

Principal Results of a Market Study for a New Garbage Collection Service

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CONTENTS

I. BACKGROUND1

- A. The Problem1
- B. The Alternative2

II. STUDY DESCRIPTION3

- A. Objectives3
- B. Methodology3

III. CONCLUSIONS6

- A. Target Groups6
- B. Foreseeable Advantages6
- C. Foreseeable Obstacles7
 - 1. Number of Collection Days7
 - 2. Plastic Bags7
 - 3. Animals8
 - 4. Disillusion with the Present Service8
- D. Promotion Messages9
 - 1. General Promotion Messages9
 - 2. Specific Messages9
- E. Communication Channels9
 - 1. Interpersonal9
 - 2. Mass Media10
 - 3. Printed Materials11
- F. Recuperation of Costs/Willingness to Pay11
- G. Other Considerations11
 - 1. Recycling11
 - 2. Follow Up for the Launching of the New Garbage Collection System12
 - Number of Complaints12
 - Neighborhood Cleanliness12
 - Customer Satisfaction12

IV. MAJOR FINDINGS14

- A. Characteristics of the Sample14
 - 1. Study Participants14
 - 2. Living Conditions15
 - 3. Employment, Incomes, and Garbage Collection Service Payment16
- B. Views Concerning the Relevance of Garbage Collection
 - When Compared to Other Neighborhood Problems18
 - 1. How Serious a Problem is Garbage18
 - 2. Why is Garbage a Problem19
 - 3. Responsibility for Solving Neighborhood Problems19
- C. Household Waste Management Practices20

- D. Knowledge and Opinions About the Collection System29
 - 1. Basic Knowledge29
 - 2. Knowledge of Waste Collection Days30
 - 3. Type of Transportation30
 - 4. Awareness About the Need to Use Plastic Bags30
 - 5. Awareness About the Service Charges30
 - 6. Opinion of Present Service31
 - 7. Opinion of Service by Tricycles31
- E. Beliefs Related to the New Waste Collection Plan and Willingness to Pay32
 - 1. Benefits and Drawbacks of Required Behaviors32
 - 2. Social Norms33
 - 3. What Would They Do If the New System Didn't Work?34
 - 4. The Complaint System34
 - 5. Preferences Regarding Service Providers34
 - 6. Willingness to Pay for Collection Service35
- F. Channels of Communication35

APPENDIX A: THE GREENCOM PROJECT42

I. BACKGROUND

A. The Problem

The City of Machala, capital of the El Oro Province, is located on the southern coast of Ecuador near the Peruvian border. It is the fourth largest city in Ecuador with a population of 176,000. Machala has been experiencing an explosive population growth since 1950. According to the calculations by the Centro de Estudios de Población y Paternidad Responsable (CEPAR), by the year 2000, Machala will have a population of around 214,000 habitants, 40% more than 1990. The population density translates to 67 habitants per hectare. In certain sections of the city, especially those zones where squatters have settled, the population is relatively dispersed. The infrastructure in many of these zones is limited or nonexistent.

Machala has a serious problem with solid waste accumulation and with its garbage collection system. A recent study reported that only 50% of the homes (around 88,000 habitants) receive garbage collection service. Only 82 of the 127 tons of solid waste that are produced daily in the city are collected. This leaves more than 45 tons of solid waste scattered throughout the community daily, which creates serious environmental, sanitary, and health problems. The study also found that 80% of the garbage collected is organic, 18% is recyclable, and only 2% is unusable.

The study reported that this problem stems from the inefficiency of the present solid waste collection service and its inadequate coverage of the area. Presently, the system operates poorly despite the number of garbage collectors employed, partly because damaged machinery is not repaired. The system also suffers from a lack of modern accounting and administrative systems.

"The municipality is investing exaggerated quantities in the trash collection service, much of which can be reduced, especially if we take into account the number of trash collectors and their low productivity...The funds with which these trash collectors are paid could be used more efficiently, spending them on trash collection itself and on increasing the coverage of solid waste collection, rather than employees and activities which are not productive."

The study concluded that to improve the solid waste collection system,

"alternative systems should be developed which could increase collection to all of the community, be administered in a more efficient way, and dispose of this waste in a more environmentally sound and sanitary manner."¹

¹The Improvement of the Collection and Processing Services of Solid Wastes and Street Cleaning in Machala, Ecuador@ (United States Agency for International Development Regional Office of Housing and Urban Development, 1994.

B. The Alternative

The City of Machala is considering the development of a new collection system based on commercial administrative principles to improve solid waste collection and disposal.

In December 1994, the City began a pilot plan to collect solid waste with tricycles in four neighborhoods of the city. To assist this pilot service, the clients had to put their trash in plastic containers (bag or box) on the sidewalk in front of their houses on the two days of the week selected for collection. In March 1995, the service by tricycle was extended to six more neighborhoods, including neighborhoods where solid waste was previously collected by trucks.

This market study, carried out in April 1995, a few months after the initiation of the pilot plan, provides information to the decision makers of the City about the understanding, attitudes, and practices of the clients of this pilot collection system, as well as of those who had regular and irregular collection services, and of potential clients who have never had any service.

II. STUDY DESCRIPTION

A. Objectives

During the month of April 1995, the Environmental Education and Communication (GreenCOM) Project, with support from the Ecuadorian firm Paez y Asociados Consultor, conducted a market study to help design the new solid waste collection system and to define the Promotion, Publicity, and Public Relations Plan for the new municipal enterprise responsible for solid waste collection and disposal.

The study had the following specific objectives:

1. To establish the saliency of solid waste collection with respect to other community problems.
2. To identify the psycho-social factors that either facilitate or hinder the adoption of the behaviors required by the new garbage collection system, with an emphasis on the perceived advantages, perceived drawbacks and normative beliefs around those behaviors.
3. To determine: (a) if the target audience knows how the solid waste collection service is presently paid for, and (b) how much the target audience is willing to pay for a regular solid waste collection service.
4. To identify the communication channels to be used to reach the target audience.

B. Methodology

Study groups were selected based on three criteria:

- ! type of trash collection service (regular, pilot, sporadic or none);
- ! socio-economic status (middle and lower), and
- ! gender.

In order to select the neighborhoods to participate in the study, a general listing of all the neighborhoods in Machala was established. The neighborhoods in the list were classified by socio-economic class and type of garbage collection service. Socio-economic class was determined using the municipal classification of neighborhoods. That classification is based on property value and construction characteristics.

For sample selection, only the middle- and lower-class neighborhoods in the list were considered. Upper class and socio-economically mixed neighborhoods (middle class and lower class) were ignored. The upper-class neighborhoods were ignored because they are not representative of the general conditions of the city and their number is negligible. The new garbage collection system would minimally affect those neighborhoods. On the other hand, the socio-economically mixed neighborhoods were ignored to eliminate the possibility of over sampling one of the classes making up those neighborhoods.

Once the classification was established, a random selection within each neighborhood category was made. Replacements were drawn under two circumstances. First, if a visit to the neighborhoods demonstrated the houses were mixed instead of being mainly either lower- or middle-class. And second, if the City was going to expand pilot services by tricycle collection to those neighborhoods in the months between the selection of the sample and the initiation of the field work.

Based upon maps provided by the City, five blocks were selected in neighborhoods made up of up to 15 blocks in total, and proportionately so in neighborhoods consisting of more blocks. For each block, ten interviews were conducted (five with the adult male of the couple and five with the adult female in the couple). A ceiling of 25 interviews with males and 25 interviews with females was established in each neighborhood. In terms of household selection, once the starting point on the northeast corner of the block was established, the interviewer began his or her work in the first household and continued visiting one in every two houses, alternating between male and female respondents.

The survey sample selected includes 300 people of which 48% are women and 52% are men. The following table illustrates the survey sample.

Table No. 1
Names of Selected Neighborhoods and Number of Respondents by
Socio-Economic Level and Type of Trash Collection Service

SOCIO-ECONOMIC LEVEL	COLLECTION SERVICE				TOTAL
	PERMANENT	SPORADIC	PILOT	NONE	
MIDDLE CLASS	Centro Puerto Bolívar (50 persons)	Manuela Cañizares (50 persons)	Alcides Pesantes (50 persons)		150
LOWER CLASS		Rayitos de Luz (50 persons)	Primero de Enero (50 persons)	Israel (50 persons)	150
TOTAL	50	100	100	50	300

The questionnaire has seven sections: 1) identification of the interviewer and the interviewee; 2) perceptions of the relative importance of garbage in relationship to other neighborhood problems; 3) understanding of present collection services; 4) present practices of solid waste treatment at the household level; 5) opinions of the new garbage collection plan; 6) use of mass media and other channels of communication; and 7) personal data of the interviewee. The questionnaire was pre-tested in Machala prior to its use.²

²A copy of the questionnaire can be obtained by contacting the GreenCOM Project at the address listed on the inside cover.

III. CONCLUSIONS

A. Target Groups

Primary Group: Adult males and females

Potential Secondary Group: Children

The primary group should be the adult males and females given that the two sexes are involved in solid waste management, especially in the lower class. Furthermore, since the male is the person who normally pays for the garbage collection service, he should be included in the primary group, especially for messages related to the payment of services that will be discussed later on.

For issues related to garbage management at the household level (e.g. where to put the trash for its collection) or if a recycling component is included in the intervention, children should be considered as a secondary audience either as players or as sources who motivate or educate their parents to comply with new services (social norms).

There are very important differences between the clients by type of solid waste collection service. They are discussed in a later section of this report.

B. Foreseeable Advantages

The target groups will benefit from the new system in several ways. These benefits must be "packaged" to promote the new system as well as the behaviors that its implementation will require.

- ! The most important repercussion of resolving the solid waste problem concerns health. The new service should be positioned as a contribution to the health of the community.
- ! The most relevant benefit for promoting the new system is that it is sponsored by the municipal government.
- ! The most outstanding advantage to obtain support for this new service is its convenience in terms of time and effort.

C. Foreseeable Obstacles

1. Number of Collection Days

The most outstanding obstacle for the middle class, those clients with regular service and some of the clients of the pilot plan, is the frequency with which waste will be collected. The results of the study indicate that due to the accumulation of garbage and foul odor, these clients prefer collection more frequently than twice per week.

The new system will be confronted with the challenge of providing garbage collection that is fair, efficient, and cost effective. Presently, the City is planning to continue with daily service for current upper and middle class clients and to provide new clients with service twice per week. Any regular and systematic service will be better than having no collection service at all. However, the option of a fair system that provides garbage collection three times a week to all of its clients without considering their socio-economic status should be considered. A cost analysis should be conducted in order to determine if this is economically feasible. The final result of this analysis could suggest a reduction in the number of collection days for the upper and middle classes who presently have daily service, and this may not be politically feasible.

Another alternative is to determine the cost of service for each collection and determine the number of days of the week assigned for garbage collection based upon payment. For example, the client pays "x" quantity for each collection. This price strategy could be especially useful if the present payment system is changed, and the clients begin to pay for the services directly, instead of doing so through a surcharge of 10% on their electric bill. In this case, it would be important to promote the concept of cost and benefit C the value of payment will depend upon the services the client receives.

2. Plastic Bags

The greatest obstacle for the lower class is the need to throw out their solid waste using plastic bags or other disposable receptacles and the extra cost this would represent. Presently, the lower class is using bags more frequently to throw away their garbage, but they are probably not throwing the bag out. Rather they are using it to carry their garbage to the disposal site, and reusing the bag a number of times.

Various alternatives to overcome this barrier exist.

- ! Emphasize to the lower class that any disposable receptacle can be used: a plastic bag, a bag made out of burlap, a box, or even wrapping the garbage in newspaper (for "dry" garbage).
- ! Distribute plastic bags and include them in the cost for garbage collection service. Presently, the plastic bags cost 100 sucres each. This option would increase the cost by 1000 sucres for the clients who have service two times per week, and by 2,500 sucres to the clients who have daily service, an increase which could be rejected by the clients.

! Identify and promote the distribution of more economic plastic bags. For example, the OIKOS Corporation is developing a program for recycling the plastic bags used in banana production.

! Subsidize plastic bags for the lower class.

3. Animals

A foreseeable obstacle for clients in many of the categories studied is that animals may scatter the garbage. The following solutions are possible in order to reduce this obstacle: a) Promote the habit of putting out the garbage in the morning on the day of collection and not the night before, and b) Build or motivate the clients to build metal baskets. Metal baskets already exist in a number of middle- and upper-class neighborhoods. The baskets allow the people to leave the garbage at a height that facilitates collection and prevents dogs or other animals from ripping it apart.

4. Disillusion with the Present Service

There is a lot of disillusion with the present service, especially among clients with sporadic service. They consider the present services bad and are less willing to pay. In general, the people surveyed think that a municipal service is the least reliable service. Furthermore, there is a large proportion of people in all of the groups studied (including those with regular service) that reported that if a collection day is missed, they would dispose of their trash in the neighborhood instead of waiting until the next collection day, suggesting that clients believe that the service is unreliable. However it is important to note that the perceptions of pilot program clients are different than those of respondents in the other study groups, indicating that the provision of an effective and efficient service can change the perceptions and practices of its clients.

The new system must operate based on business administration principles. Furthermore, it would be important to improve the existing services for the clients and later carry out expansion of that service to new clients in a systematic and efficient manner in the time frame stipulated to avoid disillusioning them and creating expectations for the new clients that the company can not fill.

D. Promotion Messages

1. General Promotion Messages

- ! The City is creating a new system for garbage collection and in doing so is contributing to the health of the people;
- ! It is easy to work with the system, and it will save you time and effort;
- ! Since you are paying for the service, you have a right to receive it and complain if you don't receive it.

2. Specific Messages

Objective: Motivate the acceptance of and compliance with the new garbage collection system, including:

- ! Putting the garbage in plastic containers, bag, box, or wrapped in paper (especially for the lower class) for its collection;
- ! Putting the trash in front of their house on the designated collection days (and, if motivated, to construct baskets to prevent scattering). It would be important to promote this message among both new and current clients, given that many of the latter do not know when the collection days are;
- ! Storing the garbage for the next collection day if it is not picked up on the designated day;
- ! Complaining or telephoning the office in charge, if the garbage is not picked up on the designated day;
- ! Putting the garbage out the morning of the collection day (and not the night before).

E. Communication Channels

Interpersonal

The City used interpersonal communication channels, visits by supervisors and the involvement of neighborhood leaders to promote the pilot plan among the new clients. The results of the study demonstrate that this promotion had a very positive impact, and that this channel should be used further. However, other channels should be used to reinforce interpersonal communication.

The results of the study also show that the proposed community representatives in the Promotion, Publicity, and Public Relations Plan are an adequate interpersonal mechanism for achieving community participation. The majority of those interviewed said that they would be willing to

participate in some activity in order to resolve the garbage problems in their neighborhoods if it didn't require much time. As it has been argued in the Promotion Plan, the community representatives should get involved when the service begins to be provided to each neighborhood in order to get the participation of all community members. Starting the service in a neighborhood that is relatively clean will also help establish a basis for the "quality of neighborhood cleanliness" for the performance of the garbage collectors.

Mass Media

To make the campaign cost effective, only radio and print should be used. Television is not an effective means given that the television audience watches national broadcasts, air-time is expensive on these national broadcasts, and the promotion funds are limited. The radio public service announcements should be broadcast on the following frequencies and hours:

- 1) Radio Vía between the hours of 5 and 7 am and between 2 and 6 pm during the news,
- 2) Radio Superior between the hours of 6 and 8 am during the news.

The public service announcements should be broadcast on both frequencies in order to reach the large majority of the population. If funds are available or if the frequencies donate air-time, the following should be used:

- 1) Radio Caravana between 6 and 7 am during the news,
- 2) Radio Superior especially during the 6 pm news, and
- 3) Radio Machala between 2 and 6 pm.

The ads should be placed in the following newspapers: 1) El Correo, 2) El Nacional, and 3) El Extra.

It would be very important to use two radio frequencies and the three newspapers simultaneously to reach the majority of the population in an integrated manner.

For political reasons, it may be necessary to use the local television station. To be cost effective, the local station should only be used if they donate the air-time. The study indicates that it would not be economical to use this station because of the small audience it attracts.

Printed Materials

The relatively high level of schooling and literacy of those interviewed indicates that printed materials, such as pamphlets and stickers, can be used to promote the services of the new enterprise. Specifically, a sticker announcing the collection days should be created. Given that the neighborhoods will have different collection days, this message should be distributed by fliers, not by mass media. As is described in the Promotion, Publicity, and Public Relations Plan, before launching the service in a new neighborhood, each client should receive a visit by the garbage collector or supervisor, during which the new service and what they must do to cooperate is explained. The collector or supervisor should leave a sticker the client can place in a visible location as a reminder of the collection dates. It would be equally important to carry out a promotion of the collection days with the existing clients as with the new ones, given that so many people do not know the correct days of collection.

Presently, the City is using a logo of a "banana man" to promote their various services. The logo changes in accordance with the type of service which is being offered; for example, the garbage collection logo shows the banana man with a broom. Given that the majority of the population believes that the collection of garbage is the responsibility of the City, the new system could continue to use this logo. In that manner, they would see the new system as sponsored by the City and it would provide continuity between the old and the new service.

F. Recuperation of Costs/Willingness to Pay

The results of the study indicate that the majority of people know that they are paying for garbage collection service. Most of them know that they are paying via their electric bill and are willing to pay for the service. It is important to note that those interviewed without service are more willing to pay for the service even though they have a low income.

G. Other Considerations

1. Recycling

The City should consider including a recycling program in their new services. The study, "The Improvement of Collection Services and Solid Waste Processing and Street Cleaning in Machala, Ecuador," indicated that 80% of the garbage collected is organic, 16% is recyclable, and only 2% cannot be used in any way, meaning that only 2% of the garbage produced needs to be deposited in a landfill.

The results of this market study indicate that the majority of the people are currently separating their garbage. Eighty percent reported that they separate their organic waste and recycle it by giving it to animals or other people. The present study indicated that those people who receive sporadic service also separate their garbage and manage it in various ways, while those people

who receive regular service, including those of the pilot plan, are changing their habits and combining all of their garbage to be collected or carried to a landfill. The establishment of a service which doesn't include ways to recycle is, in effect, eliminating practices which are environmentally sound in the long run. If the new enterprise included a waste recycling component, it would be reinforcing and basing itself upon sound practices that people are already doing. The study indicates that the duties of waste recycling could be promoted, taking advantage of the existing perception of "the use" of different types of garbage & glass, plastic, cans, and paper.

2. Follow Up for the Launching of the New Garbage Collection System

The results of the study indicate that there are three ways to monitor the performance of the contractors of the new service: a) the number of complaints received for bad service; b) the "cleanliness of the neighborhood;" and c) the "satisfaction" of the client. The application and testing of the three systems is recommended especially in the first year when the new system is being initiated.

- ! ***Number of Complaints:*** The contractors of the new system should have a public relations section for handling complaints and dealing directly with the public. Their office should have a window open to the public during working hours and a telephone number that the public can call. The person responsible for public relations should be experienced in public relations pertaining to the private sector (e.g., the customer is always right and the role of the enterprise is to serve the client), and how to manage the complaints in a way that facilitates and assists the decision makers to adopt the necessary measures to improve the service (negotiate with or if necessary fire the pertinent contractor).

- ! ***Neighborhood Cleanliness:*** Considering the number of people who reported they dispose of their garbage in the neighborhood if it is not collected, keeping an eye on the cleanliness of the neighborhood can monitor the performance of the garbage collectors. The supervisors can pass through the neighborhoods taking note of the quantity of garbage in specific places where the neighbors of the community continue to throw their garbage. This observation could be facilitated by electing a community representative in each neighborhood before launching the new service as is described in the Promotion, Publicity, and Public Relations Plan. The supervisors should create standard forms for noting the cleanliness of the neighborhood by collector. At the end of a stipulated period of time (each month, for example) they should consider rewards (time, money, awards such as employee of the month) for the collectors that have maintained "clean neighborhoods."

- ! ***Customer Satisfaction:*** The supervisor should interview ten customers (randomly selected) in two to three served neighborhoods (also randomly selected). This would help in maintaining personal contact with the customers of the system, and it would provide information on how to improve the service over time. Interviews should have three questions to make its use feasible and practical:

- 1) Was your garbage collected this week? On which days?
- 2) What problems did you have with the garbage collection this week? Do you have any complaints?
- 3) What suggestions do you have for improving garbage collection in your neighborhood?

IV. MAJOR FINDINGS

This analysis explored differences by:

- socio-economic class,
- type of collection service, and
- gender.

The results are presented by first making a general statement about the distribution of frequencies of the variables under consideration. Then, statistically significant differences by socio-economic class, type of service, and gender are presented. In limited instances, allusion is made to general tendencies although they may not be statistically significant.

Comparisons with categorical variables were made using Chi²'s. Categorical variables are variables where phenomena or events can be classified into discrete categories. For example, sex is a categorical variable as there are two possible categories: male and female. Comparisons with continuous variables were made using either t-tests or analysis of variance depending on the number of study groups in the comparisons. T-tests are used when two results for two study groups are being compared. Analysis of variance is used when results for more than two study groups are being compared. Examples of continuous variables are age and years of schooling.

The probability of obtaining the results detected is expressed through the p-value. All statistics with a p-value equal to or less than .05 are statistically significant. That means that we are accepting 5% probability that the relationships and/or differences detected can occur by chance. Since the chance factor is so low, it means that chance alone does not explain them. By implication, they would be statistically significant relationships or differences.

A. Characteristics of the Sample

1. Study Participants

The age of those interviewed ranges from 19 to 72 years with an average of 38.7 years. The men interviewed had an average age of 40.5 years, and the women, 36.8 years. This difference is statistically significant ($t=3.39, p<.01$).

The majority of those interviewed (67%) were not born in Machala; however, most of the migrants did not migrate recently. On average, migrants have been living in Machala for 16.4 years. This means that they arrived at the city at the average age of 22.3 years. There is no difference in the period of residence in Machala by gender. Yet, there are differences by socio-economic status. On average, lower class migrants have been living in Machala 14.9 years whereas middle class migrants have done so for 18.3 years ($F=3.9, p<.05$).

Forty-six percent of those interviewed reported that they completed their primary education, 40% reported that they completed high school, and 14% reported having college education. Although there were no educational differences by gender, there were differences by socio-economic status. Respondents with only primary school education came for the most part from lower-class

neighborhoods. However, respondents with higher educational levels came from middle-class neighborhoods. The lower-class tended to have completed primary education, while the middle-class had completed high school or had (some) college education. That is to say, 73% of those with a primary education live in lower-class neighborhoods while 62% of those with a secondary education and 90% of those with college education live in the middle-class neighborhoods ($\text{Chi}^2=63.1, p<.000$).

The size of the family is important because of the volume of waste that is generated per person. While the number of people that live in visited households varies between two and 15, the average number is 5.2 residents per household. The distribution of this variable favors the lower limits. There are no significant statistical variations by socio-economic status. There are also no statistically significant differences between households supported mainly by men or women.

2. Living Conditions

The majority (58%) of those interviewed live in single family homes with gardens, one third (34%) live in lower-class row houses or unfinished homes, and a minority (6%) in apartments. A large portion of the houses in the middle class neighborhoods are single family homes (82%), and most of the houses in the lower-class neighborhoods are row houses or unfinished homes (61%) ($\text{Chi}^2=102.5, p=.000$). The houses in neighborhoods with a better garbage collection system, either with daily service or served by the pilot plan, are single family homes. Row houses/unfinished homes are more common in areas with sporadic service or no garbage collection service ($\text{Chi}^2=19.2, p=.004$).

One third of those interviewed (31%) have plumbing inside the house, one third (33%) have outdoor plumbing, and the rest (34%) buy their water from water trucks. The houses in the middle class neighborhoods tend to be supplied by internal plumbing (53%), while the houses in the lower class neighborhoods tend to be supplied by outdoor standpipes (54%) ($\text{Chi}^2=85.5, p=.000$). All of those interviewed in neighborhoods without garbage collection get their water from water distribution trucks, and those that live in neighborhoods where there is some kind of collection system, whether it is regular or sporadic, get piped water ($\text{Chi}^2=118.2, p=.000$).

Forty-one percent have latrines, 30% have private toilets, and 26% have toilets shared with other homes. The households in lower-class neighborhoods usually have latrines (71%), and those in middle-class neighborhoods have toilets, which may be private (45%) or shared (39%) ($\text{Chi}^2=116.3, p=.000$). The large majority of the houses that don't have garbage collection have latrines (84%), while those who have some sort of garbage collection usually have private toilets (35%) or shared toilets (31%) ($\text{Chi}^2=56.9, p=.000$).

All visited households have electricity.

3. Employment, Incomes, and Garbage Collection Service Payment

The head of the family is defined as the person upon which the family depends economically. Based upon this definition, 94% of the households are headed by males, and 6% are headed by

females.

Seventy-three percent of the respondents declared they were employed the month prior to the interview. More men (88%) than women (57%) reported having been employed during the month prior to the survey ($\chi^2=38.5$, $p=.000$). The proportion of respondents who were unemployed is statistically similar in the lower and middle class neighborhoods. However, the proportion of respondents who were unemployed the month prior to the interview is greater in the neighborhoods without garbage collection service than in the neighborhoods with service (30% vs. 11%) ($\chi^2=16.1$, $p=.000$). The vast majority of the unemployed respondents (88%) reported that the family was supported by the respondent's spouse.

While more than half of the men were usually employed in the service sector as guards, chauffeurs, and business employees (53%), the women were usually divided into two categories of employment: odd jobs, including street vending or cleaning clothes (35%), or salaried employees in the service sector (32%) ($\chi^2=21.3$, $p=.000$).

On the other hand, similar proportions of residents in middle class and lower class neighborhoods are employed in the service sector. However, when comparisons are made between middle and lower class respondents, a larger percentage of the former are professionals and office employees (33%) and a larger percentage of the latter are self employed in the informal sector (28%) or are wage earners (19%) ($\chi^2=25.4$, $p=.000$).

The majority of the households have multiple incomes. In 50% of the households, two or more people pay the household bills (in 41%, two people pay; in 12%, three people; and in 3%, four people). In half (51%) of these households, the second income is that of a woman. There is a correlation between the number of people who contribute their income to the family and the number of women who participate in this contribution. The higher the number of family members contributing to the family's income, the higher the probability that those family members are female ($r=.77$, $p=.000$).

The majority (89%) of respondents reported that the male in the couple is the family member that contributes the most to pay the household bills. This is true regardless of the socio-economic status of the neighborhood where the household is located or the type of waste collection service the neighborhood has.

The majority (81%) also reported that the male in the couple contributed the most to pay for the last electric bill and consequently for the waste collection service. However, the proportion of women who paid the electric bill is higher in households in middle class neighborhoods (13%) than in the lower class neighborhoods (6%). These percentages are too small to test for statistical significance. It is more common for relatives to pay the electric bill in families from lower class neighborhoods when compared to their middle class counterparts ($\chi^2=8.39$, $p=.001$). Over one fifth of those interviewed in the neighborhoods without any garbage collection service reported that the previous month's electric bill was paid by a relative who is neither the head of the household nor the spouse of the head of the household ($\chi^2=21.6$, $p=.001$).

B. Views Concerning the Relevance of Garbage Collection When Compared to Other Neighborhood Problems

1. How Serious a Problem is Garbage

To understand the views concerning the relative seriousness of garbage as a problem, three questions were asked.

- ! One, which of a list of common problems affecting Machala, affected the respondent's neighborhoods. The problems considered were: water supply, waste collection, delinquency, transportation, access to health centers.
- ! Two, how serious was each one of these problems.
- ! And three, how seriously did each of these problems affect the respondent's family.

Regarding the first question, the problem most commonly cited was delinquency (71%), and the second was waste (62%). There was no statistical difference by gender. There were differences, however, by socio-economic class and by the type of waste collection service in the neighborhood. While 80% of respondents from lower class neighborhoods reported that waste collection is a problem in their vicinity, only 44% of respondents from the middle class shared this opinion ($\text{Chi}^2=39.7, p=.000$).

Also, significant differences were noted by type of waste collection service. The majority of people with sporadic collection (75%) or without service (98%) view garbage as a problem in their neighborhood, in comparison to the minority of people with regular service (44%) or pilot service (41%) ($\text{Chi}^2=61.9, p=.000$).

In one set of questions where respondents were asked to rate five problems: waste, water provision, transportation, delinquency, and lack of health units; on a 4-point scale of seriousness, where 1=not serious and 4=very serious, waste received an average rating of 3.1. Furthermore, significant differences were observed concerning which of the five problems was the most important. Respondents in lower-class neighborhoods (3.2) perceived the waste problem as more serious than those interviewed from the middle class (2.9) ($F=4.8, p=.03$). The severity of the waste problem is greater in neighborhoods with sporadic collection (3.4) and with no service (3.4) than in the neighborhoods with regular service (2.9) or with pilot plan service (2.6). ($F=19.0, p=.000$).

When questioned which of the five problems has a greater impact on their life, the most common answer was waste (31%) and water (27%). Focussing on these two problems only, significant differences arise based upon socio-economic status and the type of waste collection service. Residents in middle-class neighborhoods reported that water (59%) had the greatest impact on their lives. That position was attributed to waste (69%) among respondents from lower class neighborhoods ($\text{Chi}^2=13.7, p=.000$). On the other hand, respondents with regular service see water as a problem impacting them more than waste (68%). The same is true among those interviewed without any collection service (59%). However, those interviewed with sporadic waste service consider the problem with the greatest impact to be waste ($\text{Chi}^2=68.3, p=.000$).

These results suggest that respondents that confront waste problems are expressing their concern about them.

2. Why is Garbage a Problem

Respondents were asked what makes waste a problem, giving them the opportunity to provide more than one answer. In general, there is more concern with the effects waste has on health than with the poor aesthetics caused by the accumulation of waste. In order of frequency, the problems mentioned are: it causes diseases (32%), it attracts flies and mosquitos (23%), it causes bad odors (19%), it attracts rats (14%), dogs will scatter it (10%), and it looks bad (9%).

There are some statistically significant differences based upon socio-economic status. In general, these differences arise from the general concern about waste that prevails among lower class respondents. Among lower-class respondents, it is more common than in the middle class to think that waste can:

- ! cause disease (46% vs 21%) (Chi2=17.17, p=.000),
- ! attract rats (23% vs 6%) (Chi2=16.7, p=.000),
- ! generate bad odor (25% vs 13%) (Chi2=6.9, p=.01), and
- ! be scattered by dogs (13% vs. 7%)(Chi2=3.7, p=.05).

Significant differences also exist based upon the type of waste collection. Respondents from neighborhoods poorly served or without any service at all collapsed into one category tend to worry more frequently than their counterparts elsewhere that waste can:

- ! cause disease (48% vs 16%) (Chi2=35.3, p=.000),
- ! attract flies (30% vs 17%) (Chi2=7.4, p=.006),
- ! attract rats (23% vs 3%) (Chi2=19.8, p=.000),
- ! generate bad odor (25% vs. 14%)(Chi2=5.5, p=.02), and
- ! be scattered by dogs (15% vs 5%) (Chi2=7.2, p=.007).

There are no significant differences between men and women in these perceptions.

3. Responsibility for Solving Neighborhood Problems

When asked who should solve the five problems discussed, there was almost a total absence of a sense of personal responsibility. Less than 1% of the respondents believed that had a role to play in solving those problems. Generally, they considered that local government has the responsibility for solving the problem of potable water (66%) and waste (67%). The national government should solve the problems of delinquency (76%) and the shortage of health centers (75%). By comparison, those interviewed consider that the solution for the problem of transportation come from three parties: the national government (41.3%), the private sector (36.3%), and the City (15.3%).

More specifically regarding waste, when addressing the role of local government, many

respondents expressed the need to have a "semi-private" waste collection system which would employ contractors for the collection and management of solid waste. About one fourth (23%) of those interviewed believed that the private sector should solve the waste problem. This opinion reflects a community-level openness in favor of the contracting of (small) businesses for the management of the waste collection system.

No differences by gender regarding these opinions was detected. Men and women agree on who should be responsible for solving the different local problems included in the questionnaire.

C. Household Waste Management Practices

The results concerning the way families handle solid waste within the household are the most complex of this study, given the numbers of issues to be concerned with: waste products, frequency of disposal, role of family members in the process, etc. As far as the new waste collection system is concerned, it is important to define the target audiences and to select which behaviors, which benefits associated with those behaviors, and which messages to promote. The analysis has been carried out with that perspective in mind. However, the available data can be analyzed more in-depth to draw future lessons for interventions associated with household waste management practices.

The waste products in the visited households the week prior to the survey were, by order of frequency: raw organic (98%), cooked organic (97%), paper (90%), plastics (60%), cans/metals (43%), glass (14%), and wood/garden waste (10%). From a socio-economic status perspective, waste glass was more frequently reported by the middle class ($\text{Chi}^2=4.5$, $p=.04$), and waste paper was more frequently reported in the lower class ($\text{Chi}^2=7.8$, $p=.000$). In general, men and women reported the existence of the same waste products.

When directly asked if they separate their waste, only one third (28%) reported they do. No significant differences were found by socio-economic status or gender, but rather by type of service. Those who indicated they separated their waste (60%) usually come from neighborhoods with sporadic waste collection service ($\text{Chi}^2=28.2$, $p=.000$).

In general, respondents who indicated that they separate their waste do so in order to "make the most use of waste" (43%), "facilitate its disposal" (23%), or "to give it away" (21%). However, differences were found by socio-economic status and type of service. The lower class separates "to make the most use of waste" (50%), while the middle class does it to "facilitate its disposal" (47%) ($\text{Chi}^2=8.53$, $p=.04$). There is a marginal statistical relationship between the reasons given to justify the separation and the type of waste collection service. In the better served areas, waste is separated "to be given away," while in the poorly served areas, waste is separated "to make the most use of (it)" (47%) ($\text{Chi}^2=7.1$, $p=.07$).

In the majority of the households, women (88%) are in charge of separating waste. No statistically significant differences were found in this regard by socio-economic status, type of service, or sex of the respondent.

Even though the majority of those interviewed reported they do not practice waste separation, in reality they are doing it, especially with cooked foods and to some extent with raw foods. During the questionnaire field test, it was detected that respondents did not consider cooked or uncooked foods "waste". Rather they believed that these are "useful products." There is a special Ecuadoran term to refer to this type of products: **Alabasa**. The term is used to refer to animal feed in general, but mainly for feeding pigs. This study confirms that showing that the majority of respondents, regardless of the socio-economic level and across waste collection services, separate cooked organic waste and treats it differently from any other waste product. In fact, 75% of respondents in this study indicated that they (re)use cooked organic waste. In general, the lower class gives it to their animals, and the middle class gives it away. There are no differences by gender.

On the other hand, a great number of the households that have better waste collection service, either regular or pilot, usually dispose of the cooked and uncooked food waste instead of using it or giving away. Even though these differences are only 4 to 6% respectively, they are statistically significant ($\chi^2=6.1$, $p=.01$, and $\chi^2=3.7$, $p=.05$). The treatment of other types of waste differs depending on socio-economic status. In general, middle class respondents reported giving their waste to the waste collector, while those interviewed in the lower class tend to throw it in the estuary or burn it if it is flammable. In the specific case of foods, cooked or uncooked, the tendency among lower class respondents is to give it to the animals. The most commonly mentioned ways of disposing waste by waste product and socio-economic class are presented in Table 2.

Table No. 2
The Most Common Ways to Dispose of Waste
by Waste Product and Socio-Economic Class
(Percentages)

Waste Products	Most Commonly Mentioned Disposal Manner for Each Waste Product	Lower Class	Middle Class	Chi2 and p
Raw Organic (n=294)	Collector	18	67	98.0, p=.000
	Animal feed	26	11	
	Canal	31	1	
Cooked Organic (n=290)	Collector	8	26	35.9, p=.000
	Animal feed	70	46	
	Give away	16	24	
	Canal	5	0	
Paper (n=269)	Collector	16	67	104.5, p=.000
	Canal	33	1	
	Burned	30	12	
Plastic (n= 180)	Collector	16	86	96.2, p=.000
	Canal	34	0,00	
Cans/metal (n=130)	Collector	0	83	82.9, p=.000
	Canal	45	0,00	
Glass (n=43)	Collector	0	83	36.7, p=.000
	Canal	69	0	

The same tendencies are seen when studying waste disposal practices by type of service. These differences become more obvious when the type of service is broken down into two categories: poorly and better served areas. The "poorly served area" includes sporadic or no service. The "better served area" includes pilot or regular service. There is a tendency to give the trash to the

collection truck in the better served areas. In the poorly served areas, on the other hand, there is a tendency to give the cooked and uncooked food to the animals and dispose of the other waste types by throwing them into the canal or burning them if they are flammable.

Table No. 3
Most Common Ways to Dispose of Waste
by Waste Product and Collection Service
(Percentages)

Waste Products	Most Commonly Mentioned Disposal Manner by Waste Product	Poorly Served Area	Better Served Area	Chi2 and p
Raw Organic (n=294)	Collector	21	63	108.9, p=.000
	Animal feed Canal	26 31	10 1	
Cooked Organic (n=290)	Collector	1	32	61.3, p=.000
	Animal feed Canal	74 4	43 1	
Paper (n=269)	Collector	18	63	137.7, p=.000
	Canal Burned	35 36	0 7	
Plastic (n=180)	Collector	27	86	, p=.000
	Canal Burned	34 28	0 1	
Cans/metal (n=130)	Collector	32	69	65.4, p=.000
	Canal	36	0	
Glass (n=43)	Collector	0	94	17.9, p=.001
	Canal	69	0	

Table 4 indicates the frequency of waste disposal during the week prior to the survey. The percentages presented in the table were calculated based on the respondents who indicated having the type of waste product listed. According to these data, the general tendency is to dispose of paper, cans/metals, and plastic twice per week. Raw organic waste and glass are disposed of twice per week by about half of the households, and daily in at least one third of the households. The general tendency is to dispose of the cooked organic waste daily.

Table No. 4
Frequency of Disposal of Household Waste
By all those Surveyed by Type of Waste
(Percentages)

Waste Product	Disposal Frequency				
	Daily	Every other day	Twice/wk	Once/wk	Once/month
Raw organic (n=294)	38	8	50	4	
Cooked organic (n=290)	76	6	17	1	
Paper (n=269)	16	8	65	9	2
Plastic (n=180)	13	7	71	7	1
Cans/Metals (n=130)	18	10	63	9	
Glass (n=43)	28	9	46	12	2

There are differences by socio-economic class in the case of all recyclable waste products: paper, plastics, cans, and glass. In general, middle class respondents tend to dispose of these waste products daily and lower class respondents tend to dispose of them twice a week. Just as an example to prove the point, among those who reported disposing of paper the week prior to the survey, 70% of lower class respondents and 59% of their middle class counterparts did it twice per week. On the other hand, 6% of the lower class do it daily compared to 26% of the middle class ($\chi^2=22.6, p=.000$). The differences observed between socio-economic classes for the other types of recyclables products included in the questionnaire (e.g., plastics, cans, and glass) are also significant.

Concerning the frequency of waste disposal, there are also statistically significant variations by type of collection service. The differences exist generally because those who have regular service tend to dispose of the different kinds of waste daily, and those with pilot service dispose of their waste twice a week. Basically, this indicates that those with a regular service have adapted to the service schedule.

In the case of those without regular service, there are a few observations worth noting. These

observations concern recyclables. Among those interviewed with sporadic service, there is a tendency to dispose of paper, plastic, and cans twice a week. Among those with no service at all, there is a tendency to dispose of these same recyclables at least once per week. Disposal of glass seems to be more erratic, but this could be a result of the reduced number of cases having reported disposing of glass the week prior to the interview.

No differences in the frequency of waste disposal by gender were observed.

There is no habit of using organic waste as fertilizer. Only one person interviewed uses cooked organic waste as fertilizer, six people (2%) utilize uncooked foods in this way, and no one uses their garden refuse in this way.

In general, when compared to women, men have different perceptions about how frequently waste is disposed of, about the distance that must be traveled to dispose of waste, and about the time spent disposing of waste. Waste disposal is normally considered to be more time consuming by men than by women.

A marked difference was observed between lower- and middle-class respondents regarding the use of plastic bags for waste disposal. The majority of those interviewed from the middle class reported that they disposed of their inorganic waste in plastic bags, while the majority of the lower class uses other types of bags. This result is very important as the new system will require clients to put their waste in a throw-away container to facilitate collection. Probably due to cost, the lower class doesn't use plastic bags and is likely to refuse to use them.

The role of family members in waste disposal by type of waste product and socio-economic class are presented in Tables 5 through 8. In general, the responsibility for the disposal of waste is shared between women and children. However, it appears as if among the lower class, men are more involved in this task than originally anticipated. This is particularly true regarding the disposal of two recyclable products: paper and metal. The same trend is observed regarding plastic without the differences reaching statistical significance. A different trend appears in the case of glass, but that may be the result of the limited number of cases used in the analysis. Furthermore, hypothetically it can be argued that in the middle class, and depending on the type of waste, domestic help and children may replace adult males in this role.

Table No. 5
Role of Family Members in Disposal of Plastic by Socio-Economic Status

Status	Men	Women	Children	Domestic Help	Other	Chi2 and p
Middle Class (n=86)	13%	38%	38%	6%	5%	Chi2=7.7 p=.10
Lower Class (n=94)	25%	36%	37%	1%	1%	

Table No. 6
Role of Family Members in Disposal of Paper by Socio-Economic Status

Status	Men	Women	Children	Domestic Help	Other	Chi2 and p
Middle Class (n=128)	12%	41%	34%	9%	4%	Chi2=15.9 P=.003
Lower Class (n=140)	26%	39%	33%	1%	1%	

Table No. 7
Role of Family Members in Disposal of Glass By Socio-Economic Status

Status	Men	Women	Children	Domestic Help	Other	Chi2 and p
Middle Class (n=23)	16%	36%	33%	9%	6%	Chi2=11.9 P=.02
Lower Class (n= 13)	25%	44%	31%	0%	0%	

Table No. 8
Role of Family Members in Disposal of Metal By Socio-Economic Status

Status	Men	Women	Children	Domestic Help	Other	Chi2 and p
Middle Class (n= 64)	20%	30%	47%	0%	3%	Chi2=5.2 p=.15
Lower Class (n= 64)	38%	31%	31%	0%	0%	

In terms of who makes the decisions concerning the disposal of waste at the household level, the majority sampled say that women handle waste disposal of cooked organic waste and, to a certain extent, that of raw organic waste as well.

The decision concerning the handling of other solid waste is shared between men and women. However, just as in the disposal of waste, the men in the lower class are more involved in the decision making in the management of waste than in the middle class. For example, concerning decision making about disposal of plastics, 55% of those interviewed in the lower class reported that the men made this decision in comparison with 20% in the middle class. This result emphasizes the importance of including men in the primary target group.

However, there are differences in the opinions of men and women considering who makes these decisions. For example, the majority of the men (64%) believe they make the decision concerning the disposal of glass while the majority of the women (73%) believe that they decide.

Table No. 9 illustrates how easy respondents think it is to dispose of household waste. The figures in this table are averages and correspond to a 4-point scale where 1 is very difficult and 4 is very easy. As indicated in the table, waste disposal practices are perceived to be easier to perform for middle-class respondents than for their lower-class counterparts.

Table No. 9
Rate of Difficulty Attributed to Waste Disposal by Type of Waste and Socio-Economic Class
(Average Values in a Scale of 1-4)

Waste Product	Lower Class	Middle Class	t	p
Raw organic (n=294)	2.6	2.9	2.6	.00
Cooked organic (n=290)	2.9	3.0	1.1	.07
Paper (n=269)	2.6	2.8	3.8	.00
Plastic (n=180)	2.6	2.8	3.4	.08
Cans/metal (n=130)	2.3	2.8	5.9	.00
Glass (n=43)	2.5	2.9	0.5	.45

An analysis of variance has shown that in the case of raw organic waste, the perception of ease of disposal is dictated by: 1) the proximity of the disposal site, and 2) the use of a plastic bag to do so. On the other hand, this perception of ease is connected to the same conditions plus the ability to dispose of the waste in a place less than six minutes away from the home for the disposal of paper and metals.

D. Knowledge and Opinions About the Collection System

Questions on this topic explored the knowledge respondents had about the present waste collection system, mainly: days when collection takes place, the type of transportation system used, what type of container is required to dispose of waste, and how the service is paid for. Also, there were questions to explore the opinions clients had about their current waste collection system.

In general, men and women have the same level of knowledge concerning their present service. However, significant differences were found by type of collection service. In general, respondents in the pilot program area were more knowledgeable about the characteristics of their waste collection service, demonstrating the impact made by the promotion carried out for the new service.

1. Basic Knowledge

The results indicate that there is a high level of knowledge of the service presently offered. Those interviewed that have regular service know that they have it, and those that don't have it know that they don't. About half (48%) of those interviewed with sporadic service reported that they received waste collection service, and the other half (52%) were not aware they had a service. Practically all those interviewed from the pilot plan neighborhoods know their neighborhood has a waste collection service. There were no differences noted by gender.

2. Knowledge of Waste Collection Days

Only in the groups with regular or pilot plan service can the level of knowledge concerning which days the waste is collected be evaluated given that they are the only ones in the survey with specific days for collection. The majority (70%) of those interviewed from the pilot plan and half (56%) of those with regular service correctly knew the collection days. There is no difference in the level of knowledge of collection days with respect to gender. There are, however, differences relating to socio-economic class. A greater proportion of those interviewed in the lower class (99%) compared to the middle class (42%), tend to know the correct days for collection ($\text{Chi}^2=34.7, p=.000$).

These results indicate once again that the promotion concerning the new service has had an impact. However, the fact that one third of the clients from the pilot plan and practically half of those with regular service do not know the collection days implies the necessity to emphasize this message among existing clients and promote it even more using various channels of information when services are expanded to new clients. This message should be promoted in middle-class households even though the responsibility for putting the waste out on the sidewalk on collection days falls on domestic help and children.

3. Type of Transportation

Those who have collection service know how waste is collected. All of those interviewed with regular service and practically all those (99%) interviewed with sporadic service where the collection take place using a truck knew that the waste was collected in that manner. Practically all (91%) of those with the pilot plan interviewed knew that in their neighborhood tricycles were used for the same purpose. No differences were noted by gender.

4. Awareness About the Need to Use Plastic Bags

More of those interviewed from the pilot plan know that they should dispose of their waste in plastic bags. 96% of the respondents from the pilot plan area understand this requirement, in comparison to 73% of respondents from areas with regular service, 49% from areas with sporadic service, and 25% with no service at all. More lower class respondents are aware (96%) of the need to use plastic bags than those in the middle class (71%) ($\text{Chi}^2=14.3, p=.000$). However, lower class respondents are not necessarily using the plastic bags even though they know that they should be.

5. Awareness About the Service Charges

Regardless of what waste collection service they receive, all Machala residents pay for waste collection through a surtax of 10% on their electric bill.

The majority of those interviewed know that they are paying for waste collection service (86%). No differences were noted based upon gender, socio-economic class, or type of service. Among those interviewed who know they are paying for waste collection service, the majority

(95%) know that they are paying it through their electric bill. No differences by gender, socio-economic status, or type of service were noted.

6. Opinion of Present Service

Sixty-five percent of respondents think that the collection service they receive is "good", 29% said it is "satisfactory", and 7% said it is "bad." As expected, there are statistically significant differences by type of collection service. Table 9 presents those differences by type of service, excluding those with no service as they did not answer the question. One aspect that stands out is the high percentage of respondents in the pilot area which rate the service as **A**good@which speaks in favor of the program being implemented.

Table 9
Rating of the Quality of Garbage Collection Service by Type of Service Available
(Percentages)

Rating of Service	Permanent (n=50)	Pilot (n=99)	Sporadic (n=49)	Statistics
Good	66	72	47	Chi2=10.6 p=.03
Satisfactory	24	24	45	
Bad	10	4	8	

7. Opinion of Service by Tricycles

Thirty-seven percent of the respondents were acquainted with the waste collection service that uses tricycles. Eighty-seven percent of them come from the neighborhood where the pilot program is being implemented. Among those who are acquainted with the service, 73% believe that the tricycle service is "adequate."

In general, those who believe that the service is adequate say so because it requires less effort or is more convenient and easier (69%), and is more regular (23%) than what they had before. There are statistically significant differences by gender. 83% (the majority) of the women believe the service is more convenient and easier in comparison with 55% (about half) of the men. Furthermore, 31% of the men highlighted its regularity in comparison to 15% of the women. Likewise, the men tended to emphasize the lower cost of the service (12% in comparison to 2% of the women) (Chi2=8.3, p=.04).

In general, the few who believe the service is inadequate said so because of the accumulation of waste (54%) and the need to use plastic bags (21%). There is a tendency among the lower class to be worried about the pilot system because of the requirement to use plastic bags, while those in the middle class fear the accumulation of waste. On the other hand, the worry about having to use plastic containers seems to be characteristic of the men, and the preoccupation with waste accumulation seems to be more characteristic of the women. However, the low number of cases

that believe the service is inadequate makes it difficult to confirm this point of view statistically.

E. Beliefs Related to the New Waste Collection Plan and Willingness to Pay

In this section of the questionnaire, respondents were asked about the perceived benefits and drawbacks of the different behaviors required by the pilot waste collection service, specifically:

- ! Putting the waste in plastic bags,
- ! Putting the waste on the sidewalk in front of their house,
- ! Putting it out twice a week.

Furthermore, opinions about different waste collection systems were explored (private, municipal, and community), as well as the willingness to pay for a regular waste collection service.

1. Benefits and Drawbacks of Required Behaviors

Practically all (98%) of those interviewed reported that they want a regular waste collection service. However, the benefits and drawbacks associated with the behaviors required by the new system vary by socio-economic status and type of waste collection service.

The most outstanding benefit of the new system for all of the groups is the reduced "cost" in terms of effort (50%) and time (31%) that is anticipated by putting the waste on the sidewalk in front of the house. The disadvantages mentioned concerning the placement of the waste in front of the house in order of frequency are: the fear that waste would be scattered by dogs (29%), that it would be unsightly (28%), and that it would smell bad (24%). These disadvantages can be solved with simple solutions at a low cost that are described in Section III, Conclusions.

The results of the study indicate that some of the perceived disadvantages relate to socio-economic status and type of collection service, as described below.

Number of Collection Days

Study participants have expressed a concern about the number of days proposed for collection: twice a week. Collection twice a week is considered insufficient by 60% of study participants. This concern is more frequently expressed by middle class respondents ($\text{Chi}^2=9.4, p=.003$) and by those with permanent collection services ($\text{Chi}^2=12.4, p=.006$). The most commonly expressed preference is that collection be done daily (42% of participants). This tendency is more pronounced again among middle class participants ($\text{Chi}^2=20.9, p=.000$) and among those with permanent service ($\text{Chi}^2=81.1, p=.000$). As far as pilot plan clients are concerned, 40% believe there should be daily collection, 33% said three times per week would be good, and only 18% of those interviewed from the pilot plan area agreed with collection twice a week.

When directly asked, "what is the disadvantage of waste collection twice weekly?" the most common answers were that waste would pile up (49%), it would cause a bad odor (23%), and it would attract insects (13%). No differences by collection service, socio-economic class or gender were found.

The Plastic Bag

Lower-class respondents (65%) tend more frequently to see drawbacks in the use of plastic bags to dispose of garbage when compared to their middle-class counterparts (51%) ($\text{Chi}^2=6.6$, $p=.01$). The same is true among participants with poor or no collection service (67%) when compared to those with regular collection service (49%) ($\text{Chi}^2=9.2$, $p=00$).

Among respondents expressing concerns about the use of plastic bags, the two most commonly mentioned drawbacks are their cost (59%) and bags getting ripped apart by dogs (29%). The cost of bags is more frequently mentioned by lower-class respondents (65%), and destruction of bags by dogs is more commonly mentioned by middle-class respondents (57%) ($\text{Chi}^2=16.2$, $p=.00$). No further differences in this regard were found by type of garbage collection service or gender.

2. Social Norms

The survey also studied whether there are social norms that favor the different behaviors required by the new system. The questions formulated concerning this were: "Who would approve if you did x." and "who would be disapprove if you did y." In general, many, if not the majority, of those interviewed could not cite specific referents that would approve the performance of the behaviors considered: putting out the garbage twice a week (55%), and using plastic bags to do so (47%). Citing referents who would disapprove that those same behaviors be performed was harder to do: putting out the garbage twice a week (79%), and using plastic bags (84%).

However, it is interesting to note that among those who did cite a referent who would approve the practices, the more frequently mentioned are family members, the municipality and neighbors. For putting out the trash twice a week, the referents more commonly cited are the spouse (37%) and children (34%). In this case, there is marginally significant tendency for children to be mentioned more frequently by men (42%) than by women (24%) ($\text{Chi}^2=10.0$, $p=.07$). On the other hand, the referents more commonly cited for the use of plastic bags to dispose of waste are the municipality (50%), the neighbors (19%) and children (15%). Again, there is a marginal statistically significant tendency for children to be more frequently mentioned by men (22%) than women (8%) ($\text{Chi}^2=10.1$, $p=.07$). These results alert to the role that children may play in messages targeting fathers.

3. What Would They Do If the New System Didn't Work?

In response to the question "What would you do if they didn't pick up the trash on the specified day?" the results indicate differences by socio-economic class and type of collection service.

Whereas 66% of middle class respondents indicate that they would wait for the next waste pickup, 50% of lower class respondents indicate that they would throw the waste in the canal (Chi2=78.1, p=.00). By the same token, 62% of respondents with permanent collection service would wait for the next pickup day in comparison with 42% of respondents with no service and 36% of respondents with sporadic service who would do the same. Yet, 44% of those with no service and 32% of those with sporadic service would throw the waste in the canal compared to 2% of those with permanent service (Chi2=41.4, p=.00) These results indicate that faced with an unreliable service, residents would return to their old habits. Thus, they demonstrate the importance of carrying out the collection of the specified days so as not to disillusion the clients and to keep the neighborhoods clean. Furthermore, given the fact that 54% of respondents in the pilot area would wait for the next pick up as would residents in neighborhoods with permanent service indicates that indicates that an efficient service could curb the tradition of throwing away the waste inadequately. Finally, the percentage of respondents who said that they would throw the waste away in their neighborhood instead of waiting for the collection truck also suggests the necessity of promoting the message of keeping the waste until the following collection day if it is not collected on the specified day.

4. The Complaint System

Generally, those interviewed reported that the easiest way for handling complaints in case of a breakdown in the system is going to the office in charge (69%), informing the community leader (18%), and calling by telephone (11%). There are no statistically significant differences by socio-economic class, type of collection service or gender.

5. Preferences Regarding Service Providers

In general, the majority of all of the groups believe that compared to a municipal or a community collection service, a private system is more honest (60%) and more reliable (67%), yet more expensive (75%). There are statistically significant differences by type of collection services, socio-economic status and gender.

Collection services provided by community groups are believed to be more effective by clients with either permanent service or in the pilot area, private collection services are considered to be more effective by clients with sporadic service, and municipal services are considered to be effective by those that have no service (Chi2=32.2, p=.00).

41% of the lower class clients think that the municipal system is more effective compared to 28% of their middle class counterparts (Chi2=6.8, p=.03).

There are marginally statistically significant results suggesting that women tended to prefer a municipal waste collection system while the men lean towards a private service. More women than men believe that a municipal system is more effective, honest, but at the same time more expensive. Men tend to hold the same views about a private service.

6. Willingness to Pay for Collection Service

The large majority of respondents (over 80%) are willing to pay for the waste collection service.

In terms of how much clients would be willing to pay, only a few (12%) would pay less than 100 sucres. The majority would pay between 1000-3000 sucres (20%- 1000 sucres, 29%- 2000 sucres, and 20%- 3000 sucres). One fifth (19%) would pay over 3000 sucres. When 3,000 sucres/month is used as a break point to form a group who is willing to pay more and another who is willing to pay less, lower class respondents compared to middle class respondents want to pay less ($\chi^2=9.5$, $p=.00$). Also, clients in areas with poor or no service are more frequently willing to pay under 3000 sucres/month whereas those in areas with better services (permanent or pilot) are more frequently willing to pay more than that amount ($\chi^2=3.7$, $p=.05$).

F. Channels of Communication

The questions about radio and television asked whether respondents used those media the day prior to the survey. Newspaper readership, however, covered up to one week of time prior to the survey. This was done because the pretest of the questionnaire indicated that Machala residents tend to buy newspapers less frequently than they would listen to their radio or watch television.

Radio and Television Listenership and Newspaper Readership

In general, the majority of respondents listened to the radio in the morning (53%) and watched television in the evening (82%). Lower class respondents listened more often to the radio in the morning (61%) than by the middle class (45%). The middle class, on the other hand, more frequently watched (86%) television in the evening than the lower class (78%). Sixty-four percent reported that they read the newspaper the week prior to the survey. This medium is used more by men than women and more by the middle class than the lower class. These tendencies plus the statistical significance of the tendencies are presented in Table 10.

Table 10
Media Use: Radio, TV and Newspaper

Media		Percentage of Respondents Using Radio and TV by Time of Listenership, Gender and Socio-Economic Status						
		Total (n=300)	Gender			Socio-Economic Status		
			Masc. (n=155)	Fem. (n=145)	p value	Middle (n=150)	Lower (n=150)	p value
Radio	Yesterday Morning	53%	53%	53%	.91	45%	61%	.01**
	Yesterday Afternoon	8%	16%	21%	.33	14%	22%	.10
	Yesterday Evening	6%	7%	5%	.63	7%	5%	.63
Television	Yesterday Morning	23%	21%	26%	.38	30%	17%	.01**
	Yesterday Afternoon	35%	30%	41%	.06	39%	31%	.18
	Yesterday Evening	82%	83%	81%	.76	86%	78%	.10
Newspaper	Read Any Paper Last Week	64%	74%	53%	.00***	77%	51%	.00***

The television channel Ecuavisa 7 has the largest audience. The study indicates that the local channel, OK-27, has few viewers.

Table 11
TV Channels Watched by Gender and Socio-Economic Status According
to Different Daytime Periods

TV Channels		Percentage of Respondents Watching TV by Channel and Time of Day						
		Total	Sex			Socio Economic Status		
			Masc.	Fem.	p value	Middle	Lower	p value
Morning	Watches in the morning (n)	70	32	38		45	25	
	OK - 27	10%	13%	8%	.77	11%	8%	.99
	Ecuavisa - 7	71%	78%	66%	.40	73%	68%	.87
	Teleamazonas - 11	7%	3%	11%	.41	7%	8%	.75
	Telecentro - 13	4%	3%	5%	.85	4%	4%	.52
	Telesistema - 3	10%	6%	13%	.56	9%	8%	.76
	Gamavisi\ñ - 9	6%	9%	3%	.58	7%	4%	.99
	Sí TV - 12	0%	0%	0%	n/a	0%	0%	n/a
Afternoon	Watches in afternoon (n)	105	46	59		58	47	
	OK - 27	5%	9%	2%	.24	3%	6%	.79
	Ecuavisa - 7	73%	70%	76%	.64	78%	68%	.35
	Teleamazonas - 11	3%	2%	3%	.76	3%	2%	.76
	Telecentro - 13	10%	9%	12%	.86	16%	4%	.10
	Telesistema - 3	17%	17%	17%	.79	14%	21%	.49
	Gamavisi\ñ - 9	2%	2%	2%	.48	2%	2%	.48
	Sí TV - 12	0%	0%	0%	n/a	0%	0%	n/a
Evening	Watches in evening (n)	246	129	117		129	117	
	OK - 27	5%	9%	2%	.04	7%	3%	.26
	Ecuavisa - 7	85%	86%	84%	.79	84%	86%	.80
	Teleamazonas - 11	2%	2%	3%	.93	3%	2%	.93
	Telecentro - 13	6%	7%	4%	.46	6%	5%	.95
	Telesistema - 3	7%	4%	9%	.18	9%	4%	.19
	Gamavisi\ñ - 9	2%	2%	2%	.65	2%	3%	.93
	Sí TV - 12	0%	1%	0%	.84	0%	1%	.83

Among the radio stations, the stations Radio Vía (53%) and Radio Superior (27%) have the largest audience. The most important hours for future promotional activities are in the morning, especially during the news broadcasts. Radio Vía also has a large audience in the afternoon (32%), as do Radio Superior (19%) and Radio Machala (19%).

Table 12
Radio Stations Listened by Gender and Socio-Economic Status
by Daytime Periods

Radio Stations		Percentage of Respondents Using Radio by Gender and Socio-Economic Status						
		Total	Sex			Socio Economic Status		
			Masc.	Fem.	p value	Middle	Lower	p value
Morning	Listens during morning(n)	159	82	77		68	91	
	Radio Caravana	8%	7%	8%	.95	13%	3%	.04*
	Radio Via	52%	42%	58%	.06	32%	67%	.00***
	Radio Superior	27%	35%	18%	.03*	40%	18%	.00***
	Radio Machala	3%	4%	1%	.49	4%	1%	.47
	Radio el Oro	3%	4%	3%	.93	3%	3%	.64
	Radio Guayaquil	1%	1%	1%	.43	2%	1%	.88
	Radio Cristal	3%	4%	1%	.49	2%	3%	.91
	Radio Sucre	3%	4%	1%	.49	2%	3%	.91
Other	2%	0%	4%	.21	3%	1%	.74	
Afternoon	Listens during afternoon (n)	54	24	30		21	33	
	Radio Caravana	11%	13%	10%	.93	14%	9%	.90
	Radio Via	32%	38%	27%	.57	19%	40%	.19
	Radio Superior	19%	13%	23%	.56	29%	12%	.23
	Radio Machala	19%	21%	17%	.98	29%	12%	.23
	Radio el Oro	2%	0%	3%	.83	0%	3%	.81
	Radio Guayaquil	0%	0%	0%	n/a	0%	0%	n/a
	Radio Cristal	6%	0%	10%	.32	0%	9%	.42
	Radio Sucre	9%	17%	3%	.20	10%	9%	.72
Other	4%	0%	7%	.54	0%	6%	.69	
Night	Listens in evening (n)	18	11	7		11	7	
	Radio Caravana	33%	36%	29%	.84	46%	14%	.37
	Radio Via	17%	18%	14%	.67	9%	29%	.65
	Radio Superior	17%	9%	29%	.65	18%	14%	.67
	Radio Machala	11%	18%	0%	.68	9%	14%	.66
	Radio el Oro	0%	0%	0%	n/a	0%	0%	n/a
	Radio Guayaquil	6%	0%	14%	.83	0%	14%	.83
	Radio Cristal	0%	0%	0%	n/a	0%	0%	n/a
	Radio Sucre	6%	9%	0%	.81	9%	0%	.81
Other	11%	9%	14%	.66	9%	14%	.66	

Newspaper and Magazine Preferences

The newspaper with larger audiences are: 1) El Correo, 2) El Nacional, and 3) El Extra. In relation to specific newspapers, there are not many differences in readership by gender or socio-economic status.

Only one fourth reported they read other material the week prior to the survey indicating that other magazines and photo novellas should not be used for promoting the service.

Percentage of Respondents that Read Any Newspaper (n=192) by Newspaper Name and Frequency of Readership								
Frequency	El Correo	El Nacional	Opini\ñ	El Universo	El Comercio	El Extra	El Expreso	El Telégrafo
Once/wk	7%	5%	1%	3%	1%	3%	0%	0%
Twice/wk	12%	8%	5%	4%	1%	6%	0%	0%
3 times/wk	5%	3%	1%	1%	0%	1%	0%	0%
4 times/wk	0%	1%	0%	0%	0%	2%	0%	0%
5 times/wk	1%	0%	1%	0%	0%	1%	0%	0%
6 times/wk	0%	0%	0%	1%	0%	0%	0%	0%
Daily	26%	12%	5%	6%	0%	10%	1%	0%

Information Sources for Local and National Events/News

To understand how they obtain new information, respondents were asked if they obtained information about one specific major local event and one specific major national issue and how that information was obtained. The majority (89%) had been informed of the two types of news indicating that in general, the population of Machala is informed about major local and national news. No statistically significant differences by gender or socio-economic class were found.

However, those interviewed are informed about local and national news by different means. They are informed of local news by newspapers (42%) and by radio (34%), and they are informed on national news by television (84%). No one referred to friends as sources of information in general; only a few mentioned they had learned of local (11%) and national news (3%) through a friend.

Community Groups as Channels of Communication

The study indicates that there are no groups or organizations that play an important role in the life of the large majority of the people, and for this reason should not be a focus in the promotion. Only a small number (17%) of respondents reported that they are members of a group, club, or organization. Although there are no statistically significant differences by socio-economic status, such differences exist by gender as 25% of the men are members of such associations in contrast to only 9% of women ($\chi^2=13.7, p=.00$).

For the men, the most popular group is the athletic club (67%). Women on the other hand belong either to neighborhood committees (31%) or to a political group (23%). Despite the small numbers of respondents involved, these differences are statistically significant ($\chi^2=21.5, p=.001$), so the results become more striking.

Over two thirds (69%) of the respondents indicated they would join a community organization to improve the waste collection system. There were statistically significant differences by gender as more men (73%) than women (64%) expressed their willingness to participate in such an organization ($\chi^2= 6.5, p=.04$). No differences were noted by socio-economic status. Among respondents that are doubtful whether they would join such an association, time is the most

outstanding limitation. This implies that if neighbors are organized for collaborating with the new system, it should be for specific actions that don't take much time and not for long meetings or discussions.

APPENDIX A: THE GREENCOM PROJECT

The Environmental Education and Communication (GreenCOM) Project promotes public awareness and community support for new environmental policies and practices. GreenCOM also promotes changes in individual behaviors and institutional practices. It does this through collaboration with environmental education and communication (EE&C) components of USAID Mission and Regional projects. GreenCOM project staff work with host- country partner institutions by providing short- and long-term technical assistance to support a broad range of EE&C activities.

State of the Art EE&C Methods

GreenCOM approaches social and behavioral change from the perspective of thirty-five years of applied social science and educational research. It puts into practice a program-planning process that promotes behavior change by offering benefits people want, reducing the barriers they face, and using persuasion) not just information) to involve them in community decision making.

The GreenCOM approach combines social marketing, communication, and education to help individuals and groups change around focused environmental issues, while at the same time giving them the knowledge, problem solving skills, and commitment to understand and tackle a broad range of longer-term environmental concerns.

GreenCOM works with a wide array of host-country public- and private-sector institutions and programs such as:

- ! School systems
- ! Extension systems
- ! Workplace/industry education programs
- ! Natural resource management projects
- ! Biodiversity projects
- ! Community-based action programs
- ! Popular media
- ! Municipalities
- ! Democracy/governance programs

GreenCOM Project Components

The GreenCOM Project has four components: Operations Support, Applied Research, Information Exchange, and Synthesis and Dissemination.

Operations Support

The most significant component of GreenCOM provides EE&C support to USAID Missions and Regional Bureaus through current and planned Environment, Natural Resources, and Education projects. Operations Support over the life of the project ranges from complex, long-term projects in six to eight "emphasis" countries to focused tasks in up to fifteen additional countries.

Applied Research

Practical, field-driven research is integral to the entire range of GreenCOM activities. Qualitative and quantitative research using a mix of methodologies is central to how the GreenCOM team helps program managers design, implement, and understand effective EE&C strategies.

Information Exchange

An EE&C Information Exchange Center for public use consisting of state-of-the-art materials and a user-friendly database is located at the GreenCOM offices, with assistance available by mail, phone, fax, or e-mail. In addition, GreenCOM will publish a periodic bulletin about EE&C projects and methods targeted for field practitioners and host an international conference on EE&C methods.

Synthesis and Dissemination

The project team will disseminate the lessons learned and approaches refined under GreenCOM to a broad range of professionals working in development. GreenCOM will produce a field-oriented handbook and complementary video, place articles in key journals and newsletters, and host training events. Project staff also actively seek and employ other innovative and cost-effective means to extend outreach at the global and grassroots levels.

GreenCOM: Present and Future

GreenCOM is jointly funded and managed by the Center for Environment, Center for Human Capacity Development, and the Office for Women in Development of the Bureau for Global Programs, Field Support, and Research. GreenCOM has worked or is currently active in Ecuador, Egypt, El Salvador, The Gambia, Jordan, Mexico, and The Philippines. A level-of-effort contract (five years, with a two-year extension) provides core staff and support services. A companion (requirements) contract provides the services required by individual USAID Mission and Regional projects over the same period. All field activities are funded through Regional and Mission projects.