

Benefits of the selective collection in the public company Companhia Docas do Pará - CDP, in the Amazon / Brazil

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ABSTRACT

The present work has as study area the headquarters building of Companhia Docas do Pará - CDP, being this a public company of mixed economy, responsible for the administration and commercial exploitation of the port facilities of the state of Pará, in the Brazilian Amazon. CDP implemented the selective collection in 2008, so the objective of this work is to analyze the benefits to the company during the periods of implementation of this new waste collection system. The methodology adopted consists of collecting data together with the environmental sector of the CDP regarding to the annual amount of waste that is generated in the company in years ranging from before the implementation of the system in 2007 until 2017, totalizing 10 years of analysis. Afterwards, all the data obtained were organized to, then, perform the statistical work through the program Excel 2010. With the study, it was observed that CDP produced a high amount of non-recyclable solid waste, for which 5 weekly collections were paid to outsourced companies. Between 2007 and 2017, there was a reduction in the generation of non-recyclable materials, resulting in a financial savings of around R \$ 54,837.00, since a large part of the waste generated was selected and donated to cooperatives in the region, minimizing the collections by outsourced companies for the frequency of once a week, in addition to the benefits for the environment, for the members of the cooperative and the already mentioned, economy for the company.

Keywords: solid waste, recycling, benefits of selective collection, Companhia Docas do Pará.

INTRODUCTION

Pollution of the environment, especially of water resources, the deterioration of the life of landfills, the social problem represented by the large number of waste pickers in the dumps, the excessive use of raw materials due to demographic growth and unbridled consumerism are problems that could be mitigated by changing the behavior of the population with at least one sustainable action: proper disposal of urban solid waste, which is a serious problem to be faced and solved by environmental managers in Brazil. Recycling is a mechanism still little explored, but with a potential for significant use, since it can be used as an extremely viable environmental, social and economic indicator in the solid waste management process [1].

According to the Associação Brasileira de Normas Técnicas - ABNT [2], solid waste is those that come from industrial, domestic, hospital, commercial, agricultural, service and sweeping activities, being solid and semi-solid. This definition includes sludges from water treatment systems, those generated in pollution control equipment and facilities, as well as liquids that, by their characteristics, should not be discharged into the public sewer system or water bodies.

Selective collection offers several advantages [3], among them, the environmental benefits with the reduction of virgin raw material exploration and the economy of renewable and nonrenewable natural resources; energy savings in material reprocessing compared to extraction and production from natural raw materials and the recovery of secondary raw materials, and the reduction of waste disposal in landfills and the resulting environmental impacts.

It is reported on the economic valuation of recyclable materials and their potential to generate business, work and income [4]. It emphasizes that the selective collection contributes significantly to the urban sustainability, as well as it has been integrating over the years a profile of social inclusion and income generation for the most needy sectors and excluded from access to formal labor markets.

However, despite the knowledge about the many benefits of selective waste collection in Brazil, it is still not a widespread practice, as pointed out by data from the Sistema Nacional de Informações sobre Saneamento - SNIS [5], that only 20% of Brazilian municipalities have selective collection programs. This represents more waste being sent directly to landfills or dumps, further reducing their useful life. As a governmental incentive, in order to control at least the waste from the public administration, in addition to supporting recyclable waste pickers, Decree N°. 5,940 [6].

Since the publication of Decree n° 5.940 [6], the entities of the federal public administration should directly and indirectly institute the separation of discarded recyclable waste, still in the generating source, and its destination to associations and cooperatives of materials collectors recyclable.

Companhia Docas do Pará - CDP is a mixed economy public company, founded in 1967, responsible for the administration and commercial exploration of port facilities in the state of Pará, in the Brazilian Amazon. The CDP implemented the selective collection in 2008, with the creation of a selective collection commission, with the acquisition of selective collectors in accordance with Resolution CONAM n° 275 [7], which establishes the color code for the different types of waste, to be adopted in the identification of collectors and transporters, as well as information campaigns for selective collection.

Selective collect is one of the instruments of Law n° 12,305 – Política Nacional de Resíduos Sólidos [8] and aims at the reuse of waste that would generally be disposed of in landfills. The process of implementing selective collection must necessarily be part of a waste management program. One of the great amounts of this instrument when used in a company is that it subsidizes the establishment of targets and the use of codes, and also contributes to the effective reduction, reuse and separation of waste at source, strengthening recycling. In addition to the investments in the necessary infrastructure, it is necessary that the employees are committed and aware of their importance in the efficiency of the implemented action.

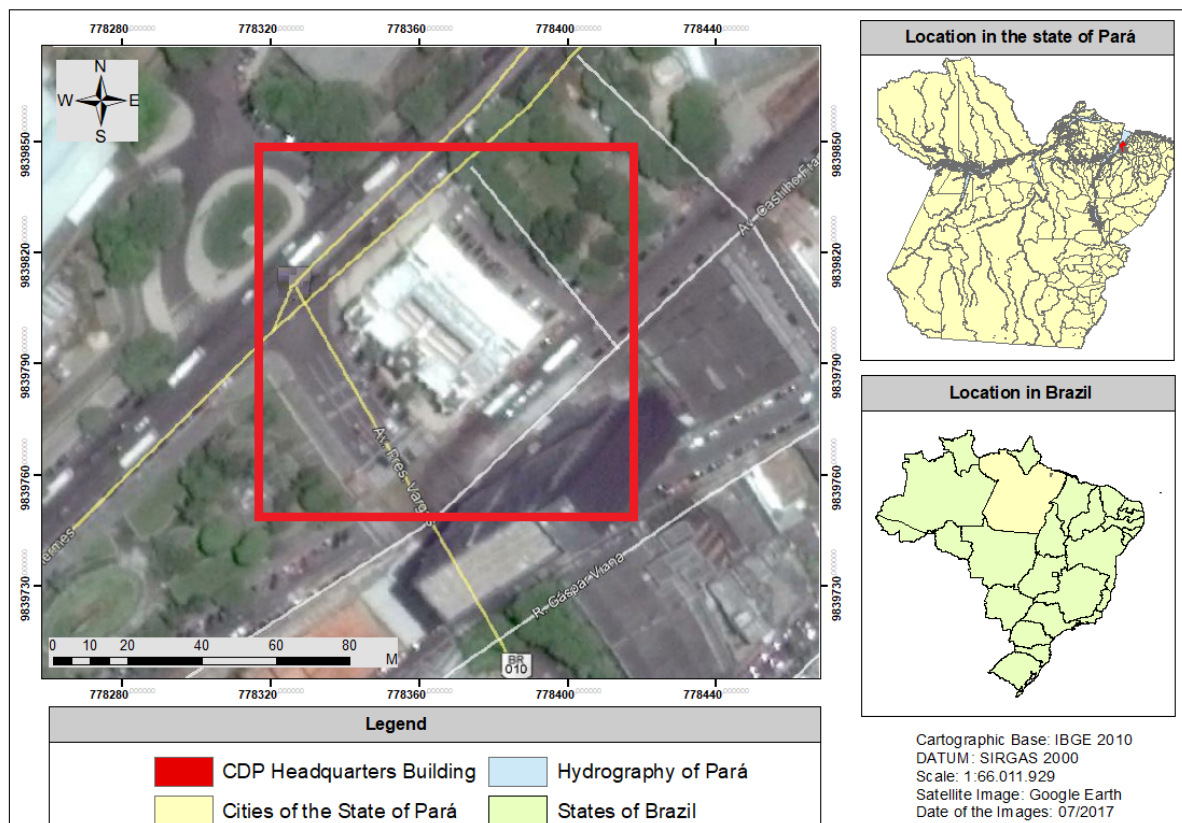
The selective collection can be defined as the stage of collecting recyclable materials in the municipal waste, after separation in the generating source itself, followed by its packaging and availability for collection at predetermined days and times, or through delivery at voluntary delivery points, in exchange offices, to scavengers, scrap yards or charities [9]. It is reported that the selective collection operations of recyclables present in the solid waste aim at the interception of their traditional management cycle, avoiding that these materials are added to the heterogeneous and uneven set of garbage, giving them a path different from the usual, which can represent several gains for society [9].

In this context, the objective of the present study is the survey and identification of the economic benefits that the CDP obtained in the period from 2007 to 2017, through the evaluation of costs that the company was responsible for the transportation and disposal of solid wastes before and after the implantation of the selective collection, besides the identification of the results obtained from the implantation of the collection of waste subject to recycling.

MATERIALS AND METHODS

The work has as study area the Headquarters Building of Companhia Docas do Pará – CDP, located in Av. Presidente Vargas, 41 - Campina, Belém/PA, where is the administrative head office of that undertaking (Figure 1). The number of employees filled in the Headquarters Building is 122 people, who develop their activities from Monday to Friday from 8:00 a.m. to 2:15 p.m.

Figure 1 - Area of study adopted in the research.



Source: Authors (2017).

The research was developed in two stages. The first stage was divided into two phases. In phase 1 a bibliographic research was carried out on articles, theses, dissertations and documents made available by CDP as the contract signed between CDP and outsourced company to carry out the collection, transportation and final destination of solid waste. In phase 2 were verified the residues inventories of the Headquarters Building from 2007 to 2017, payment processes including invoices and certificates of final destination and interview with one of the then managers of the environment sector of CDP.

In the second stage, the data were tabulated, as well as the statistical work and formulation of the calculations, carried out through the Excel 2010 program, as well as the generation of quantitative monthly and annual waste and their respective final destination costs, and comparisons with the help of such software.

RESULTS

The northern region of Brazil presents an index of municipalities with a selective collection initiative of 58.4% [10], an unsatisfactory result in view of the social, environmental and economic benefits that the practice of selective collection can provide. As these public policies are not investigated at the municipal, state or federal

levels, some mitigation measures have been implemented in isolation, such as Decree N°. 5.940/2006 [6], which establishes the separation of recyclable waste discarded by agencies and entities of the direct and indirect federal public administration, at the generating source, and its destination to the associations and cooperatives of the collectors of recyclable materials, and other measures.

In order to comply the mentioned Decree, Companhia Docas do Pará has prepared its Solid Waste Management Plan, which provides for the collection, packaging and disposal measures to be practiced for all types of waste generated, both in the Headquarters Building and in the port units.

The environmental management sector reports that selective collectors for paper, plastic and organic waste were available in all rooms of the building, as well as collectors for paper, plastic, metal, non-recyclable, organic, glass, batteries and batteries in the areas of circulation. Also reported that since the implementation in 2008, so far, several environmental intervention meetings have been held with the objective of sensitizing employees and outsourced employees highlighting the importance of selective collection and individual responsibility of each actor involved, as well as clarifying possible doubts regarding the classification of waste and hygiene that should be used before disposal of some packaging, such as: jars and bottles of yogurt, coffee cup, Tetra Pak, etc.

Positive results were obtained, causing a progressive decrease in the number of collections performed weekly by contracted company. Initially, in 2007 an average of five (5) weekly collections of waste per contracted company were carried out, around 20 monthly, while in 2017 the average collection was 1 (one) weekly, around 4 to 5 per month..

Taking into account that the cost of each collection in 2007, before the implementation of the selective collection was R\$ 300,00 (three hundred reais) and from 2014 the value of the collection increased to R\$ 399,00 (three hundred and ninety-nine reais). Comparing, for example, the year 2007 with an average of 20 monthly collections and the year 2016 with an average of 5 monthly collections, an economic advantage of R \$ 48,060.00 was found. This represents a reduction of 75% of the waste that is destined for final disposal.

As for the waste that was selected, that is, waste separated at source, no longer destined for the controlled landfill, the main materials generated in a company with an administrative characteristic, such as paper, cardboard, plastic, metal and long packaging life. The paper recycling rate has grown in Brazil, reaching a 63.4% recovery in 2015 [10].

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The recyclable materials are removed daily from the collectors and temporarily stored in 200 liters bags with the coloration varying according to the type of waste, and later delivered to the headquarters of a cooperative in the region, usually once a month.

Selective collection has great importance in social and economic aspects, as it provides the organization of garbage collectors, who for decades have lived on the margins of society, winning the opportunity to obtain dignity and significant gains for the cooperative and / or associates, as an example, the paper, which attributes a gain to the cooperative in 2016 of R\$ 374.00 and the plastic of R\$ 2,205.00. It was not possible to determine the total gain of the cooperative with the residues donated by CDP throughout the period, since the control of the

waste sent to it only started in 2016 and the data of 2017 were lost with the damage of the HD of the computer where the data was.

It can not be inferred that the amount of waste that was destined to the cooperative was the difference between what was generated before the implantation of the collection and what was counted later, since it is possible that there was a reduction in the generation, since the employees of the Company participated in several interventions where the CDP emphasized the importance of practicing some of the objectives of the National Policy on Solid Waste, such as non-generation, reduction and reuse, and after these measures, recycling, followed by treatment and/or final destination.

In the period considered in this study, it was evaluated that the employees of the CDP began to collaborate actively in the process, gradually increasing the total of recyclable waste, so the cost savings with the destination of non-recyclable materials.

The Table 1 shows the inventory of solid waste generated in the study area from 2007 to 2017, counting the amount of waste generated annually, the monthly average, the number of annual collections made by the contracted company, the monthly average of collections made, the annual amount paid by CDP for the final collection and disposal service and the monthly average of the amount paid.

Table 1 - Inventory of solid waste at CDP.

Year	Annual amount of waste generated (kg)	Average monthly (Kg)	Number of collection / year	Monthly average	Total value of service (R\$/year)	Average monthly (R\$)
2007	10.763,00	896,92	232	19,33	69.600,00	5.800,00
2008	10.435,50	869,63	231	19,25	69.300,00	5.775,00
2009	9.558,00	796,50	222	18,50	66.600,00	5.550,00
2010	8.740,00	728,33	218	18,17	65.400,00	5.450,00
2011	8.105,00	675,42	215	17,92	64.500,00	5.375,00
2012	5.713,00	476,08	167	13,92	50.100,00	4.175,00
2013	4.861,00	405,08	115	9,58	34.500,00	2.875,00
2014	4.879,00	406,58	103	8,58	41.097,00	3.424,75
2015	3.389,00	308,09	90	8,18	39.334,75	3.264,55
2016	4.942,00	411,83	73	6,08	29.127,00	2.427,25
2017	3.286,00	298,73	37	3,36	14.763,00	1.342,09

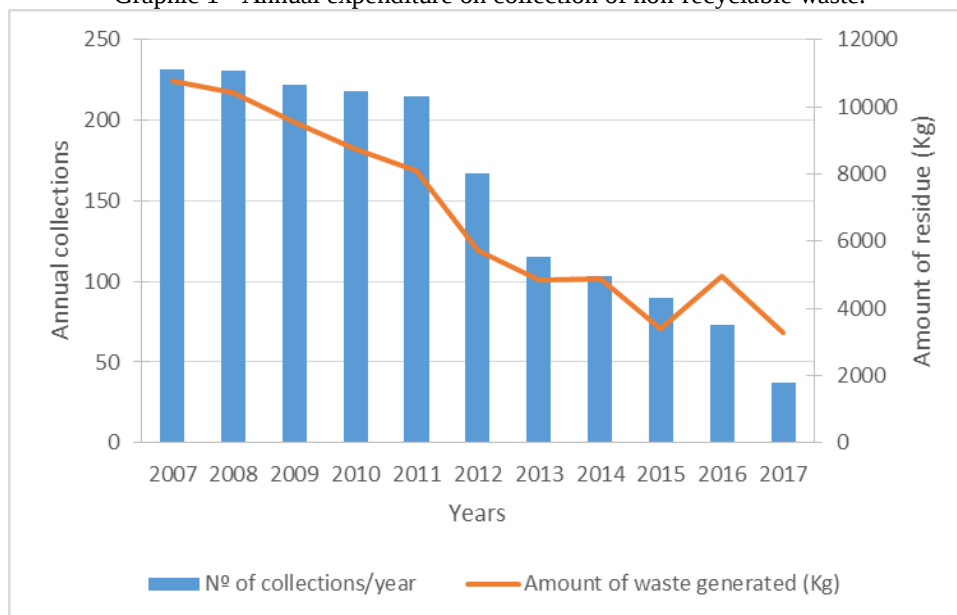
Source: Authors (2018).

Table 1 shows that the highest amount of waste generated annually was the years 2007 with 10,763 kg and monthly average of 896.92 kg and in 2008 with 10,435 kg and a monthly average of 869.63 kg, which is due to the process of adaptation of the company and its employees to the new policy, begun in 2008, besides the implementation of changes in habits and behaviors regarding the disposal of solid waste. The quantity of waste generated, consequently the number of collections made, decreased throughout the study period, with 9,558 kg in 2009 with 222 collections, 10% less than in 2007. In 2012, the number of collections reduced to 167, totalizing 5,713.00 kg, a reduction of 53% in relation to the year 2007.

In the period from 2012 to 2017, there is a considerable decrease, with the registration of 167 collections in 2012, totaling 5,713.00 kg of waste, while in 2017 there were only 37 collections for 3,286 kg of material.

The Graphic 1 adequately represents the process of evolution of the selective collection program implemented at Companhia Docas do Pará in 2008.

Graphic 1 - Annual expenditure on collection of non-recyclable waste.

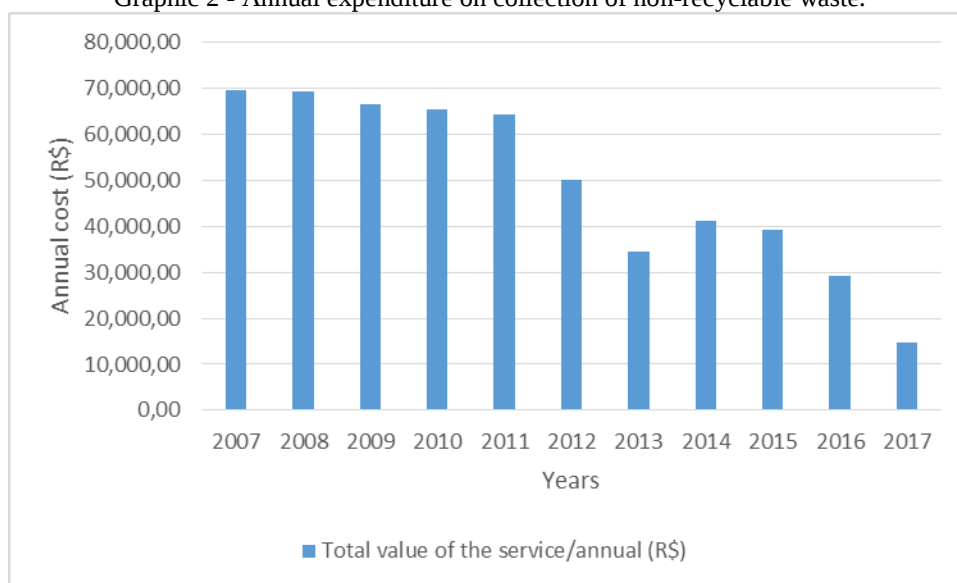


Source: Authors (2018).

After analyzing Graphic 1, it can be inferred that the program had a high rate of acceptance and collaboration by CDP employees, resulting in a considerable reduction in the annual production of non-recyclable solid waste, consequently in the reduction of collections by outsourced companies.

This implies directly in the mitigation of funds destined to the collection of non-recyclable waste, as observed in Graphic 2.

Graphic 2 - Annual expenditure on collection of non-recyclable waste.



Source: Authors (2018).

As shown in Graphic 2, it is possible to affirm that the implementation of the selective collection in the CDP obtained positive results with the reduction of waste generation, the contribution with cooperative members in economic vulnerability, the reduction of materials to be disposed in landfills, besides the significant reduction of funds destined to outsourced companies for the annual collection of solid waste, representing between 2007

and 2017 a financial savings of approximately R\$ 339.543,00, even taking into consideration the readjustment and increase of the collection price , as previously mentioned.

CONCLUSION

This research reveals positive results with the implementation of a selective collection system at the Companhia Docas do Pará - CDP, since they understood the environmental factor by reducing the waste generated, fomented social inclusion of the cooperative of the cooperative that receives the recyclable materials, increase of the income of the cooperative, consequently of the collectors, in the economic factor with the reduction of costs with the destination of the waste generated in the company, as well as the advances in the educational context with the notorious environmental awareness that some employees developed besides the benefits to the environment with the contribution to increase the useful life of the controlled landfill, decrease of the use of raw material, consequently reduction of the costs of production; mitigation of soil, water and air pollution. Therefore, it is concluded that the selective collection is an adequate alternative of environmentally favorable destination of the recyclable solid residues generated in administrative institutions in the Amazonian context. Emphasis is placed on the important participation of employees who responded very positively in the process of implementation and maintenance of the program, contributing almost totally to the efficiency of selective collection. Other important actors in this procedure are the employees of the general services area who also contributed a lot, continuing the activity, because the employee discards the waste in the collector segregating adequately at the source, however if the cleaning professional does not give adequate continuity, collect in the same bag only similar waste, the process becomes flawed and over time unsustainable.

Considering 232 collections made in 2007, the value for collection R\$ 300.00, the total paid the contracted company that provided the service of collection, transportation and final destination was R\$ 69,600.00, as well as the generation hypothesis of this same amount of waste in subsequent years, CDP would disburse a total of R\$ 880,440.00 in the period from 2007 to 2017. However, the selective collection was implemented and over the years it has shown a viable program in all aspects, thus, the real cost with the service was R\$ 540.897,00, generating savings of R\$ 339.543,00 on average of 30.867,55 per year for the same period, even considering the increase in collection service that cost R \$ 300.00 in the period from 2007 to 2013, suffering a readjustment of 33% in 2014, costing R \$ 399.00.

It is worth to mention that one of the greatest difficulties encountered at the beginning of the implementation of the policy for the separation of recyclable waste was with the company's own employees, since there are no public policies for selective collection in the cities, for daily practice in their residences. Cultural transformation is a difficult process, requires patience, persistence and in this case, convincing power. Therefore, after numerous and continuous interventions of the environmental sector with the employees it was possible to obtain all the positive results already exposed.

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The cooperative also had economic benefits, since the CDP became a permanent donor and the waste that is destined for the aforementioned cooperative does not need sorting, because it already arrives separated and sanitized when necessary.

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