

A Recycling and Waste Management Initiative in San Ignacio de Velasco, Bolivia

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I: Introduction

The Global Poverty Initiative (GPI) is a student-led group at the Massachusetts Institute of Technology dedicated to improving the lives of people in impoverished countries through the implementation of sustainable projects. Some of the projects that the group has initiated include: building greenhouses in a rural Mexican town and educating the local families on how to use them to grow vegetables to provide much needed vitamins and nutrients, and a project in Indonesia dedicated to creating safer job opportunities for pregnant women to stabilize their income and decrease the infant mortality rate.

GPI identified San Ignacio de Velasco (SIV) as a location for a new project after learning about its rich history and culture, and after discussing with APRODETUR-Velasco – an association that works to promote tourism in the Velasco region - the touristic potential of SIV, which is largely inhibited by a considerable waste management problem. In August of 2013, GPI sent a group of four students to SIV to survey the city, and to determine the viability of a new project that would have potential for positive impact. After surveying many local families, the students concluded that trash on the streets was a problem despite a nearly comprehensive municipal trash pickup program. Further investigation suggested that a large component of the problem is a lack of awareness about the importance of proper waste management. In addition, the current volume of trash going to the landfill on a daily basis is not sustainable.

Considering all the factors, GPI decided that SIV would benefit most from a recycling program. Such a program, coupled with a thorough educational campaign containing information on general waste management as well as recycling, would greatly reduce the volume of materials sent to the landfill and thrown in the streets. The main objective of this project would be to show people that much of their waste is composed of valuable resources that can instead be reused.

In August, GPI initiated a program in two local schools, Facundo Flores and Mariscal Sucre. Students in these schools were educated about recycling and engaged in a weeklong competition to collect the most recyclables for their class. The students showed great enthusiasm in the competition, collecting a combined total of nearly 300 kilograms of recyclable materials. These materials were then transported to, and sold in, Santa Cruz by a local family. Santa Cruz, which is a larger city 400km away from SIV, is the nearest venue in which there are companies and recycling centers that will buy recycled materials. The family that transported and sold the materials in Santa Cruz made an agreement with the school to return twenty-five percent of the profits from the sales to the school.

In January 2014, GPI sent three students back to Boliva to continue the recycling project. They spent several days in Santa Cruz learning about the recycling process and visiting reprocessing plants such as Kimberly Clark and Pantanal. In San Ignacio, because schools were not in session, the group pursued general community education in addition to beginning a pilot program in the neighborhood El Bisito. The details of the work accomplished in SIV and further goals for the project are the subject of this report.

II: Background Information on Recycling and Waste Management

1. What is recycling?

Recycling is the process of collecting and reusing materials, such as plastic, aluminum, paper, and glass, to create new products. In San Ignacio, this process includes the collection of the used materials and transport to Santa Cruz. In Santa Cruz, the recycling centers and businesses buy these old materials to transform them into new products. Recycling has numerous benefits: it helps keep the surrounding environment free of toxic gases and chemicals that can contaminate the air and water supply, it decreases the amount of trash that ends up in the streets and in landfills, and it creates jobs for people who collect and process the materials.

2. Roboré Case Study

There have been numerous successes with recycling programs started in small towns like San Ignacio. A similar project was started in Roboré, Bolivia in 2006 by Peace Corps volunteer Abraham Mooney. In this program, which has still been running since Mooney's term ended, the municipal government provides citizens, businesses, and schools with plastic bags to collect their recyclable materials. The materials, which are collected door-to-door by local waste pickers, are then transported by train to Santa Cruz and sold to reprocessing centers.

GPI has been in contact with Mooney, and from researching the logistics of this project, and many others like it, we believe it is feasible to begin a similar recycling initiative in San Ignacio that will be beneficial to the entire community.

3. Recycling in Santa Cruz

We spent the first week of our trip in Santa Cruz meeting with companies that are heavily involved in the recycling process. They provided us with knowledge of how recycling works on a large scale and gave insight as to how to implement the same type of project on a smaller scale in SIV. At Kimberly Clark, one of the leading paper products companies in the industry, we learned about several recycling initiatives the Kimberly Bolivia branch is involved in, as well as their dedication to environmental responsibility. They expressed interest in a potential partnership with SIV – to help with material transportation – if the city began regularly collecting a certain minimum quantity of paper materials. Pantanal, a plastic recycling factory, explained the logistics of reusing old materials and offered to send professionals to train and educate workers on proper recycling practices. Our last meeting was with the Foundation for City Participation and Alleviation of the Poor (PAP Foundation). This non-profit organization works to organize the waste pickers of Santa Cruz by educating them on recycling practices in an effort to increase the profit they make from their collection. The foundation also provides necessities like carts to facilitate collection and a storage area for the collected materials to stay until they are sold. These meetings gave us a much deeper understanding of the multifaceted recycling culture in Santa Cruz, provided us with direct contacts from each company, and showed the potential for future partnerships when San Ignacio takes the first steps towards a comprehensive recycling program.

4. Why is recycling needed in San Ignacio?

During our time in San Ignacio, we have observed the trash problem first-hand. We visited the local landfill, and learned that it is near capacity. This means that the municipal government will likely need to build a new one, an expensive investment requiring a great deal of land, unless the existing waste management program is critically reviewed. Loose trash litters most of the streets in San Ignacio (Image 1), and heaping bags and boxes of waste line the streets in the local market (Image 2). Due to the scarcity of public garbage cans, families must leave bags of garbage on the ground outside their house, which allows dogs and insects to get to the trash before the municipal government picks it up. The few public trashcans do not encourage proper waste management since most are too small to accommodate even one of the bags typically used to store waste (Images 3-4). These issues emphasize the need for a revamped waste management system and thorough community awareness, education, and participation.



Image 1: Loose trash on the ground is a common sight in SIV



Image 2: Bags and boxes of trash fill the street median in the central market, where dogs often rip through the garbage before it is picked up by the municipal trash collection.



Images 3 and 4: These photos were taken on residential streets in SIV, where people were unable to fit all of their trash into the small garbage cans.

The lack of means to keep the city clean greatly compromise the growth tourism market in San Ignacio. A tourism business is very possible, judging from the rich Bolivian culture, the well-preserved Jesuit history, and numerous landmarks and natural iconic landscapes, such as ‘El Guapomo’, the beautiful community lake seen in Image 5. All of these things are diminished in quality, and are at great risk of losing their appeal, until the city of San Ignacio takes responsibility in caring for its surroundings and educating its population on proper waste management and recycling practices.



Image 5: “El Guapomo” is a popular tourist site in SIV which suffers from pollution and a littered shore due to poorly managed waste in the city.

III: Objectives

1. Short-term goals:

- Implement a successful pilot program in the neighborhood El Bisito
 - Educate the community on recycling and sustainable waste management
 - Organize the El Bisito community by finding a leader within the community who can assemble a committee that will meet regularly to discuss the program
 - Place public trashcans in the neighborhood
 - Develop, with the committee, the first steps toward a sustainable waste management and recycling system

2. Long-term goals:

- Ensure comprehensive, citywide education on waste management and recycling
- Install trashcans in all public areas and educate the public on how to use them
- Create a sustainable, citywide waste collection and recycling program

IV: Methodology

1. Our Research

Our first priority for this project was to make sure we had a comprehensive, accurate understanding of the population we were going to be working with. There are very few statistics available about waste management and recycling in San Ignacio de Velasco, and we did not want to rely only on reports published focusing on major cities in Bolivia, such as Santa Cruz, La Paz, Cochabamba, and Sucre. This led us to develop our own survey to obtain statistics specific to San Ignacio. In the span of two weeks, fifty-one families were surveyed. The surveys were either given verbally, or the respondent was asked to fill them out by hand. The questions on our survey, seen in Figure 1, covered demographics, household waste management, perceptions of recycling, and interest in learning more about recycling and waste management. At the bottom of the survey was a short, educational blurb on recycling. We were able to survey families from ten different neighborhoods (Figure 2, Chart 1), giving the surveys to an assortment of households.

Judging from our surveys, the average household in San Ignacio is about 5.6 people, but displays great variability amongst families (Figure 3). We asked each family to estimate how many kilograms of trash they generate within their household on a weekly basis. Because this is a difficult question for someone to accurately guess, we also accepted them to make their estimate in terms of how many small black bags they fill each week. These bags, shown in Image 6, are used by the majority of families in SIV for collecting the trash. Using a spring scale, we went around town and weighed several of these bags full of trash as we found them outside of people's houses. We established the typical weight of one of the bags was around 4 kilograms. We then used this value to convert all of the survey results to kilogram measurements. This method indicated that the average quantity of trash generated per person per household each week is about 2.6 kilograms (Figure 4).

- 1.) ¿En cuál barrio vive? _____
- 2.) ¿Cuantas personas viven en su casa? _____
- 3.) ¿Podría Ud. estimar, cuántos kilos de basura se genera en su casa por semana?
- 4.) ¿Piensa que la basura es un problema en San Ignacio? Sí No No sé
- 5.) ¿Qué hace Ud. con la basura de su casa (la entierra, la entrega al camión recolector, la quema, etc.)?

- 6.) ¿El gobierno municipal recoge su basura? Sí No No sé
Sí, ¿con qué frecuencia? _____
- 7.) ¿Ha escuchado hablar del tema de reciclaje de basura? Sí No No sé
Sí, ¿qué ha escuchado? _____
Sí, ¿piensa que es difícil reciclar? Sí No No sé
Sí, ¿por qué? _____
Sí, ¿sabe por qué es importante reciclar? Sí No No sé
Sí, ¿por qué? _____
- 8.) ¿Ud. separa su basura?
¿Plástico? Sí No No sé
Sí, ¿qué tipo (botellas de plástico, etc.)? _____
¿Aluminio? Sí No No sé
Sí, ¿qué tipo (latas, etc.)? _____
¿Papeles? Sí No No sé
Sí, ¿qué tipo (blanco, mixto, periódico, etc.)? _____
¿Vidrio? Sí No No sé
Sí, ¿qué tipo (botellas de licor, botellas de Coca Cola, etc.)? _____
- 9.) ¿Además del gobierno municipal, alguien más le recoje su basura? Sí No No sé
Sí, ¿Quién? _____
¿Con qué frecuencia? _____ o no sé
¿Cómo (en un camión, en un camioneta, uds. lleva a los recolectores, no sé, etc.)?
_____ o no sé
¿Recibe dinero por su basura separada? Sí No No sé
Si no, ¿conoce una persona o familia que recolecta la basura separada? Sí No No sé
¿Quién? _____
- 10.) ¿Ud. querría aprender más sobre reciclaje y cómo puede participar? Sí No No sé

Reciclar es el proceso de recolectar materiales usados como plástico, aluminio, papel, y vidrio y transformarlos en nuevos productos. Los materiales no son basuras, son recursos. El reciclaje crea puestos de trabajo, apoya la industria, y ayuda el medio ambiente.

¡GRACIAS!

Figure 1: This recycling and waste management survey was distributed to fifty-one households in SIV.

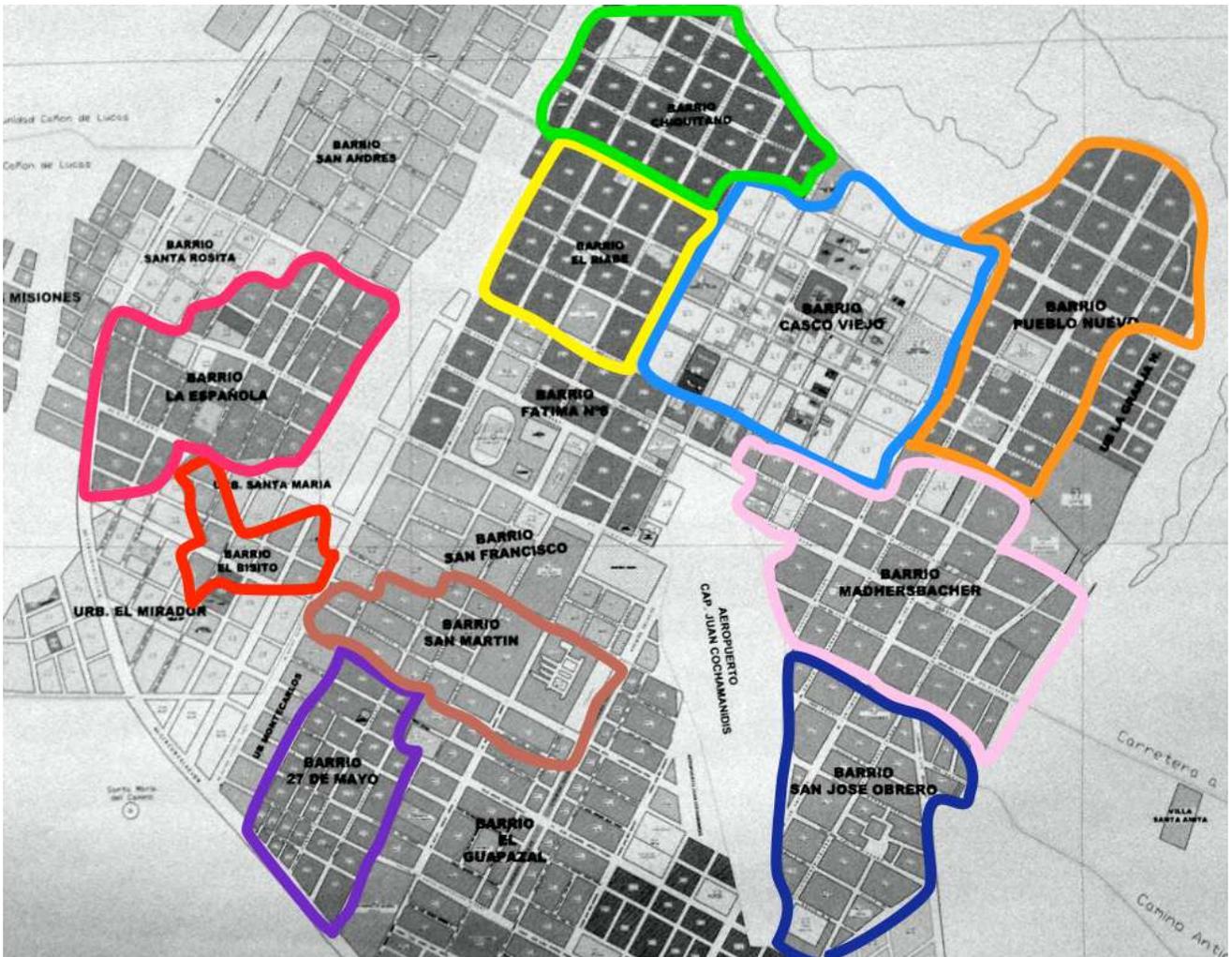


Figure 2: Surveys were conducted in the ten neighborhoods highlighted.

Neighborhood	# of Households Surveyed
Casco Viejo	15
Chiquitano	10
El Bisito	8
Pueblo Nuevo	7
El Riabe	4
Española	3
Madhersbacher	1
27 de Mayo	1
San José Obrero	1
San Martín	1

Chart 1: Number of surveys distributed in each of the neighborhoods

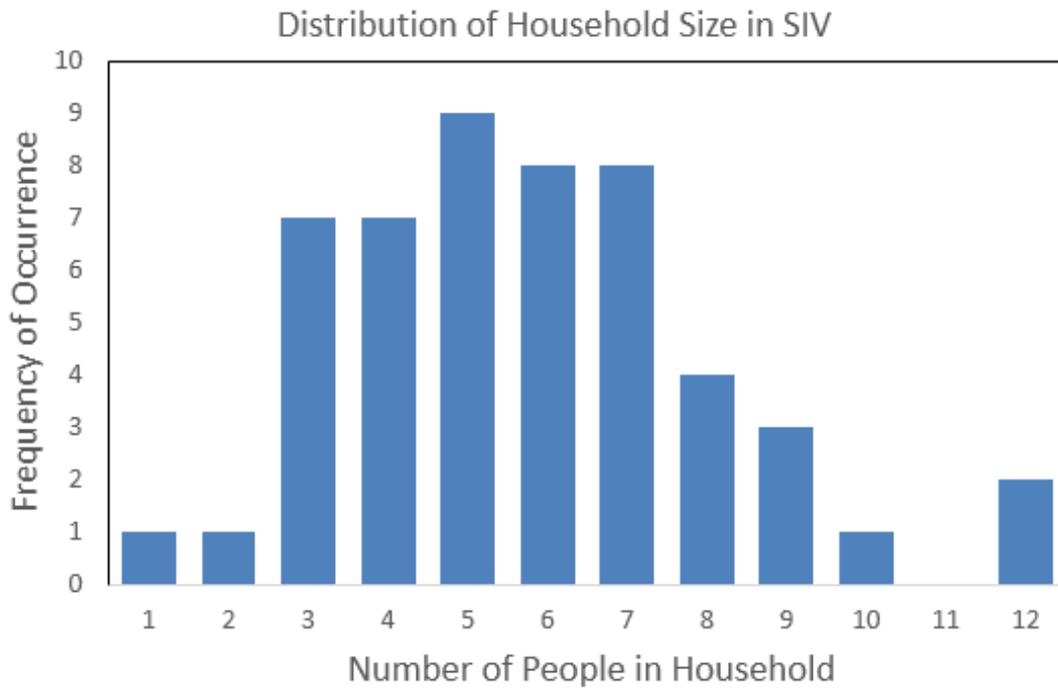


Figure 3: The average household size in SIV according to the surveys is 5.6, but varies significantly between 1 to 12 people.

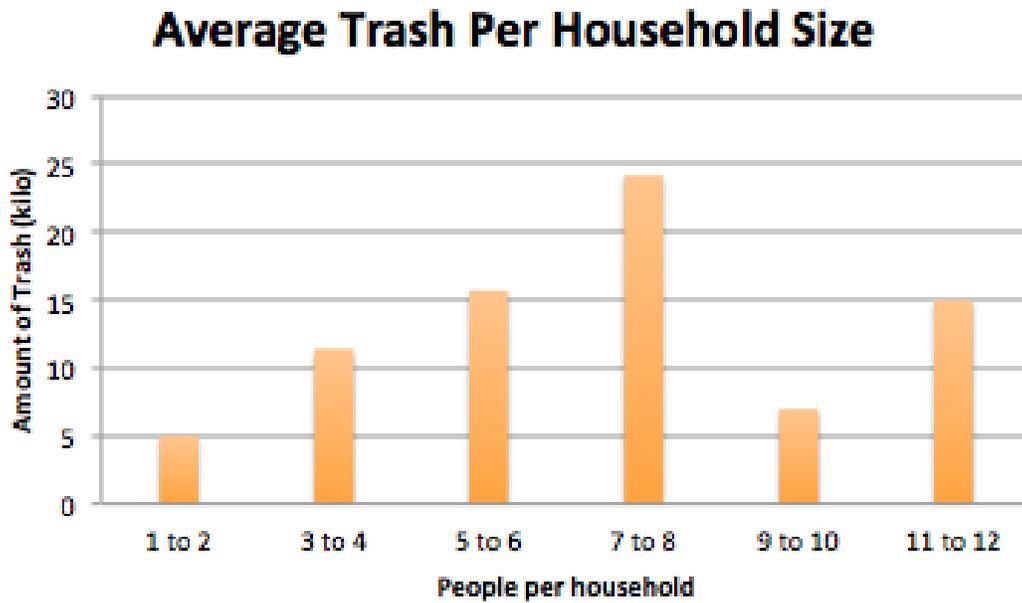


Figure 4: The average trash generated per week per family varies from 5 to 25 kilograms.

Contrary to expectations, this waste is not all transported to the local landfill. Municipal trash collection routes do not reach all of the neighborhoods of SIV, including El Bisito, the location of our pilot project. Though we were informed that expanded trash collection to these neighborhoods is being examined, the residents are currently left to manage their own waste. Figure 5 shows a copy of the municipal collection schedule. Neighborhoods written in, such as El Bisito, do not currently have their waste collected by the municipal government.

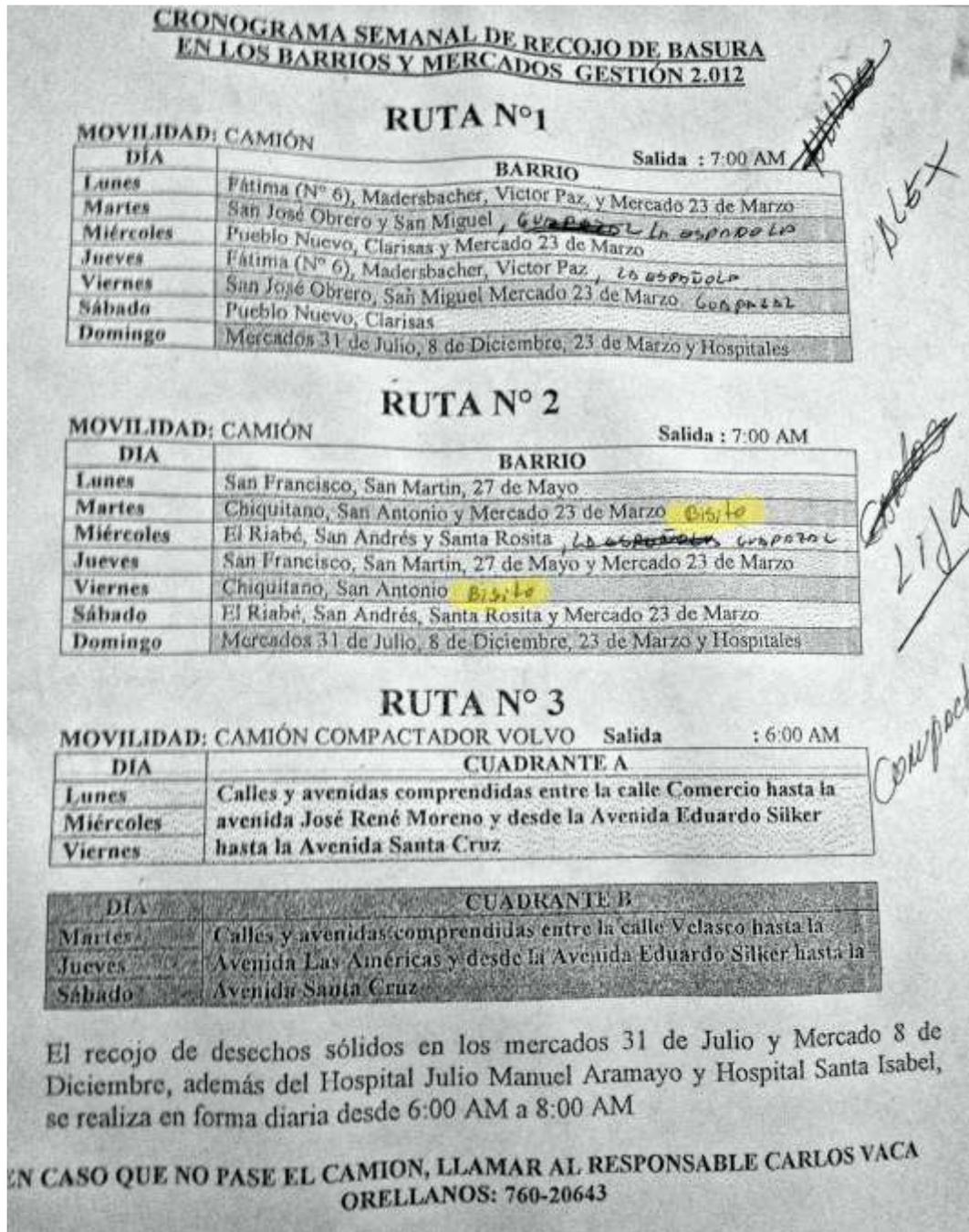


Figure 5: Current municipal trash pick-up schedule excludes some neighborhoods, such as El Bisito, which have been hand-written into the schedule based on the municipality’s plan to reach such neighborhoods.

A great deal of the uncollected waste in these neighborhoods is being irresponsibly dealt with. As depicted in Figure 6, 75% of residents without municipal waste collection burn their trash: an unsafe, environmentally detrimental practice; 17% bury it in their own yards: an unsanitary and unsustainable option; and only 8% responsibly bring their waste to the landfill, which is often a difficult trip for people in remote locations in town.



Figure 6: Residents lacking municipal trash collection choose to burn the trash (75%), bury it (17%), or bring it to the landfill (8%).

Importantly, people recognize that waste management in SIV needs to be improved. Arguably the most striking finding from the surveys is that one hundred percent of respondents believed that trash is a problem in San Ignacio. This evidence has given us the motivation to proceed with a joint educational and waste management/recycling program in San Ignacio. We want to encourage interaction between the municipal government and the community so that together they can devise a more efficient, environmentally conscious waste management plan.

At the heart of this program should lie a recycling initiative. Recycling is relatively easy, as well as environmentally and economically sustainable. A recent study conducted by Kimberly Clark found that eighty percent of the waste generated in Bolivia could be recycled. By separating recyclables from the general waste, the quantity of trash going to landfills could be greatly reduced. Furthermore, money could be made off of the materials by reselling them to reprocessing plants, instead of simply wasting the resources.

However, the educational component of this program must be addressed before any other progress can be made. For example, many of the people we surveyed think that it is difficult to recycle. When asked, only slightly more than half of respondents said “No”, that it is not difficult to recycle

(Figure 7). The remaining fraction of responses was equally split between “I don’t know” and “Yes”. Of the twenty-two percent of people who thought it was difficult to recycle, forty percent stated that the difficulty came from a lack of means (Figure 8). This shows that despite an interest in, and a basic understanding of, recycling, many people find it hard to do on their own. Many people do not have bags for separating the materials or a way to transport and sell the sorted materials. There needs to be a program in place to facilitate this process. Thirteen percent of people found recycling difficult solely because they did not know how to do it, emphasizing the need for more widespread, comprehensive education on recycling.

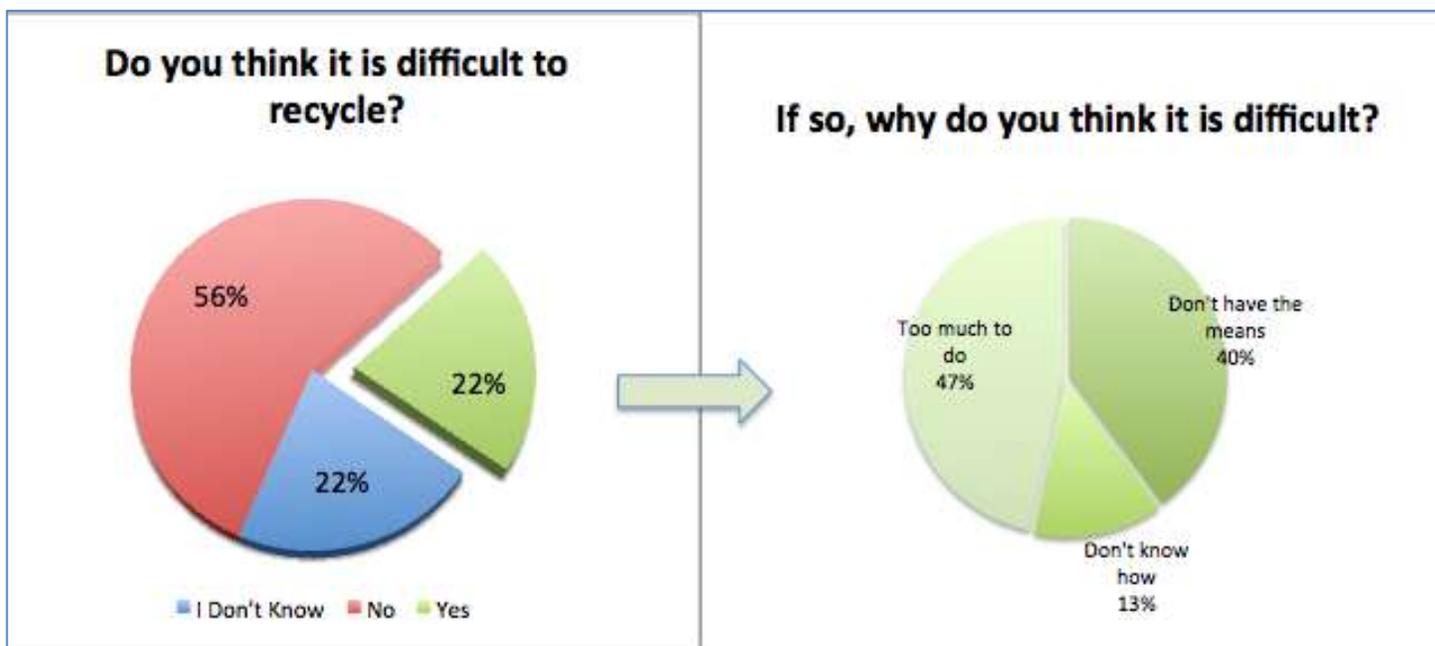


Figure 7 (left): Just over half of survey respondents believe that recycling is not difficult, while the remaining 44% either think it is difficult or are unsure.

Figure 8 (right): People who believe that it is difficult to recycle have three general reasons: It’s too much work (47%), resources are lacking (40%), or they don’t know how to recycle (13%).

Finally, a startling 47% of people who think it is difficult to recycle think that it is difficult because it requires too much work. This last bit of information is interesting because also in the survey was the question, “Do you separate your trash into any of the following categories: plastic, paper, aluminum, glass?” Almost half of respondents indicated that they already separate their waste (Figure 9). Many families explained to us that they often collect their plastic bottles apart from their other waste, or save their cans and glass bottles. Yet, eventually most of these families dispose of the separated materials along with the rest of their waste. This data suggests that the people who think recycling is too much work do not really understand what is required of them. People have the misconception that recycling requires a lot of work, unaware that they are already doing the only action required of them—separating their trash.

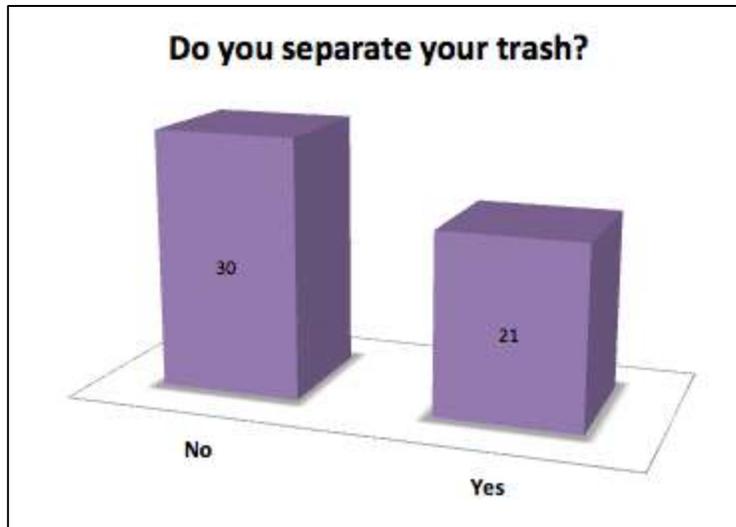


Figure 9: Forty-one percent of people surveyed answered that they already separate their trash into different categories such as plastics, paper, glass, etc.

There are many indicators that there is an extreme lack in education on recycling. About eighty-four percent of respondents indicated that they had heard of recycling, a promising number, yet when asked to define recycling, less than half gave even one correct fact or statement about recycling (Figure 10). This is startling because it indicates that many people mistakenly believe that they already know what recycling is, and therefore may not seek out information on the topic. Without a vigorous educational campaign, these people may make poorly informed choices on waste management decisions.

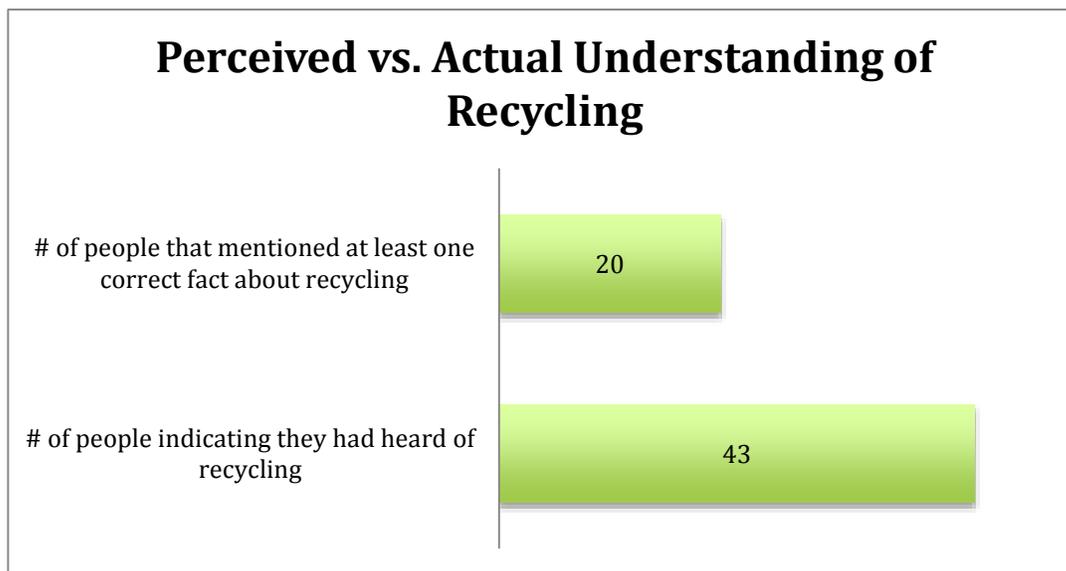


Figure 10: Although forty-three of the fifty-one people surveyed answered that they have heard of recycling, only twenty people were able to provide an accurate fact about recycling.

However, there are many positive signs and ways that the population's understanding can be improved. For example, the vast majority of people surveyed are interested in learning more about

recycling (Figure 11). A resounding ninety-three percent of respondents indicated that they would like more information on the topic. Residents of SIV recognize that waste management issues afflict their town, and they want to do something to fix the issue. By recognizing the problem, it is possible to begin looking for solutions.

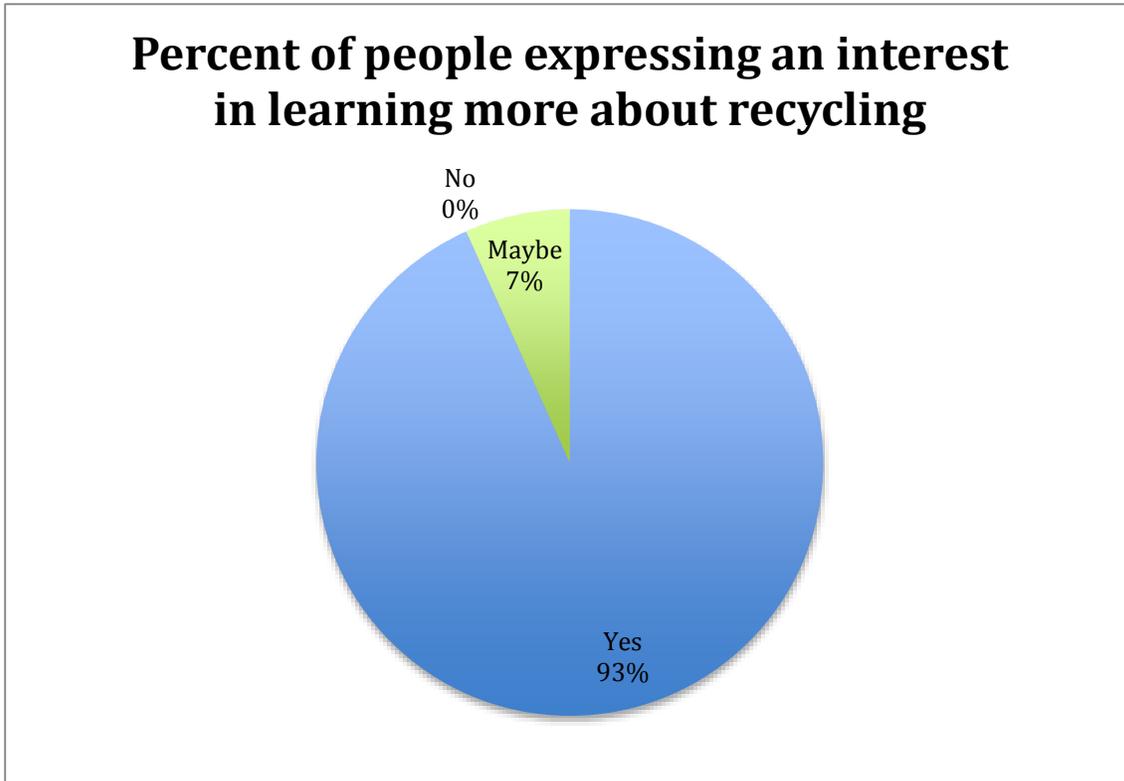


Figure 11: Ninety-three percent of survey participants indicated that they would be interested in learning more about recycling, while zero percent said they would not be interested. The remaining respondents were undecided.

2. El Bisito Pilot Project

We decided to implement a pilot recycling program in a single neighborhood to observe the level of interest, as well as to work out the logistical steps necessary to begin a citywide recycling initiative. Because of the multitude of misconceptions about recycling, it was critical that this pilot program begin with a community meeting, featuring a strong educational component, to discuss the problem of waste in SIV, the detrimental effects of poor waste management, the idea of recycling, and how community members could get involved.

Judging from the surveys, we decided to initiate the program in the neighborhood El Bisito. El Bisito is an ideal community for the pilot, because they do not currently have municipal trash collection. Instead, the majority of families in El Bisito burn and/or bury their waste. Because these methods of waste management carry many risks, such as water contamination and air pollution, El Bisito residents would greatly benefit from a recycling program. A well-managed program would significantly decrease the overall volume of waste. Materials that can be recycled would be

removed from the overall quantity of trash being thrown away, decreasing the quantity of burned and/or buried waste.

The initial meeting was held in the home of one of the community leaders, Matilde Sosa. Approximately ten families came to the presentation, during which the proposed plan for the pilot, and how it would be executed were detailed. In three days, the same family that collected materials for the recycling program in Mariscal Sucre and Facundo Flores, would come to El Bisito and purchase the separated materials from participating families. After the pilot, we would show the results to the government and interested community members in El Bisito. We distributed lists of the materials that the family would purchase to the attending families, explaining how, and what, to separate (Figure 12).

<u>Lista de Recolecta de Reciclaje</u>	
1. Latas de cervezas	~ Bs. 3 / kilo
2. Aluminio grueso (respuestos de movilidades, ollas, sartenes, etc.) <i>sin fierro</i>	~ Bs. 3 / kilo
3. Vidrio: Garrafrones de vinos (Brasilero y Argentina)	~ Bs. 1 / cada una
4. Vidrio: Botellas de Sidra, Doble V, Ron	~ Bs. 0,50 / cada una
5. Cobre (cables, enchufes, etc.)	~ Bs. 20 / kilo
6. Bronce	~ Bs. 10 / kilo
7. Baterías viejas (de autos, camionetas y camiones)	~ Bs. 35 a 70 /cada una
8. Hueso	~ Bs. 0,50 / kilo
Plástico y papel solo se compran en la casa de la familia Camacho	
*** Los precios por materiales varían dependiente en los precios en Santa Cruz ***	
<i>Recuerde: Por favor separe los materiales diferentes en bolsas diferentes</i>	

Figure 12: List of materials that the collecting family is willing to buy, including approximate selling prices for each material

A program of this form is not only easy for the families – all they must do is put plastic, aluminum, glass, paper, etc. in different bags, and wait for the collecting family to come to their neighborhood – but is also beneficial to the collectors who are given the opportunity for business expansion. Three days after the first meeting, the collector family arrived to purchase the families’ materials as scheduled. There was such an overwhelming quantity that they had to weigh the materials, pay the owners, and return later to collect them all. During this first trip, over fifty kilograms of recyclables were recovered.

3. Reflection on the Pilot

This first experience in El Bisito demonstrated that the community is very interested in recycling and that a more permanent program is worth pursuing. There are numerous benefits to this initiative. Beyond the environmental factors already discussed, we observed a new phenomenon: groups of young children gathered plastic bottles and other materials collected from around the neighborhood to sell to the collecting family. This shows that the project incorporates participation

from the children in a fun and educational way by motivating them to collect recyclables. This effort simultaneously cleans the streets, provides pocket money, and educates children on recycling and environmental awareness.

A second community meeting was arranged after the first collection to enable participants to reflect upon their experience, and to decide together how to shape the future of the program. This meeting was more of a conversation between our group and the residents. Fifteen families came to this meeting, during which the recycling program was discussed as well as the topic of waste management in general. Residents that had sold their recyclables to the family described the process to their peers, and agreed that they would like to see the pickup become a regular occurrence. We provided interested community members with contact information for the collectors, to facilitate communication regarding transportation and pick-ups.

Various benefits were discussed, such as the supplementation of family incomes and a clean neighborhood. There were attendees who had not participated in the initial collection that also expressed interest in becoming involved. Other topics were covered as well, including, the existing municipal waste pickup routes, and the installation of garbage bins in common spaces in the neighborhood. The people at the meeting agreed that there are several basic needs that are not being met in El Bisito. More details about the opinions of El Bisito community members and SIV residents in general are located in the Personal Testimonies/Community Voices section.

4. Proposed Plan Moving Forward

The success of the pilot project in El Bisito demonstrates the potential that the recycling program has moving forward. We hope to see a similar system adopted by more neighborhoods in SIV. The expansion of such a project will bring with it widespread improvements in health, sanitation, and city beauty. Moving forward, the neighborhood El Bisito will be communicating regularly with the collector family to coordinate pickups. The community members have chosen to instill in their children the importance of waste management, and clean streets.

V: Personal Testimonies/Community Voices

Interview 1

Concerned female community member that we surveyed:

“Me gustaría basureros en lugares públicos y cursos en las escuelas en reciclaje.”

“I would like trash bins in public places and courses on recycling in the schools.”

Interview 2

Luciana, a member of El Bisito who participated in the pilot and attended the second community meeting:

“Es muy importante tener tres cosas: un camión del gobierno que recoge por El Bisito, basureros alrededor del parque, y un programa de reciclaje que funciona.”

“We need three things very desperately: a trash collection route that goes through El Bisito, trash cans around the playground, and a functional recycling program.”

Interview 3

Ana, a resident in El Bisito familiar with the collector who attended the second community meeting:

“Necesitamos un programa o una clase en las escuelas para que los niños pueden aprender de reciclar y cómo cuidar al medio ambiente.”

“We need a program or a class in the schools so that the children can learn about recycling and how to care for the environment properly.”

VI: Conclusion

Our greatest hope is that our goals can be continued even when there is no GPI team in San Ignacio. We hope to stay in contact with our partners on the ground, whether government officials, community leaders, school teachers, or concerned citizens.

We hope that education remains a priority in San Ignacio, and that in the schools, teachers educate their students on the social, environmental, economical, and health benefits of an effective and comprehensive waste management and recycling program. It is these children that have the potential to better their community by spreading awareness, and by devising new solutions to deal with waste. Instilling a sense of environmental responsibility at a young age is a key factor in

promoting proper waste management and recycling habits. We hope that the government will incorporate these ideas into the school curriculums.

Furthermore, it is crucial to place more trashcans in public areas throughout San Ignacio, including, but not limited to, the market, the plaza, playgrounds, parks, and busy street corners. These trashcans also require an element of education, as residents need to be trained on how to utilize them. The mentality of the community needs to change to embrace the idea of clean streets for everyone.

Lastly, trash collection needs to be expanded to all neighborhoods to minimize the practices of burning, burying, and dumping trash. With a better waste management program, recycling can be intelligently implemented as a key component. The current pilot recycling project in El Bisito should be studied and encouraged as it progresses to provide a template for a future more comprehensive, government-run collection program.

We strongly urge the municipal government to use the information that we have collected to sustain and expand the current pilot project. A contact list including the names of the companies and people that we have partnered with is located at the end of this report under ‘Contacts for more information’.

There are a few straightforward steps that the municipal government could take to work towards developing community-wide recycling program:

- Provide large vehicles to facilitate more efficient collection from the different neighborhoods and transportation to Santa Cruz
- Offer to educate families dealing in recyclables with professional training provided by companies in Santa Cruz like Pantanal
- Promote a communal system by providing communities with large recycling bins and oversee that the proceeds benefit a local, publicly-owned resource, such as restoring churches or renovating neighborhood playgrounds
- Form a partnership with recycling reprocessing centers and organizations in Santa Cruz to ensure an efficient system from collection through transportation

VII: Contacts for more information

Pantanal:

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SIV Director of Solid Waste:

Carlos Enrique Vaca Orelhana
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VIII: Acknowledgements

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Kimberly Bolivia. "Tu papel en el medio ambiente."

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al medio ambiente



a limpiar su comunidad



a la salud de su familia

a mejorar sus ingresos