‘Garbage is not Garbage’ & “Bus Tubes”: Recycling and Transport in the Sustainable City: Curitiba, Brazil

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ABSTRACT

This funded research project studied garbage and recycling programs and the bus transportation systems in Curitiba, Brazil. Observations were made and interviews conducted with key community members. Ninety percent of Curitibanos participate in recycling programs today (Meadows, 1995). Seventy percent of all Curitiba’s *trash* is recycled, which is reportedly seven times the average in the United States (Johnson, 2001). Curitiba provides models of effective recycling methods and allocation of urban waste. Buses in Curitiba run in lanes specifically dedicated for high-speed travel, and there are tubular stations at each stop to speed up the entry and exit of passengers (Langston, 2006). Over 2.1 million people, in a city with over 3.2 million people (including surrounding municipalities) use the buses daily (URBS, n.d.), and several buses, called double-articulated buses, can carry up to 300 passengers at a time; meaning 50,000 people can be transported in just one hour (Ben-Tal, 2005). The continual success of the city of Brazil in achieving sustainability goals is attributed to new programs, advancements in technology and education of the younger generation to ensure processes previously implemented are continued.

INTRODUCTION

In the 1950’s, Curitiba had a population of only 150,000 inhabitants. As the city grew in the 1960’s, many citizens expressed dissatisfaction with the urban design practices of constructing highways and building large complexes and shopping malls. They were more interested in considering environmental stability and human needs and brought that to the mayor’s attention. They wanted user-friendly transportation and a clean, thriving city. The mayor then proposed a contest for a master plan that would allow for the rapid growth of the city. He circulated the best ideas, debated with citizens and held town hall meetings.

One of the architects who proposed ideas for the city’s Master Plan was Jaime Lerner. His architectural designs included the bus tubes seen below in Figure 1. He became mayor in 1971 and was unrelenting in his dedication to sustainability resulting in an approval rating of ninety-two percent in the following three - four year terms (Meadows, 1995). Following his election, Lerner implemented his ideas on sustainability. In 1972, an historic boulevard, Rua das Flores, was converted, virtually overnight, into a pedestrian only area. Lerner hired workmen to plant thousands of flowers over the weekend and didn’t allow motorists on the road on Monday morning (Parkins, 2006). Store owners were furious and a local automobile club wanted to reclaim the street. Rather than call the police, Lerner brought in strips of paper the length of the boulevard and found dozens of children to paint pictures, thus preventing vehicles from using the street (McKibben, 1999). Shopkeepers later embraced the idea of pedestrian areas and the trend spread all over the city. It is still present today as one of the most commercially thriving streets, and as weather permits, children still come to paint pictures in the street every Sunday. Eventually, more automobile streets in the city were transformed into pedestrian only zones; presently there are over fifty blocks that are pedestrian only (Dismantlement, n.d.).

Figure 1. Bus tubes designed by Jaime Lerner

Although the population has grown remarkably, public green space has grown more quickly. There is now on average fifty-two square meters of public space per capita, higher than any other city worldwide and four times higher than recommended by the United Nations (Parkins, 2006) and the World Heath Organization recommendation of just twelve square meters (McKibben, 1999). Green space is not the outstanding statistic that Curitiba is proud of. Seventy percent of Curitiba's garbage is recycled (Johnson, 2001) and ninety percent of the population participates in recycling programs (Meadows, 1995). These efforts earned Curitiba the highest environmental prize in 1990 from the United Nations Environment Programme (UNEP) and since 1989 when the garbage programs were put in place, over 419,000 tons of recyclable waste has been separated rather than discarded (Making, 2004).

In the 1940's, Curitiba attracted many new settlers because of the thriving agricultural industry (Frontline, 2003). That attraction has only increased since the implementation of the Mast Plan making Curitiba even more appealing, as it is the "Cidade da Gente" or "City for the People". Since the 1970's, the population has tripled in Curitiba showing a 165% increase between the seventies and nineties alone (Lindin, 1993). Currently the population of metro Curitiba is 1.7 million people and over 3.2 million including the twenty-six municipalities (URBS, n.d.). The city is projected to have one million more inhabitants by year 2020 (Parkins, 2006). Obviously, with this increase in population growth, innovative ideas had to be implemented to ensure the city would have a sustainable future. That is what spawned the ideas of affordable mass transit and the city's remarkable garbage and recycling programs. The previous mayor, Jamie Lerner once said,

> "There is no endeavor more noble than the attempt to achieve a collective dream. When a city accepts as a mandate its quality of life; when it respects the people who live in it; when it respects the environment; when it prepares for future generations, the people share the responsibility for that mandate and this shared cause is the only way to achieve a collective dream" (Environic, 2006).

HISTORY

Ideas about public transportation did not actually start in the 1950's. Back in 1887, the program called Empreza Curitybana, run by the company Boaventura Capp made available the first animal drawn street car. It traveled a direct route from the center of Curitiba to the borough of Batel. There was a first class section that required shoes and a second class section called "bone mixto" in which people could travel barefoot (URBS, n.d.).

Electric streetcars were introduced in 1912 to serve the people. An improvement in the system was necessary since the customers' demand increased from 680,000 people in 1903 to 1.9 million passengers by 1923. Buses later began to circumnavigate the city, and in 1938, 10.9 million people were using electric streetcars, and 2.6 million were using buses. Technology advanced and comfort of the buses improved and by 1951 electric streetcars were eliminated (URBS, n.d.).

Plans for renewing the system continued. As the city was growing, there was a lack of comprehensive organization in Curitiba. In 1956, a Master Plan was published that established structural bus routes that would serve the different axes for urban movement. There were license contracts signed with thirteen different companies making fifty buses and eighty shared taxis available to the public (URBS, n.d.). Just fifteen years later, 673 buses carried 515,000 passengers daily (URBS, n.d.). The Master Plan was a success since dependency on individual vehicles decreased and seventy-five percent of travelers were using the buses.

The city never stopped growing, and more improvements were necessary to ensure success in Curitiba. That was when it was decided to implement Rede Integrade de Transporte (RIT), or the Integrated Transit Network. After much research, in September of 1974, twenty new express buses entered the operation on an experimental basis only. The buses were color-coded red, traveled on the North/South axis and stopped every 400 meters. The system grew to be known as an "above ground subway" because of its efficiency (URBS, n.d.). On average, 1.9 million passengers used it monthly and as Lerner said, "You can build in two years a good system. It's not difficult, because it has not too much public works. It's very simple" (Langston, 2006). Continued improvements were necessary, as he said himself that the express buses are the first step to meet the needs of the public (URBS, n.d.).

Following those improvements, people's needs were met and in the early 1980's, Curitibanos started to leave their cars at home. In 1974, a one-way, one-fare system made it even more affordable. The RIT moved under the management of the company called Urbanização Curitiba S/A (URBS). Despite the fact that Curitiba remains the highest per capita car ownership in Brazil, gas use is thirty percent below the other eight comparable Brazilian cities, attributed to the bus transportation (Dismantlement, n.d.).

URBS became the official management system of the Curitiba Public Transit System. RIT was able to carry almost 500,000 passengers a day (URBS, n.d.). By the early 1990's, there were over eighty feeder lines bringing citizens in from the boroughs to one of the five express axis lines. At that time there were 239 bus lines in the whole

system. In 1990 alone, RIT was carrying fifty-four percent of total users and by 1995 that number increased to eighty-four percent. The improvements didn't stop there (URBS, n.d.).

In October 1991, following URBS request to Volvo, articulated buses were introduced. The first bus of this nature had a capacity of 250 passengers. It was at this same time that Direct Lines were created. As shown in Figure 2, these lines used ramps within the bus tubes to load the buses that allowed for easy entry and exit of passengers and the tube-like bus stops were also introduced making it possible to change buses without paying an additional fare (URBS, n.d.).

Figure 2. Photo of Bus Tubes and Bi-Articulated Bus in Curitiba

Improvements continued over the years expanding bus routes, as displayed in Figure 3 and 4, and now voice prompters will notify passengers of upcoming stops and which doors should be used to exit. 1999 celebrated twenty-five years of the Southern Circular line, and in 2000, fifty-seven larger buses were substituted for eighty-seven smaller ones. Today, after 119 successful years, 1.9 passengers use RIT on 275 lines while employing 12,700 people (URBS, n.d.).

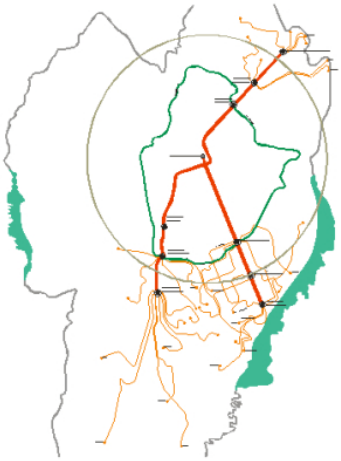

Figure 3. 1979 display of Curitiba's Bus Routes

Figure 4. 2001 display of Curitiba's Bus Routes

METHOD

It was necessary for my research on sustainability in Curitiba to conduct a more ethnographically based study on how the system actually works in addition to researching documents. Using a mixed methodology of interviews (Table 1) and observations (Table 2) allowed me to better understand Curitiba and its residents. Learning from the perspective of the Curitibanos helped me appreciate why they were making the effort to be a leader in sustainability. I was also able to walk around the city and experience everything first-hand, observing a different way of life to the United States. Interviewing corporate and government employees was important in helping me learn about how issues had emerged and were decided upon. Government officials are constantly analyzing ways to balance the needs of people in poverty-stricken areas and the needs of farmers hoping to maintain efficient demand where not

everyone can afford the produce. Businesses find it important to encourage employees to use bus transportation rather than individual cars and to encourage sustainability in the city and within the company.

Table 1. Interview Schedule

Name	Methodology	Date	Employer
Sylvia Mara Ramos	Interview	15 January 2007	URBS employee – bus transportation
Daniel Costa	Interview	16 January 2007	URBS engineer – bus transportation
Jason Rodrigues	Interview	16 January 2007	Siemens Corporate Employee – corporate social responsibility
Giselle Martins do Anjos	Interview	17 January 2007	SMMA civil engineer – garbage and recycling programs

Table 2. Observation Schedule

Observations	Date
Tourist Bus Line	11 January 2007
Jardim Botânico – green preservation area	11 January 2007
Re-modeled quarry utilized for urban space	11 January 2007
Garbage Collectors downtown	12 January 2007
Passeio Publico – first public park and zoo downtown	13 January 2007
Buses and bus tubes at full capacity during rush hour	13 January 2007
Rua das Flores – pedestrian boulevard	14 January 2007
Discussions with Brazilians about life in Curitiba	15 January 2007
View from Telecom Tower – most green space per capita	15 January 2007
Street Cleaners sweeping	16 January 2007
Parque Baragüi – largest park in the city	17 January 2007
Garbage collectors in the slums preparing to turn in garbage	17 January 2007

OBSERVATIONS – Bus Transportation

Upon arrival in Curitiba, I began to utilize the available bus transportation. Buses were accessible to every type of citizen whether an eight year old getting to school or a retired resident in a wheelchair, on his or her way to get groceries, as shown below in Figure 5.

Figure 5. Handicap accessibility of Bus Tubes

Forty-six percent of bus fares are paid using the Cartão Vale Transporte, or Electronic Transit Card. As shown in Figure 6, 598,000 users are paying passengers. The Electronic Transit Card users are able to acquire credits directly from URBS or on the internet and payment can be made at any bank branch. People that qualify for an expense-paid Electronic Transit Card are senior citizens, people who are handicapped, students living further than one kilometer from school, and URBS system operators. Other people who qualify for free transportation are people with minimum salaries on welfare, mail delivery personnel, policemen in uniform, and Justice Agents. 127,000 cards are issued to passengers with the age of sixty-five or over, 33,000 are issued to people who are disabled, 2,000

are issued to students, and 15,000 issued to URBS system operators. There are over 20,000 companies in Curitiba that offer to provide the bus fare for their employees to encourage bus use (URBS, n.d.).

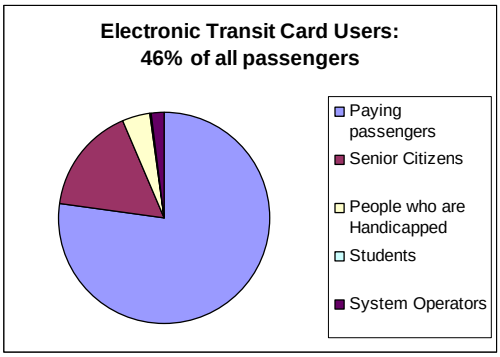

Figure 6. Pie Chart showing percentages of transit card users

At the majority of the main stops, people enter bus tubes through turnstiles as they pay or scan their electronic transit cards to get into the bus tube. Inside, they are then protected from the weather and wait for the bus to arrive. There are lifts for those who cannot take the stairs and once they are inside the bus tube, everything is handicapped accessible with the use of platforms. The system is quite efficient since the bus conductor does not have to stop for the amount of time it would take to help paying passengers. Also, passengers are then able to board at various doors. Some buses, the bi-articulated buses, have five sets of doors for embarking and disembarking. This allows for rapid stops with as many as three hundred people loaded on a single bus.

The buses carry passengers from outlying boroughs on Feeder lines to the center of the city. From terminals, Curitibanos are able to transfer to different lines to get to where they need to go without paying another fare. Conventional lines bring people directly from the boroughs to the downtown area without the option of transfers. There is also an Inter-borough line that connects boroughs without passing through the downtown area. Direct bus lines travel efficiently as auxiliary lines for express transportation. Trunk lines travel throughout the city using normal city streets. And the Center Circular operates for short trips with a special fare for passengers to get to central city areas. All of these buses run effectively during peak hours catering to the needs of the public. Waiting times are never excessive and people riding the buses never have to deal with rush-hour traffic since the majority of the buses run on exclusive bus-only lanes.

Eighty-nine percent of citizens approve of the bus transportation available in Curitiba according to a survey conducted by URBS. The Master Plan ensured that there would be growth patterns within the city to keep everything organized. In addition to this, the structural corridors were composed of a triple road system for the buses, as seen in Figure 7. The central road would be restricted bus only lanes dedicated to express lines. Parallel to the bus lanes are two local roads running in opposite directions to serve individual transportation (Horizon, 2003).

Figure 7. Triple Road Bus System

INTERVIEWS

While in Brazil, I was able to meet with key community members to discuss some questions I had dealing with my research. They are quite accustomed to this type of interview since people from around the world go to Curitiba, Brazil to study their traffic systems and garbage and recycling programs (Ben-Tal, 2005).

Sylvia Mara Ramos – URBS employee

My first interview was with Sylvia Mara Ramos. She helped me with some initial questions upon my arrival. She explained how the company runs completely without the help of subsidies and only relies on the fare the passengers pay (Ramos, 2007). The fare in January 2007 was R$1.80 weekly and R$1 on Sundays. This translates to US$0.87 weekly and US$0.48 on Sundays (Coin Mill, 2007).

Sylvia also explained to me during the interview that there are 4,175 bus drivers and 4,010 money collectors currently employed at URBS. I questioned why there are money collectors when such a simple task could easily be changed into a machine that dispenses tickets. Sylvia explained that this is one of many attempts to keep the city's booming population employed (Ramos, 2007).

Daniel Costa – URBS engineer

My second interview in Brazil was Daniel Costa who is an engineer at URBS. He was quick to mention that although population in Curitiba has tripled since the 1970s, the number of taxis has remained constant (Costa, 2007). This reiterates the fact that the demand for private transportation is simply not comparable to the United States. This ever-growing population has required an on-going process of expanding the bus transportation system to fit the needs of the citizens. They have increased the bus fleet to a current number of 2,190 buses (URBS, 2006). They have also traded in smaller buses and replace them with bi-articulated buses with a maximum capacity of two hundred and seventy passengers.

They are not only expanding the lines throughout the entire city and thirteen surrounding areas, but they have converted once normal car lanes into bus exclusive lanes making for more efficient travel and are constantly implementing more direct routes. As seen in Figure 8 below, Daniel said that although the average speed of the direct lines has decreased from thirty kilometers per hour to twenty-five kilometers per hour, they have projected by the end of this March 2007 an average speed up to forty kilometers per hour (Costa, 2007). One way this is accomplished is by the direct line buses getting the first priority at traffic lights, for example. When the speed of the buses is faster, there is a higher incentive to ride, ensuring a high demand for direct lines. Another way they have made sure that all bus speeds remain as fast as possible is by they have cutting down the trips to the center of the downtown area. When the network system started in 1974, ninety-two percent crossed the downtown area. Today, only thirty percent travel downtown creating a more efficient transport system. URBS has been able to sustain the demand of the system and will continue to cater to the needs of its citizens (Costa, 2007).

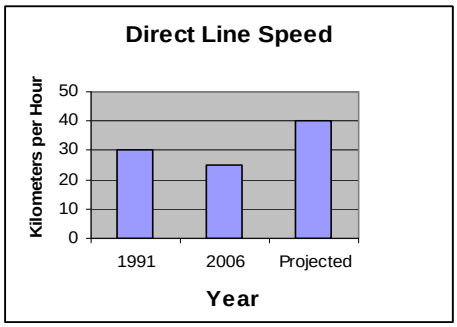

Figure 8. Projected Direct Line Speed

I wondered if they had considered the use of a metro system, as many other large cities comparable to their size have implemented metros and other light rail systems. Both Sylvia and Daniel told me it had been researched thoroughly. Daniel said there is plenty of space in Curitiba where the metro could travel. The problems that would result would be an increase in price that would disadvantage many citizens when their taxes would increase as well as the fare to ride the metro (Costa, 2007). Rapid bus transit is constructed twenty to one-hundred times more cheaply than light rail or subway systems, not to mention how much more quickly it can be done (Langston, 2006). A metro would take an excessive amount of time to construct putting the entire city at a halt since they have extremely high demand for public transportation. Daniel told me there is no immediate action being taken to construct a metro and they are interested in continuing to expand their bus transportation (Costa, 2007).

Another question I asked Daniel how crime and violence affect the bus transportation systems. In other countries, I have felt unsafe on unfamiliar transportation and have been a witness to violence and theft. After my first few days in Curitiba, I felt safe and never saw any problems on the buses or near the bus tubes. Daniel said that there is crime and from time to time theft occurs when citizens steal from the money collectors. Daniel also said,

"When people are proud [of their city], there is less crime and violence" (Costa, 2007). They are working constantly to improve the quality of service that citizens in Curitiba demand. Generally, as Sylvia mentioned, buses and bus tubes are safe (Ramos, 2007). With higher quality, people are less likely to commit acts of violence and URBS is helping to eliminate this when they grow with the demands of the population.

DISCUSSION

After learning about such an expanding population in Curitiba, I was intrigued enough to look up the unemployment levels since there seem to be continuous efforts to keep it under control. Unemployment levels in Curitiba were estimated in 2004 at 11.5% (Move, 2004). In the 1990s unemployment was between 10%-12% and reached as high as 15% in some municipalities (Schwartz, 2005). There were programs initiated to deal with the problem but people continually arrive and the population has not ceased growing. There are constant attempts visible all over the city, for example employing money collectors, as Sylvia mentioned, to remedy the unemployment that I observed in Curitiba.

In La Crosse, Wisconsin, the Municipal Transit Utility (MTU) bus transportation system doesn't run the same way. After my return from Brazil, I was interested in learning more about our local transportation as a means to compare the two systems. Keith Carlson, the Transit Manager from MTU was very helpful and enthused to hear about Curitiba. Seventy-five percent of the revenue for the MTU bus system is dependent on government subsidies (Carlson, 2007). Only twenty-five percent of costs are actually paid for by the consumers riding the buses every day. What is also surprising is that it costs US$1 to ride the bus here, more expensive than in Curitiba, and it does not substantially cover the costs of the bus transportation system in La Crosse. Obviously, there are differences in demand, culture and other factors that affect La Crosse.

Also comparable to Curitiba, Brazil is New York. They have been planning a Second Avenue subway line for the past fifty years and it will not be completed until 2021 (Ben-Tal, 2005). The line will not be able to carry more passengers than the bus system implemented in Brazil in just two years and it will cost over four billion dollars (Ben-Tal, 2005). There is no surprise why Curitiba has stayed with their idea of a bus transportation system for their people. New York also has only 14.5 square meters of open space per capita (Lindin, 1993) and although New York City is a prime destination for many Americans sixty percent of their population polled stated that they wanted to leave their rich and cosmopolitan city for another (McKibben, 1999). This same survey provided results that ninety-nine percent of the Curitibanos told pollsters that they were happy with their city and seventy percent of residents in São Paulo said that life would be better in Curitiba (McKibben, 1999). I actually met a woman who grew up in Curitiba and has now moved to São Paulo to follow her job and she said that she missed the transportation in Curitiba, even though São Paulo has a vast metro system, and she misses the cleanliness of the city.

OBSERVATIONS – Garbage and Recycling Programs

While in Curitiba, I examined the garbage and recycling systems and how they are different from American systems. In Curitiba, garbage is placed into raised metal bins that stand like baskets on the curb of their street. This seems to make them well aware of how much garbage they are throwing out daily. From there, it is collected by either city-employed garbage collectors or independent entrepreneurs who collect garbage with their own carts and turn in the garbage at collection sites. In some areas, garbage is collected daily, or twice or three times a week in the city where there are only fifty-one garbage trucks (Martins, 2007). This is obviously a different system that is successful in a cheap and efficient way compared to collection strategies in the United States, particularly La Crosse, Wisconsin.

There are many programs that Curitiba takes pride in. At first, I was interested in "O Lixo que Não é Lixo" which translated from Portuguese means "Garbage that is Not Garbage". The intriguing name caught my eye in class as well in Brazil. This program has been the seed of many other programs all aiming to keep Curitiba clean. "SE-PA-RE" or the "Separate" program is a way Curitibanos have educated children to understand the importance of separating trash into certain categories: paper, plastic, glass, metal, and organic waste. "Câmbio Verde" is the "Green Change" program where families can bring their garbage to specific sites where it is weighed and collected, and they are paid with fresh fruits and vegetables. The "Compra do Lixo" or "Buying of Garbage" program is available for the independent collectors to get paid after collecting garbage from small villages or from businesses in hard to access areas where it would not be collected otherwise. Another interesting program in Curitiba is the "Varrição Manual: Limpeza" or the "Manual Street Cleaners" who are city employees who sweep the streets to keep the city clean. All of these programs deserve to be looked at more carefully.

Jason Rodrigues- Siemens Employee

I got the chance to speak with a corporate employee about how they deal with garbage and recycling responsibilities. He was able to explain why landfills in the area are emitting less pollution. There is less water, soil and air pollution since thy have effective ways of maintaining the government-regulated landfills (Rodrigues, 2007). Regulations include landfills can only be seven stories high. The area set aside for the landfill is 410,000 square meters, but only 237,000 square meters can be used, where the remaining area is preserved. This landfill pictured in Figure 9 will only be able to be used until 2010, and unlike many other landfills, there are other strict requirements they must follow. There is a thick plastic lining beneath the landfill that doesn't allow for contaminated seepage. Also, a drainage system allows for water to drain in to treated ponds and before the water leaves the ponds, it is clean enough to drink. There are also chimneys that filter the air that escapes from the covered landfill so air pollution doesn't occur. As seen in Figure 9, landfills are terraced in circles where grass and other wildlife are planted to help the decomposition process. Jason also mentioned that energy consumption has decreased since the program began. As an employee at Siemens, Jason explained how they individually participate in garbage separation. For example, they have international partners in Germany who send them packages in the mail, yet if there is too much packaging that exceeds what is necessary, Siemens Germany will have to pay for the packaging to be all shipped back to Germany to be taken care of properly. They also make sure to separate all the garbage that goes through business operations and recycling everything possible (Rodrigues, 2007).

Figure 9. Landfill near Curitiba, Brazil

Giselle Martins dos Anjos – SMMA Civil Engineer

Giselle Martins dos Anjos, a Civil Engineer for Secretaria Municipal do Meio Ambiente (SMMA), or the Municipal Environmental Bureau, helped answer some of my questions. As a city employee, she was very informative, yet the language barrier seemed to be our biggest obstacle. She said "O Lixo que Não é Lixo" (Garbage that is not Garbage) is a program that was started in 1989. There are 35.50 tons of *not garbage* collected daily through the use of this program. Since 1989, landfills have a longer life in Curitiba than anywhere else in the world. If we were to compile everything that has been separated and recycled rather than put into the landfill, she said we would be able to fill 1,200 twenty story buildings, each one consisting of two-hundred and eighty square meters (Environic, 2006). Recovered materials are sold to local industries for reuse.

Also started in 1989, was a program with cartoon characters representing different pieces of garbage teaching children how to be more involved in garbage separation and why it is so important, as seen in Figure 10. The SE-PA-RE (Separate) program is aimed at educating children and since 2005; there has been a 38.99% increase in involvement in garbage separation. They advertise facts such as every fifty kilograms of paper transformed into newspaper will save one tree from being cut down and how it takes over one-hundred years for plastic and metal to decompose. Having easily understandable facts for children is obviously important to ensure Curitiba can keep its high standards possible of sustainability.

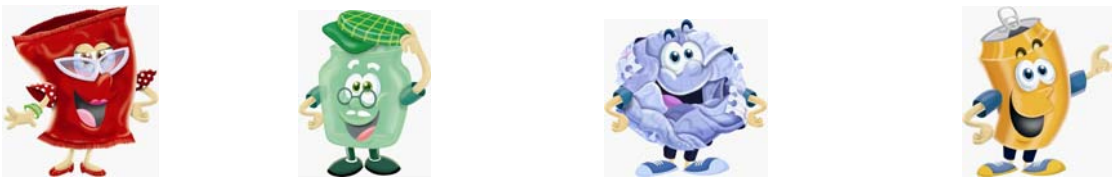

Figure 10. Cartoon Characters representing a family promoting garbage separation to children

In 1991, "Câmbio Verde" (Green Change Program) began with the goal of helping the poverty-stricken in Curitiba. This was a way for people to bring in their garbage and exchange it for fruits and vegetables while also benefiting the city in other areas such as keeping streets clean, providing jobs for people in poverty and helping farmers maintain demand. The garbage would be separated and recycled properly, as well as keeping demand at a reasonable rate for farmers. People are able to go to one of seventy-eight different locations to bring their garbage and have it weighed, and each location is available for exchange twice each month. Although the net worth of different materials varies, about four kilograms of garbage is the equivalent of one kilogram of fresh fruits and vegetables and over 60,000 kilograms of food is given out to Curitibanos each month. The government purchases the fruit and vegetables from local farmers in Brazil. There is an abundance of produce that otherwise would be wasted with a surplus that would cause prices to decrease. The government is ensuring economic stability for farmers, meanwhile, providing for the poor who would otherwise be unable to afford it for their families. With "Câmbio Verde" in place, nine tons of garbage is collected daily in Curitiba, which is an increase since 2005 of thirty-two percent (Martins, 2007).

"Compra do Lixo" (Buying of Garbage Program) is available to twenty-five different communities. This is a program that benefits over 16,000 people directly or indirectly and 555 tons of garbage is bought by the city every month. Citizens who are collecting the garbage work hard and are well respected for what they are doing. They travel around with large carts collecting garbage from small villages and businesses downtown that otherwise would not have a collection service available. They collect large amounts of paper and garbage and when they turn it in at the end of the week or month, the collectors get about one kilogram of fruit and vegetables for about ten kilograms of garbage in the "Compra do Lixo". Certain sites do not always give away produce, and in that case, citizens get tickets for food and other goods at a local shopping market or tokens redeemable for the bus system. Although surprising, individuals collecting the garbage for the citizens are in a respectable position according to Curitibanos, as they are keeping busy and are cleaning the streets.

The reason individual garbage collectors are so important has something to do with the number of garbage trucks. Gisele said that there are only fifty-one garbage trucks and only twenty-three recycling trucks (Martins, 2007). With the help of citizens, the city is able to be free of litter without a high dependence on collection trucks. Individual garbage collectors are an essential component of the economy in Curitiba.

The limpeza (public cleaners) are well-respected city employees in the city. There are over 2,000 employees assigned to areas in the city to sweep and clean the streets. This may seem ridiculous to some, but this is just another way that the system in Brazil of maintaining a clean environment with a strong emphasis on sustainability in the future.

CONCLUSION

Curitiba is a city that has surpassed most other cities in sustainability issues. Curitibanos have taken pride in how they have managed a huge population growth and grown with the diversity it offers since settlers have come from all over Europe, the Middle East and Asia. Curitibanos are extremely happy with their city, and Curitiba is truly a world-class model. Curitibanos are innovative and have used the Master Plan to establish a sensible and sustainable living environment. Citizens would rather live in Curitiba than anywhere else since the city excels in planning and citizen participation and programs are integrated into their way of life to benefit everyone directly or indirectly.

Transportation throughout the city would have been impossible without the Rede Integrade de Transporte because too many vehicles would occupy the streets. Now, pedestrians have the priority at main intersections and commercial areas are thriving in pedestrian-only zones. As population has increased, the availability of bus transportation has as well, maintaining a high demand and efficiency in speed to get travelers where they need to go more quickly than they could otherwise by car. Air quality has always been a concern for the Curitiba residents, so URBS has made sure to adapt to changing standards. The buses undergo maintenance inspections and run on Biodiesel B-20, frying oil B-20 and MAD8, which is a mixture of diesel oil and anhydrous alcohol (URBS, n.d.). Documents mentioned that since the system is powered by diesel, the reduction of car usage compensates, if not surpasses, the difference in carbon monoxide emissions (Horizon, 2003). Pleasing the people of Curitiba is the main objective while making sure they will be able to provide for future generations.

The garbage and recycling programs provide for people who would otherwise not be able to provide for themselves and their families. The programs offer fresh fruits and vegetable to people who couldn't afford them purchased from farmers who would otherwise have a surplus. Programs teach children the importance of separation to keep landfill life long while making sure the streets are clean and something in which to be satisfied. People then are proud of their home and low crime rates reflect positive feelings.

Traveling to Curitiba showed to me that it is possible to renovate our cities in America to make life more sustainable. Making simple transitions to using public transportation and having more recycling options will ensure an optimistic future. Jaime Lerner said, "To make it happen is to propose a project that the majority of people find desirable. The city is not a problem, the city is the solution" (Ben-Tal, 2005). He says complaining about cities being too big or lacking financial resources is just an excuse. Getting a good strategy in place will ensure the sustainability of any city worldwide.

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