The Citizen Participation Inside The Integrated Solid Waste Management – Porto Alegre Case

Ana Paula Bortoleto, Keisuke Hanaki, Toshiya Aramaki, the University of Tokyo

A P Bortoleto
The University of Tokyo
Department of Urban Engineering
7-3-1 Hongo, Bunkyo
Tokyo
113-8656 Japan
Email: bortoleto@env.t.u-tokyo.ac.jp

EXECUTIVE SUMMARY

Solid waste production is a serious problem worldwide, particularly among industrialized nations where it continues to increase in both absolute and per capita terms. Therefore, in dealing with solid waste, both integrated management and public participation are required.

This study aims to present the effects of citizen participation on Integrated Solid Waste Management – ISWM, considering all stages of urban cleansing: solid waste production, collection, transport, treatment, recycling and final disposal, as well as to help decision makers and agencies involved in solid waste management in developing a policy that will utilize citizen participation as an important tool.

Porto Alegre has been chosen as the area of study due to the fact that its system is known, internationally, as a good example in developing countries. In 1990, after implementation of its ISWM System, Porto Alegre local government created a partnership (currently in practice) with the recently founded Scavengers Association, where the local government is responsible for the collection and the association is responsible for sorting the recyclable waste into the so-called Unidades de Triagem [Sorting Units], storing and selling it. Even though, Selective Collection started initially in one neighborhood, by 1996, it had already reached practically every neighborhood in the city.

The methodology to evaluate this system consisted of Life Cycle Assessment to estimate environmental loadings based on the solid waste generated. The economic costs were analyzed through life cycle cost assessment and the social aspects were analyzed employing survey and statistical methodology.

The results showed the decrease in environmental impacts and Porto Alegre has, now, one of the most affordable ISWM Systems in Brazil. Another important fact highlighted by this study is that environmental education changed the conception and practice of the most part of Porto Alegre’s population regarding their behavior, habits and attitudes related of the solid waste management at their houses. However, some citizens are not used to dispose their solid waste in a correct way; indicating that this concern did not usually carry over to their participation in environmental behavior.
There can be no doubt that the householder possesses the key to sustainable management of municipal solid waste; but a successful ISWM depends on several factors. Therefore, more research is needed on this subject to establish more accurate models to increase cooperation between all stakeholders improve citizen participation inside solid waste schemes and consequently, decrease environmental impacts and economic costs.

**Keywords:** Integrated Solid Waste Management, Waste Prevention, Life Cycle Assessment and Environmental Behavior.

**INTRODUCTION**

Waste is an inevitable product of society. From the days of primitive society, human and animals have used the resources of the earth to support life and to dispose their wastes.

In early times, the disposal of human and other wastes did not pose a significant problem because the population was small and the amount of land available for the assimilation of wastes was large. However, problems with disposal of wastes can be traced from the 14th century, littering of food and other solid wastes in medieval towns led to the breeding of rats and the outbreak of the plague epidemic which killed half of the Europeans causing many subsequent epidemics and high death tolls.

Historically, health and safety have been the major concerns in solid waste management. These concerns still apply. Solid wastes must be managed in a way that minimizes risk to human health. However, nowadays, society demands more than this, as well as being safe, solid waste management must also be sustainable. In other words, it must consider the whole life cycle of waste from the cradle to the grave. Therefore, in dealing with solid waste, an integrated management is required.

An ISWM System combines waste streams, waste collection, and treatment and disposal methods, with the objective to achieve environmental benefits, economic optimization and societal acceptability. Using a range of management options in an integrated system gives the flexibility to channel waste via different treatments as economic, environmental and social conditions change.

Nevertheless, for an ISWM Systems to operate effectively public participation is necessary. In other words, individuals must understand their role in the waste management scenario and co-operate with the local authorities for the system to work. Adding to that, the public must be confident that any material they source separated for recycling is sent for recycling and not landfilled or incinerated.

Recently, new studies have been developed in order to understand how citizen participation helps to solve solid waste disruptions, where sustainability is one of the main factors included. Most of them are based on the conventional waste management, which do not include all the activities in urban cleansing. Although, all these studies have presented trustworthy data, no absolute results have been achieved. Social, economic and environmental aspects must be included simultaneously to improve the decision-making tool.

Hence, this study will address the lack of comprehension in the citizen participation inside ISWM Systems subject based on the evaluation of environmental, economic and social impacts. And, to achieve this it will introduce the unique system adopted in Porto Alegre, presenting how this system works in the local context.
STUDY CASE

According to the National Survey of Basic Sanitation (IBGE, 2000), about 69% of the solid waste produced in Brazil is disposed in adequate landfills but the remaining part has being still disposed in waste dumps. The 13 biggest cities are responsible for 32% of the waste collected in urban centers and almost 100% of them has adequate final disposal.

In addition, 236 out of the 5507 Brazilian municipalities have a Selective Collection implemented as an alternative to resolve the environmental, economic and social problems consequents of informal solid waste collection in wastes dumps (CEMPRE, 2004).

The research was delimited to Porto Alegre considering the previous elements and the fact that its ISWM System is internationally recognized as a good example of the municipal urban cleansing management in developing countries.

PORTO ALEGRE CITY

Porto Alegre is the capital city of Brazil’s southernmost state, Rio Grande do Sul (Figure 1), with a population of approximately 1.5 million, distributed in an area of 470.25 km², of which the first Urban Development Planning of 1979, established an urban area of 326.17 km² and an agricultural area of 148.08 km². According to National Census (2000), the urbanization level decreased from 98.73% to 97.07%, but continues to be one of highest in Brazil.

Since 1996, Porto Alegre has consistently had the highest standards of living of all Brazilian metropolitan areas with second highest Human Development Index – HDI (0.865) of the country and a Gross Domestic Product – GDP per capita of US$ 3300. Its progress is linked, mainly, to the way in which the city has been managed over last 12 years.

Porto Alegre city generates approximately 1,000 tons of household waste which 30% out of that could potentially be recycled. Nowadays, the recycling efficiency reached 20% of the total solid waste collected, considering the recyclable waste collect through the formal and informal selective collection (Table 1).
<table>
<thead>
<tr>
<th>Population</th>
<th>1,448,322 inhabit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total solid waste collected</td>
<td>296,140.33 t/year</td>
</tr>
<tr>
<td>Local population attended</td>
<td>100%</td>
</tr>
<tr>
<td>Household solid waste production</td>
<td>0.62 Kg/ inhabit. day</td>
</tr>
<tr>
<td>System’s cost</td>
<td>US$ 3,575,320/year</td>
</tr>
<tr>
<td>System’s self-sufficiency</td>
<td>51.3 %</td>
</tr>
<tr>
<td>Recycling efficiency</td>
<td>20 %</td>
</tr>
</tbody>
</table>

**PARTICIPATORY BUDGET**

For fourteen years the Work Party has ruled the city of Porto Alegre, with a coalition of left parties. This city experience considered as a paradigmatic reference for management democratization – in Brazil and overseas – has elected the Orçamento Participativo [Participatory Budget], as the main alternative to the democratization of the State with the society.

The Work Party, which had almost no experience in government at that time (1989), developed the Participatory Budget mostly by trial and error, and its scope increased over the years. This mechanism was conceived as a community intervention on decisions related to the investments to be applied on regions, and is thus reason why it is also known as the Regional Participatory Budget.

The Participatory Budget is structured chronologically. Regional assembly meetings, in which city administrators and participants review the Investment Plans of the previous year, are held in March and April. In June and July, the administration makes a presentation about revenue collection and the funds that will be available for investment in the following year. The regional sessions also rank their investment priorities for the year and elect delegates to sit on the Participatory Budget Council. This body discusses the executive administration’s budget and develops the next Investment Plan according to the weighting system and the rankings of the regional assemblies. In September, the Participatory Budget Council follows the progress of the bill in the City Council and discusses the details of implementation of the investment plan with the municipal bureaucracy (Figure 2).

As a direct consequence of the high level of citizen involvement in allocating the municipal budget, the proportion of investments serving lower income communities increased in the past years, along with integration of public environmental management policies and the regeneration of public spaces. These results have represented an important advance on the aim of social priorities reversion, and on a new political relation between government and society.

**PORTO ALEGRE ISWM SYSTEM**

In 1989, Porto Alegre was in an emergency situation. The dumpsite had already reached its capacity, its soil was containment and because of that the pollution emission was also increasing at the environmentally protected areas. Besides that, a large number of people were living through the collection of recyclable waste inside the dumpsite and consequently, spreading the diseases caused by waste among the population. At the same time, the Partido dos Trabalhadores [Work Party] was led to power after having been elected for the City Council, which it would head for four consecutive terms, for a period of 16 years.
In 1990, accompanied by an intensive awareness raising campaign aimed at the population at large, the Municipal Department of Urban Cleansing (DMLU), a department of the public administration created in 1979 which earned the status of autarquia [independent state company] in 1989, implemented the ISWM in Porto Alegre.

This system was based on four interrelated components (Figure 3):

- Citizen participation;
- Public Environmental Management Programs;
- Comprehensive knowledge of Porto Alegre’s natural and built environment and;
- Environmental Education.

The ISWM’s objective was not only sustainable development of the urban area of Porto Alegre through the avoidance of solid waste production, but also a strategy to fight poverty with a project of income generation and sustainable work.
Thus, to promote the inclusion of poor communities at the economic scenario, the first action was to create an organization for those who were living by collecting recyclable wastes, the Scavengers Association. Secondly, the dumpsite was closed and the soil and water were treated with bioremediation techniques.

A partnership with the Scavengers Association was created to introduce the selective collection at the city, where until now the local government was responsible for the collection and the association was responsible for sorting and selling the recyclable waste at the so-called Unidades de Triagem [Sorting Units]. The Selective Collection started, initially, in one neighborhood however by 1996 it had already reached practically every neighborhood in the city.

The nine existed Sorting Units are managed by former scavengers (collectors) organized in associations, a condition imposed by DMLU for these workers to receive the waste from the Selective Collection, as well as the water and electricity they need to carry out the separation work. The main activities are: the separation of materials, cutting, crushing and storing. The equipment necessary for the production process is baskets, shredders, presses and scales; provided by the City Council. Together the scavengers manage to fetch higher prices for their waste materials and higher quantities of it can be sold directly to the formal recycling industries, thus avoiding the middlemen.

The ISWM in Porto Alegre (Figure 4) uses a combination of four methods:

- Source separation into domestic, industrial, commercial and hospital solid wastes;
- Selective Collection;
- Different treatment, re-use, disposal for each type of solid waste, and;
- Promotion of environmental education.

At the present day, the selective collection has 80 employees, 29 trucks and collects around 40t/day of solid waste. According to DMLU, the cost of the selective collection is US$42 per ton, being one of lowest cost in Brazil. It is estimated that independent collectors (not members of the scavengers association) collect 150 tons of solid waste out of which 70% is potentially recyclable.

![Integrated Solid Waste Management System of Porto Alegre](image-url)

Figure 4 – Integrated Solid Waste Management System of Porto Alegre.
METHODOLOGY

This study considered the household solid waste management inside the ISWM System of Porto Alegre. Therefore, the boundary of this analysis included from waste collection to final disposal, and also the stages for reprocessing recyclables to secondary materials (Figure 4).

Life Cycle Assessment – LCA evaluated environmental loadings and Life Cycle Cost Assessment – LCCA was utilized to provide costs estimates of Solid Waste Management. Both LCA and LCCA considered the current system scenario, with all stages and facilities to manage municipal solid waste.

The Survey-Statistical Methodology was used to understand the social agents’ vision involved and also to verify the importance of citizen participation in this ISWM System. Therefore, different questionnaires were applied for each social actor: Local Government, Recycling Industries, Scavengers Association, Professional Experts and Population.

In case of the local population, the questionnaire evaluated these topics:

- Recycling behavior;
- The individual’s perception of social pressure to recycle waste;
- The individual’s perception of his ability to perform this behavior, and;
- Environmental education and awareness.

This survey was applied to 600 citizens, randomly extracted from a telephone printed list; and sent by mail with an enclosed, pre-paid return envelope. This approach was used because of its facility of selecting respondents despite the disadvantage that not all residents are listed. The response rate reached 20% and all answers were analyzed through a Statistical Methodology. For the other social actors, an interview in person was conducted.

DISCUSSION

The Participatory Budget is an example of participatory democracy because it reconciles direct democracy, embedded in associations and meetings, and representative democracy at the urban level. But the relationship between the formal elected representatives and popular movements has not been without problems. In fact, this conflict has been one of the main political issues in Porto Alegre. Nevertheless, the city has witnessed a remarkable improvement regarding the behavior of
the politicians and community leaders who, as in the rest of Brazil, were used to clientelism. Now, they face a more informed population and more politicized grass-root organizations. One remarkable success of the Participatory Democracy has been the ISWM System, implemented in 1990. Now, environmental impacts decreased and Porto Alegre has, now, one of the most affordable ISWM Systems in Brazil.

There is considerable evidence that local government assistance in organizing and promoting the Scavengers Association has been successful. Scavengers were formally involved in the process; Sorting Units were created where they are able to work with improved conditions and infrastructure. The quality of recyclable waste also increased, because the major part of the population accepted and contributes to the Selective Collection doing source separation. The survey showed that environmental education changed the conception and practice of the most part of Porto Alegre’s population regarding their behavior, habits and attitudes related of the solid waste management at their houses.

However, despite all these efforts, some citizens are not used to dispose their solid waste in a correct way, which increased the contamination of recyclable waste. Nowadays, the Sorting Units are facing some problems. Besides its contamination, the amount of recyclable waste provided by the formal selective collection is decreasing. Although it is the responsibility of DMLU to supply waste to the Sorting Units, scavengers frequently complain of not getting enough “raw material” to continue their work. Independent collectors, who, being familiar with the schedule of the selective collection, are doing the collection before the trucks. Other competitors of the Scavengers Associations are the beverage companies, which promote selective collection campaigns in private schools where the consumption of soft drinks (aluminum cans) is higher. Even though the DMLU claims that it is making efforts to raise environmental awareness among general population, it is important to highlight the need to raise awareness also among “independent” suppliers of waste, such as businesses and public organizations.

In 2006, because of these current problems, the expiration and the legal impossibility to renewal its contracts with private companies, DMLU restructured the ISWM System. Public audiences were held to allow suggestions, critics and discussions about the new proposal. More than US$ 15 million will be invested in the next five years to modernize the system’s processes and improve its social aspects. The new ISWM will be effective in the beginning of 2007.

CONCLUSION

There can be no doubt that the householder possesses the key to sustainable management of municipal solid waste; but a successful ISWM depends on several factors. The co-operation between those who make part of the chain is imperative, because more improvement means more responsibility and awareness. In that context, environmental education plays an important role inside this chain, and only brings results within medium and long term. Public support can also be enhanced by stable waste management systems where changes to waste sorting habits or to the waste collection are rarely required. Where system changes are necessary, effective communication is needed to inform the public of its benefits. Thus, in a near future a better quality service of waste collection, separation and recycling can be provided by the system. On the other hand, incentives for sorting units and recycling factories represent one of the alternatives to increase the need for recyclable waste as raw material.

The importance of analyzing environmental values in terms of their empirical dimensions as well as their effect upon environmental behavior was found to be crucial. It is important to continue researching on this subject, by analyzing the ISWM System as whole and try to establish more
accurate models to increase cooperation between all stakeholders and also to improve citizen participation inside the solid waste scheme.

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REFERENCES


