Handling Of Solid Residues in the Federal University of the Bahia/Brasil

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Abstract: *According to the Ministry of Environment (2015), Management of Solid Residues (GRS) is still a set of practiced actions, straight or indirectly, in the stages of collection, transport, treatment, and, final destination inside the environmental standards adapted of the solid residues. In the Federal University of the Bahia – UFBA exists, besides the teaching activities, hospital activities, of laboratory, restoring that produce a considerable quantity of residues. In many unities of the UFBA the collection and the destination of the residues are not being done in appropriate way. So, this article had as I aim to show how there was carried out the management of the solid residues produced in the UFBA, of way to minimize the environmental impacts, to maintain the health of the persons, carrying out works of Environmental Education, minimizing the waste. This model does not follow the rules of a Program of Management of Solid Residues, but yes immediate measures for control of the same thing, being based on the model implemented by UNICAMP (University of the Campinas), as soon as that of the UFBA presents similar physical structure. For so much there was introduced the selective collection and the recycling (production of compound), in the daily life of each unity. One hopes that the UFBA could minimize the aggression to the environment, contribute with the improvement of the esthetic scenery, with a better and healthier life, contribute with the environmental education and pioneers and constant growth maintain his history of actions with excellence.*

Keywords: solid waste, environmental education, environmental management.

1. Introduction

According to Law No. 12,305, of August 2, 2010, Solid Waste Management is a set of actions carried out directly or indirectly, in the stages of collection, transport, treatment, and also disposed of environmentally proper of solid waste. Thus, according to this law, the management of solid waste must be observed not generation, reduction, reuse, recycling, solid waste treatment and disposal. Therefore, technologies for energy recovery of waste may be used, provided that their proven technical and environmental viability.

It is observed that public buildings, by their nature, are large waste generators, but also provided an appropriate management is done, can be considered an ideal place for focused environmental education awareness about the proper disposal of waste. However, it is important to clarify that the opportunities of this reduction must be identified in specific study for each case, with the recommendation of the actions undertaken beings and analysis of technical feasibility, mainly. As emphasized by the Ministry of Health, the whole society is affected by the damage caused to the environment and individualistic, consumerist and disposable model hinders understanding by the citizens of their share of responsibility in the face of environmental problems.This paper presents the actions carried out on the premises of the Federal University of Bahia, regarding the proper disposal of solid waste in order to minimize environmental impacts in these environments, and promote with the faculty, students and environmental education work staff, looking minimize waste, favoring the selective collection and contributing to improving the community's quality of life that works or frequents the campus of the Federal University of Bahia-UFBA.

It is observed that education creates new habits in contributing to reducing waste and to build a more conscious society and committed to public health. In turn, it is observed that the selective collection is an alternative to solve the problem of solid waste, allowing waste of reuse, and treatment through recycling and composting.

It is important to note that this article does not include a SWMP (Solid Waste Management Plan), but only reports the adequacy to the problem of disposal of solid waste produced in the campus of the Federal University of Bahia. It is expected that from this adjustment is implemented project management of solid waste through selective collection and recycling of waste produced on the premises of the Federal University of Bahia, or adequately dispose solid waste, initially, those generated on campus Federation / Ondina, and later meet all campuses, and thus minimize damage to the environment, contribute to improving the aesthetic landscape, with a better and healthier life, contribute to the education of those directly or indirectly involved with this program and can serve as a reference for other communities.

2. Materials and Methods

2 1 Study Area

Within the history of the University, the Federal University of Bahia is one of the oldest, started on February 18, 1808, with the institution of the Bahia School of Surgery, first university course in Brazil, followed by the incorporation of courses

Pharmacy (1832), Dentistry (1864), the Academy of Fine Arts (1877), Law (1891) and Polytechnic (1896) and the Faculty of Philosophy, Sciences and Letters (1941) [1]

With approximately 25,000 students at the undergraduate, the issue of waste becomes a problem to be considered, imagining that this number of students corresponds to a small town. The lack of environmental education in these environments causes an ill use of space within the University.

2 1 1 Area Geographic Location

The Federal University of Bahia, is located in the city of Salvador, in northeastern Brazil [2] e [3]
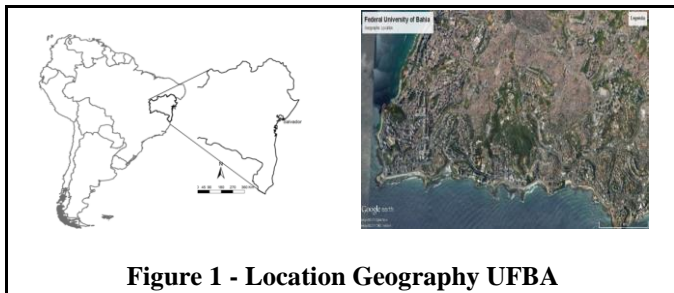

Figure 1 - Location Geography UFBA

2.2. Theoretical Assumptions

According to Law No. 12.305, of August 2, 2010, in Article 2 Chapter III

"Solid waste is all material, substance, object or well disposed resulting from human activities in society, whose final destination is carried, it is proposed to proceed or is required to do, in solid or semi-solid state and gas contained in containers and liquids whose characteristics make it impossible to launch the public sewage system or water bodies, or require it to technical or economically viable solutions in light of the best available technology".

The classification of solid waste, according to NBR 100004, involves the identification of the process or activity that gave rise to them, their constituents and characteristics, and the comparison of these constituents with waste listings and substances whose impact on health and the environment it is known.

Law No. 12.305, in Article 3, Paragraph VII [4] defines environmentally sound disposal as one that "includes reuse, recycling, composting, recovery and energy use". Also according to this Law and generally "are specific actions in order to prevent damage or risk to public health and safety and to minimize adverse environmental impacts". It notes that it is necessary to the proper classification of waste to better allocation.

According to the Municipal Plan of Integrated Solid Waste Management Vinhedo [5], the waste is classified as to their physical nature in wet and dry. As for its chemical composition in organic, waste animal or vegetable origin, and most of them can be used for recycling and inorganic, those who do not have biological origin. NBR 10.004 waste is classified as:

a) Waste Class I - Hazardous - are wastes characterized as flammable, corrosive, reactive, toxic or pathogenic;
b) Waste Class II - Non-hazardous - are divided into class IIA or IIB class
• Waste class IIA - No inert - present biodegradability properties, combustibility or water solubility.

• Waste class IIB - Aggregates - Any insoluble residue in distilled or deionized water at room temperature.

Law No. 12.305 of 02/08/10, the Law No. 4352, 30/06/2009 and the Ministry of Health, have some definitions relevant to understanding of the theme: solid waste, recycling, reuse and waste.

The *Recycle* is considered a process of transformation of solid waste from the transformation of its physical, physico-chemical or biological weapons, which will give rise to a new product with different purpose of the original product. Since the *waste tailings* are not likely to be reused, recovered, and should be disposed of properly. It is considered *Reusing* waste recovery, without which they undergo any kind of biological transformation, physical or physico-chemical, to its final disposal. *Waste health services* are considered those resulting from activities and services related to compliance with human or animal health, requiring different management, either in treatment or final disposal (Law No. 4352 of 30/06/09). Are considered *common waste* all waste resulting from administrative activities of sweeping and cleaning services, food waste and other. The most dangerous elements within the waste are called *radioactive tailings* radioactive materials or contaminated with radionuclides, from clinical laboratories, nuclear medicine and radiotherapy, which present a different and unique monitoring and governed by rules of the National Nuclear Energy Commission - CNEN. CNEN Resolution 13/88 of 08/01/1988 [5]

2 2 1 Selective Collection

The disposal of solid waste still is a difficult problem to solve is observed that the dumps are still the target of much of the urban waste, affecting significantly the environment, health and people's quality of life, given the rapid exhaustion of life of the sanitary landfill when these. This requires solutions for the final disposal of waste, even in the generation of points in order to reduce its volume.

Selective collection is the continuous process of collection and separation of waste as is organic, recyclable and waste. This separation can occur in itself a source as in screening centers or recycling plants. Therefore, one should use appropriate containers in certain colors in law. Resolution No. 275 of the National Environmental Council - CONAMA - set the colors to be used on the containers of materials to be recycled. Table 1 shows the colors of containers for waste.

Table 1 - Color containers for waste selection

Color waste	container type
Blue	Paper / cardboard
Green	Glass
Yellow	Metal
Red	Plastic
Black	Wood
Orange	Hazardous Waste
White	Outpatient Waste and Health Service
Purple	Radioactive Waste
Brown	Organic Waste
Gray	General waste not recycled or mixed

It should also be adopted appropriate symbology for each selective waste container. According to the Packaging Association - ABRE (2016), the identification of the packaging is important to the respective symbol of their material, this will contribute to the correct identification of waste and their separation, simplifies the work of recycling. Figure 2 shows the very symbols for containers for selective collection.
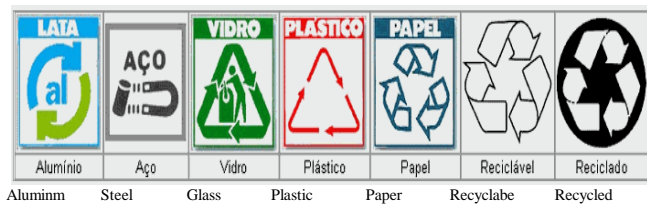

Figure 2 - Symbology selective disposal

2 2 2 Advantages and Selective Collection

Selective collection is one of the most important processes related to waste collection, because the ranks, giving correct destination for its various types, thus following for recycling.

Among many benefits, the selective collection reduces environmental pollution, reduces the spread of disease and contamination of food and reusable materials and consequently reduces the costs of recycling. In addition, it brings social benefits with job creation, reduction of waste transportation costs, reduces the amount of waste being thrown in landfills and improves the quality of life of the population.

The recycling advantages bring to light the 3Rs (Reduce, Reuse and Recycle), but not all materials that can be recycled, many still end up getting no destination [6]. According to the Ministry of Environment [7] are the following materials considered recyclable and non-recyclable, as shown in Table 2.

Table 2 – Material considered recyclable and non-recyclable

MATERIALS	RECYCLABLE	NOT RECYCLABLE
PAPER	newspapers, magazines, notebooks, books, office papers, packaging, cardboard, long life tetrapack	carbon paper, cellophane, plasticized paper, tracing paper, dirty paper, toilet paper, adhesive labels, photos
PLASTIC	plastic in general, sacks and bags, jars, lids, plastic bottles, cleaning product packaging	foams, polystyrene, acrylic, adhesive, taken, packaging and toxic corrosive material
METAL	cans in general, aluminum pieces, copper, lead, brass, wire, metal scraps, staples and clips	aerosol cans, paint cans, cans of pesticides, batteries, steel sponges.
GLASS	bottles, flasks in general, glasses, broken glass	mirrors, porcelain and pottery, lamps, crystals and flat glass

2.3. Materials and Methods

Administer and manage waste, it is a task that requires planning and constant monitoring, should not be a simple act immediately, but a continuous process of education to become part of everyday life of society.

2.3.1. Method

As previously mentioned, the project reported in this article did not at first show the implementation of a Solid Waste Management Program at the Federal University of Bahia (UFBA), but introduce actions that sensitize the local community so that in future such a program it was used in educational institution.

This project is based on actions proposed by UNICAMP (Campinas University), in relation to waste, that due to the similarities between the institutions. The program used at that University included the preparation of an internal organization plan to carry out selective collection, which at first was not adopted in all units at first, and now all units participating in the selective collection. All feature collection container observing the rules according to the type of waste.

The truck passes and removes the material, which is referred to a shed where all waste, is sorted, then being separated and sold or donated, and also sent for composting.

The actions implemented in UNICAMP brought positive results, showing that a well done planning and their environmental education programs with the community can change the local aspects promoting environmental improvement and local quality of life, based on this method were implanted the procedures to be used by the City of UFBA (Federal University of Bahia).

2.3.2. Methodological Procedures

Then relying on the management and selective collection of UNICAMP, the Federal University of Bahia (UFBA) sought to establish and implement a selective collection plan in its units, this because it was found that the best treatment for solid waste is recycling.

As previously mentioned recycling of solid waste enables the preservation of natural resources, reducing energy consumption and reducing the amount of waste being thrown into landfill thereby reducing their impact on the environment. However, to succeed in recycling, it is necessary to have a Plan for Waste Management, but for that the community should be prepared for all the changes that will come with the development of the same.

Thinking in this direction UFBA, from the initiative of the University Campus Hall, started one for this first time Project, awareness, preparation and diagnosis of the current situation in which are the units of the university, before promoting a management plan Solid waste (SWMP).

This project required beyond the awareness of everyone involved, coordinated procedures for the proper carrying out of actions and achieve the proposed objectives. Thus the methodology to be applied involves six stages:

Step 1: organization of the team under the coordination of SUMAE (Superintendence of Environment and Infrastructure), disclosure of the project in "*Campis*" UFBA and the orientation of the teams that were formed for this purpose.

2nd step: collecting information regarding characterization of the unit, the waste and the quantities of waste generated daily in your unit. This information was responsible for the subsequent actions regarding the destination of such waste. Figures 3, 4 and 5 shows the table found in the question of disposal of solid waste in UFBA.

Figure 3 - General Waste

Figure 4 - Trees leaves Figure

5 - Construction debris

Consisted of a preliminary study of costs and identifying strategic locations for installation of equipment according to the importance and volume of waste generated. Table 3 presents the preliminary cost estimate for implementation of selective collection form.

Table 3 - Cost of implementation of selective collection

Item	Description	Quantity	Unit	Price unit.	Total price
01	polypropylene Collector 120	10	Unid.	260,00	15.600,00
02	of 4 high density polyethylene bins supported with 50 for selective collection	7	Unid.	610,00	10.370,00
03	polyethylene Trash average density of 20	10	Unid	12,00	36.000,00
04	Folders - Solid waste and selective collection	1000	Unid	1,00	1.000,00
				Total cost	62.970,00

Source: authors

Step 3: environmental education in some of the units of UFBA, represented by lectures, workshops, courses and visual information on the subject.
Step 4: presented the result of the actions in each of the units chosen as a model by the SUMAE, which discussed the feasibility of its application.
Step 5: (in progress) Implementation in all units

Step 6: (in progress): reports on the results of actions in all *"campis"* UFBA

Solid waste should be separated at source agreement are: paper, plastic, aluminum and remains of fruit peels, vegetables and food and taken to area for recycling. The remaining waste (spent) will be placed in containers suitable for the purpose of collection and transport for urban sanitation services of the City of Salvador, to the final destination. Composting will be performed as known methods and properly adapted to local conditions; Figure 6 shows one of the formed windrows.

Figure 6 - Windrow composting

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3. RESULTS AND DISCUSSION

One of the discussions regarding the implementation of a system of selective collection was related issue of upfront costs, which was considered normal for the organization's experts. The implementation of the selective collection was inserted into the campus of the University changing some preliminary characteristics identified at the beginning, work, the areas previously covered trash at present are clean, as shown in figure 7 fully organized areas without garbage show. Throughout the environmental education process with staff and student.

Figure 7 - Areas after the environmental education process

Figure 8 - Areas after the environmental education process

Figure 8 - Areas after the environmental education process
As the University has a very large area one dumps installation sketch was created, as shown in Figure 8
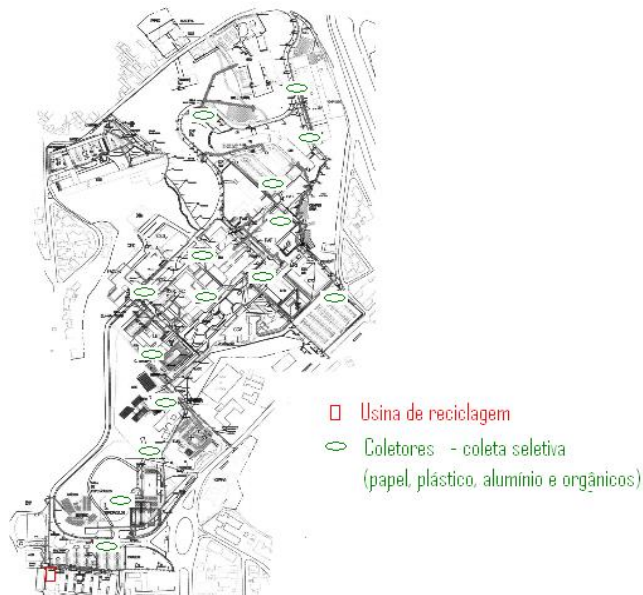

Figure 8 - Plant location of the recycling plant and containers Selective collection

Throughout the implementation process of this project can be seen change in attitude within the sites chosen for this first time postures correction by the public.

4. Conclusion

The implementation of the project showed that an initial sensitization process is necessary for the development of a Solid Waste Management Program (SWMP) within the university and this awareness is linked to environmental education, not only for teachers, but also for the students and all the administrative part.

Separation of waste, their collection and their correct destination will bring great benefits to the University, in the landscaping, the resources generated by the collection, the conscientization of all. The management of the University must be shared with everyone.

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