

EVALUATION OF THE URBAN SOLID WASTE MANAGEMENT OF THE COOPERATIVE COOCAMARJI IN JI-PARANÁ, RO, BRAZIL.

Nilra de Souza Pinheiro Lôbo¹; Flávio José Nery Conde Malta ^{1*}; Maria Dolores Alves Cocco ^{1*}.

¹. University of Taubaté - UNITAU
Environmental Science Master Programme

*Correspondent authors: e-mail: relacionamento@unijpa.edu.br , flavio.malta@unitau.br,
maria.cocco@unitau.com.br

ABSTRACT

The article presents the results of the evaluation of the management process of urban solid waste recycling in course by a cooperative in the municipality of Ji-Paraná, state of Rondonia, Brazil. Three evaluation methods were used: a semi-structured interview focusing the analysis of a profile of the recyclable waste collectors; identification and quantification of urban solid waste and the elaboration of a spreadsheet for comparing local policy and the national guidelines for urban solid waste collection. Despite the fact that the municipality of Ji-Paraná does not practice the selective collection of urban solid waste it was found that the cooperative processes only 54,11% of all produced waste in which the most recyclable material is iron, followed by plastic bottles and cardboard although those are the less negotiable materials carried out by the cooperative. Workers at the cooperative are mostly man whose salaries are more expressive, between one and two minimum wages, and that only 5% earn more than three minimum wages. For more than 81% of the cooperated the total working day amounts from nine to twelve hours basically related to selecting waste material to be recycled. It is concluded that the integrated evaluation method applied to this case has allowed a better and comprehensive view over the process of managing urban solid waste at Ji-Paraná. The most acute problem is seen to be the lower wages associated to a long working day journey, as well as a fragile system of commercializing products by the cooperative.

Keywords: Environmental science, environmental impact, urban solid waste.

Avaliação da gestão de resíduos sólidos urbanos da cooperativa coocamarji em Ji-Paraná, RO, Brasil.

RESUMO

Este artigo apresenta os resultados do processo de avaliação de gerenciamento dos resíduos sólidos urbanos (RSU), através das ações socioambientais realizadas por uma cooperativa de catadores de materiais recicláveis, no município de Ji-Paraná, no estado brasileiro de Rondônia. Três métodos de avaliação foram utilizados: entrevista semiestruturada para a análise do perfil dos catadores de materiais recicláveis, identificação e quantificação dos resíduos sólidos urbanos e a construção de planilha de comparação da política pública municipal e as diretrizes nacionais de resíduos sólidos. Ainda que o município não possua um serviço de coleta seletiva de RSU, verificou-se que a cooperativa processa apenas 54,11% de todo resíduo que é produzido, onde o ferro é o material mais reciclado, seguido do pet, do alumínio e papelão, que são os resíduos menos comercializados pela

cooperativa. Os cooperados, por sua vez, são de maioria masculina, onde se observou o ganho mais representativo, entre um a dois salários mínimos e somente 5% recebem acima de três salários. Conclui-se que a integração de métodos da pesquisa permitiu uma visualização sobre a gestão de resíduos urbanos onde o maior problema é a baixa remuneração associada à elevada carga horária de trabalho, a baixa valorização dos produtos comercializados pela cooperativa, que gera impacto negativo em relação à permanência dos associados, além da falta de incentivo público dos órgãos municipais em implantar a coleta seletiva que facilitaria as ações socioambientais dos catadores.

Palavras-chave: ciências ambientais, impacto ambiental, resíduos urbano.

1. INTRODUCTION

The collection of urban solid waste in Brazil begun in the decade of 80-90 and since then it has gained importance by means of recycling materials due to the exhaustion of natural resources and environmental degradation.

Urban solid waste has become one of the most serious threats to the environment and consequently to all forms of life (Zaneti, 2003). In Brazil, people who work as urban waste collectors begun to organize themselves in cooperatives or associations from 1980 onwards. Their first aim was to their working activity to gain recognition as profession and thus getting the support from non-governmental institutions a great number of meetings were part of the national agenda so that in 1999 a new popular movement came about to support workers at the collection of urban solid recyclable waste, the National Movement for Recyclable Solid Waste Collectors- MNCR, 2015.

As a result the working activity was recognized legal by the Ministry of Work by force of a ministry decision number 379 in October 2002. According to this document those are the workers who collect recyclable solid waste material such as cardboard, plastic, glass and others. (Brazil, 2002)

According to Gonçalves ,2003, there are four types of collectors: Those who commute from one urban center to another , called “trecheiros”, are mainly collectors of cans as a means to feed themselves up; those who locate their activity inside the dumping ground without any fixed working journey sometimes as a complementary money to a temporary working activity related to building construction; the individual collector who works isolated and at their own cost pushing his wheelbarrow all the way thorough the neighborhoods, and finally, those who belong to structured cooperatives or NGOs.

In 2003, there was the First Latin American Waste Collectors Congress when a document titled Letter of Caxias do Sul was issued as an important way to narrow down dialogue amongst workers and unify an agenda of their claims in South America.

The second Congress happened in 2005 when a more oriented movement of the workers has strengthen and fortified the importance of cooperatives and associations as well as the making of public policies and legislations concerning their working activity.

In 2008, there was the III Latin American Recyclable Waste Collectors Congress in Colombia, in which a document titled Letter of Bogotá was issued with a view to reinforce the importance and the commitment of participating organizations to mobilize at a global scale for the recognition of their profession.(MNCR,2015)

The municipality of Ji-Parana, in the state of Rondônia, Brazil, in accordance to the National Policy for Solid Waste, valid for all Brazilian municipalities, has created in November 30th, 2010, the Cooperative of Workers in Recyclable Waste Material – CCOCAMARJ, with a main objective of increase economic value of recyclable material and social recognition of waste collectors, promoting their role as environmental transformation

agents and as relevant workers for society wellbeing. (Ji-Paraná, 2010)

According to Romani, this attitude from the municipality of Ji-Paraná is defined as a proactive solid waste policy in that it has a sense of contributing to society consciousness of the need to reduce waste production. (Romani et al, 2017).

As well as waste discard is carried out in controlled landfills following national legislation NBR 8849/1985, a technique of disposing urban solid wastes down to the ground without menacing public health and security and reducing environmental impacts. (ABNT, 2017)

The waste collector stands within such a context as an agent of promoting recycling from its beginning when urban solid waste is separate from other trash along the streets and hand out to recycling organizations therefore aggregating value to all material subjected to further transformations. (Calderoni, 1988).Valle, 2000, has put that recycling is a way for remaking the whole cycle of waste materials, bringing them back to its origin as raw material, even those more difficult to degraded can be reprocessed and to keep its original characteristics. The recycling process involves selective collection, screening, processing, packing and storage.

According to Souza (2014) the municipality of Ji-Paraná does not provide a public system of solid waste collection, but only its separation into those which can be recycled. This activity is done by the collectors at the local cooperative, COOCAMARJ.

Thus, it can be said that this research and its results are relevant because it verifies all the stages in the urban solid waste management carried out by the cooperative in Ji-Paraná, state of Rondonia, Brazil. Moreover the research also has aimed to support the National Program of Technical Education and Employment (Pronatec) in providing education for the collectors in partnership with the Ministry of Environment. (MMA, 2016)

2. MATERIAL AND METHODS

2.1. The study area

Ji-Paraná is a Brazilian municipality in the state of Rondonia, with 131.560 inhabitants in 2016, according to the Brazilian National Institute for Geography and Statistics – IBGE. It is the second more populated municipality in the state and the fifth in terms of demographic density, about 19, 1 person per square kilometer. It is located at 363 km from Porto Velho, the state capital.

In looking at table 1, related to the economic profile of Ji-Paraná, it is possible to say that the municipality's economy is based on a tertiary economic sector mostly dominated by commerce and services.

Table 1: Number of formal employments in the municipality of Ji – Paraná extracted according to productive sectors of local economy between 2014 and 2015.

Sectors of the economy	2014	%	2015	%
1 – Mineral extraction	104	0,4%	88	0,3%
2 – Manufacturing industry	4.746	17,0%	4.465	16,1%
3- Industrial services of public utility	205	0,7%	217	0,8%
4– Building construction	1.576	5,7%	1.604	5,8%
5 – Commerce	10.409	37,4%	10.302	37,2%
6 – Services in general	7.051	25,3%	7.229	26,1%
7–Public administratiion	3.044	10,9%	3.074	11,1%
8 – Farming, fishing and hunting	703	2,5%	716	2,6%

Total

27.838

27.695

Source: Rais/TEM, 2016.

Data from the Brazilian National Institute for Geography and Statistics – IBGE , 2010, show the municipality of Ji-Paraná progressing in the ranking of human development indicator (UN), going from 0,433 in 1991, considered low, to 0,714 in 2010, considered by the UN as a high development standard. The amount of solid waste collected in Ji-Paraná is 100 tons per day which means a monthly production of 3000 tons according to the firm responsible for street cleaning, collection and transportation of urban solid waste in the municipality.

2.2. The cooperative of recyclable urban solid waste in the municipality of Ji-Paraná.

The research was carried out in the Cooperative of collectors of recyclable urban solid waste of Ji-Paraná, the COOCAMARJ. The controlled landfill is located in the Southeast of Western Amazon at latitude $10^{\circ} 53' 07''$ S and longitude $61^{\circ} 57' 06''$ W, a rural area far seven kilometers of urban area, occupying an area of 45 hectares. The access to this area is possible through a rural, unpaved road, distant 1600 meters from the federal road BR-364, connecting Ji-Paraná to the capital of the state of Rondonia, Porto Velho (RO).

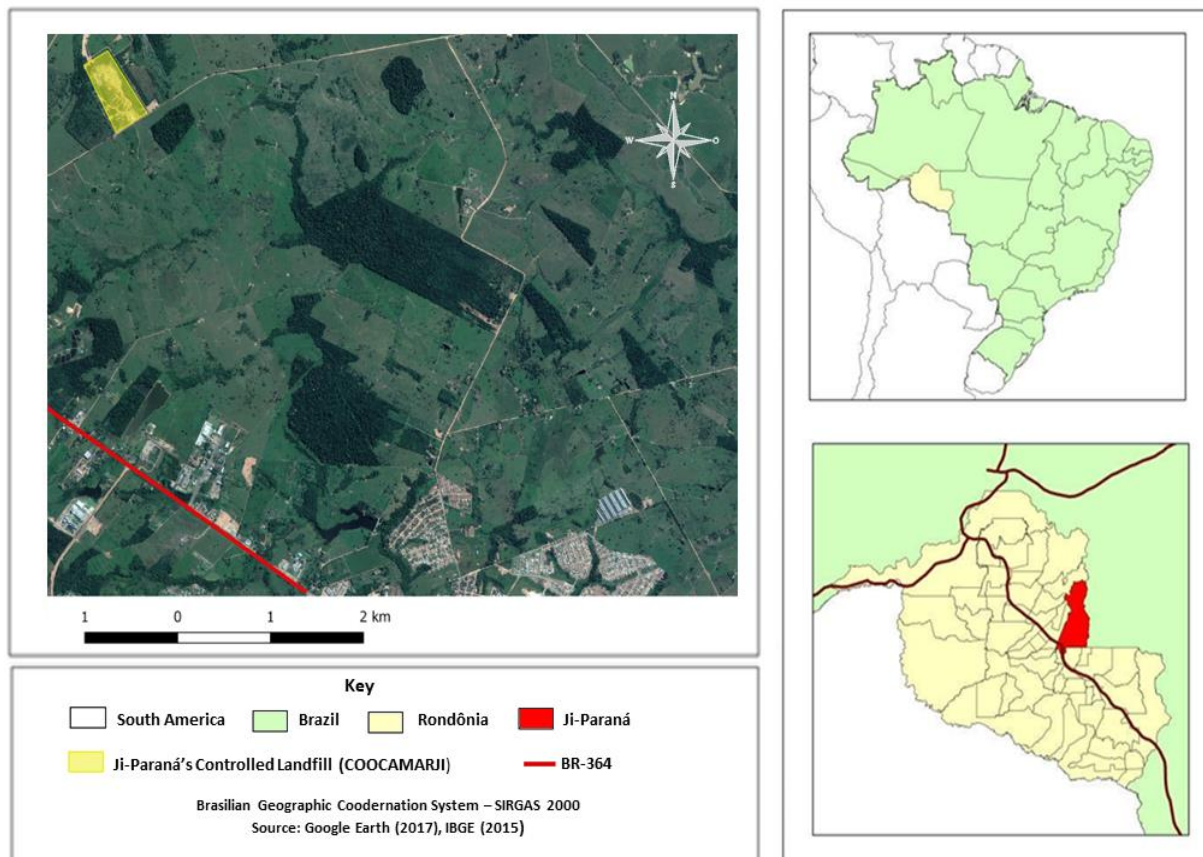


Figure 1: Location of the COOCAMAR landfill in Ji-Paraná, Rondônia, Brazil.
Source: Google Earth, 2015 and IBGE, 2015.

2.3. Methodology Proceedings

This is an exploratory research that takes a case study as a strategy for getting a quantitative analysis. The cooperative of collectors of recyclable material in the city of Ji-Paraná was chosen as a case because it represents the principal financial source for a community under social and environmental risk.

The selection of indicators was based on the Municipal Plan of Integrated Management of Solid Waste in Ji-Parana, produced by the municipality in 2012. This local Plan supports the National Policy for Solid Wastes as a condition for getting access to federal resources and contemplates the principal objectives defined in the National Plan, such as technical, institutional, administrative, legal and social economic aspects. More specifically, the local plan indicates the need for implementing different actions towards the collection and final disposal of solid wastes, including programs of environmental education and selective collection of urban solid waste materials.

The strategy for collecting data in this research included interviews with open and closed questions, in order to identify socioeconomic profile of workers at the cooperative, and verify their accordance to the activities, the organization and management as well as social and environmental aspects such as quality and risks to worker's health based on their level of satisfaction in relation to the performed activities.

Data obtained were analyzed and tabulated and further on they were compared to what is proclaimed by existing legislation so that it could be possible to define levels of vulnerability in worker's security.

3. RESULTS AND DISCUSSION

3.1. Profile and level of satisfaction of urban solid waste collector's activity

First of all it was seen the social and economic profile of the workers of COOCAMARJI. There were 24 workers interviewed in which 48% were 40 years or more old, and only 19% were less than 20 years old. The majority of the interviewed workers are man, about 57%, whose role is to be the head of their families. Among those 64% share their work with their companions. Around 82% of the interviewed workers are married or have a stable relationship. Those without companionship were considered bachelors. Therefore the research has also considered in his universe all workers whose marital status include those who were never legally married, separated, divorced and widows as well.

This data was associated to the worker's number of children and it was found that only 21% of them have no children and that 38% in the same universe have more than three children. More than half of the interviewed have their own house, about 58% of all. Those are the workers that were contemplated by the Federal Housing Program, "Minha Casa Minha Vida" which has a target on low wage people but no exclusive policy for those who work with the collection of urban solid waste. Another 34% of the interviewed pay their monthly rent, and only 8% live in borrowed houses. All 100% of interviewed workers have access to electric energy.

3.2. The characterization of the urban solid waste collector's profession.

In the following moment, research data was raised from the professional activity of the urban solid waste collectors in Ji-Paraná. It was found that most of the interviewed, about 57%, work at the cooperative for more than five years, and only 33% of them are cooperated for less than one year. Their income at COOCAMARJ results of their productivity, calculated on the basis of the amount of recyclable material collected, a model taken from other cooperatives and considered to be more efficient.

However, workers argue that before this model was adopted there was a fixed salary to all cooperated but it was changed because of low productivity and lack of efficiency in the selection of recyclable material with a direct impact on the amount of money received by each work.

Nowadays, the workers are conscious that the higher the amount of hours dedicated to the cooperative, the greater will be their income, usually varying from one to two minimum wages.

According to data collected only 38% of workers associated to the cooperative in Ji-Paraná, perceive less than one minimum wage, and around 57% of them perceive between one and two minimum wages, corresponding today to R\$ 1600,00 (one thousand and six hundred reais). Only 5% of the cooperated workers perceive more than two minimum wages because their amount of working hours is bigger than the others.

Amongst the 24 workers interviewed 81 % had declared their wage as insufficient for sustaining their families, and had complained of financial difficulties due to the low value attributed to the commerce of recyclable material. It was noted also that for 18% of cooperated workers the income perceived with their activity is sufficient given the fact that they are married or living together but without children and both contribute with their basic needs and expenses.

Individual daily working hours varies from eight to 12 hours depending on each worker, and for each one there are some salary deductions expenses , such as water, electric energy, telephone as well as other fixed items like fuel and conservancy of vehicles belonging to the cooperative.

Financial funds are those exclusively originated from urban solid waste collection and recycling and further selling to intermediate buyers who pay for prices under the market value. Consequently it generates a finance dependence coming out from anticipated money from future collection and recycling.

There is no bank credit line for the cooperative which could help in improving their services and make more money from selling their product in the market.

3.3. The COOCAMARJ management process according to their associates.

Based on the answers given during the interview, as well as the identification and profile analysis of the workers of COOCAMARJ together with the results of the interview made with the actual manager of the cooperative, it can be noted that there is a poor result in the management process. One reason is that the manager himself is excessively concentrated in operating the process therefore unable to dedicate his work as manager and planner concerned with the cause of the problems instead of their effects.

Another reason is the lack of knowledge on management of the cooperative, although 54% of interviewed workers has considered the present management as a good one others had no answers to more open questions like who are the buyers for the recyclable material, what amount is taken to commerce monthly and with what regularity to mention a few.

The organizational structure based on hierarchical command as established in the statute of the cooperative is well accepted by the workers in spite of their poor knowledge of administration and strategic planning what makes necessary management capacitation as to face the present and future questions.

Finally it can also be noted that 84% of the interviewed workers don't have any idea of the prices of which the material is sold out because of an excessive concentration of administrative tasks on the cooperative manager.

3.4. Social environmental data associated to quality and risk to the workers' health

Monthly, the COOCAMARJI cooperative takes in 85000 kg of urban solid waste collected in the city of Ji-Paraná, in which 46000 kg are rejected and taken to the landfill, which means that only 54% of all solid waste collected is processed in the cooperative. Out of this percentage only 45% is really adequate to recycling, that is to say 39000 kilos in all waste taken to the cooperative.

The cooperative is responsible for the final destination of all waste not possible to be recyclable and in order to accomplish this task it has to allocate his workers at expense of the whole management process which in turn has to be done rapidly not to accumulate mixed organic material on the recycling floor.

In the following table 2 it is possible to see the percentage of waste material selected for recycling.

Table 2 – Monthly production of solid waste material adequate to recycling in COOCAMARJI Cooperative.

Amount of collected Solid waste material in tons.		
Material	Weigh	Percentage (%)
PET	6	15,38
Aluminum	1	2,56
Iron	22	56,41
Plastic	3	7,69
Plastic bag	5	12,82
Cardboard	2	5,12
Total	39	100%

Source: COOCAMARJI, 2016

In the process of solid waste separation for recycling there is no defined routine none a description of how it should be done concerning the operation itself and the use of equipment for individual protection (EPI), as determined by the national legislation (Law number 6514 of 1977), particularly the NR 6, concerning the need for daily individual protection of the worker subjected to constant and permanent risk to his health and the NR9, which demands for all firms the adoption of a program of environmental risk prevention.

Subsequently, some risks were identified in the COOCAMARJI process such as a lack of thermal control affecting human comfort, chemical risk deriving from contact with chemical waste like batteries and biological waste like syringes and needles. It has been noted a lack of a proper lighting in certain working areas and the presence of possible ergonomic risks due to excessive loading and repetitive movements.

Only 14, 7% of workers in the cooperative have assumed that their activity may be harmful for their health although that has been a relative perception among them. Some workers referred to ground contamination and others to problems with bad smell, virus infections and various forms of contamination deriving from their contact with the waste.

4. CONCLUSION

A selective urban waste collection is a necessity in Ji-Paraná given the fact that the amount of disposed waste has increased as shown in the results of this research. If that happens, more employment posts can be created and absorb urban waste collectors into a more rentable, controlled and healthy activity.

Nevertheless, in order to the work at the CCCAMARJI cooperative be more rentable it may be necessary to set up a commission with a purpose of creating an adequate management process able to qualify the manager and its team to assess the question of collecting urban solid waste in Ji-Paraná within a broader scope in recycling other types of waste material and consequently be more profitable.

An improvement in the income of the cooperative can only be possible when a new management process is applied to it. Low wages, one of the main problems as found, as well as the long working hours are great obstacles for the success of the cooperative and a significant impact on consolidating a fixed working team and the recruitment of new ones.

Finally it is recommended improving training, capacitation and consciousness of the workers as a way to minimize health and risk problems in the process and optimize a better output from the activities in accordance to existing legislation. It is expected that the results of the research may subsidize evaluating the management process of recycling urban solid waste in Ji-Paraná by introducing social and environmental actions based on local policy development.

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