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# Occupational safety and health in the screening of municipal solid waste in coop cidade limpa of Santo André

Eliana Vileide Guardabassio[a], Moacir Dias[b], Raquel da Silva Pereira[c] , Lilian Venturi [d]

[a] Master in Business Administration from Universidade Municipal de São Caetano do Sul - USCS. Professor and Undergraduate Course Coordinator at Faculdade de Mauá - FAMA / UNIESP, São Paulo, SP - Brazil, e-mail: eliana.vileide@yahoo.com.br

[b] Master in Business Administration from Universidade Municipal de São Caetano do Sul - USCS. Professor at Universidade Municipal de São Caetano do Sul (USCS) - São Caetano do Sul, SP - Brazil, e-mail: moacir.dias@uscs.edu.br

[c] PhD in Social Sciences from Pontifícia Universidade Católica de São Paulo (PUC / SP). Professor at Universidade Municipal de São Caetano do Sul - USCS, São Caetano do Sul, SP - Brazil, e-mail: raquelspereira@uscs.edu.br

[d] Master in Business Administration from Universidade Municipal de São Caetano do Sul (USCS). Professor at Universidade Nove de Julho - Uninove, São Paulo, SP - Brazil, e-mail: lilian.venturi@gmail.com

## *Abstract*

This paper presents exploratory search held in cooperative Coop Cidade Limpa, Santo André – São Paulo. It is aimed at verifying risks of accidents and occupational diseases in the screening of Municipal Solid Waste. The study started from the following question: What are the risks posed to workers in the sorting of waste in cooperatives? It was performed through on-site observation, accompanied by interviews with the members in their work activities. The data were used to describe the risks of accidents and industrial diseases. It demonstrated the awareness of people regarding the risks in dealing with waste and cooperative processes.

***Keywords***: *Cooperatives. Risks. Accidents. Safety, Occupational Health.*

## Introduction

Due to population growth and stimulating consumption, the environment suffers various degradations because world consumption is above the carrying capacity of the planet Earth. Thus, humanity threatens to deplete natural resources at a rate that exceeds the capacity of reconstruction (GOLEMAN, 2009).

Many sectors of society have been discussing the issue of waste generated by a capitalist form of exacerbated consumerism as well as proposals for systemic management, involving segments grouped in seeking solutions to the socioeconomic and environmental issues arising from the disposal of waste. It is necessary to minimize the generation of waste to rational levels, from the reduction of consumption and finding alternatives for the recycling of materials, to the extent where their production is inevitable, although there is a reduction (CALDERONI, 1999).



The contribution of recycling provides several positive factors such as preserving natural resources, reducing the amount of waste generated by households and industries in order to reduce environmental pollution, and generating jobs and income for many people.

For recycling to happen, it becomes necessary to raise awareness of the population and especially the managers of firms in relation to the practice of sustainable consumption, which involves the reduction and product reuse before disposal. It should always make the inevitable waste return to productive cycle by leveraging the already existent added value.

The efficacy of the selective collection at the municipal process implies the involvement of different agents: the pickers of recyclable materials, the local government; community, condominiums, clubs, schools, businesses and citizens.

One of the main strategies in partnership with the government is social inclusion of scavengers by organizing them into cooperatives, such as the Clean City Coop, object of this study.

The theme was chosen due to the growth in the number of cooperatives that receive and separate waste, where cooperators are vulnerable to accidents and occupational diseases due to exposure to risk agents.

Ignoring the risks in the work environment can provoke accidents and occupational diseases in dealing with these residues and the absence of proper use of personal protective equipment, as indicated in Norm NR-6 and OHSAS 18001, can pose a threat to the physical integrity of a worker.

The study started from the following question: What are the risks posed to workers in the waste sorting in cooperatives? This study aimed to identify and describe the environmental risks of handling waste until referral marketing of recyclable material and unserviceable material or waste to landfills.

The research is exploratory and descriptive case study and the Clean City Coop was created with the cooperation of the members in their work activities. Descriptive research aims to describe the characteristics of a given population or phenomenon, or establishing relationships between variables. It required the use of standardized techniques of data collection: questionnaire, interviews and systematic observation.

It began by researching the theoretical framework on selective collection of municipal waste, recycling, occupational accidents and diseases and environmental haz-

ards, which make up the second item of this article. The third item presents the methodology and field research, with the presentation of data in item 4. Analysis of data is presented in Section 5, followed by concluding remarks in section 6 and references used.

## Theoretical platform
## Solid Waste



The global concern about problems related to waste and the environment is contained in the final report produced by the Conference of United Nations on Environment and Development held in Rio de Janeiro in 1992 (ECO, 92). The document proposes that one of the main commitments of humanity to future generations is the way to achieve development that is more sustainable, reconciling social justice, economic efficiency and environmental balance (CAVALCANTI, 1995).

According to NBR 10004/2004, solid waste is defined as waste in the solid state, semisolid, which results from activities of the community of origin: industrial, domestic, hospital, commercial, agricultural, service and sweeping. In this definition we include sludge from water treatment systems, those generated in equipment and plants for pollution control, as well as certain liquids whose characteristics make it impossible for them to be released into public sewage system or water bodies, or that require technical and economically unviable solutions taking into consideration the best available technology solutions.

The Brazilian Association of Technical Standards - ABNT classified the waste as follows:

> a) Class I – Those that due to their characteristics of ignitability, corrosivity, reactivity, toxicity and pathogenicity, may present a risk to public health, causing or contributing to increase in mortality or incidence of diseases and/or have adverse effects on the environment when handled or disposed of improperly.
> b) Class II - The aggregates are not considered those that do not fall into the waste classifications and class I or class III, may have as properties flammability, biodegradability and water solubility.
> c) Class III - Considered inert, are those subjected to the solubilization test (NBR 10.006 - Solubility - Waste Procedure) do not have any of their solubilized constituents in concentrations above the standards defined in Listing Nº 8 - Standards for testing solubilization of the standard (ABNT-NBR 10004, 2004).

The management of solid waste is associated with the control of generation, segregation, storage, collection, transportation, processing and disposal of waste in accordance with environmental, economic and public health principles (TCHOBANOGLOUS et al, 1993). Waste management must be integrated, with close monitoring of the entire waste cycle, from generation to final disposal, using techniques compatible with the local technology (LEITE, 1997).

## Selective Collection

Separate collection is characterized as the process of separation of recyclable materials such as paper, glass, plastics and metals from the rest of waste in their own generating sources.

According to Lajolo (2003), the process of selective collection is divided into five stages, with different agents taking part in each. In the first stage, industries, commerce, service providers, institutions and the general public generate solid waste. Some of these agents currently already separate the recyclable from organic material. The second step is selective collection, which can be accomplished by autonomous collectors, private garbage collection companies or the local council. This is the most important part, and perhaps even today, the least valued by the society.

Next, there is the sorting and classification step, also by waste collectors and wastepaper wholesalers where the material is separated by type, classification and pressing. This step requires major technical knowledge on the part of agents for handling of materials, more than in the two previous ones, because they need to know exactly what the composition of the material is and how it can be recycled.

In the fourth stage, the recyclables can be received by cooperatives or specific recycling companies for some sort of processing, such as granulation of plastic materials. Finally, in the fifth stage, the material is sent to the industry where it is finally recycled into a new product, and thus returns to the market to be consumed again.

The municipal selective collection can have more of an executing agent. Responsibility for municipal cleaning is down to the local council or to whom it delegates it. In a survey conducted by Business Commitment for Recycling - CEMPRE in 2012, it was found that 48% of selective collection is performed by the local council itself, 26% is performed by contractors, and 65% supported maintaining or recycling cooperatives agents as executors of selective municipal collection(CEMPRE 2012).

> The most successful programs are those in which there is a combination of models of selective collection:
> Most municipalities still collect door-to-door (88%);
> The Voluntary Delivery Stations are alternatives for the population to participate in selective collection (53%);
> The support for the hiring of recycling cooperatives, as part of the municipal waste sorting, continues to advance (72%) (CEMPRE, 2012).

The efficacy of the selective collection process at the municipal level must involve different agents: the pickers of recyclable materials, local government, community, condominiums, schools, businesses, screening plants through cooperatives, associations, NGOs and citizens in general.

## Recycling

It is described as the process of reuse of post-consumer waste as raw material to manufacture new products. The recycling results from actions through which the waste would become garbage or where the garbage is collected, segregated, benefited

and processed for reuse as raw material in the manufacture of other goods previously made only with virgin material (GRIPPI, 2006).

To CEMPRE (2005), recycling per se refers to the return of waste to industries where they will be reprocessed and used to manufacture new products. This process does not begin in recycling, but at an earlier stage, and it is necessary in order to put into practice sustainable consumption, reducing and reusing as much as possible the packaging and consumer products. To that end, one should give preference to products with less packaging, reusable ones, easily recyclable, or those that have been recycled.

All possible waste returning to reprocessing industries and subsequently back to the consumer market is considered recyclable. The most commonly considered recyclable materials are aluminum, iron, paper, cardboard (boxes), construction debris, yarn, paint cans, plastic and glass.



Some are considered recyclable paper: sheets and scrap of paper, newspapers, magazines, cardboards, and cards, envelopes, writing drafts, photocopies, brochures and general printing. Recyclable metals are: aluminum cans, steel cans, fittings, pipes, window frames and wire.

Recyclable plastics are: caps, containers, jars of food, thermoplastic polymers (known as PET), mineral water bottles, containers of cleaning and toilet products, PVC, plastic bags, toys, buckets, besides the famous disposable party and birthday items (plates, cups and cutlery). Glass is recyclable: pots, cups, bottles, jars, sauce containers, jelly, medicines, among others, and glass bottles in general. Other materials are commonly mistaken and are not recyclable glass: mirrors, lamps, ceramics, porcelain, crystal and ampoules of drugs (VILHENA, 1999).

According to CEMPRE (2012), of 5,563 municipalities, only 766 have selective collection systems operated by local councils, which leverages the importance of this type of resource to the success of recycling, wherever installed.

Recycling provides many benefits: cost savings with the disposal of waste; prevention of floods caused by improper waste disposal in the rainwater drainage systems; generating employment and income to social inclusion of waste pickers; increase the life span of landfills and contribute to environmental preservation. The first step it to realize the importance of recycling, but the biggest challenge is to contribute to make it happen, as it requires changing habits.

## Health and Safety

The 20th edition of the Social Security Statistical Yearbook - AEPS (2012) presents preliminary data of accidents recorded in Brazil in 2011. The number of accidents had increased slightly in 2011 (711 164) compared to 2010 (709,474). A larger number of workers lost their lives due to occupational accidents in 2011. There were 2,884 deaths, while 2,753 were recorded in 2010. The less serious consequences such as simple medical care and sick leave for less than 15 day periods accounted for 56.2% in 2011, up from 54.9% in 2010 (AEPS, 2012).

The 2012 yearbook conceptualizes work accidents as those related to performing work in the service of a company or by the exercise of the special working unin-

sured, causing bodily injury or functional, permanent or temporary disturbance that causes death, loss or reduction of work capacity.

Professional illness and occupational disease are both considered work accidents. Also equaling to a work accident are: the work-related cause which, though not the only cause, has contributed directly to the occurrence of the injury; certain accidents suffered by the insured at the place and time of work; illness resulting from accidental contamination of an employee in the performance of his activity; and the accident suffered in the service of the company or the path between home and workplace of the insured and vice versa.

Decree 3.214/78 created The Specialized Service in Safety Engineering and Medicine - SESMT in Brazil in 1978, due to a large number of occupational accidents. SESMT comprises medical professionals, occupational nurses, labor safety technicians and engineers, and it aims the prevention of accidents and diseases in order to permanently work with the preservation of life, the promotion of workers' health and professional environment, ensuring a more effective level of safety and health for all workers.



> [...] Work disaster is what occurs by exercising work for a company with an insured employee, independent worker, resident physician, as well as the specially insured, in the exercise of their activities, causing injury or functional disruption to cause death, loss or reduction, temporary or permanent capacity for work [...]. (LAW nº. 8213/91, Article 19).

Occupational disease is understood as the one acquired or triggered due to special conditions under which the work is done, and directly related to it, in a constant ratio mentioned in Annex II of Decree No. 3048/99.

For Hammer (2001), in an organization where employees are unaware of the work processes, the probability of risk is much greater because the flaws and deviations of processes can have negative health and environmental impacts on worker safety.

Soto (2000) points out that human beings need money for basic needs, so they are subject to any type of situation, often neglecting safety issues.

Among the possible reasons for accidents at work, Costa and Costa (2004) emphasize: social factors; inappropriate instruction; activities done in an unplanned manner; incorrect and/or inept supervision; violation of rules; improper work practices; improper maintenance; inadequate use of personal protective equipment; use of materials of unknown origin; incompatible layout; personal hygiene; excessive workload; lack of organization and cleanliness; overconfidence, carelessness; and working methods lacking pertinent risk factors.

Thus, occupational health features three concepts that explain some basic criteria on the application, such as the promotion of environmental conditions; control of the causative factors of diseases; and prevention, reduction and elimination of harmful causes (ARAUJO, 2006).

## Environmental Risks

The NR-9 Program - Prevention Program - PPRA, Decree 3214/78 of Ministry of Labor, presents the group of environmental risks. To be considered environmental risk factors, such agents need to be present in the workplace at certain concentrations or intensity, and the maximum time for worker exposure to them is determined by pre-established limits. Environmental risks are considered physical, chemical and biological agents, ergonomic hazards and risks of accidents, existing in workplaces that may cause damage to the health of workers.

- Physical risks: those arising from processes and production equipment and can be: noise, vibration, abnormal pressures relative to atmospheric pressure, extreme temperatures (high and low), ionizing radiation and non-ionizing radiation.

- Chemical hazards: those arising from the handling and processing of raw materials and include: dust, fumes, mists, gases and vapors.

- Biological risks: those arising from handling, processing and modification of microscopic living things including: genes, bacteria, fungi, bacilli, parasites, protozoa, viruses, and others.

- Ergonomic hazards: they are contrary to ergonomic techniques, which require workplaces to adapt to the man, providing physical and psychological well-being. Ergonomic risks are also linked to external factors (environmental) and internal (emotional), in summary, when there is dysfunction between the individual and their workplace.

- Accident Hazards: depend on the physical conditions, on improper physical work environment and technology, and are able to endanger the physical safety of the worker.

Diniz (2005) comments that the prevention of accidents must be performed by general measures of behavior, elimination of unsafe conditions and training of employees, with the mandatory use of individual protective equipment (EPI), including the supervision of all activities, and training of employees as to their proper use. The development of work procedures through SESMT and CIPA, according to Decree 3214/78, assessed the risks and patterns of work identified, charging all employees with safety and accident prevention.

The anticipation, recognition, evaluation and control of existing environmental risks, or those that may exist in the workplace, establish criteria according to which present risks in the company activities will be treated with the use of accident prevention programs.

The basic principle of a safety system based on legal considerations involves the need to establish valuation parameters that incorporate not only the operational aspects, but also the political, management, and top management commitment to the process, as well as change and continuous improvement of safety and health at work (QUELHAS; FILARDO ALVES, 2007).

The Program for Environmental Risk Prevention - PPRA and the Medical Control and Occupational Health - PCMSO inserted in organizations, aim to establish criteria and procedures, and allied to or shared with other systems, to ensure the identification, assessment and control of hazards and risks related to work, always with the goal of eliminating or neutralizing accidents and industrial diseases.

We consider that all this theoretical discussion about the risks in the workplace should also be applied to cooperatives in order to survey the existing risks and the environment in which they perform the separation process of solid waste.

## Methodology

The exploratory and descriptive research was from a case study in Coop Cidade Limpa, with the participation of cooperative members in their work activities. This study aimed to describe the characteristics of this particular population and the establishment of relationships between variables. Case study is a research strategy that examines a phenomenon in its natural state, multiple employing of the techniques of collecting and processing data, and specific approaches to the analysis thereof (YIN, 2005).

It required the use of standardized techniques of data collection: questionnaire, interviews and systematic observation. The study included document analysis and examination of records provided by the management of the organization.

According to Manzini (2004), there are three types of interviews: structured, semi-structured and unstructured. In this case, we opted for semi-structured. The interview was applied to 20 cooperators (56% of workers) in various activities, selected in their workplace. The questions were related to the knowledge of the member of the cooperative about the risk of accident or illness that work activity generated and its possible future consequences, should they have an accident or be affected by an occupational disease through selective collection of solid waste.

The observation as a tool for data collection brought information analyzed in this article that will serve for further research. Upon observing, visible data were recorded and the notes were made by Cursive record, using keywords check list and codes, which were later transcribed. A controlled and systematic observation becomes a bona fide scientific research instrument. It is realized with a proper planning of work and prior preparation of the researcher/observer (LÜDKE, 1986).

A survey was conducted in November 2012 through interviews, document analysis and on-site observation, and among the data collected included photos and recording videos. The footage captured sounds and images from many aspects that could be confronted with the statements and documents analyzed, providing greater reliability to the process, following the guidelines of Pine Kakehashi and Angelo (2005). Thus, the use of video allowed a greater degree of accuracy in the collection and analysis of information, a demonstration against the traditional questions of subjectivity of qualitative research.

## Data presentation
## Santo André and Urban Solid Waste

Santo André, municipality that is part of the metropolitan area of São Paulo, has an area of 174.38 km$^2$, of which 50% are in an environmentally protected area. The selective collection began to be implemented in 1997, with the pilot work in some

neighborhoods and public spaces and was expanded so that today 100% of the city is benefitted with this kind of collection.

The Municipal Environmental Sanitation Service - Semasa is a semi-public authority, and in 1997, expanded its services to cleaning, drainage, environmental management and civil defense. Santo André has its own landfill, home to the central waste treatment.

Table 1 – Data of Santo André

| |
|---|
| **Location: 18 km from São Paulo** |
| **Total area: 174.38 km²** |
| **Population - 2010: 676,407** |
| **Total Companies - 2010: 2,249 industries, 19,573 shops and 32,108 service providers.** |
| **Households - 2010: 239,634 (permanent private)** |
| **Vehicle fleet in 2010: 459,600** |
| **Index Paulista Social Responsibility (IPRS): Group I - high level of wealth, education and longevity.** |
| **HDI-M: 0.835 - 24th place in the ranking of the State of Sao Paulo** |
| **Annual per capita income - 2008: R$ 22,638 (2010 figures)** |
| **2010 Budget: 1.96 billion** |
| **GDP - 2008: R $ 15.20 billion (2010 values)** |
| **Formal employees - 2010: 193,991** |
| **Consumption Potential - 2010: U.S. $ 14.3 billion** |
| **Exports (2010): U.S. $ 669.69 million** |
| **Imports (2010): U.S. $ 662.56 million** |
| **Schools: Elementary: 223, Secondary: 98 and Higher: 12** |
| **Access to water supply: 98% of the population** |
| **Access to sewerage: 96% of the population** |
| **Access to solid waste collection: 100% of population** |

Source: Santo André Yearbook (2012).

The mode of waste collection is door-to-door, which is made up of waste collection in two broad categories: the wet waste (designation used for organic waste) and dry waste (recyclable waste). The collections occur on alternate days for each type of waste. Santo André has extensive collection, but the unions do not have the technical ability to invest in technology, the fact causing many casualties.

The collection of recyclables in city is between 32 and 40 tons a day. Waste is also divided between the Coop Cidade Limpa and another cooperative that also shares space in the landfill.

In addition to collection stations, Semasa also provides the population of St. Andre with 351 sites in the city equipped with PEVs (Voluntary Delivery Posts) consisting of a raffia bag specially designed to receive waste from dry waste sorting, allocated to places with high visibility, such as parks, supermarkets, schools and other establishments.

Recyclable waste is sent to two cooperatives located in the center of solid waste (Figure 1) that are Coop Cidade Limpa, with 36 members of the cooperative, and Coopcicla, the first cooperative of Santo André, with 69 members. Both were set up with the assistance of the local council, employing people attended by social reintegration pro-

jects such as drug addicts and the homeless. The financial management of these cooperatives is autonomous.

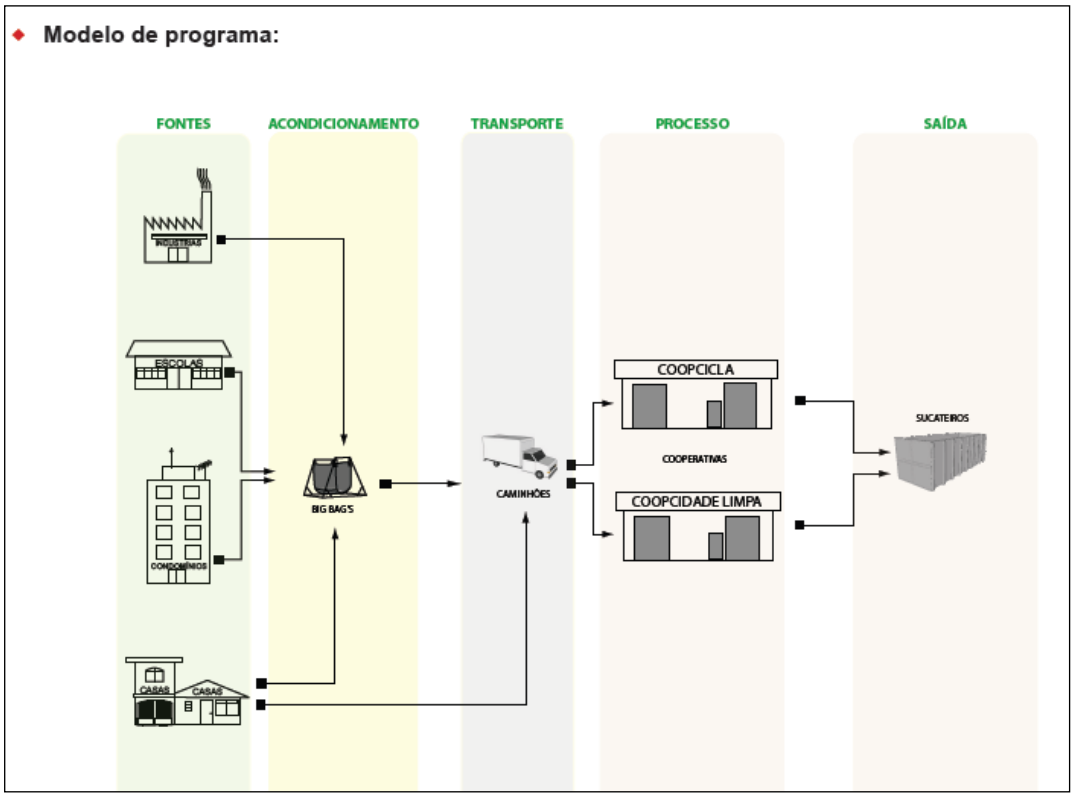


**Figure 1** – Program Model
Source: The authors.

When it comes to environmental education, the city first provided information and raised awareness of teachers so that they exert the function of multipliers, covering the public schools and later state ones. Teachers relied on books distributed by Semasa, together with the Municipal Education and training courses. The city maintains a project called School Park, where there are workshops and courses for environmental education and recreation, affecting all age groups.

Table 2 – Solid Waste Santo André

| | | |
|---|---|---|
| **Stations and Collection Stations Voluntary Delivery** | | |
| Operated by Semasa staff | 0 sampling stations | |
| Operated by employees of the Contractor | 15 sampling stations | |
| Voluntary Delivery Posts (ENP) | ENP 351 (in open areas) | |
| **Quantity of materials received at Seasons Collection** | | |
| Rants | 1.412,39 ton. | |
| Construction waste - DRC (aggregates, pruning, debris) | 32.368,52 ton. | |
| Wood | 48.000 m3 | |
| Lamps | 3.126,59 ton. | |
| Batteries | 5,86 ton. | |
| Tires | 1.066,61 ton. | |
| **Totals of Waste Recycling (tons)** | | |
| Sampling stations | 1.412,39 ton. | |
| Door to door | 6.263,50 ton. | |
| Large Generators | 519,32 ton. | |
| **Quantity marketed** | | |
| CoopCicla | 2.904,58 ton. | |
| Coop Cidade Limpa | 1.345,16 ton. | |
| **Solid Waste Collection** | | |
| Humid | 219.982,33 ton. | |
| Rants | 8.730,93 ton. | |
| Solid Waste Health | 1.456,03 ton. | |
| **Landfill** | | |
| Wet waste | 219.978,22 ton. | |
| Solid Waste Health | 1.418,29 ton. (Treated) | |
| Large waste generators | 4,11 ton. | |
| Reject Cooperatives | 4.187,19 ton. | |
| Reject Screening Wood | 175,98 ton. | |
| **Distribution of Daily Trash Collection in Santo André - 2009/2010** | | |
| Percentage of population served | 100% | 100% |
| Nº of Employees in the collection | 191 | 367 |
| Ton. of garbage collected/Day | 588,2 | 963,2 |
| Household garbage ton./Day | 522,6 | 611,05 |
| Hospital waste ton./Day | 7,9 | 4,0 |
| Industrial waste ton./Day | 1,0 | 1,0 |
| Recyclable garbage ton./Day | 16,4 | 24,3 |
| Municipal Waste ton./Day | 23,4 | 219,8 |
| Production per capita / day garbage (gr.) | 1.700,0 | 1.452,7 |

Source: Semasa, 2012.

Table 2 shows the mapping of solid waste collected in the municipality, with highlight to 2904.58 tons, processed and marketed in Coop City Clean.

## Coop Cidade Limpa

The cooperative was founded in 2000 and currently has 36 members, divided into administrative, financial and production functions. The waste received is separated

by categories such as glass, plastics and paper, which are then compressed and sent to the market.

It receives recyclable waste from selective collection of general public and five sampling stations, containing especially plastics and cardboard among the received materials. The daily average of all recyclable material received is ten tons.

The organization was chosen not only for convenience and ease of access, but also for presenting potential risks of occupational accidents and diseases in relation to exposure of the cooperative to municipal waste. The cooperative is on the premises of the municipal landfill and the search for better working conditions and health in the work environment should be treated similarly to that in other jobs or production modes. The current president of the cooperative has been its member for seven years. The other workers present during the survey were interviewed below.



According to the CFO, a group of 25 unemployed people who gathered at Community Park headquarters João Ramalho, decided to found a cooperative. The motivation was the situation of general unemployment in the ABC region, coupled with the beginning of selective collection in the municipality of Santo André.

The oldest group, which began in the cooperative, is comprised of ten people. There is a relative rotation of members and as one leaves, another is admitted with the same rights as those who have already been there the longest.

According to the book of registration, the cooperative had in January 2011, 139 members, and based on previous enrollment books, has already had 440 cooperative members since its founding.

The CFO advises that it is not difficult to sell recyclable material, but the amount received is reduced thanks to intermediaries (collectors, wastepaper wholesalers and scrap dealers). The cooperative cannot sell directly to the recycling companies. He emphasizes the quality of the material that reaches the cooperative, said the collection is done too late, so the recyclable material is exposed in public for long periods, which enables much of this material, with the highest resale value sales (especially metals), to be collected by scavengers, scrap dealers and others. He further reported that the rate of waste is around 80%, very high.

The awareness and public education about the importance of selective collection are pressing, and essential to the work of the members, who along the dry residue also receive very moist residue, which was not separated correctly by the residents, resulting in the contamination of recyclable materials, especially paper, preventing its recycling, and turning it into rejects.

Upon receiving recyclable materials, or dry waste from selective collection, they separate it manually by categories such as paper, plastic, glass and metal.

Then, it is manual sorting and classification step, performed by the members, where the material is separated by type and composition. This step requires technical knowledge for handling the material, since it is necessary to know the composition of the material, given that the better separated, the higher the resale value. After classification, materials are compressed and baled.

In the fourth step, the recyclable material may have some type of cooperative processing, for example, grinding the plastic material in flakes; finally, during the fifth step the material is forwarded to the industry when it is ultimately recycled into a new product, entering the productive chain as raw material.

During the observation, it was found that a pile of material that was prepared on the ground outside the shed had already been pre-screened. The cooperative members were allocated different tasks: put the material in the treadmill, screen the material of the mat, press the plastic and transport the material to a position of dispatch.

The hardest work is to place the material in the mat. A certain amount of material is separated, placed in plastic boxes and dumped on the treadmill. During the visit, it was possible to perceive a very good organizational climate. The CFO is always very present, coordinating the group.

It is noteworthy that during all interviews and observation we could observe unsafe working conditions, since the workers mostly did not use personal protective equipment and trod on waste during the execution of work.

Waste from electronic and electrical equipment, hazardous because it contains heavy metals that can trigger diseases, received no special care during treatment, leaving people exposed to these hazardous materials.

Evidenced through documents, Coop Cidade Limpa meets safety and occupational hygiene programs: Prevention of Environmental Risks - PPRA; The Medical Control and Occupational Health - PCMSO. These programs are mandatory for companies and aim to preserve health and physical integrity of workers, through the anticipation, recognition, evaluation and control of the consequent occurrence of existing or possible environmental hazards in the workplace. Cooperative documents, such as registration books, bylaws, the PPRA and PCMSO, were well organized and readily available for consultation.



## Analysis and discussion

The efficacy of the selective collection process at the municipal level must involve different agents: the pickers of recyclable materials, local government, community, condominiums, clubs, schools, businesses, and general public.

In addition to some problems observed resulting from the dynamics of work, such as lack of PPE during screening, there are also: speed and height inadequate mats, risks of accidents, high possibility of acquiring diseases because of contact with contaminated materials, inadequate maintenance of equipment and spaces occupied for disposition.

Although the manager has responded affirmatively to the question regarding the use of PPE by workers, this fact was not observed in the observation spot. Note that the cooperative members are at risk of accidents and occupational diseases and ignore the everyday implications of these risks to their health.

The accident risks present in cooperatives performing the separation of solid waste are imminent, considering the cooperatives' inexperience in dealing with these wastes and lack of habit in the use of PPEs, which are given to them for their activities, yet, through the lack of knowledge and training, remain unused. Norm NR-9, Ordinance No 3214/78 provides guidance on the use and type of PPE for work activities, as well as OHSAS 18001 - Occupational Health and Safety, guides for the management of Occupational Health and Safety (CERQUEIRA, 2006).

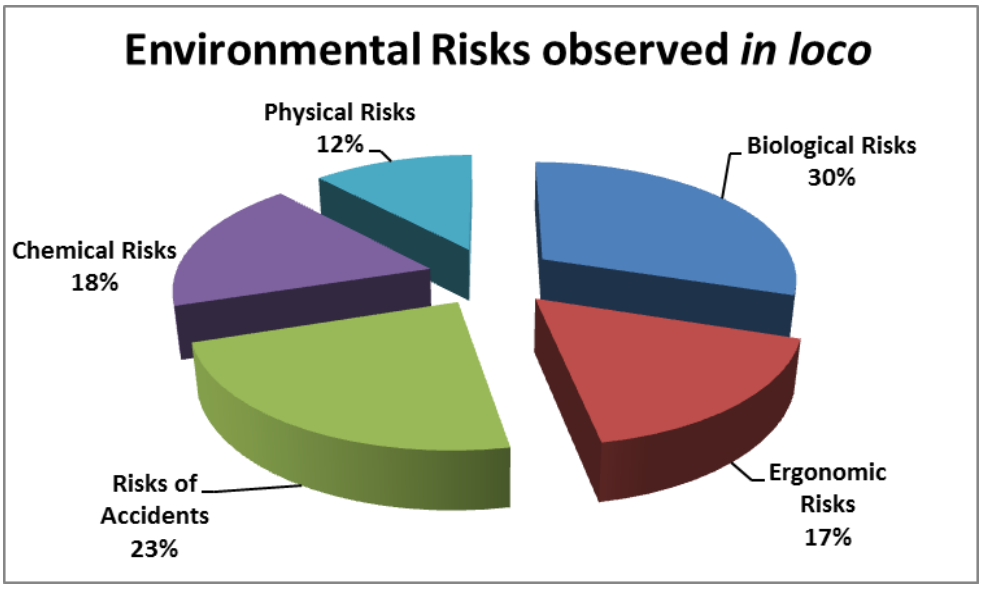


**Figure 2** – Environmental Risks
Source: The authors.



The observation spot and data collection interviews were important in the assessment of environmental risks. According to the statements of the interviewees, Figure 2 was prepared by the research team, formed by a professional in safety and environmental issues. He pointed the risks to the researchers and showed their respective percentage.

Table 3 indicates the risk awareness, according to the interviewees, showing if they know the risks present in the workplace and their consequences in relation to physical integrity.

Table 3 – Knowledge of the risks

| | |
|---|---|
| **Not aware of the risks and consequences caused by risks** | 10% |
| **Have little knowledge of the risk and its consequences** | 30% |
| **Think that have knowledge of the risk and its consequences** | 40% |
| **Are aware of the risks and consequences** | 20% |
| **Total of interviewees** | 100% |

Source: The authors.

The little knowledge demonstrated by the cooperative of the risks present in the workplace is a result of their reality and their way of life, a precarious economic and financial situation, which did not allow them to deepen their knowledge, since most members live near the landfill, in humble homes and only completed elementary school, or not even that in some cases. Nevertheless, the cooperative has legal requirements, such as PPRA and PCMSO. It did not become safe and needs to take preventive

action due to poor working conditions, the hygiene, risks and health hazards, lack of application and safety and occupational hygiene programs in the environment. As observed in loco and in the interview with the cooperative, the results indicate little knowledge of accidents and damage to health in solid waste separation. As for operators of machinery and equipment, they argue that work in balers offers no risk to the physical integrity of the operator, however, it is noteworthy that the transaction with the baler operator is positioned next to the hand to the point of pressing, while the machine compresses, he turns back towards the machine, running a risk of an accident and may result in injury and loss of members.

It is also observed that the machine does not have any safety emergency stop located next to another operator, which would shut down the machine in case of an accident. The machines feature a wear and tear due to constant use, as well as a belt that circulates in horizontal movement in transporting the waste to the screening. It was observed that the height of the operator compared to the height of the mat hinders the correct body positioning in waste separation. To compensate for this difference in height, the members of the cooperative use pallets and other objects that pose risks of falls and ergonomic hazards.

On the issue of biological risks, we find little knowledge on the part of workers about hygiene since meals are had on the spot where there is stored and scattered debris. Despite the use of gloves in waste separation to avoid direct contact with sharp objects in the screening, the members are vulnerable to accidents. If not treated properly, these can cause infections, and while working and eating, they breathe polluted air and are subjected to strong smell, characteristic to waste, with only a few workers wearing masks during their job activities.

Upon arrival of the trucks unloading the waste, the cooperative members are too close to the vehicles, which can hit them if they are not alert.

The ergonomic risk is present in almost all activities, particularly in the collection of waste that is scattered on the floor and picked up and bagged for proper separation. The workers in this process bend and rise repeatedly, characterizing poor posture that can lead to occurrence of occupational diseases.

Although a document certifies the integrated pest control in place, the high incidence of organic waste that accompanies solid waste can attract insects and rodents to the site.

## Final considerations

It is observed that the cooperative members know the risks to their health in a simplistic way. The knowledge demonstrated is the result of daily practice. The Program for Environmental Risk Prevention - PPRA is documented, but not reflected in the attitudes and knowledge to implement this in the workplace. This superficial knowledge, however, does not become a safe preventive action due to poor working conditions and the risks and damage to health present at the workplace.

The main risks inherent to the activities of the cooperative identified in dealing with solid waste are: Physical Hazards, considering the noise and heat radiation environment caused by the tiles heated by the sun; Biological Hazards, considering the lack

of knowledge or local hygiene habits, as well as exposure to protozoa, bacteria, viruses, fungi recyclables can bring; Chemical Hazards, considering the packaging of toxic chemicals present as gases, vapors or dust; in the form of medicines and other products placed inadvertently along with the recyclable material; Ergonomic Risk, considering the intense physical effort, incorrect posture and repetitive movements; Accident Hazards, considering the risk of fire, risk of falls, impact of other objects on the worker's body , risk of bites from venomous animals.

The cooperative's awareness of the occupational safety and health in the use of personal protective equipment, knowledge of the risks present in the workplace, machinery and other equipment can be of great value in reducing, eliminating and appointing risks and reported in Cooperative's PPRA and PCMSO.

It is worth to remember the responsibility of the generators of household waste, companies, hospitals and others to correct and carefully separate these residues, as well as the proper way of disposal of broken glass and sharp objects to prevent accidental punctures and occupational diseases when manipulated on the treadmill. The correct packing of these residues contributes to the reduction of accidents of cooperative during sorting.

Creating a work environment where everyone is motivated towards prevention of accidents does not make occupational health and safety a priority, but an acquired value, where job security is present 24 hours a day. Dealing with occupational health and safety depends on commitment for safe performance of their activities and work processes.

From the above results, further research will be developed in the field of occupational hazards in recycling cooperatives.



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