

Challenges and Opportunities of Waste Collection in Caracas: Sucre Municipality Case Study

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Abstract

This paper provides an overview of solid waste management by local authorities in the Sucre municipality in Caracas, Venezuela. Sucre is currently faced with serious demographic, economic, social, urban, and administrative challenges in solid waste management. The municipality, called Petare, has one of the largest slums in Latin America. It is estimated that more than a million people live in Petare, and 30% live in poverty. Venezuela is also facing a political problem that has affected the solid waste management throughout the country. Local authorities in Sucre have worked with communities to develop solutions to confront these difficulties.

Author's Note

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Keywords: Venezuela, Petare, slums, garbage, waste collection, solid waste, recycling, community involvement, municipality, urban, environmental education, mochileros, participatory budgeting

1. Introduction

“When night falls we are greeted with violence, with the onset of morning we are welcomed with the garbage”, said a resident of the Petare slum of Venezuela. The brick labyrinth of Petare began as a small independent city that was at the eastern hills in the outskirts of Caracas. However, the two cities eventually merged as Caracas grew. The urban settlement, which is today a slum, emerged during the decade-long construction of a highway (Brillembourg, A., & Klumpner, H., 2008). The number of squatters increased as workers built ad-hoc barracks on the foot of the hills. Today it is estimated that about a million people live in the slums of Petare. The slopes extend for miles, covered in patched houses made of brick, tin, and cardboard.

In recent years, there has been a dramatic increase in urban-dwelling populations. In 2008, for the first time in history, more people lived in towns and cities than in rural areas (United Nations Population Fund, 2007). While urbanization has brought increased wealth and opportunities, it has also brought poverty and deteriorating living conditions. About 1 billion people in today’s world call the slums home (Global Report on Human Settlements – UN-Habitat, 2003)

Urban poverty has been recognized as an important subject in the international development agenda, and one focus of the UN Millennium goals is to improve the lives of slum dwellers. To accomplish this goal much has to be addressed, from serving the basic needs of society to infrastructure and security. In order to sustainably meet these, the solution should incorporate a more holistic approach by involving the community in the improvement of living conditions. This allows them to take ownership of possible solutions and facilitates dialogue between municipal authorities and communities (UN-Habitat, 2003).



Figure 1: Picture of Petare.

One of the consequences of denser urban fabric is the increased generation of waste. The rapid expansion of urban dwellers in slums makes it increasingly challenging for municipal authorities to provide basic services such as waste collection. It is estimated that each person produces over 1-1.5 kg (2.2-3.3 lbs) of garbage a day and this accumulation of waste can lead to severe environmental degradation. The issue of waste collection is extremely significant because it links to health, environment, and safety. Uncollected waste can lead to flooding, insects, rodents, and diseases. Improper disposal of waste can pollute water and air, making it an important environmental challenge. Improper burning of garbage causes pollution and can become a serious fire hazard.

Municipalities in Venezuela usually have limited financial resources to deal with such issues. The municipality often has to rely on taxes from richer areas to cover the costs of waste collection in poorer areas; the case of Petare is no different. A Datanalis¹ survey showed that garbage is the slum dwellers' biggest issue after insecurity.

2. Solid Waste Collection in Urban Settings

There are different strategies through which municipalities can have approach the issues of solid waste collection (Andre & Cerda, 2006). One option is that the municipality undertakes the responsibility of waste collection fully, thus assuming the responsibility for the health and safety of its population. In this model, the population served is not restricted to certain types or quantities of garbage, and they are in charge of collecting the garbage as often as possible. The costs must be born on domestic, commercial and industrial users, and materials are not recycled most of the time. Another alternative is a more managed approach. The model is based on environmental precaution, and includes the separation of organic waste. The waste is treated as the responsibility of the producer because the municipality can be selective in what it collects, and materials are recycled. Strategies are implemented to minimize waste generation, and technology is applied to treating waste.

There are several benefits to the involvement of the community. For one, it develops a sense of citizenship and ownership. Citizens become managers of the project and a part of the solution. This not only addresses the needs of the community, but also generates internal management mechanisms. It also develops local knowledge on the topic, empowering the community and enhancing the social capital of the municipality.

However, there are disadvantages to consider as well. By transferring the responsibility to the community, including administrative and labor costs, the overall cost of waste collection may increase. Another possibility is a decentralization of the collection process. Several different organizations, such as neighborhood associations and cooperatives, will participate and dilute the responsibility to optimal service.

¹ This study was led by the Office of Strategic Analysis of the Municipality of Sucre. The survey was developed by Datanalisis (private company) in 2010. Range of study: individuals, male and female, aged 18 years and socioeconomic status A, B, C, D and E. Sample size: 1,250 people. 2.77% sampling error. Confidence level: 95%. Type of sampling: in homes. Information Collection: Semi-probabilistic. Random, stratified by sex, age, socioeconomic status and region.

3. The Sucre Municipality Case

3.1 Background on the Challenge

The city of Caracas is divided into 5 municipalities. Sucre is the second-largest municipality in Caracas and holds some of the largest urban slums in Latin America, including Petare. The Petare slum is a single slum that includes an estimated 10 major neighborhoods, which are further divided into subdivisions. There are an estimated 1,200 barrios (mini neighborhoods) within the slums (Ñañez, 2009).



Figure 2: Entrance to Julian Blanco waste transference plant.

Each municipality is responsible for managing its solid waste disposal. In Sucre, local authorities have chosen to establish an agreement with a private concessionaire, a solid waste management company called SABENPE. The garbage disposal fees are charged through the electricity bill. However, given that most electricity in slum dwellings is illegally connected to the grid, the collection of fees is drastically lower than the extension of the service. Another issue that further affects the subscriptions is the lack of an enforcement mechanism. Although the users are liable for paying the collection fees, they often do not pay since there are few potential consequences. Previously, people would have their electricity cut if they did not pay the collection fees. However, the central government ruled that the collaboration of different services is illegal, and thus eliminated any incentive to pay. Given that waste collection is a public health concern, the municipality cannot halt the collection of garbage in a neighborhood simply because a percentage of users avoid paying the collection fees.

Aside from these challenges, a presidential decree in 2003 forbade the increase of the garbage collection fees. Since the company does not receive enough

money to make the necessary investments, their workers often go on strike, and the consequences are felt by citizens. Since 2009, the municipality has had to subsidize a part of the private company's operating costs, making the company a public and private initiative.

The municipality of Sucre produces an average of 1,100 tons of garbage a day. On average, between Monday and Thursday, 1200-1,380 tons of garbage are collected per day, while Friday, Saturday, and Sunday only 700-800 tons of trash are collected due to limited resources. Solid waste collection is a particularly challenging situation in the areas further up the hills and the inadequacy of current services is obvious.



Figure 3: Open air garbage accumulation at the entrance of Jose Felix in Petare.

At the entrance of the neighborhoods, there are often overfilled giant garbage containers, each with a capacity of 5,000 kgs. The overflow of garbage is exacerbated by people that rip open the trash bags in search for food and spread the waste. The spilling of the garbage not only causes foul odors and unsanitary conditions, but also the stoppage of traffic in characteristically narrow roads.

In theory, the garbage from smaller containers is collected every morning; however not everyone brings his or her garbage down in time. By the afternoon, the container is usually full again. Also, other communities take their garbage to existing containers since some areas lack proper disposal infrastructure, adding to this overflow. The larger containers (roll-ons) are too big for the regular garbage disposal trucks, and they require a special truck with a crane. The truck can only handle one roll-on container at a time, so it must drop off an empty one before taking the full one. However, each truck can only pick up a limited number of containers a day on its route, which results in the accumulation of trash for days.

In the upper parts of the slums, where there are no roads and no containers, so many people dispose of their waste indiscriminately. This causes the community

to overflow with garbage. Small tractor-like machines come to pick up the garbage in these areas, but collection is only twice a week.



Figure 4: Stairs in Petare leading to houses further up the hill.

3.2 The Venezuelan Political-economic Context

The issues of waste collection have to be seen within the greater political-economic issues the country is facing. Waste collection has multiple dimensions beyond the inadequate number of containers, infrequent collection, and scarce access in remote areas. There is also a larger structural problem stemming from the lack of investment due to the political and economic instability within the country.

The central government has taken on a regulatory role and the Venezuelan economy is in a deep recession after shrinking 1.4 % in 2010 and facing almost 30% inflation (Reuters, 2011). This year the government has already expropriated a record number of companies. Just eight months into 2011, and 384 companies so far have been expropriated compared to 286 companies in 2010, 139 in 2009, and 26 in 2008 (La Segunda, 2011). Venezuela has had a currency control regime since 2003, creating a large black market. Currency control has restricted companies' access to foreign currency, and they are obliged to import dollars from the black market, whose rates are about double the official rate. Today, the official exchange rate is estimated to be 4.30 Bolivares to the dollar; however the rate for a dollar on the black market is 8.30 Bolivares. This has caused a scarcity of goods, which has greatly affected solid waste collection. New trucks and vehicles are in very short supply, and used vehicles are worth triple the price of a new vehicle because of the shortage of new trucks and cars. This makes it too expensive for both SABENPE and the municipality to buy new machinery.

Another crucial factor affecting the high costs of solid waste collection is labor. Venezuela has strict labor laws, making it costly to hire and fire workers. In the case of garbage collectors, they are entitled to more benefits than most industries as a result of several strikes that left the city flooded with garbage. Workers have exploited their strategic position and demanded higher pay and benefits.

In this context, administration of garbage disposal no longer seems viable, given that the revenue is not enough to sustain costs of operations, maintenance, collection and service modernization.



Figure 5: Truck at a garbage transference plant called “Julian Blanco,” where larger containers are filled to take garbage to the landfill.

3.3 The Local Context: Strategies applied in Sucre

Local governments have been searching for strategies to provide sustainable urban waste management services through policy reform. These include anything from financing sweeping staff to purchasing waste containers.

One of the tools the municipality has created to address the needs of the communities is the *presupuesto participativo* (participatory budgeting). Its objective is to allow the communities to designate their own priorities and take part in decision-making. The municipality designates funds for each division of its municipality (41 in total), and each community has three boards: social, construction, and public space. Any resident of that community can join the boards and has voting power to decide on which projects will be planned and participate in the implementation boards, which receive technical support from the mayor’s office. The objective is to reflect and prioritize the needs of each community. In 2011, 2% of the *presupuesto participativo* funds are being designated to projects related to solid waste, including the recovery of open-air landfills and programs that introduce recycling in the communities.

There have been significant changes to the administration of solid waste collection since the municipality assumed a part of the responsibility and a number of solutions have been formulated. They are at different stages of implementation and many more are in the process of being devised. The municipality wants to both improve garbage collection and the perception of the process. However, the municipality has limited funds and therefore needs to consider how to reach the maximum impact with the available resources. It is also searching for solutions through which certain programs become self-sustainable.

4. Solutions

4.1 Containers

While in theory the containers are the responsibility of the garbage company SABENPE, they commonly ignore the issue. There are two types of containers, smaller containers that make up the majority and can hold up to 1.5 tons of garbage, as well as roll-ons which can hold up to 5 tons. Many of the containers are in poor condition, filled with holes that allow the trash to fall outside the container and litter the surroundings. There are also not enough of them. Some containers are always overfilled, while other areas there are none whatsoever. Collecting trash from the empty spaces delays the trucks further and slows down the collection routes.

The information on the location and state of the containers belongs to SABENPE, which makes it hard for the municipality to monitor. Therefore, the municipality is currently georeferencing all the containers with a GPS. They will document the location of each container and their condition in order to replace those that are damaged. All areas that should have a container but have already been noted and georeferenced, and new containers will be purchased. This solution will be implemented quickly and have a strong impact on the community.



Figure 6: Roll-on container.



Figure 7: Municipality of Sucre georeferencing containers.

4.2 Mochileros (Backpackers)

The *mochileros* are people in the community equipped with garbage bags who climb into areas where there are no roads or containers to collect the trash directly from people's houses. The term *mochila* means backpack in Spanish. While initially they came with backpacks to collect garbage, it became easier to drag the bags. Nonetheless, the term *mochileros* stuck. Since some people have to travel long distances up and down the stairs to dispose their garbage, many of them throw the garbage in any empty space they can find or leave it on the access stairs. Since these areas are not on the garbage truck routes, the garbage can sit in these areas for days, which contributes to the bad odors and unsanitary conditions. Thus, the *mochileros* have begun to collect the garbage on a daily basis. It has been a very successful initiative that has been piloted in two neighborhoods within Petare: "19 de Abril" and "José Félix Ribas."

The project in "José Félix Ribas" has been very successful and efficient, mostly due to contributions from local leadership. The neighborhood is particularly important because it connects all the sub-neighborhoods in Petare, but it is also has the reputation of being the most dangerous. The *mochileros* project is run by Junior, a community leader with political ambitions in next year's elections. Junior has been living in the neighborhood for 30 years and claims to know everybody, "even the scoundrels." They have hired 61 *mochileros* and one supervisor from the community using the *presupuesto participativo*. The supervisor is Junior's daughter, who goes through all the routes on a motorcycle with her husband to ensure efficient collection.



Figure 8: Mochileros moving house to house to pick up garbage.



Figure 9: Mochilero carrying the garbage to the collection point.

There are 10 sub-neighborhoods, each with its own supervising collector, and a team of anywhere from 2 to 4 other members, male or female. “It is important to have both men and women on the teams. The women are more reliable workers, and they are more often on time and can be counted on, reliable, but men are also needed for carrying all the heavy garbage and wheeling it down to the truck route,” explains Junior. They work from 6:30 to 9:30 in the evening Mondays through Fridays, and being a *mochilero* is usually their second job. Many of them work for the municipality in the cleaning squads that sweep the streets during the daytime. The project is estimated to affect 200,000 people. The *mochileros* go from house to house collecting the garbage and dumping it into the larger containers. Though many of the sub-neighborhoods are dangerous, Junior emphasizes that his workers are allowed access into certain stairwells because he knows everyone that lives there. The *mochileros* mentioned that it is not uncommon for people to come running after them when they take out the trash, re-open the garbage bags, and remove the guns that they were hiding inside.



Figure 10: Team of Mochileros bringing trash to the collection point.

In “19 de Abril” community leaders attempted to make a garbage collection program, recycling cooperative, and an educational initiative. This project was intended to reach 600 families, which consisted of 2700 people. They hired a total of 96 young people from the community during the first year to collect the garbage from door to door. The requirements for participation in the program were current enrollment in school and being drug-free.

In order to establish the recycling cooperative, neighbors and the community had to be trained. Sessions were held for the community where the organization and monitoring of the recycling project were explained. There was also capacitation training for several different levels within the community. These training sessions had the objective of promoting recycling. A total of 48 recycling bins were placed where people separated paper, cardboard, and glass. Glass and paper were stored in a warehouse and sold on a monthly basis.

In planning the project, the amount derived from recycling was estimated to cover the labor costs of the *mochileros* and administrators, as well as 30 % of the operational costs and a fund for social projects in the community. Unfortunately, the income did not cover all of these costs, and the money collected was only used to improve public spaces in the community. The project was unable to move forward, as its biggest constraint was the transportation of recycled materials. They needed a truck that was designated for recycling purposes and were unable to obtain one. The initiative was suspended but there are plans to restart it in 2012.

4.3 Educational Campaign

In order to maintain the cleanliness of the public spaces, it is crucial to have the participation of the community. Therefore, the municipality is developing an educational program that will be implemented in both the schools and the neighborhoods. The idea is to establish environmental brigades composed of about

30 different people per sub-neighborhood. These are volunteers from the communities who will be trained and will keep watch over the practices in the neighborhood. The idea is that the training will be dynamic and interactive, where residents are able to fully engage and aid in the development of educational activities. The program will also begin in schools this coming academic year. This will aim to bring awareness to the importance of civic participation by addressing issues such as taking out the garbage at the right times and throwing it in the right places.

4.4 Proposal for Recycling

A longer-term project that is in the planning stages is a proposal for recycling. Recycling will be crucial in the coming years as Caracas' main landfill will soon be full, and recycling might be a way of reducing the environmental impact and improving the sustainability of waste management. Extra money from recycling programs can be returned to communities in need. There are different ways of going about this, and the first thing that would have to be done is a feasibility study to assess the economic viability of the project. Currently, aluminum and relatively small quantities of glass and paper are recycled. Studies should look at the viability of recycling plastic and making fertilizer out of organic waste.

The municipality of Sucre produced an in-depth study where it separated and analyzed the amount and types of garbage in each zone. The objective of the study was to generate both quantitative and qualitative information about the composition of the garbage. The information was matched with information about the population per district, including age, income, type of housing, education, employment situation, and type of employment. Matching the decomposition of the garbage with the socio-demographic information was important in order to understand the patterns of waste production. With data on the characteristics of the population and the garbage, future programs can be better managed and focused.

Currently the municipality of Sucre generates 1.45 kg of garbage per capita every day. The garbage is 19% organic waste, 34% paper/cardboard, 27% plastics and glass, metal and textiles occupy no more than 4% each (Proconsult C.A., 2010). There are also breakdowns per neighborhood. Petare generates almost one third of the solid waste and its primary garbage component is paper. (Figure 11).

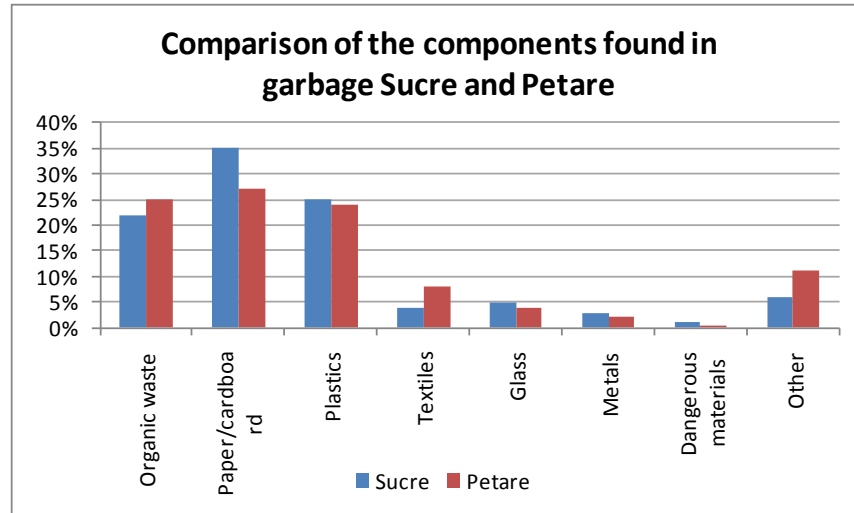


Figure 11: Composition of wasted from Sucre and Petare (Proconsult C.A, 2010)

With this information, the municipality plans on hiring a consulting company that can analyze the viability of a recycling or composting industry. With plastic and PET bottles, the material can be transformed to make jeans, carpets, hoses, plastic bags, car bumpers, and other goods. The study will implement a cost benefit analysis to examine further development of the industry. The organic waste can be composted to create fertilizer. Venezuela currently imports fertilizer, and the organic waste can be used to derive compost. The municipality has a piece of land on which it established a tree nursery to launch a composting pilot using the organic waste.

There is only one glass company, Owens-Illinois, currently operating in the country, and it was taken over by the government in October 2010. The company buys back glass bottles and are able to set a very low repurchase price due to their government-imposed monopoly power. Furthermore, they are situated a few hours away from Caracas and require a large stock of glass before sending a truck for a pick up. However, 44% less energy is consumed by recycling glass as opposed to producing it from scratch (the equivalent of 136 liters of petroleum), and 1.2 tons of raw material are saved. Three thousand bottles recycled reduces 1 ton of garbage and reduces fresh water use for the process by 50% (Martinez Chang et al., 2010). Though recycling is not an easy task for Petareños, the key to solving the problem lies in finding the right marketing idea. If the municipal government succeeds in conveying the message that recycling glass is both sustainable and profit-generating, people will surely start recycling this material.

Carton and paper is currently recycled but also at low prices. If half of all paper consumed were to be recycled, it would account for 75% of the fiber needed to make new paper. It also would avert the release of 2.5 tons of carbon dioxide, the destruction of 17 trees, save 100,000 liters of water, and free up 3.57 m³ of space inside the landfill (Martinez Chang et al., 2010). It can be argued that the lack of recycling activities in Municipio Sucre and the rest of the country stems from the lack of a market for this practice. Since the supply side of this activity is controlled by the central government through the expropriation of the recycling industry, and environmental policy is not on the national agenda, there is no existing recycling

industry. An effective answer could lie with the local government igniting this practice through grassroots educational campaigns.

5. Conclusion

The technical complexity, political dynamics, and administrative issues complicate the provision of public services in the Sucre municipality of Caracas. Urban waste collection is particularly challenging for policy makers and authorities of the municipality. Sucre generates more waste than any other municipality. It is also economically and topographically diverse: it incorporates a small rich segment at its borders with impoverished slums, and flatter areas accessible by truck with entire sides of mountains. With such a scenario, effective urban collection services are not economically efficient. Consequently, the municipality has to subsidize about half the cost of the service.

In April of this year, a new law for waste administration was passed, allowing the municipalities to fix the tariff structure of the collection service. This is an opportunity that the municipality has to not only evaluate their current structure, but also look into new management models that can increase efficiency and sustainability of collection.

Despite these difficulties, the Sucre municipality has found creative solutions to challenging problems, seeking to improve the quality of life of the inhabitants of the municipality with regards to solid waste collection. The initiatives derived from the *presupuesto participativo*, such as the mochileros and recycling in “19 de Abril” should be replicated in other communities within the municipality. Leaders should continue to seek alternative ways through which these projects can be self-sustaining rather than dependent on a mayor’s term. The municipality is analyzing how to implement an effective tariff for the following year and continues its search for creative ways to collect and process solid waste. Several of its initiatives have been innovative, and should serve as models for other similar political divisions within the country.



Figure 12: Camile (far left), Junior (center), Daniela (far right), and mochileros in Jose Felix.

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