150= \$ 2,700,000 /YEAR | 25% |
| 2. GLASS | 78 TON/DAY *365 * \$24/TON \$ 685,000 /YEAR | 14.5 * 365 * 24= \$ 127,000 /YEAR | 18.5% |