International Journal of Advanced Engineering Research and Science (IJAERS)
Peer-Reviewed Journal
ISSN: 2349-6495(P) | 2456-1908(O)
Vol-9, Issue-7; July, 2022
Journal Home Page Available: https://ijaers.com/
Article DOI: https://dx.doi.org/10.22161/ijaers.97.6

Urban Solid Waste in Brazil: Concept, Characterization and Regulation

Veridiana Torres da Silva[1], Antônio Roberto Xavier[2], Andrea Yumi Sugishita Kanikadan[3], Aiala Vieira Amorim[4], Olienaide Ribeiro de Oliveira Pinto[5], Rosalina Semedo de Andrade Tavares[6], Karla Renata de Aguiar Muniz[7], Michella Rita Santos Fonseca[8], Maria Vandia Guedes Lima[9], Marcus Rodney Portela Cysne[10], Juliana Fernandes da Silva Queiroz[11], Antonio Leonardo Moreira de Aquino[12], Júlio César Lopes de Oliveira[13]

[1]Specialization in Science Teaching, Department of Education of Baturité, CE, Brazil. E-mail: torresveridiana2016@gmail.com/. Orcid: https://orcid.org/0000-0002-3679-4477.
[2]Post-Doctor and Doctor in Education, Post-Graduate Program in Sociobiodiversity and Sustainable Technologies, Redenção, CE, Brazil. E-mail: roberto@unilab.edu.br/.Orcid: https://orcid.org/0000-0002-3018-2058.
[3]PhD in Applied Ecology by the Inter-Unit Graduate Program in Applied Ecology by ESALQ/USP, Brazil. E-mail: akanikadan@unilab.edu.br. Orcid: https://orcid.org/0000-0001-5057-4801.
[4]PhD in Agronomy (Phytotechnics), University of International Integration of Afro-Brazilian Lusophony/Institute of Rural Development, Redenção, CE, Brazil. email:aialaamorim@unilab.edu.br. Orcid: https://orcid.org/0000-0003-4222-3459.
[5]PhD in Agronomy (Phytotechnics). Postdoctoral internship - PDPG/SEMI-ARID - CAPES/FUNCAP Scholarship, Academic Master's Degree in Sociobiodiversity and Sustainable Technologies, University of International Integration of Afro-Brazilian Lusophony, Redenção, CE, Brazil. E-mail: agron.olienaide@gmail.com. Orcid: https://orcid.org/0000-0002-8333-3665.
[6]PhD in Administration, Institute of Applied Social Sciences, University of International Integration of Afro-Brazilian Lusophony. Redenção, Ceará, Brazil. E-mail: rosalina@unilab.edu.br. Orcid: https://orcid.org/0000-0003-3592-5559.
[7]Master's student in Sociobiodiversity and Sustainable Technologies at the University of International Integration of Afro-Brazilian Lusophony, Redenção, CE, Brazil. E-mail: karlla.renata@hotmail.com/ORCID: https://orcid.org/0000-0003-4007-2482.
[8]Master in Teaching and Teacher Training, Municipal Department of Education of the Municipality of Caucaia, CE, Brazil. E-mail: michellafonseca@yahoo.com.br/ORCID: https://orcid.org/0000-0003-3258-965X
[9]Master in Educational Sciences, State University of Ceará, Brazil. E-mail: profavandiaguedes@gmail.com/ORCID: https://orcid.org/0000-0003-3258-965X
[10]Master's Degree in Applied Linguistics, Federal Institute of Education, Science and Technology of Ceará, Fortaleza, CE, Brazil. E-mail: marcuscysne@hotmail.com/ORCID: https://orcid.org/0000-0003-3905-8763
[11]Master's student in Sociobiodiversity and Sustainable Technologies at the University of International Integration of Afro-Brazilian Lusophony. E-mail: 3jhulyfernandes@gmail.com. ORCID: https://orcid.org/0000-0002-3393-0541.
[12]Specialization in Gender, Diversity and Human Rights. E-mail: aquinomleonardo@gmail.com/ORCID: https://orcid.org/0000-0001-7325-1247.
[13]Specialization in Gender, Diversity and Human Rights, Municipal Department of Education of the Municipality of Baturité, CE, Brazil. E-mail: juliolopes1110@gmail.com/ORCID: https://orcid.org/0000-0001-8749-5306

Received: 09 Jun 2022,
Received in revised form: 30 Jun 2022,
Accepted: 07 July 2022,
Available online: 13 July 2022

Abstract**—** *The study's main objective was to discuss the concept, characterization and other norms that govern and regulate Urban Solid Waste in Brazil. Methodologically, this is a theoretical-empirical study by means of a bibliographical procedural method, exploratory as to the objectives and of a basic nature with a qualitative approach. As for data collection techniques, research was*

***Keywords*— Sleep Initiation and Maintenance Disorders; SARS-CoV-2; Student Health.**

carried out in secondary sources such as books, scientific articles, legislation, guidelines, and norms that define and regulate solid urban waste in Brazil. As for the analysis techniques, we used content analysis and narrative socio-historical contextual discourse. As conclusive results, the study allowed us to verify that two needs to be fulfilled by the public power and Brazilian society are evident: a) the fulfillment of the norms, legislation, and guidelines in relation to Urban Solid Waste, and 2) the putting into practice of a public policy of integrating and integrating environmental awareness that is efficient, effective and disseminated within society on a national, regional and local level.

I. INTRODUCTION

This research deals with the concept, definitions, classification, and regulation of urbansolid waste in Brazil in contrast to Environmental Education (EE). To this end, the research focused on theoretical and empirical sources by analyzing and interpreting scientific writings, legislation, technical standards, and other relevant guidelines.

The National Congress after twenty-one years of discussions on the National Solid Waste Plan (PNRS), approved it in 2010, turning it into Law No. 12.305 [1]. This law involves the three federative entities - Union, States and Municipalities; the productive sector and society in general, in an institutional articulation that aims to seek solutions to the problems in the management of Municipal Solid Waste (MSW's), which compromise the quality of life of all Brazilians. With the approval of the PNRS, the discussion on the theme in question was requalified and given new directions [2].

Since August 2010, based on the concept of shared responsibility among the federated entities, the society as a whole - citizens, governments, private sector and organized civil society - became responsible for the environmentally adequate management of solid waste [3].

Today, citizens must be responsible not only for the correct disposal of the waste they generate, but also for rethinking and analyzing their role as consumers. The private sector is responsible for the environmentally correct management of waste solid waste, by their performance in the production chain and by product innovations that bring social and environmental benefits. It is the responsibility of the public authorities - at thefederal, state, and municipal levels - to prepare and implement solid waste management plans [4].

Therefore, society has been pressured to make changes in habits, related to unbridled consumption due to a high socioeconomic and environmental cost caused by the generation of SUW's, forcing one to seek sustainable alternatives that diminish impacts. One of the alternatives that can help minimize these impacts is to separate the recyclable materials and send them to artisans, collectors, entities, or companies that will reuse or recycle the material [5].

According to the Ministry of Environment, RS's acquire commercial value, if properly managed, and can be used in the form of new raw materials or new inputs. Therefore, it is necessary to implement a management plan that will bring positive social, environmental, and economic results, because the intention is to reduce the consumption of natural resources at the source and provide the opportunity for income generation, leading to social inclusion and reduction of environmental impacts caused by the improper disposal of this waste.

The definition of urban waste involves multiple variables because its origin and formation are associated with various factors: seasonality, climate, habits and customs, economy, floating population, among others. Thus, the identification and quantification of these factors require study and in-depth work for a long period [6].

[7] states that it is common to define solid waste as all residues that result from man's daily activities in society. The WHO, on the other hand, defines SUW as "anything that the owner no longer wants, at a certain point in time, and that has no commercial, current or perceived value" [8]. This concept may be considered outdated given that SUW possesses great economic potential and income generation forpopulations.

[9] differentiate between garbage and MSW's, because there is an understanding that separated materials, which can be recycled or reused, are treated as solid waste, while mixed and agglomerated materials have more of a garbage connotation.

According to [10] 0004/2004, RS's constitute the solid or semi-solid remains fromhuman activities or not, that despite not presenting a utility where they were generated, can be transformed into inputs for other activities. It is notoriousto know that the waste generated at homes, at

work, at school, etc. They are collectedperiodically by the collection service of the cities, as well as the sweeping of squares and public places, which may include tree leaves, branches, and pruning residues.

II. THEORETICAL AND METHODOLOGICAL FOUNDATIONS

Law 6938/81, which deals with the techniques for the destination of SUW's, establishes principles and outlined objectives in relation to the environment. The law deliberates all responsibility to the municipalities in the management of the SUWs produced within their jurisdiction, except for industrial waste, in which the generator is responsible for the handling and destination of its waste - the polluter pays principle [11].

In Brazil, there are important parametric documents that regulate solid waste, including the Brazilian Standard 10004/2004 and Law No. 12,305 of August 2, 2010 [10].

According to the ABNT-10004/2004 standard, the concept adopted for waste is:

> Waste in solid and semi-solid states, resulting from industrial, domestic, hospital, commercial, agricultural, service and sweeping activities. Included in this definition are sludges from water treatment systems, those generated in pollution control equipment and installations, as well as certain liquids whose characteristics make it unfeasible to discharge them into the public sewage system or bodies of water or require technical and economically unfeasible solutions in view of the best available technology.

Law 12.305/2010 presents the definition of waste as being:

> [...] discarded material, substance, object, or asset resulting from human activities in society, to whose destination is proceeded, proposed to proceed, or is obliged to proceed, in solid or semi-solid states, as well as gases contained in containers and liquids whose characteristics make it unfeasible to discharge them into the public sewage system or bodies of water, or require solutions that are technically or economically unfeasible in view of the best available technology.

[12] considers that these two legal instruments conceptualize solid waste in similar ways. The definitions present the waste with no commercial value and utility, but this concept has acquired new conceptions nowadays, because most of the materials can be used for some other purpose, even acquiring an economic value, either directly, such as the laminated packaging chips discarded by industries, being used in the making of boards and plywood; or indirectly, such as the use of fuel to generate energy used in various processes.

However, the states and municipalities' environmental control agency must interfere inthe problem in a supplementary manner, by means of inspection, demanding adequate handling, storage, transportation, and final disposal of such residues. Thus, urban cleaning management in the cities can occur in three ways: directly by the municipality, by a specific public company or even by a mixed economy company created for this purpose [13].

According to regulatory documents, the legal form to adequately dispose of SUWs is that of landfills, with appropriate final disposal methods, whether these are: sanitary, controlled, with shredded or compacted waste. The processes classified as destination; recycling, composting, and incineration plants constitute waste treatment or improvement processes, and not final disposal [13].

Thus, the [4] discusses the best-known forms of final disposal of solid waste which are: sanitary landfill, controlled landfill, and open-air dumpsite.

a) From the landfill

It is considered an engineering technique used for the final disposal of MSW on the ground, through confinement in layers, covered with inert material, usually soil, having drainage systems for gases and leachate, produced [14].

The landfill is a storage space in which MSW from households, industries, and construction and demolition are discarded. In Brazil, the organization of the final disposal of MSW considered environmentally appropriate has specific legislation, with the landfill as the most correct form of final disposal [3].

[15] conceptualizes landfills as processes used for the disposal of waste on the ground, particularly household waste, based on engineering criteria and specific operational standards, in a safe manner according to environmental pollution control and safety standards.

[16] states that this system should be designed to receive and treat the waste produced by the populations, avoiding harmful consequences to the naturalenvironment.

Thus, the construction of a sanitary landfill must be based on studies of the environmental conditions of engineering, to reduce the impacts caused to the environment andpublic health.

According to what [17] points out, the disposal of SR's in landfills entails several risks, such as the production of leachate and its leakage, which can contaminate water and the soil surface; the fact that the waste is toxic and pollutes the air.

The author concludes, when referring to disposal in landfills, that "garbage dump and landfill" would have the same meaning, considering synonymous expressions, being thesecond more accepted, for "sounding better". Thus, he defines dumpsite and landfill as "a holefull of garbage that stinks and spews out liquids", because the purpose of a landfill "is to bury the garbage so that it is isolated from the water table and kept dry without contact with air. When this occurs, the waste slows its decomposition, and is considered the "sanitary" part of the process [17].

b) Controlled Landfill

It consists of the place of disposal of MSW's on the ground, with partial control of compaction, coverage, effluent treatment, gas drains, waterproofing, being an activity not allowed in accordance with the current legislation [18].

[15], a controlled landfill is a variable of the open-air dump, in whichthe waste receives a daily covering of inert material, being handled in a random manner. However, this does not solve the pollution problems generated by the waste, because it generates liquids and gases.

[19] say that controlled landfill is considered an intermediate solution between the dump and the landfill. For it is an attempt to transform dumps into landfill, since these sites are built chimneys to release the gases and try to capture the *leachate*by pumping, returning it back on top of the pile of garbage; to reduce the contamination of groundwater. In other words, the controlled landfill is also considered an inadequate disposal since it has no collection and treatment of the leachate and gases.

c) Dump site

This is when USW's from houses, industries, hospitals, and others, are thrown on the ground, without any coverage, forming ramps, causing serious problems to the environment and public health, affecting mainly the collectors and residents of the vicinity.

[15] calls lixão "common landfills", which is characterized by the discharge of garbage without treatment, also called: dumps or empties. He considers this disposal technique "the most harmful to man and the environment", however, the most used in developing countries, such as Brazil.

According to [20], landfills are the oldest and most precarious method of waste disposal and disposal of SW. These are places where SW are discarded in the open, without care as to the negative impacts caused, to groundwater, waterways, soil, and vegetation, attracting flies, cockroaches, and poisonous animals.

[16] states that, "lixão is the same as "open air" disposal, being considered inadequate and illegal according to Brazilian legislation. He considers as the most appropriate way for the disposal of urban waste the sanitary landfill because it aims at minimizing environmental impacts.

However, the final disposal of SUW's is a challenge for public administrations to comply with the current legislation with selective collection, reducing the volume of waste in landfills, managing all the necessary actions for its destination, and offering strategies to enable changes in the population's habits, regarding conscious consumption and the adequate disposal of the waste produced.

In as much as the environmental impacts caused by SUW's are concerned, [16] discusses waste, showing that its production has a wide variation, according to factors that justify the increase of domestic waste in Brazil, being composed of 50% organic matter. First, there are climatic factors such as when there is a lot of rain, increasing the moisture content. In the fall, there are many leaves; in the summer and during special seasons, people consume more drinks, increasing the volume of packaging. Another factor that produces an increase in waste is demographic, because the larger the urban population, the higher the *per capita* production of waste.

Another factor that centralizes this theme: are the socioeconomic ones, because the higher the cultural, educational, and acquisitive level, the higher the incidence of recyclable material and the lower the incidence of organic matter.

[12] says that SR's cause impacts that interactively affect the physical environment: water, air and soil; the biotic environment: fauna and flora; and the anthropic environment: the man and his socioeconomic and cultural relationships. The impacts on the physical environment are due to the release of gases during the decomposition of waste and from the burning of waste, whether intentional or accidental.

Thus, environmental impact according to the art. 1 of [21] is "any change in the physical, chemical and biological properties of the environment, caused by any form of matter or energy resulting from human activities

directly or indirectly. According to [22] the impacts generated by the absence of SUW management are diverse and include sanitary, environmental, economic, and social aspects.

[6] also state that sanitary impacts are those that most affect the population, causing various public health diseases. The garbage produced itself is not a cause of disease but acts as a focus for the infestation of biological vectors such as rats, cockroaches, flies, mosquitoes, insects in general that are transmitters of bacteria, viruses, protozoa, and pathogenic fungi that cause morbidity and mortality.

[23] adds that the inappropriate accumulation of waste in dumps creates a public health problem because it favors the multiplication of disease vector animals such as rats, which transmit leptospirosis and bubonic plague, and flies, which carry in their legs thousands of bacteria that are harmful to man, as well as the proliferation of microorganisms that are dangerous to health.

Thus, the excess organic matter present in urban garbage - food leftovers, fruit, and vegetable scraps from street markets, among others, constitutes the ideal habitat for theproliferation of vectors, which allied to the high rate of malnutrition of the country's lower- income population, produces serious diseases, with greater emphasis on childhood.

For [6] the environmental impacts are reflected in the pollution of the soil and surface and underground water bodies, caused by leached liquids.

The economic impacts, on the other hand, are easily detectable when one considers thehealth expenses with the needy population. The effort becomes innocuous because the population continues to be contaminated by garbage close to their homes. There are still high costs for the deactivation of dumps and areas of clandestine disposal of urban waste.

Another impact considered secondary is the financial loss of families and society, by the fall in productivity at work, caused by diseases and their recurrence. In addition, there is the real estate devaluation of the areas near the dumps, resulting in low investment in this area [6].

About the social impacts, [6] show the practice of waste picking in streets, avenues, markets, fairs, and dumps, done by men, women, and children, who live in contact with dangerous and contaminating materials such as medical and toxic waste.

The text "The limits of growth", which addresses reflections on the limits of human development, was published in 1968, in Rome, through the contributions of several authors onenvironmental issues. In this period, there were problems that, at that time, already raised concerns among the peoples of the world, such as the extension of poverty, the increasing rejection of values; the destruction of the environment, among others [24].

Since then, several social movements have arisen, which have discussed human relations with the environment. These movements have increasingly instigated some segments of the world society to those concerns, resulting in the First World Conference in Stockholm, in 1972, in Sweden, which addressed issues on Environment and Human Development.

Once the Stockholm Declaration was elaborated, values and concepts that all countriesshould rescue in the use of the environment in an ecological and rational way were inserted in the international agenda. The highlight of this declaration is that, besides allowing the beginning of a possible dialogue between industrialized and developing countries, it was to promote ecological practices to review how economic growth should happen, highlighting the pollution of global goods such as air, water, and soil [24].

In "The limits of growth", the observation that the world, if seen "from the outside", to analyze its limits, environmental capacity and reserves, man would recognize nature and its importance, but not the possibility of this relationship in an indifferent way [25] stands out.

The WHO, based in Geneva, contests this "outside" view in 1987 in Brundtand's "Our Common Future", brought in the form of a report, with a call for a broadening of the vision of how the world develops and for future planning not to negatively affect natural resources [24].

The International Conference on Development and Environment has made this appeal authentic. Rio-92, as it became known, is considered the most important in the history of environmental issues, held in 1992 in the city of Rio de Janeiro, were present, heads of state and government, with the design to develop discussions on sustainable actions, in order to draw up an action plan aimed at combating the negative results that economic growth has generated to the environment [26].

At Rio-92, positions were advocated that would represent significant changes to the social reading that was being formed, including problems presented by productions involving the consumption and exploitation of the global goods, the modification of spaces, and an education of future generations [26].

These reflections and discussions on the subject have resulted in the emergence of a new language, which gradually came off the paper and started to show up in practice. O man began to point out his role in society in relation to the natural elements, seeking the existing link

between man-nature and the relations of men among themselves [24].

> This may or may not mean a fine-tuned orchestration of curricular practices. Many educators, concerned with the environmentalist problematic, agree that environmental education is the realization of activities aimed at the formation of a strict environmentalist, conservationist and/or preservationist conscience [24].

In this way, it is necessary for society to have knowledge about environmental issues, because it is of utmost importance for "the subjects" to build and develop an awareness that favors the development of curricular approaches related to the environment.

Methodologically, this is a theoretical-empirical study by means of a bibliographical procedural method, exploratory as to the objectives, of a basic nature, and with a qualitative approach for analyzing a social issue seeking to understand the social subjects and their behavior in relation to the phenomenon studied [27]; [28].

The data collection techniques were carried out through research in secondary sources such as books, scientific articles, legislation, guidelines, standards that define and regulate the urban solid waste in Brazil. As for the analysis techniques, it was used the content analysis and the narrative socio-historical contextual discourse [28]); [29]; [30].

The study brought to light the most fertile debate on the concept, characterization, and other norms that govern and regulate Urban Solid Waste in Brazil, the actions and performance of the public power, and on the responsibility that each person in Brazilian society must have in relation to environmental issues and causes.

III. RESULTS AND DISCUSSION

The study we adopted focuses on the classification of municipal solid waste according to its origin, based on Law 12.305/2010. There are several classifications for solid waste and criteria to divide it. However, one should follow those based on the legislation. Brazilian Standard 10004/2004 presents the classification of solid waste in two classes: Class I and Class II, A and B:

Table 1: Waste classification

Class I Residues - Dangerous	They are those that present danger - risk to public health or the environment - or one of the characteristics of: inflammability, corrosivity, reactivity, toxicity, pathogenicity, or are listed in Annexes A or B of the standard.
Class II A waste - Non inert	They are those that do not fit into the class I waste classifications, Dangerous, or Class II B waste class, inert. Class II A waste may have properties such as biodegradability, combustibility, or water solubility.
Class II B waste - Inert	They are any residues that do not have any of their constituents solubilized at concentrations above the water potability standards, except for appearance, color, turbidity, hardness, and flavor, as per annex G, of the referred standard [10].

Source: Compiled by the authors

In corroboration with the above demonstration, [12] makes a comparative analysis of the Brazilian Standard and Law No. 12,305/2010. The first classifies solid waste into two groups: Hazardous (class I) and NonHazardous (class II), while the Law 12.305/2010classifies them according to their origin, counting eleven distinct groups, and, as to hazard in two classes Hazardous and NonHazardous. It emphasizes that by the Norm,

> [...] the waste classification process involves identifying the process or activity that gave rise to it and its constituents and comparing these constituents with listings of waste and substances whose impact on health and the environment is known [12].

The author concludes that the concept of hazardous waste adopted by the Standard is more restricted than that adopted by Law 12.305/2010. Both consider as hazardous waste those with hazardous, flammability, reactivity, and toxicity. The law expands this concept, adding to the waste characteristics of pathogenicity, carcinogenicity, teratogenicity, and mutagenicity, warning that they cause risk to public health and environmental quality.

Table 2: Classification of waste by origin.

Urban Solid Waste	Description	Material Type
Household waste	They are those resulting from domestic activities in households, usually consisting of food leftovers, decomposing products.	Paper, cardboard, plastic, glass, nonferrous metal, disposable diapers, polyethylene terephthalate/pet packaging, ferrous metal, tree trimmings, animal feces, among other items.
Urban Cleaning Waste	This is the waste that comes frompublic places.	Waste from streets, squares, parks,public sweeping weeding, scraping demolition material /debris from construction sites, among others, as well as old furniture, large branches, ceramic appliances, and materials that areuseless for use.
Urban solid waste	It is the name used to refer to all the types of waste generated in the cities and collected by themunicipal service.	Household waste, sweeping waste, commercial waste and, in some cases, rubble), that is, it is all the household and urban cleaning wasteproduced by the population [19].
Waste from commercial establishments and serviceproviders	They are residues generated in the urban and/or rural areas, originated from commercial activities and services service.	They are waste from supermarkets, restaurants, squares, and other services (BRASIL, 2010).
Waste from public sanitationservices	They are residues from fluvialdrainage, cleaning of culverts	Glassware, bags, debris generation, decomposing animals, amongothers are found [3].
Industrial waste: waste generated in production processes and industrialfacilities	Among them are residues considered as dangerous: products out of specification.	They are paints, raw materials, and intermediary products such as solvents; oily dregs from refining processes; electrodes; decanter box residues; contaminated PPE among others [3].
Health service waste	These residues, from hospitals - hospital waste - drugstores, medical and dental offices, clinical analysis laboratories, veterinary clinics, among other establishments that provide services like these.	These are syringes, needles, dressings, and other materials that may present some type ofcontamination by disease-causing pathogens" [19].
Construction waste	This includes construction and demolition materials; pavement and building renovations and repairs.	They are ceramic components - bricks, blocks, tiles, coating plates, among others; mortar and concrete; and from other infrastructure work including soil - blocks, pipes, curbs generated in the construction sites from earthworks; from the manufacturing process and/ordemolition of precast concrete parts.
Argo-forestry residues	They are residues from agricultural and cattle raising activities. They are all the residues that can be generated in agricultural and cattle raising activities; forestry, including those related to inputs used in these activities (BRAZIL, 2010).	These are waste oils, plant protection product packaging veterinary medicine packaging and labeling, pesticide packaging, and plastics, among others.

Transport residues	Transport service residues are those that originate at ports, airports, customs , road and rail terminals, and border crossings.	The waste collected at these sites is treated as "septic waste", because it can contain disease-causing agents brought from other countries. It may contain pathological agents and spread diseases between cities, states, and countries, mainly through food leftovers, food products and personal use.
Mining waste	Mining waste is generated in thedrilling activity,	These are tailings generated from iron, limestone, titanium,

Source: Prepared by the authors

All these materials, properly separated, can generate beneficial impacts both environmentally and economically; contributing to the generation of income in communities where selective collection of waste is p practiced at its origin and its recycling can be another possibility of income generation for communities. This would avoid health problems caused by the proliferation of infectious and parasitic disease vectors.

There is a worldwide concern in relation to the final disposal of SUW's produced by the populations, intensified from the conferences organized by the United Nations, from Stockholm and Vancouver, in the 1970's, resulting in the search for measures of lesser impact on the environment, contributing to its balance and socio-environmental sustainability. One ofthem are the treatment techniques that allow energy to be obtained through its recovery, which significantly reduce the impact that waste causes to the environment.

There are several methods of urban waste treatment. The option for one or a combination of two or more of them will depend on the composition of the garbage and the public policy adopted by each state.

In Brazil, the regulatory framework for the environmentally adequate final disposal of SUW's is supported by Law No. 12.305/2010 in art. 3, item VII, which provides for the RSU'sincluding its reuse, recycling, composting, recovery and energy recovery or other purposes, obeying the specific operational rules of the regulatory agencies: National Environmental System - SISNAMA, National Health Surveillance System - SNVS and Unified Agricultural Health Care System - SUASA; in order to avoid public health and safety problems, as well as aiming to reduce environmental impacts.

As for the types of destination of Urban Solid Waste emphasized in Law No. 12,305/2010, they are:

Table 3: Types of waste destination.

Waste destination	Description
Reuse	Reuse is defined as "the process of using solid waste without its biological, physicalor physical chemical transformation. Thus, the reuse of waste means extending the useful life of objects and or giving them a new function, for example, plastic ice cream and margarine jars can be reused to pack other foods or to store utensils, besides being possible to use it as a plant pot, among others.
Recycling	Recycling means "the process of transforming solid waste that involve the alteration of their physical, physicochemical, or biological properties,with a view to transformation into inputs or new products".
Composting	is a simple measure that occurs through the biological process of decomposition and recycling of organic matter contained in animal or plant remains, forming a rich fertilizer for the soil. It provides an appropriate destination for organic waste, reducing its

	accumulation in landfills and repairing the soil. This technique promotes an adequate destination for organic agricultural residues, industrial and domestic. This organic compost can be applied directly to the soil to improve its characteristics, without causing risks to the natural environment.
Recon very and energyuse	It is a technology that transforms waste into electrical and thermal energy using its calorific power as fuel; energy recovery is provided for in the provisions of the PNRS. The energy recovery of MSW can occur through the gases derived from landfills or by thermal treatment processes. An example of biogas generation in a landfill is started a few months after the waste landfill started and will continue for about 15 years after it is closed.

Source: Prepared by the authors

According to the types of destination of waste, it should be understood in this definition, that there can only be destination for waste that was "generated". Once generated, the waste can take several paths, whether they are an open-air dump, or environmentally appropriate if they are for reuse, recycling, composting, and recovery and energy use of this waste.

The current situation in Brazil shows unemployment and underemployment, aggravated by the lack of job openings and the low educational levels of the population, forcing them to perform unhealthy labor activities, such as the collection of garbage and the housing of families in the garbage dump.

In the dumps, the people who work there are subject to conditions that are inadequate to the human being. [31] state that in informal jobs it is common the absence of both environmental and individual protection equipment, and that the insufficient training of workers is added to the risk factors to the specific health of the activities that are developed in these places.

Thus, actions are required to implement mechanisms that minimize the environmentalimpacts caused by man, through compliance with the obligations of goals and objectives of the public authorities, since it is their responsibility to provide the urban infrastructure as wellas the mobilization of the population for the planning and sharing of actions on how it will bedestined RSU's, observing the resources and investments available. The environmental issue related to the proper disposal of SUW's has been a constant concern of governments and of society in general, which must take on shared responsibility

Based on this premise, law 12.305/10, which established the PNRS, provides the principles, objectives, and instruments (Article 4) for its implementation, as well as guidelines on integrated management and solid waste management, including hazardous waste, theresponsibilities of generators and the government and economic instruments applied. Thus, the law contains important tools to enable the confrontation of the social, economic, and environmental consequences of the adequate management of the waste produced by the population with technical planning.

In addition, the law guides a proposal that institutes the prevention and reduction of waste generation. It encourages the practice of sustainable consumption habits and provides a set of tools to increase the recycling and reuse of waste, valuing the material that haseconomic value and can be reused or recycled. Therefore, it ensures that the disposal of waste that cannot be reused or even recycled minimizes negative environmental impacts.

The National Policy for Solid Waste (PNRS), based on Law No. 12.305/2010, outlines guidelines for its integrated management. The Law announces that the municipalities need to plan the correct operation for the selective collection and disposal of waste produced by the population.

In this way, the Law enables the creation of important goals that will contribute to the elimination of open-air dumps and indicates planning tools at the national, state, and municipal levels, as well as at the micro, regional, inter-municipal, and metropolitan levels; inaddition to establishing that private parties must prepare their Solid Waste Management Plans.

IV. CONCLUDING REMARKS

After conducting this study, some judgments can be declined about Urban Solid Waste and Environmental Education (EE) or lack thereof in the Brazilian context and / or Ceará. Starting with the lack of compliance with the rules and legislation and the absence and practice of a public policy of efficient, effective, and widespread environmental education in the educational environment at national and regional levels. This has hindered any action that rethinks a strategy to reduce the waste that is produced. Although this has not been the object of this research, it seemed to us that this assertion is applicable to those municipalities of the space use agreement, already mentioned here.

The way in which the public authorities in their different

spheres manage SUW's is inadequate, especially when it comes to transportation, such as buckets or even trucks with small bodies, with sheets of plywood on the sides, to pack more garbage, making it impossible not to lose the garbage collected during transportation, as is evidenced on the roads and/or places where they pass.

It is possible to see that an integrated and integrating public policy of the public power in the different spheres from municipal to national for the final disposal of SUW's is of extreme importance, so that in each "generator environment", no longer of garbage, but of residues, the sorting by selective collection would be done, that is, in the domestic, commercial, hospital, and industrial environments, this is the action of each citizen, this forthe so-called dry residues. The humid or organic ones, in a responsible public policy, wouldbe destined to composting. Thus, the population would have several benefits generated by the selective collection and composting, because in this way "the waste", properly separated, would generate more income, adding value to the worker who lives from the collection.

Therefore, it is necessary to change the actions and actions of the government and to change the habits of the population through a more effective environmental education regarding "their garbage". This problem must be seen in an integrated way in its multiple dimensions.

REFERENCES

[1] BRAZIL. Law no. 12.305, of August 2, 2010. Instituting a Política Nacional de Residues Solidus; altera a Lei no 9.605, de 12 de fevereiro de 1998; e ad outraps Providencia's.

[2] PRS. Solid Waste Portal: Legal Aspects, Waste Management Plans. 11/05/2013. Available at: <http://www.portalresiduossolidos.com/plano-nacional-de-residuos-solidos/> Accessed:16 nov 2016.

[3] BRAZIL. Official Diary of the Federative Republic of Brazil: Legislative Power, Brasília, DF, 2010. Available at: http://www.mma.gov.br/port/conama/legiabre.cfm?codlegi=636.

[4] PNRS. National Plan for Solid Waste. Brasília: MMA, 2012. Disponível em: http://www.sinir.gov.br/documents/10180/12308/PNRS_Revisao_Decreto_280812.pdf/ e183f0e7-5255-4544-b9fd-15fc779a3657.

[5] BRAZIL. Ministry of Education. Education manual for sustainable consumption.Brasília: MEC/MMA/IDEC, 2005. Available at:<http://portal.mec.gov.br/dmdocuments/publicacao8.pdf>

[6] BASTOS, R. de H. et al; Cap:8, Management of Solid Waste in the Municipality of Guaramiranga-Ceará. In_____. Serra de Baturité: an integrated view of environmental issues/ABNER, M. N. N. C. et al. (Org) BASTOS. F. H.: Fortaleza: Expression Grafica e Editor, 2011.

[7] LIMA, J. D. Urban Solid Waste Management in Brazil. 1 Ed. ABES. Campina Grande - PB, 2001, 267p.

[8] BIDONE, F. R. A.; POVINELLI, J. Conceptus Basics de Residues Solidus. EESC- USP/Escola de Engenharia de São Carlos - Universidad de São Paulo. São Carlos: 2001,120p.

[9] NAIME, R; SANTOS, K, L. Diagnosis of solid waste management in the municipality of Campo Bom - RS. Engenharia Ambiental - Espírito Santo do Pinhal, v. 6, n. 3, p. 563-576,sep/dec 2009.

[10] ABNT- Brazilian Association of Technical Standards. NBR 10004. Rio de Janeiro, 2004. 71p. Available at: <http://www.ebah.com.br/content/ABAAAfRNMAB/nbr-10004-residuos-solidos-classificacao>

[11] BRAZIL. Law No. 6.938 of 1981: Provides on the National Environmental Policy Environment, 1981. Available at: http://www.planalto.gov.br/ccivil_03/Leis/L6938.htm Accessed: apr. 2018.

[12] SANTOS, G. O. Solid waste, and sanitary landfills: in search of a new look/Gemmelle Oliveira Santos; preface Suetônio Mota. - Recife: Imprima, 2016.

[13] IBAM. Manual for Integrated Solid Waste Management. Brazilian Institute of Municipal Administration. Rio de Janeiro, 2001. José Henrique Penido Monteiro ... [et al.]; technical coordination Victor Zular Zveibil. Rio de Janeiro: IBAM, 2001. Available at:< http://www.resol.com.br/cartilha4/manual.pdf >Accessed 10 Jun 2017.

[14] OLIVEIRA, M. C. Qualitative survey of the situation of RSU's: Escudo de Caso no municipia de Barreira - Ce. Unilab. 2016. Available at:< http://repositorio.unilab.edu.br:8080/jspui/bitstream/123456789/558/1/Marlytana%20Costa% 20de%20Oliveira.pdf>

[15] FERNANDES, J. U. J. Garbage: urban public cleaning: solid waste management from the perspective of administrative law. Belo Horizonte: Del Rey, 2001.

[16] MARQUES, R, F, P, V. Environmental impacts of urban solid waste disposal on soil and surface water in three municipalities of Minas Gerais /Rosângela Francisca de Paula VitorMarques. - Lavras: UFLA, 2011. 95 p.

[17] LEONARD, Annie. The history of things: from nature to trash, what happens to everything we consume. Technical revision André Piani Besserman Vianna. Translation Heloísa Mourão. Rio de Janeiro: Zahar, 2011.

[18] FEPAM - Technical Guideline for the Environmental Licensing of the activity of Final Disposal De RSU's. Available at: <http://www.fepam.rs.gov.br/CENTRAL/DIRETRIZES/DT - 004-2017.PDF>

[19] NASCIMENTO. M. N et al. (Org.) Solid Waste Booklet: Sustainable Technologies Program; Projeto "No Clima da Caatinga". Org.: Associação Caatinga. Publication May 2015. Available at: https://issuu.com/climadacaatinga/docs/cartilha1_2small_1aab8f949a9ce4

[20] COPOLA, G. The National Solid Waste Policy: Lei federal nº 12.305, de 2 de agosto de 2010: os aterros sanitários de rejeitos e os municípios. Fórum de Direito Urbano e Ambiental, Belo Horizonte, v. 10, n. 58, 2011.

[21] CONAMA. National Council of the Environment. RESOLUTION No. 001, of January 23,1986. Available at: <http://www.mma.gov.br/port/conama/res/res86/res0186.html>
[22] PEREIRA NETO, J.T. Solid Waste Management in Small Municipalities. Science and Environment Magazine, number 18, Santa Maria - RS, 1999. 42-52p.
[23] SARIEGO, J. C. environmental education: as ameaças ao planeta azul. São Paulo: Scipione,2002.
[24] CASCINO, Fabio. Environmental Education: principles, history, teacher training. 02.ed. São Paulo: SENAC, 2000.
[25] OLIVEIRA, G. C. S; TONIOSSO, J. Environmental education: pedagogical practices in early childhood education. Cadernos de Educação: Ensino e Sociedade, Bebedouro-SP, 1 (1):30-43, 2014.
[26] MILHORANCE, Flavia. What was Rio 92. O Globo. 30 May 2012. Available at: <http://www.oglobo.com.br/> Accessed on: 25 May 2013.
[27] XAVIER, A. R. et al. Research in Education: historical and theoretical-methodological aspects. EDUCA. Multidisciplinary Journal in Education, [S.l.], v. 8, p. 1-19, jan. 2021. Available at: https://www.periodicos.unir.br/index.php/EDUCA/article/view/4627/3815>.
[28] GIL, A. C. Methods, and techniques of social research - 6th ed.
[29] SEVERINO, Antônio Joaquim. Scientific Work Methodology. 26. ed. - São Paulo:Cortez, 2013.
[30] CHIZZOTTI, Antonio. Research in humanities and social sciences. 4 ed. São Paulo:Vozes, 2011.
[31] MENDES, R.; CAMPOS, A. C. C. Health and safety in informal work: challenges andopportunities for the Brazilian industry. Brazilian Journal of Occupational Medicine, Belo Horizonte, v. 2, n. 3, p. 209-223, jul./set. 2004.