

Solid Waste Management in Brazilian Prisons: The Case of Maranhão and Benchmarking of Sustainable Actions in the Brazilian Prison System

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Abstract:

Objective: To analyze solid waste management in the Maranhão prison system in the light of Law No. 12.305/2010 and Resolution No. 5/2012, as well as to systematize in a benchmarking sustainable actions that are developed in prisons in Brazil.

Theoretical framework: The study was based on theoretical reflections on solid waste management, vulnerable populations and environmental education.

Method: This is an analytical-descriptive study with a qualitative approach, which used a case study at the Maranhão State Secretariat for Penitentiary Administration (SEAP).

Results and conclusion: There is no specific sector for solid waste management at SEAP, and there is a lack of an action plan for environmental education, circular economy and control of the production and final disposal of solid waste in Maranhão's prisons. The study presented a benchmarking of sustainable actions developed in prisons in Brazil and related to re-sentencing, income generation and re-socialization of inmates.

Research implications: There is no sector or specific action plan for solid waste management in Maranhão's prisons, but there are experiences of sustainable actions in other prisons in Brazil. This debate creates possibilities for implementing successful sustainable measures in Maranhão's prisons, which meet fundamental human rights and the right to the environment.

Originality/value: In Brazil, the prison population is the second largest in the world and continues to grow, as does the production of solid waste in prisons. Reflections on waste management in the Brazilian prison system guarantee sustainable development objectives and human rights

Key Word: Cognitive diversity; Design thinking; Learning goal orientation.

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I. Introduction

The advent of post-industrial civilization has brought great benefits to humanity, such as technological and social development, while the environment has suffered significantly from the depletion of its resources and damage to biodiversity (Silva, 2011). The so-called progress of modern technology and irresponsible consumerism have produced a legacy of problems causing severe environmental impacts on all life on the planet (POTT, 2017).

Among these environmental impacts, the excessive production of solid waste stands out. Solid waste management comprises planning, transportation, storage, collection, and final disposal of waste (MARCO, 2014). Waste mismanagement is an ever-growing problem and significantly contributes to increasing loss of quality of life and social inequalities (GAVA, 2012).

In a country with severe social inequalities such as Brazil, examining the most vulnerable populations is of great significance. Among the people most impacted by social inequalities the incarcerated is particularly vulnerable to poor health, and environmental degradation, especially with inadequate disposal of solid waste in

Brazilian prisons (MALLART, 2021). The incarcerated suffer daily from unhealthy and unsanitary conditions which grow worse with the ever-increasing population of Brazilian prisons (MORENO, 2016).

In Brazil, the prison population is the 3rd largest in the world, with an average of 820,689 prisoners, according to the National Penitentiary Department—DEPEN (BRAZIL, 2022). On another account, the prison population in Brazil is only smaller than that in the United States and Russia (SMINK, 2021). The Institute for Crime & Justice Policy Research ICPR (2021a and b), ranks Brazil third in total imprisoned population, behind China and the United States (ICPR, 2021b) and 13th by prison population rate (FAIR; WALMSLEY, 2021): the United States, which boasts the largest prison population in the world, has a total of 629 persons deprived of their liberty per 100,000 inhabitants, while Brazil has a ratio of 322 persons deprived of their liberty per 100,000 inhabitants.

Thus we can note that such a large imprisoned population can generate a significant amount of solid waste. Handled inadequately, solid waste can also affect the quality of life and environmental health and well-being not only of the imprisoned, but also visitors, families, and workers of the prison system (MORENO, 2016). Solid waste management is a challenge in prisons throughout Brazil, with waste disposal occurring irregularly; especially organic solid waste is stored and disposed of in direct violation of technical and Human Rights standards (MÁXIMO, 2017), as well as the provisions of Law 7.210/84 (Criminal Executions Law) (BRAZIL, 1984).

Brazil's Federal Constitution article 5 provisions for Human Dignity generate specific legislation to guarantee and enforce a sanitary environmentally sound and healthy prison environment. Indeed, the article 5 principle of the dignity of the human person, is paramount to a fundamental nucleus of Human Rights in Brazil (BRAZIL, 1988). The right to health and material assistance stems from the constitutional provision as well as Art. 12 of Law 7,210/84: "Material assistance to prisoners and internees shall consist of providing food, clothing, and sanitary facilities" (BRAZIL, 1984).

Resolution 5/2012 stands out among the regulation on solid waste management, which provides for the minimum rules for the disposal of waste from penal establishments and a strategy for improving the quality of life in the prison system (BRAZIL, 2012). In addition to the above specific legislation for the prison environment, there are subsidiary legislations such as Law 12.305/2010 that provides for the National Policy of Solid Waste in Brazil and Norm NBR 10.004 that provides for the classification of urban solid waste and plans for management of solid waste (BRAZIL, 2004).

Also, guidelines in the international treaties to which Brazil is a signatory must also be observed: United Nations—UN, Basel Convention, Convention on Biological Diversity—CBD/UN, together with Article 225 of the Brazilian Constitution which provides for the right to an ecologically balanced environment (BRAZIL, 1988); as well as Decree 11,044/2022, which, in Article 2, states that it is necessary for legal entities governed by private law to develop reverse logistics actions integrated with the management of solid waste (BRAZIL, 2022).

This rather complete and complex set of norms remains, for the most part, ineffective. Solid waste production and mismanagement are still increasing in Brazil (Oliveira, 2019). Also, specific data on the Brazilian prison system is still lacking.

Maranhão's 47 prisons held 11,725 persons in 2022, in freedom restriction regimes with 1,146 under electronic monitoring. The prisons located in the state capital held 5,450 persons (MARANHÃO, 2022).

In order to rethink waste management practices, as suggested by SDG 12 (Sustainable Consumption and Production) of the 2030 Agenda of the United Nations (UN), the article analyzes the solid waste management of SEAP-MA in the face of Law 12.305 /2010 and Resolution 5/2012, as well as systematize sustainable benchmarking actions that are developed in prisons in Brazil. We believe that the analysis of solid waste management at SEAP, as well as the identification of sustainable action plans implemented in prisons in Brazil, can create space for this debate and the implementation of sustainable measures in Maranhão.

II. Theoretical Background

In Brazil, the amount of solid waste has increased significantly in recent decades. Added to this scenario is the lack of environmental sensitivity and awareness of simple actions that can be applied on a daily basis, such as reducing consumption, reusing, recycling and reusing this solid waste (SANTAELLA, 2014).

According to Brazilian Standard (NBR) No. 10.004, solid waste is considered to be "[...] solid and semi-solid waste resulting from the activities of the community of origin: industry, domestic, hospital, commercial, agricultural, services and sweeping" (ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS, 2004). The issue of solid waste is one of the pillars of basic sanitation according to Law No. 11.445/2007, amended by Law No. 14.026 of 2020, the relevance of which became definitive with Law No. 12.305 of August 2, 2010, which instituted the National Solid Waste Policy (PNRS).

Despite all the legislation aimed at reducing the environmental impacts of poor solid waste management, the different social segments generally fail to meet the requirements of these normative

instruments. In addition to private enterprises, most public institutions do not properly manage their waste, including the Brazilian prison system (WINCK, 2018).

The Brazilian prison system has the 3rd largest prison population in the world, estimated at approximately 820,689 people deprived of their liberty, according to statistics from the Penitentiary Department - DEPEN. According to Smink (2021), the Brazilian prison population is smaller than the total number of people deprived of their liberty in the United States and Russia. This is reflected in the considerable volume of solid waste produced in Brazil's prisons.

Costa et. al. (2019) addressed the issue of organic solid waste generation in prisons, emphasizing the importance of addressing the application of solid waste concepts, proper final disposal, reuse, composting and recycling with a focus on organic waste waste and environmental impacts, with a view to raising awareness of the possibility of developing actions that rethink integrated solid waste management within the prison environment.

According to Silva (2019), the Brazilian prison system is a very strong example of the failure to guarantee the principle of human dignity and the lack of environmental preservation, especially with regard to solid waste management. Silva and Gomes (2016) evaluated some of Brazil's prison systems and pointed out that there is not the slightest compliance with hygiene, sewage treatment and solid waste standards in these places.

As part of the legislation guiding solid waste management in prisons, Resolution No. 5 of June 28, 2012 of the National Council for Criminal and Penitentiary Policy (CNPCCP) stands out. It sets out the minimum rules for disposing of waste in prisons as a strategy for improving the quality of life and health in the prison system. The resolution covers everything from the correct packaging of waste to its transportation and handling.

Winck (2018) points out that it seems unusual to address the issues of prisons, quality of life and the environment in the same topic, but they are directly linked and, if brought together, could generate significant results for society. Authors such as Moreno (2016), Toledo (2016), Fraga (2018), Winck (2018), Da Silva (2019) and others have addressed the importance of sustainability, environmental education and selective waste collection in prison systems. These approaches focus on solid waste and highlight the importance of what the National Waste Policy and Resolution No. 5/2012 advocate.

Environmental Education has principles confirmed in Law 9.795/99, in its Article 5, which deals with encouraging individual and collective participation in preserving the balance of the environment (BRASIL, 1999). Environmental Education (EE) is a mechanism capable of enabling changes in thoughts and attitudes in humanity, so that, starting from a critical awareness, they position themselves as individuals with sustainable habits (MORENO, 2016).

Therefore, the inclusion of Environmental Education in prisons has a great responsibility in the formation of individuals, given that it can provide a new perception of the relationships between human beings, society and nature, as well as promoting a re-evaluation of values and attitudes, in addition to highlighting the need to be and act as citizens in the search for solutions to emerging problems (SATO, 2001). According to Novelli and Louzada (2012), the relevance of environmental education, whether non-formal, informal or formal, in prisons, and how it can help to generate environmental education and culture, should be included and evaluated (GADOTTI, 1999).

However, there are inspiring examples of environmental education through work activities in prisons in Brazil. As mentioned by Melo (2014), who reported on the experience of a partnership between Porto Alegre's Central Prison, the Public Prosecutor's Office and the Vonpar Institute, which started a solid waste sorting project in 2011. In 2013, the closed regime prison Centro de Triagem Anísio Lima (CT), located at Rua Indianápolis S/N, in the Jardim Nordeste prison complex, Campo Grande, also started an environmental education project with the company Reciclagem e Preservação Ambiental LTDA (REPRAM), with the aim of classifying and preparing inmates for the process of reusing waste. Through the partnership, the company benefited from the exclusive right to receive raw materials for the recycling process, the sale of which benefited the inmates (OLIVEIRA, 2013). Run by the Rio de Janeiro State Water and Sewage Company (CEDAE), the Replanting Life Program (PRV) employs, trains and pays inmates to work in ecological restoration activities, collecting seeds, producing seedlings, planting and managing water resources. The program also promotes environmental restoration projects and distributes free seedlings produced by inmates in seven CEDAE forest nurseries (ABREU et al., 2021).

For Fernandes (2015), it would be advisable to encourage managers and inmates of these penal establishments to change their behavior in order to reuse and consciously consume water and food, as well as reusing solid waste, thus preserving the environment. These actions can be materialized through education and work, which are guarantees backed by the Penal Execution Law – LEP (BRASIL, 1984).

III. Materials And Methods

The research was based on the analytical-descriptive and qualitative methods. It is a literature review, where a critical, meticulous, and broad analysis of current publications in a particular area of knowledge with a focus on a case study (CELLARD, 2008).

The analysis of solid waste management in the Maranhão prison system takes place through a case study in compliance with Law 12.305/2010 and Resolution 5/2012. The case study is a qualitative research strategy with a study of a particular case representative of a population (MEDEIROS, 2019).

The information collected from the research's primary sources is based on legal documents on the management of solid waste in the Maranhão prison system, obtained through a letter sent to SEAP-MA – MA containing four questions about the treatment of solid waste in penal establishments in Maranhão. 1- What legislation guides the management of solid waste in penal establishments in Maranhão? 2-Is there any report on the control of solid waste produced in penal establishments in Maranhão? 3-Is there any composting and selective collection activity in penal establishments in Maranhão? 4-Is there any environmental education and circular economy project in penal establishments in Maranhão?

Information regarding secondary sources is based on Law 12,305/2010, which provides for the National Solid Waste Policy in Brazil, and Resolution 5/2012 by the National Council for Criminal and Penitentiary Policy - CNPCP, which is a specific regulation on the treatment of solid waste in penal establishments.

The first section of this paper compares the information from the State Secretariat and Penitentiary Administration - SEAP-MA report with Law 12.305/2010 and Resolution 5/2012, to verify whether SEAP-MA complies with its legal mandate. The second section aims at identifying the devising and implementing of sustainable actions and procedures from prison institutions in Brazil, under a benchmarking comparison. According to Vasconcelos (2006), benchmarking is a tool based on experiences and learning successfully applied in other companies to help organizational improvement.

This research uses benchmarking from a systematic literature review carried out on the Portal de Periódicos Capes and Science Direct data platform, with the descriptors: (Solid waste management – prison environment – environmental education – Brazil). Research published in Portuguese and English between 2000 and 2020 has been considered.

Data related to solid waste management, as well as benchmark comparisons, were analyzed through content analysis (BARDIN, 1977). Content analysis constitutes a research technique used to describe and interpret the content of selected documents and texts. The text from the denouncements and grounds was broken down into units or thematic categories, which were constructed, grouped, and analyzed based on what they had in common (CARGNATO, 2006).

IV. Results And Discussion

Data collection related to the management of solid waste in penal institutions in Maranhão, in compliance with Law 12,305/2010 and Resolution 5/2012, was carried out by means of a report by the State Secretariat for Penitentiary Administration of Maranhão – SEAP, approaching the following questions: (i) What are the laws that guide the management of solid waste in penal establishments in Maranhão? (ii) Do Maranhão prisons produce reports on the control and management of solid waste produced in penal establishments in Maranhão? (iii) Is there any composting and selective collection activity in penal establishments in Maranhão? (iv) Are there any environmental education and circular economy projects in penal establishments in Maranhão?

Data relating to the first and second stages of the research were systematized into three topics to facilitate presentation and analysis, namely: Management of solid waste at SEAP; Sustainability in Solid Waste Management in the Brazilian prison environment.

Solid waste management at SEAP-MA

The benchmark comparative analyses on the implementation of solid waste management under Law 12,305/2010 and Resolution 5/2012 provisions, is presented in the following tables which describe the main objectives and principles of each legislation, as well as compliance or not with the principles and objectives by SEAP.

Law 12,305/2010 set a milestone in solid waste management in Brazil, as it instituted the National Solid Waste Policy - PNRS, establishing principles and objectives that are detailed in Table 1 and confronted with the effectiveness of solid waste management carried out by SEAP-MA according to the responses obtained in the report.

Law 12.305/2010 principles description	Compliance in practice?		
	Yes	No	No answer

Article 1 National policy, instruments, and guidelines for solid waste management.	✓		
Systemic vision in the management of solid waste that considers the environmental, social, cultural, economic, technology, and public health variable.		✓	
Sustainable development.	✓		
Cooperation between public authorities, the business sector, and other segments of society.	✓		
Recognition of reusable and recyclable solid waste as a common good that generates jobs and income and promotes citizenship.	✓		

Law 12.305/2010 objectives description	Compliance in practice?		
	Yes	No	No answer
Art. 6th. Polluter prevention and precaution, protector and sustainability.	✓ ✓		
VIII - the recognition of reusable and recyclable solid waste as an economic good and of social value, generator of work and income, and promoter of citizenship.		✓ ✓	
IV Adoption, development, and improvement of clean technologies to minimize environmental impacts.	✓ ✓		
Continued technical training in the area of solid waste.	✓ ✓	✓	
Priority in government contracting to follow the criteria aimed at sustainability.	✓ ✓	✓	

Table 1 - Principles and objectives of Law 12.305/2010 met by SEAP-MA Waste Management

Source: The authors, 2023.

Regarding the principle of the systemic view of solid waste management, SEAP-MA does not meet the legal prerogatives. This systemic view considers not only the environmental variable, but the social, cultural, economic, technological, and public health aspects linked to waste management. Furthermore, SEAP-MA does not meet the objective related to the recognition of reusable and recyclable solid waste as an economic good and of social value, which also can improve work and income opportunities, as well as social reinserction to inmates; in spite of having reported compliance with the norms of Law 12.305/2010 as well as NBR 10.004 regarding the management of solid waste in penal establishments in Maranhão, SEAO only carries out sporadic and inconsistent activities in the manufacture of handicrafts through the reuse of raw materials donated to complement the pedagogical activities of persons deprived of liberty.

Penal establishments have traditionally been designed to distance people deprived of their liberty from society, facilities are often precarious and unsanitary and cause indignation and violence in prisons (Ferreira, 2016). Thus, the debate on the production of waste in Brazilian penal establishments has been proficuous. The expressive growth of the inmate population will directly reflect on the production of waste in prisons. Moreno (2016) reports that these prison environments generate significant amounts of solid waste from prisoners, employees, and visitors, putting extra strain on the system and likely generating more frequent failures in the management process.

The main regulation to prevent and correct actions harmful to the environment, in the context of solid waste production, is Law 12.305/2010, which was processed for two decades in the National Congress, until finally approved and enforced (RAUBER, 2011). From Table 1, we can note the non-compliance with solid waste management at SEAP-MA under Law 12,305/2010 is particularly significant under a systemic view, which integrates different sectors of society and society's needs. The implementation and enforcement of the National Solid Waste Plan – PNRS, requires changes in perception on the part of society and public authorities in order to see solid waste as an asset of economic value and income generator (MARIA, 2014).

This broader perspective on solid waste needs to be integrated with a set of actions that seek solutions for solid waste. Green (2016) reports a positive experience in New York State, where inmates grew vegetables for food and gardens for therapeutic and socio-educational purposes. Jurado (2017) notes that such sustainable practices developed with prisoners through composting, recycling, gardening, and fostering of endangered species in natural environment projects help sustainability and promote better taxpayer money savings. Still,

SEAP-MA has not yet developed any project with composting activities, selective collection, and environmental education and actions aimed at promoting sustainable development.

The problem of solid waste production and its improper disposal stems from educational and cultural failures with regard to consumption practices, responsibility, and lack of sustainability culture in the broader Brazilian society and State (FANTINEL, 2019). This non-effectiveness of public solid waste policies in public and private organizations indicates both a physical and a structural distance between public authorities and compliance with these norms and guidelines, whose problems with this integration between agencies and the government translate into the ineffectiveness of these policies with sanitation and the environment (BRITO, 2018).

The cooperation between SEAP-MA and the private sector happens through hiring public procurement for outsourced suppliers for the management of solid waste from penal establishments. Such partnerships between the public administration and private companies can contribute positively to the development and modernization of public services provided by the State in Brazil (MORAES, 2012). Yet, SEAP-MA did not grant this research access to any management program, contract, or procurement. These gaps could be filled through initiatives for environmental education in the prison environment. Since education is a valuable instrument for promoting better practices and improving the relationship between man and environment, it is possible to break old paradigms about sustainability concepts through a model that allows delegating responsibilities for conscious consumption and disposal (LOTZ- SISITIKA, 2015).

It is important to point out that caution is necessary with regard to prevention and precaution of the polluter principles, provided for by Article 6 of Law 12.305/2010. SEAP-MA report mentioned that solid waste management follows the norms of NBR 1004, which classifies hazardous waste and establishes classification criteria aimed at protecting the potential risks of this waste to the environment and health (BRAZIL, 2004). But the report did not provide details on the adoption of criteria for improving clean technologies that may reduce environmental impacts.

Dourado (2014) points out that sanitation infrastructure and services are mandatory by Article 3 of Law 12,305/2010, which provides for the rules for the final disposal of solid waste and rejects, to prevent pathologies infections, and other unsanitary effects, as the inadequate handling of these solid residues and rejects can negatively impact the environment and generate serious problems of individual and community health public health.

Resolution 5/2012 of the National Council for Criminal and Penitentiary Policy – CNPCP details and implements the principles and objectives by the National Policy of Solid Waste. Table 2 highlights the main articles and objectives of Resolution 5/2012, as well as whether or not SEAP-MA complies with these prerogatives.

Implementing Articles of Resolution 5/2012	Compliance in practice?		
	Yes	No	No answer
Article 1. DEPEN recommends that the State Secretariats responsible for penitentiary management create programs on the correct disposal of waste		✓	
Article 3. All waste produced in penal establishments must be properly separated, respecting the classification recommended by RDC 306/2004, by groups A, B, C, and D.	✓		
Article 4. Every generator must prepare a Health Services Waste Management Plan - PGRSS, based on the characteristics of the waste generated and the classification contained in this resolution, establishing the RSS management guidelines		✓	
Article 5. The PGRSS to be prepared must be compatible with the local norms related to the collection, transport, and final disposal of waste generated in the unit's services, established by the local bodies responsible for these steps.			✓
Article 6. For the packaging of solid waste, steps must be taken to facilitate sorting, storage, transport, handling, and final disposal of the waste, according to the classification by groups.			✓
Article 12. The separation of waste must be carried out at the source of waste production			✓
Article 17. All waste must be stored in a suitable shelter for the management and recovery of chemicals;			✓
Article 21. For the external transport of waste, the definition of the route, frequency, and times of municipal collection must be taken into account.			✓

Table 2 - Benchmark compliance of Resolution 5/2012 of the National Council for Criminal Public Policy - CNP as informed by SEAP-MA Waste Management

Source: The authors, 2023.

Regarding Article 1 of Resolution 5/2012, each Department of Penitentiary Security, in its State, must be responsible for the elaboration of specific programs for the management of solid waste produced in prisons. Article 4 of this Resolution alludes to the need for the public administration to prepare a Health Services Management Plan, which was not verified according to the SEAP-MA responses, which confirms the lack of a solid waste management shift.

Article 3 follows as a reference, the classification of waste according to groups A, B, C and D, which fits perfectly for penal establishments due to the flow of hospital waste, as penal establishments have medical care facilities. Finally, the absence of responses regarding Articles 5, Art 6, Art 12, and Art. 2 raises great uncertainty regarding the storage and transport of solid waste from the Maranhão prison system. Despite SEAP's duties under the national solid waste policy, it does not have a Solid Waste Management Plan, nor does it have a dedicated sector or division, which would be necessary to control the production of solid waste generated by penal establishments and their final destination.

Devising and implementing efficient waste management faces several challenges, from the diagnosis to the selective collection procedure, whose procedures are not limited to the task forces of acquiring knowledge of the composition of this solid waste and its implementation. For penal establishments, Resolution 5/2012 of the National Council for Criminal Penitentiary Policy – CNPCP was prepared to remedy these legal gaps in the management of solid waste in prisons. The Resolution ranges from waste collection, handling, and treatment to transportation and correct disposal.

Within the scope of the effectiveness of Resolution 5/2012 by SEAP-MA, the absence of a program for the correct disposal of garbage has a structural effect on all solid waste management in the Maranhão prison environment. According to Fontinel (2019), there is a need to implement public policies with solid waste management programs that address this legislation, with the aim of promoting the minimization and solution of problems generated by environmental impacts and fomentation, Horn (2015) notes that these public policy programs need to be integrated and effective in order to foster sustainable development.

The absence of responses from SEAP-MA and the outsourced company regarding compliance with Articles 5, 12, 17, and 21 of Resolution 5/2012 raises questions about the storage and transport of solid waste from the prison system, including solid health waste that can be contagious. This gap calls into question the guarantee of a healthy and balanced prison environment, the right to human dignity that is related to an existential minimum guaranteed to every citizen (CAPITANI, 2012).

Even with investments in expansion, infrastructure, and the management of prisons in Maranhão, prisoners still do not have access to education on environmental consciousness and responsibility, sustainability, selective collection, and circular economy in a prison environment, although some penal establishments in the capital of Maranhão seldom promote handicrafts ateliers, from reused raw materials and recyclables. In order to devise and promote alternatives to this scenario that this study has developed the following comparative benchmarking of successful initiatives and good practices in the management of solid waste in a prison environment.

Sustainability in Solid Waste Management in the Brazilian prison environment

Although we noted and reported the above frailties in the solid waste management systems at penal establishments in Maranhão, we have also found some sustainable actions that are successful in prisons elsewhere in Brazil. These initiatives were systematized in the benchmarking Table 3 below.

Dias, 2016:		
GOAL	METHOD	RESULTS
Promote environmental education and sustainability in the prison environment.	Interdisciplinary study with the deductive method and bibliographical research.	Dissemination and awareness on sustainable development, environmental education, and green employment in the prison environment.
Silva (2019):		
GOAL	METHOD	RESULTS
Proposes the agricultural activity of the Regional Standard Prison of Cajazeiras - PB through prison labor with the reuse of solid waste and water.	Deductive hypothetical method, qualitative research, bibliography, and legal texts. In addition to the application of an intervention project with the inmates of the Regional Prison of Cajazeiras - PB.	It enabled the remission of the penalty through the selective collection for the reuse of water and solid waste.
Nunes (2013)		

GOAL	METHOD	RESULTS
Promote environmental education in the promotion and humanization of the regional prison of Montes Claros – MG.	The methodology was based on a broad discussion of several theoretical references by authors and researchers involved in Environmental Education, Territory, and Geographic Space in the prison environment.	It promoted an intrinsic harmony in relations and pedagogical practices with environmental education projects in the prison.
Toledo (2016)		
GOAL	METHOD	RESULTS
Investigate the normative instruments, and operational and human resources existing in the research and at the Industrial Penitentiary of Caxias do Sul (PICS) - Prison System of the State of Rio Grande do Sul, related to environmental education.	Descriptive research (documentary and bibliographic), as well as scientific methods of approach: deductive and hypothetical-deductive.	Aroused reflections on the practical importance of environmental education in penal establishments.
Wink (2018)		
GOAL	METHOD	RESULTS
Identify the relationship between environmental education and the prison system and whether this environment interferes with the quality of life of individuals who are part of the State Prison of Cruz Alta	Qualitative method with the application of semi-structured questionnaires, as well as bibliographic research.	It was positively perceived that the convicts contribute to the construction of a pleasant environment, positively interfering in the environment in which they are being held.

Table 3 - Benchmarking of sustainable actions in the Brazilian prison environment**Source:** The authors, 2023.

Table 3 shows four authors who have developed research on the promotion of environmental education in prisons, whose initiatives positively promoted a new environmental perception and ethical posture of inmates in the face of the prison environment.

Based on the compared works presented in Table 3, the authors sought, through environmental education, to transform the perception of the environment and, consequently, promote sustainable or less harmful life practices to the environment. It argues that these pedagogical practices can help people deprived of their liberty with new concepts and awareness about the relationship between man and the environment (TOLEDO, 2016).

Silva (2019) presented an innovation with the remission of the penalty through selective collection practices and the reuse of water, which demonstrates relevance in the regeneration of natural resources available in the prison environment, as well as the experience cited by Toledo (2016) with normative instruments and human resources focused on environmental education practices.

This benchmarking comparison shows that investment in environmental education for inmates in the prison system people will encourage them to reflect on an invaluable good that is nature, since learning about the rules inherent in the preservation of the environment will help in understanding the rules inherent to the preservation of human life (MENDEZ, 2017).

Lipshutz (2013) also notes that environmental education promotes awareness of the value of the connectivity between humans and natural and anthropic environments and supports inmates to acquire a new environmental perception to contribute to a healthier environment, with a new behavior of conscientious consumption, reusing and recycling of resources and environmental integrity.

It is in this sense that one of the authors presented in the benchmarking links a perspective of sustainable management, through the selective collection and reuse of water in prisons, and the paroling of sentences for inmates. A rebuilt perception of the environment, linked to practical action aimed at sustainability and the common good, fits in with asserting what is necessary for the prison system: the adoption of educational public policies that promote conditions of citizenship and return to people deprived of liberty to society (CAETANO, 2017).

It is also of interest to compare this perspective of resource management within Maranhão's and Brazilian prisons with prison systems in other selected countries. Bland (2015) reports that in California, for example, solid waste management follows a policy guided by statutes that design programs for recycling, reduction, and reuse of unwanted materials, and income generation. Projects that reuse digital technologies with the prison population contribute to expanding knowledge about the architectural heritage and ecological heritage, including an opportunity to build citizenship and prepare for their return to society (MENDEZ, 2017).

With regard to normative instruments and human resources aimed at solid waste management in a prison environment, pointed out by one of the authors of the benchmarking, it can be seen that we have gradually advanced in the acquisition of greater awareness about the use of natural resources and preservation of the prison environment by part of persons deprived of their liberty. Calixto (2010) opportune to reflect that the materialization of these legal norms, especially the environmental law in penal establishments, still faces resistance or lack of clarifications that promote actions that guarantee the quality of life in the prison environment.

Successful experiences have taken place in Colombia, in Cali, where it has been proven that through a program of activities that promote care for the environment, it has been possible to create strategies involving people deprived of liberty in the practice of positive actions within the prison environment (VELÉZ, 2011).

Educational spaces can be created in prisons on issues related to the care and protection of the environment, in addition to initiatives for the remission of sentences and income generation from educational projects related to environmental culture and circular economy (HAVELEY, 2013).

V. Conclusion

Maranhão's prison system faces deficiencies in the effectiveness of public policies for the management of solid waste, which are aggravated by social, educational and public health inefficiencies.

By this benchmark comparison of SEAP-MA policies and protocols against the provisions of Law 12,305/2010, which correspond to the National Solid Waste Policy, we perceive gaps with regard to the effectiveness of solid waste management in Maranhão's prison environment.

It was observed that although SEAP-MA hired outsourced companies for the management of solid waste, the procurements and contracts do not incorporate Resolution 5/2012 or the devising and development of a Solid Waste Management Plan. DEAP also lacks a dedicated sector or department focused on the elaboration of an action plan aimed at penal establishments, which would be necessary to control the production of solid waste generated in penal establishments and its final destination, which was observed when it was not able to responses when asked about the existence of any report on the control of solid waste produced by penal establishments in Maranhão.

Also, SEAP-MA lacks any relevant educational initiative with actions aimed at environmental education and promoting sustainability practices, as well as projects with practices for the reuse of raw materials produced in penal establishments to be produced, which could generate income, social value, and promotion of citizenship, since it would enable save financial resources.

We also observed the lack of information regarding a holistic and systemic view of environmental management of solid waste with a social, cultural, economic, and public health variable, as the observed responses denoted gaps.

When we contrast the management of SEAP-MA with Resolution 5/2012 of the National Council for Criminal Policy – CNPCP, we confirm the lack of knowledge of the specific legal rule for the treatment of solid waste in penal establishments and the absence of a solid waste management plan. Also, in the absence of norms and practices of selective collection, as well as information on the control of the production of solid residues of the penal establishments and monitoring and control of the conditioning, separation, and storage of solid residues.

In order to rethink these practices of solid waste management and environmental education in prisons in Maranhão, the study collected and compared successful practices through benchmarking, which enables the flourishing of inspirations and strategies for environmental education, sustainability, selective collection, and circular economy that can be adopted in the prisons of Maranhão. Such affirmative actions will contribute to the process of re-education and re-socialization of people deprived of liberty with the acquisition of new knowledge and a new ethical attitude towards the environment.

The research points to the need to consider these successful practices and the possibility of promoting environmental education and sustainability in prison environments. The articulation of sustainable measures in prisons, with the remission of sentences through the selective collection, for example, has been a success.

Finally, the study promotes the possibility of future development of instructional materials with guidelines on the treatment of waste produced in prisons, as well as work activities of green economy that can help in the remission of the sentence and re-socialization of people deprived of liberty.

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