AMBIENTE & SOCIEDADE 25 anos 25 años 25 years

SciELO

Recyclables in São Gabriel da Cachoeira: possibilities for greater socioenvironmental development in Alto Rio Negro

Marcelo Côrtes Silva [I]
Estefany Padilha da Silva [II]
Quedma Karolayne Otero Azevedo [III]
Taynara Gonçalves Almeida [IV]
Paulo José da Silva Nascimento [V]
Pedro Moreno Feio de Lemos [VI]

Abstract: Waste management has become a leading theme for environmental sustainability, enabling the debate and structuring of various public policies that operate in local, regional, and national development. In Brazil, recyclable material collectors play a fundamental role in the management of solid waste, being the main environmental agents responsible for the reuse of waste and its consequent correct disposal, which favors environmental, social, and economic aspects. This article analyzes the role of recyclable material collectors in São Gabriel da Cachoeira, the most indigenous municipality in Brazil, located in the Alto Rio Negro, in the interior of the state of Amazonas. Through documentary analysis, reference literature in the area, and information obtained from municipal agencies, the article traces a current overview on the destination of recyclable waste in the municipality, discusses the importance of actions for local development, and directs possibilities for improving the quality of life in Alto Rio Negro.

Keywords: Solid waste management; recycling; recyclable material collectors; local development; Alto Rio Negro.

[I] *Laboratory School of Federal University of Rio de Janeiro, Rio de Janeiro, RJ, Brazil*

[II] *Federal University of Santa Catarina, Florianópolis, SC, Brazil*

[III] *Unicamp, Campinas, SP, Brazil*

[IV] *FAMETRO University Center, Manaus, AM, Brazil*

[V] *Federal Institute of Education, Science and Technology of Amazonas, Manaus, AM, Brazil*

[VI] *Federal Disctrict's Education State Department, Brasília, DF, Brazil*

São Paulo. Vol. 28, 2025

Feature Topics: Amazon

DOI: http://dx.doi.org/10.1590/1809-4422asoc01641vu28L1FT

Introduction

Waste management has become a key issue for environmental sustainability (Marshall; Farahbakhsh, 2013), which has led to the proposal, debate, and structuring of various public policies that affect local, regional, and national development. In August 2010, the National Solid Waste Policy (Política Nacional de Resíduos Sólidos - PNRS) was established, which deals with the management and integrated management of solid waste. The PNRS establishes that the management of solid waste generated in each territory is the responsibility of each municipality; therefore, the waste sector is crucial for local and regional development (Eigenheer, 2009).

In 2018, 6.3 million tons of waste were not collected. Furthermore, over 24% of the waste collected was sent by more than 3,000 municipalities to controlled landfills or dumps, which are inadequate final dispositions and cause serious damage to health and the environment (ABRELPE, 2019). Inadequate sanitation is a contributing factor to the persistence and increase of various diseases in the Brazilian population (Moura; Landau; Ferreira, 2016). Its ineffectiveness presents an obstacle to quality of life and development, as evidenced by the fact that every R$1.00 invested in sanitation can save R$4.00 in public health (Ribeiro; Rooke, 2010).

In Brazil, recyclable material collectors play a pivotal role in solid waste management, both in sanitary contexts, such as cooperatives and associations, and in the unsanitary context of city dumps and landfills. The National Household Sampling Survey (IBGE, 2012b) and the 2010 Demographic Census (IBGE, 2012a) indicate that a total of 387,910 individuals are engaged in the collection of recyclable and reusable materials throughout Brazil. This figure may represent an underestimate of the actual number of collectors given the informal nature of their work, since the demand for labor in other sectors influences their decision to remain in this field. Notwithstanding the considerable number of collectors, a considerable proportion remain informal, constituting approximately 61.4% of the total workforce. Consequently, only 38.6% are engaged in some form of contractual employment relationship. Moreover, data analyzed by IPEA (2011) indicates that the number of cooperative members remains relatively low, representing approximately 10% of all waste pickers in Brazil.

The city of São Gabriel da Cachoeira (SGC), in the state of Amazonas, has yet to implement the provisions set forth in the PNRS (Brazil, 2010). Consequently, all types of waste are still being disposed of in dumps (SNIS, 2017), a practice that has been identified as a significant contributor to numerous social, environmental, and economic challenges (Mahler, 2012). The municipality is situated on the border with Colombia and Venezuela, in the extreme northwest of Brazil. It is located in the interior of the state of Amazonas, in Brazil's North Region. Spanning approximately 700 communities, São Gabriel is home to 23 indigenous peoples and is thus the most indigenous city in Brazil. As reported by the Brazilian Institute of Geography and Statistics (IBGE, 2019), the municipality is estimated to have a population of 44,553 inhabitants, which positions it as the 12th most populous in the state of Amazonas, out of 62.

The municipality is distinguished by the presence of the Rio Negro River and the

indigenous communities that inhabit its vicinity. The city is situated at a considerable distance from the capital, Manaus, and is crossed by the Rio Negro and its tributaries (IBGE, 2019). Those geographical conditions present a significant challenge to the implementation of effective selective collection initiatives, that aim to separate and organize the different types of waste (Eigenheer, 2009; Lino; Ismail, 2011; Brasil, 2010; Loureiro; Rovere; Mahler, 2013). The municipality of São Gabriel is afflicted by a persistent prevalence of dengue and malaria, which are classified as Diseases Related to Inadequate Environmental Sanitation (DRSAI) (Moura; Landau; Ferreira, 2016). It is the sole municipality in the Alto Rio Negro region to have witnessed an increase in malaria cases in 2020, a period during which the state average exhibited a 20% decline compared to the previous year (SES-AM, 2021).

The objective of this article is to analyze the work of environmental agents of recyclable materials in the municipality of São Gabriel da Cachoeira, discuss their impact, and propose possibilities for waste management in the city. This analysis is based on the results obtained in a technical course completion work at the Federal Institute of Education, Science and Technology of Amazonas (IFAM).

This study is exploratory in nature, as defined by Gil (2008, p. 43), who states that "the primary objective of exploratory research is to develop, clarify, and modify concepts and ideas, in order to formulate more precise problems or researchable hypotheses for subsequent studies." Consequently, it permits a greater familiarity with the problem, thereby facilitating its more explicit articulation.

The initial plan was to conduct a multi-case study, given the lack of familiarity with the universe under investigation and the potential for analyzing multiple cooperatives/environmental agents. In light of the prevailing circumstances and the advancements in research, due to the COVID-19 pandemic, it was deemed prudent to pursue the development of this work based on the data gathered from the municipal agency of São Gabriel da Cachoeira (which will be elucidated subsequently).

The research employs a qualitative methodology, with direct observation in the field and data collection from the Municipal Department of Environmental Affairs.

> [...] a phenomenon can be more effectively understood when considered within the context in which it occurs and of which it is a part, and thus requires analysis from an integrated perspective. To achieve this, the researcher must enter the field of study and seek to "capture" the phenomenon under investigation from the perspective of those involved in it, taking all relevant viewpoints into account. A variety of data are collected and analyzed in order to gain insight into the dynamics of the phenomenon (Godoy, 1995, p. 21).

In accordance with the established technical procedures, the investigation is grounded in a comprehensive analysis of pertinent documentation and a systematic literature review, which serve to contextualize the discussion and propositions pertaining to the research problem.

Solid waste, recycling, and the collectors' role

In 1999, at the First Congress of Paper Collectors, the concept of establishing the National Movement of Recyclable Waste Collectors (Movimento Nacional de Catadores de Recicláveis - MNCR) was first proposed. This was formalized at a congress in 2001, attended by over 1,700 collectors. The formalization of the MNCR fostered the development of a collective identity, highlighting the need to build alliances and exchange experiences with other social movements striving for recognition and representation, such as environmentalists, feminists, and the Black movement (MNCR, 2021).

The MNCR's principles are articulated as follows:

> [...] encouraging the self-management and organization of waste pickers; class independence from political parties, governments and businessmen; the fight for integrated solid waste management, with the active participation of waste pickers; the search for viable technologies that guarantee control of the production chain; mutual support and class solidarity in the effort to guarantee access to fundamental rights; the fight against the privatization of public basic sanitation services, including urban cleaning services (MNCR, 2021).

The re-signification that waste pickers seek to give to their work and to recyclable materials opens up a frontier to establish a clearer relationship between social and environmental issues. This is because waste pickers' activities are no longer perceived as a mere consequence of a social problem; instead, they are regarded as a means of addressing both social and environmental challenges, while also exerting a significant influence on economic growth (Banco Mundial, 2018). The effective organization and social articulation of waste pickers resulted in the formulation of numerous ordinances, laws, decrees, and norms that empowered this segment and, thus, facilitated greater access to job security, job creation, income, and social inclusion (Valadão; Silva, 2024). A number of public policies aim to protect, improve and guarantee proper employment for waste pickers.

In 2002, the Ministry of Labor made the profession of "recyclable material collector" official. According to the Brazilian Classification of Occupations (Classificação Brasileira de Ocupações - CBO), waste pickers are classified under code 5192-05, in which the activity is described as follows:

> The responsibilities of recyclable material collection and sorting workers include the collection of recyclable and reusable material, the sale of collected material, the sorting of collected material, the preparation of material for shipment, the maintenance of the work environment and equipment, the promotion of recycling, the management of work, and the adherence to safety protocols (Brazil, 2013).

Since 2003, there has been a notable increase in the implementation of programs and actions designed to provide support for waste pickers in Brazil (IPEA, 2013). The establishment of the Interministerial Committee for the Inclusion of Waste Pickers (Co-

mitê Interministerial para Inclusão de Catadores) in 2003 and the enactment of Decree 5940/06 represented a significant step forward in providing support and recognition to the work of waste pickers. This decree introduced selective collection in federal public bodies and linked the destination of recyclables to cooperatives, a practice designated as "solidary selective collection" (Brasil, 2006). Furthermore, the Basic Sanitation Law of 2007 provided that waste picker cooperatives were exempt from the bidding process for hiring by public administration bodies (Brasil, 2007).

In several articles published in the PNRS of August 2010, the necessity of shared management in the waste processing process is established, and participation of waste picker cooperatives is stimulated, facilitated, and encouraged. Furthermore, the Pró-Catador Program, initially established in 2010, was subsequently revoked in 2020 and reissued in 2023 (Brasil, 2023b), with the objective of providing support for the productive organization of waste pickers, enhancing their working conditions, and expanding opportunities for the social and economic inclusion of these workers and their families.

The PNRS has recently been regulated by Decree 10.936/22, which establishes reverse logistics flows and the participation of waste pickers in this process (Brazil, 2022). In addition, the National Solid Waste Plan (Plano Nacional de Resíduos Sólidos) was approved, and Decree 5940/06 was repealed and replaced by Decree 11.413/23 (Brazil, 2023a), maintaining waste pickers as key figures in the system of selective collection and proper disposal of recyclables.

Although there have been recent repeals and reissues of decrees as described above, highlighting political disputes in the government's understanding of the role of waste pickers, producers of goods and services, and recycling industries, this set of laws is crucial to the fact that today waste pickers are responsible for 90% of Brazil's recycled waste, according to the National Association of Waste Pickers (ANCAT, 2021). Government support for waste pickers is essential to promote citizenship and emancipation and to reduce the social and economic vulnerability of historically marked groups, while enabling proper solid waste management and Local Sustainability Assessment (Avaliação da Sustentabilidade Local - ASL) (Cetrulo *et al.*, 2020).

The possibility of articulating a network of recyclers through cooperatives is based on legislation. These professionals enable the effectiveness of selective collection and the correct disposal of waste, playing an essential socio-environmental and economic role in the industrial metabolism of human society (Layrargues, 2002). Cooperatives present a valuable opportunity to address existing social exclusion by providing security, organization, and clearly defined goals, thereby facilitating the professional advancement of waste pickers (IPEA, 2013).

Additionally, reducing waste management costs is crucial for municipal administrations, as small municipalities often face challenges in generating sufficient resources to cover their expenses (Maiello; Britto; Valle, 2018). Municipal waste management that generates income from recycling and waste utilization can reduce waste management costs (Baldim *et al.*, 2020). This is particularly relevant given that data from the World Bank shows that developing countries can allocate up to 20% of their municipal budget to waste

management, while this rate is only 10% in developed countries (Banco Mundial, 2018).

In light of these challenges, the member countries of the European Union have set an ambitious recycling rate target of 65% by 2030, with a maximum landfill disposal limit of 10% (World Bank, 2018). However, in Brazil, the pursuit of economic utilization and revenue generation from waste remains underdeveloped, primarily due to the high cost of selective collection when compared to conventional methods (ANCAT, 2018).

Results and discussion

In the municipality of São Gabriel da Cachoeira, the Ekatina solid waste recycling association was established in 2011. It is based in the community of Boa Esperança, across from the municipality's waste disposal facility. Since the landfill's establishment two decades ago, many residents of the Boa Esperança community have engaged in waste collection as a means of income or as a full-time occupation, thereby serving as informal environmental stewards. Since its inception, the community has been endeavoring to formalize the association and secure accreditation from the town hall, facing various obstacles over time. During this period, they received support from institutions such as the Salesian Archdiocese, which has been active in the indigenous region since the beginning of the 20th century.

It was not until 2020, under Ordinance No. 014/2020-SEMMA/MSSGC, that Ekatina was formally recognized by the City Council as an Association of Waste Pickers and Solidary Recycling of São Gabriel da Cachoeira. The cooperative has 28 members and, according to the aforementioned ordinance, is authorized to operate in the selective collection service, especially for the dry waste called cardboard.

Their formal accreditation with the municipality is essential for providing these waste pickers with greater security in their work and establishing a network of cooperation among community residents. This initiative is in alignment with the PNRS and the Municipal Plan for Integrated Solid Waste Management (São Gabriel da Cachoeira, 2012), promoting economic, social, and environmental benefits. The partnership with the municipality facilitates access to logistical support and infrastructure, enabling the effective execution of activities. Consequently, funds from the Pro-Catador program (Brazil, 2010) can be allocated to the cooperative association to carry out its functions and achieve its objectives.

For waste storage, Ekatina utilizes a shed donated by the archdiocese to the Salesian Sisters, who have been providing social assistance in the Boa Esperança community for many years. However, the shed lacks essential equipment such as a press, scales, and other machinery necessary for waste sorting and processing. Additionally, the association lacks a dedicated transport truck, therefore the majority of recyclables collection occurs directly in the landfill, which is in direct violation of Brazilian legislation (Brazil, 2010) and contravenes fundamental principles of human dignity.

Recently, Municipal Decree No. 006/2021, established in February 2021, outlined guidelines for the proper disposal of cardboard from commercial enterprises to the Ekatina

cooperative. The second article of the decree stipulates:

> II - the transportation of discarded cardboard to the Cardboard Collection Point, between 8 a.m. and 6 p.m., from Monday to Friday, with the Ekatina association being informed in advance and in an orderly manner, whether on the initiative of the enterprise or of the association (São Gabriel da Cachoeira, 2021).

In turn, Article Four defines the collection point as the Boa Esperança community shed. Local shopkeepers are therefore responsible for delivering their recyclable materials to Ekatina's shed, thereby compensating for the absence of the association's own truck and ensuring shared responsibility for waste management, as promoted by the PNRS (Brasil, 2010).

This decree is currently under review and will encompass all recyclable waste to comply with legislation, ensure the waste is sent to an accredited cooperative, and value this waste as an environmental asset. Furthermore, public hearings and awareness campaigns are being organized, and a town hall official will be directly overseeing the cooperative's actions, aiding with documentation and contacts as needed.

Informal environmental agents working in the municipality who collect the city's waste without being organized into cooperatives also play an important environmental role. However, due to the challenges posed by the COVID-19 pandemic, it was not feasible to contact the environmental agents involved in the collection, resale, and recycling of materials for this research study. City Hall estimates that there are more than 10 informal environmental agents, which is not unexpected given that these informal environmental agents have other occupations and do not work as waste pickers on a fixed and constant basis (IPEA, 2013).

The Municipal Department of the Environment aims to catalog and provide support to all environmental agents, irrespective of their formalization in associations or cooperatives. Cataloging facilitates public authority planning of measures and acquisition of data concerning the municipality's waste (IPEA, 2011), a process deemed essential for securing resources for government and private programs supporting socio-environmental management.

The subsequent table presents information gathered from the municipal entity concerning the activities undertaken by environmental recyclables agents.

Table 1 - Description of information collected from the municipal agency on the work of environmental agents for recyclables in São Gabriel da Cachoeira

Agent	Type of waste	Destination of waste	Average amount of waste collected	Members	Average financial income
Cooperatives (Ekatina)	Cardboard	Manaus (AM) - Partnership with Aliança Cooperative	3 tons per month	(1) Members of the Boa Esperança community (2) Support: City Hall and local shopkeepers	Inconclusive, due to the pandemic
Informal Environmental Agents	Copper, metal and aluminum	Manaus (AM) and São Paulo (SP)	1 Ton of copper, 1 Ton of metal and 2 Tons of aluminum (per month)	None	R$ 3,000 to R$ 7,000 per month

Source: own elaboration.

An analysis of the data reveals that the cooperative engages in the collection of cardboard, which is sent to the city of Manaus-AM, in addition to collaborating with the town hall and local shopkeepers. Upon arrival in the capital, the waste is sold in collaboration with the Aliança cooperative, which receives the material at the port of Manaus, processes it at its facilities, and subsequently sells Ekatina's waste from São Gabriel da Cachoeira. The partnership with the Aliança cooperative was initiated in March 2021, and the initial destination of waste to Manaus is currently under development. However, it is evident that this organization has already initiated a positive transformation in the socio-economic landscape.

The City Council provides equipment for the collection work, the so-called Personal Protective Equipment (PPE), and institutes decrees and ordinances acting as is the responsibility of the public agent, according to the legislation, encouraging and supporting cooperative associations (Brasil, 2010). Due to the suspension of activities during the COVD-19 pandemic, Ekatina's financial return could not be estimated during the course of this research. Additionally, the absence of a partnership with the Aliança cooperative in Manaus in 2020 resulted in intermittent sales of recyclable materials. Consequently, the financial resources were the individual earnings of each environmental agent within the association. As a result, these resources did not come in as a shared resource managed as a cooperative association, which further complicates accurate estimation. In the case of

Ekatina, as it is accredited to the municipal body, it was decided not to make an estimate.

As illustrated in the accompanying table, informal environmental agents primarily operate through the acquisition of materials, including aluminum, metal, and copper, thereby underscoring their substantial environmental impact. Subsequent to this acquisition, the agents store, select, and resell these materials to recycling companies located in the state capital and São Paulo through partnerships with ANCAT's network of cooperatives. The agents don't have an association with the City Hall because of the bureaucracy involved, and prefer to work in an independent, and informal manner. According to the municipal government, some of these agents have received support from the town hall; however, the necessary documentation and regulations make it difficult for them to become involved. The municipal body has estimated the financial return of these informal environmental agents based on the sale of recyclables in the city in previous years.

It is important to acknowledge that the preliminary data indicates that the absence of a partnership with the municipal administration does not adversely affect the financial income of informal environmental agents. This finding aligns with the assessment by the ANCAT, which in its report states that the productivity of waste pickers supported by municipalities is comparable to that of their counterparts who do not receive such support (ANCAT, 2018). An analysis of the data indicates that Ekatina had not been operating functionally as a waste pickers' association, despite its establishment in 2011. However, the formation of associations/cooperatives has been demonstrated to facilitate partnerships that enhance income and provide greater security and support for the practice of this activity (IPEA, 2013), as well as promote the health of workers and their families (Cavalcante; Silva, 2015; Rodrigues; Feitosa; Silva, 2015). This process was initiated in the municipality through Ordinance No. 014/2020.

The data indicates that even a rudimentary estimate, such as the one presented here, demonstrates the substantial magnitude of both the waste volume and the financial return for a small urban center like the municipality of São Gabriel da Cachoeira, which has an average population of 20,000 people, in comparison to other municipalities nationwide. Recognizing the potential of effective waste management in Brazil to generate 8 billion reais per year for the economy (IPEA, 2013), the recycling potential of São Gabriel da Cachoeira becomes evident.

This potential needs to be better encouraged. The implementation of a systematic selective collection system, with designated collectors strategically positioned at key locations throughout the city, in conjunction with periodic environmental education initiatives, would significantly augment the quantity and quality of recyclable waste available for the cooperatives to manage responsibly. This is due to the fact that selective collection promotes the effective use of waste, which should result in reduced extraction of raw materials and lower energy costs for the production of new products, thus preserving the environment (Lino; Ismail, 2011).

As Pimenteira (2010) contends, the establishment of cooperatives for the implementation of selective collection represents a viable option for mitigating the financial burden imposed on municipal waste management budgets. Local development can there-

fore articulate the social, environmental, and economic bases, the so-called "sustainability tripod," which is essential for solving contemporary problems – which, as Morin (2013) points out, are planetary and complex. Pro-waste picker policies, the establishment of cooperatives, and the pivotal role these entities play in diverse contexts are derived from democratic participation (Chierrito-Arruda *et al.*, 2018), which is crucial for enhancing municipal management and quality of life in urban areas.

Improving solid waste management could also help free São Gabriel from the disastrous epidemiological situation of high rates of dengue and malaria cases, because with properly treated waste, the vectors of these diseases would not have the water, food, and shelter they need to proliferate (Moura; Landau; Ferreira, 2016). Unfortunately, diarrhea and parasitic diseases are still causes of high infant mortality in the region, and waste management planning helps treat diseases associated with inadequate environmental sanitation.

There is an urgent need for more vigorous action to promote the use of recyclable waste and reduce its irregular dumping in landfills, since such waste disposal prevents quantification of the types of waste, making management inaccurate and ineffective. The city estimates that around 30 tons are generated daily in the urban core of the municipality; however, data from the National Solid Waste Information System (Sistema Nacional de Informações de Resíduos Sólidos - SNIS) does not include information from the municipality (SNIS, 2017), as the form of landfill disposal does not allow for quantity or quality control (Mahler, 2012). In other words, local development policies cannot be successful if there is no data or planning for infrastructure. The organization of environmental agents of recyclable materials can be key in this process.

It is important to note that the COVID-19 pandemic damaged the work of the recyclable material collectors throughout Brazil (Baldim *et al.*, 2020), as the abrupt and prolonged interruption of retail, the main sector associated with cooperatives, contributed to a sharp drop in income from the sale of recyclable materials (Alessi; Pereira, 2020). Overall, the government suspended work with accredited cooperatives as part of the planned measures to prevent contagion (Baldim *et al.*, 2020), which was important to protect these workers' lives. In addition, the profile of waste pickers shows that they belong to the risk group due to a weakened immune system and various co-morbidities (Alessi; Pereira, 2020), and it is natural that the insecurity and instability of this pandemic period have affected these professionals' work.

Final considerations

Recent initiatives to enhance recyclable waste management within the municipality, as outlined in new ordinances and decrees, are just beginning to take shape. The primary objective is to eliminate as much waste as possible from improper disposal in landfills and to organize selective collection in the urban core. This will contribute to ending final disposal in the dump and establishing a new future for waste management in São Gabriel. The association's accreditation, mandated by law, demonstrates the municipal government's recent commitment to fostering cooperative initiatives. The association's

efforts are crucial for environmental sustainability, collaborating with agents to reduce waste disposal irregularities and enhance economic development while reducing social vulnerability.

Research indicates that a portion of São Gabriel da Cachoeira's recyclable waste is sent to the state capital and sold to recycling industries, contributing to environmental sustainability. Consequently, this initiative effectively prevents the accumulation of waste in the São Gabriel landfill, thereby mitigating the environmental impact of irregular waste disposal in the municipality. However, the scope of Ekatina's and the informal environmental agents' work must be expanded and recognized, and the municipal government must take more effective action to ensure proper solid waste management in the municipality. By doing so, local development will be founded on sustainable principles, in which social, environmental, and economic aspects are paramount, thereby enhancing the quality of life in the Upper Rio Negro region.

References

ABRELPE – Associação Brasileira de Empresas de Limpeza Pública e Resíduos Especiais. **Panorama dos Resíduos Sólidos no Brasil 2018/2019**. 2019. Available at: https://www.migalhas.com.br/arquivos/2020/1/492DD855EA0272_PanoramaAbrelpe_-2018_2019.pdf. Accessed on: Apr. 1, 2021.

ALESSI, G.; PEREIRA, J. Pandemia faz sumir trabalho e renda de catadores: "Somos grupos de risco. Tem idoso, fumante, diabético e cardíaco". **El País**, São Paulo, 13. abr. 2020. Available at: https://brasil.elpais.com/brasil/2020-04-14/pandemia-faz-sumir-trabalho-e-renda-de-catadores--somos-grupos-de-risco-tem-idoso-fumante-diabetico-e-cardiaco.html. Accessed on: Apr. 20, 2021.

ANCAT - Associação Nacional dos Catadores e Catadoras de Materiais Recicláveis. **Anuário da reciclagem 2017-2018**. 2018. Available at: http://anuariodareciclagem.eco.br/assets/Anua%CC%81rio%20da%20Reciclagem%202020.pdf. Accessed on: Feb. 2, 2021.

BALDIM, Márcia Letícia Loureiro Salomão; PEREZ, Francisco Javier Fiz; CHAMON, Edna Maria Querido de Oliveira; FREITAS, Márcia Regina de; GUEDES, Luiz Carlos Vieira; CAMARINI, Gladis. Catadores de materiais recicláveis: uma análise sobre a conquista de seus direitos e contribuições para o desenvolvimento sustentável. **Humanidades e Inovação**, Palmas, v. 7, n. 17, 2020.

BANCO MUNDIAL. **What a Waste 2.0** – A global snapshot of solid waste management to 2050. Washington, 2018. Available at: https://openknowledge.worldbank.org/handle/10986/30317. Accessed on: Apr. 20, 2021.

BRASIL. Presidência da República. Casa Civil. Subchefia para Assuntos Jurídicos. **Decreto Nº**

5.940, de 25 de outubro de 2006. Institui a separação dos resíduos recicláveis descartados pelos órgãos e entidades da administração pública federal direta e indireta, na fonte geradora, e a sua destinação às associações e cooperativas dos catadores de materiais recicláveis, e dá outras providências. Available at: http://www.planalto.gov.br/ccivil_03/_Ato2004-2006/2006/Decreto/D5940.htm. Accessed on: Jan. 15, 2021.

BRASIL. Presidência da República. Casa Civil. Subchefia para Assuntos Jurídicos. **Decreto Nº 12.305, de 2 de agosto de 2010**. Institui a Política Nacional de Resíduos Sólidos; altera a Lei no 9.605, de 12 de fevereiro de 1998; e dá outras providências. Available at: http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/lei/l12305.htm. Accessed on: Jan. 15, 2021.

BRASIL. **Classificação Brasileira de Ocupações**. Brasília, DF, Ministério do Trabalho, 2013. Available at: http://www.mtecbo.gov.br/cbosite/pages/downloads.jsf. Accessed on: Feb. 13, 2021.

BRASIL. Presidência da República. Casa Civil. Subchefia para Assuntos Jurídicos. **Decreto Nº 10.936, de 12 de janeiro de 2022**. Regulamenta a Lei nº 12.305, de 2 de agosto de 2010, que institui a Política Nacional de Resíduos Sólidos. Available at: https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2022/decreto/d10936.htm. Accessed on: Oct. 29, 2023.

BRASIL. Presidência da República. Casa Civil. Subchefia para Assuntos Jurídicos. **Decreto Nº 11.413, de 13 de fevereiro de 2023**. Institui o Certificado de Crédito de Reciclagem de Logística Reversa, o Certificado de Estruturação e Reciclagem de Embalagens em Geral e o Certificado de Crédito de Massa Futura, no âmbito dos sistemas de logística reversa de que trata o art. 33 da Lei nº 12.305, de 2 de agosto de 2010. Brasil, 2023a. Available at: https://www.planalto.gov.br/ccivil_03/_Ato2023-2026/2023/Decreto/D11413.htm. Accessed on: Oct. 29, 2023.

BRASIL. Presidência da República. Casa Civil. Subchefia para Assuntos Jurídicos. **Decreto Nº 11.414, de 13 de fevereiro de 2023**. Institui o Programa Diogo de Sant'Ana Pró-Catadoras e Pró-Catadores para a Reciclagem Popular e o Comitê Interministerial para Inclusão Socioeconômica de Catadoras e Catadores de Materiais Reutilizáveis e Recicláveis. Brasil, 2023b. Available at: https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2023/decreto/D11414.htm. Accessed on: Oct. 11, 2021.

BRASIL. Presidência da República. Casa Civil. Subchefia para Assuntos Jurídicos. **Lei Nº 11.445, de 05 de janeiro de 2007**. Estabelece as diretrizes nacionais para o saneamento básico; cria o Comitê Interministerial de Saneamento Básico; altera as Leis nos 6.766, de 19 de dezembro de 1979, 8.666, de 21 de junho de 1993, e 8.987, de 13 de fevereiro de 1995; e revoga a Lei nº 6.528, de 11 de maio de 1978. Brasil, 2007. Available at: https://www.planalto.gov.br/ccivil_03/_ato2007-2010/2007/lei/l11445.htm. Accessed on: Apr. 1, 2021.

CAVALCANTE, Lívia Poliana Santana; SILVA, Monica Maria Pereira da; Influência da Organização de catadores de materiais recicláveis em associação para a melhoria da saúde e minimização de impactos socioambientais. **REMOA**, Santa Maria, v. 14, n. 1, p.01-13, jan./abr. 2015.

CETRULO, N. M.; CETRULO, T. B.; DIAS, S. L. F. G.; RAMOS; T. B. Indicadores de resíduos sólidos em sistemas de avaliação de sustentabilidade local: uma revisão da literatura. **Ambiente & Sociedade**, São Paulo, v. 23, 2020. Available at: https://www.scielo.br/j/asoc/a/PqkVdLDCtjC7G9545nR3tmk/?format=pdf&lang=pt. Accessed on: Oct. 11, 2021.

CHIERRITO-ARRUDA, E.; ROSA, A. L. M.; PACCOLA, E. A. S; MACUCH, R. S.; GROSSI-MILANI, R. comportamento pró-ambiental e reciclagem: revisão de literatura e apontamentos para as políticas públicas. **Ambiente & Sociedade**, São Paulo, v. 21, 2018. Available at: https://www.scielo.br/j/asoc/a/rzWM4SZG9B4Xx7SCqZQnvmb/?format=pdf&lang=pt. Accessed on: Oct. 11, 2021.

EIGENHEER, E. M. **A história do lixo**. Porto Alegre: ELS2, 2009.

GIL, A. C. **Como elaborar projetos de pesquisa**. 4. ed. São Paulo: Atlas, 2008.

GODOY, A. S. Pesquisa Qualitativa: Tipos Fundamentais. **Revista de Administração de Empresas**, São Paulo, v. 35, n. 3, p. 20-29, maio/jun. 1995.

IBGE – INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. **Censo Demográfico 2010**. Rio de Janeiro: IBGE, 2012a. Available at: https://sidra.ibge.gov.br/pesquisa/censo-demografico/demografico-2010/inicial. Accessed on: Jan. 15, 2021.

IBGE – INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. **Pesquisa Nacional por Amostra de Domicílio 2012**. Rio de Janeiro: IBGE, 2012b. Available at: https://sidra.ibge.gov.br/pesquisa/pnad. Accessed on: Jan 15, 2021.

IBGE – INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. **Pesquisa Nacional por Amostra de Domicílio 2019**. Rio de Janeiro: IBGE, 2019. Available at: https://sidra.ibge.gov.br/pesquisa/pnad. Accessed on: Jan 15, 2021.

IPEA – INSTITUTO DE PESQUISA ECONÔMICA APLICADA. **Diagnóstico sobre os catadores de resíduos sólidos**. Brasília: Ipea, 2011. Available at: http://www.ipea.gov.br/portal/images/stories/PDFs/relatoriopesquisa/120911_relatorio_catadores_residuos.pdf. Accessed on: Jan. 15, 2021.

IPEA - INSTITUTO DE PESQUISA ECONÔMICA APLICADA. **Situação social das catadoras e dos catadores de material reciclável e reutilizável**. Brasília, DF, 2013.

LAYARGUES, P. P. O cinismo da reciclagem: o significado ideológico da reciclagem da lata de alumínio e suas implicações para a educação ambiental. *In*: LOUREIRO, C. F.; LAYARGUES, P. P.; CASTRO, R. S. de (Orgs.). **Educação ambiental**: repensando o espaço da cidadania. São Paulo: Cortez, 2002.

LINO, F. A. M.; ISMAIL, K. A. R. Energy and environmental potential of solid waste in Brazil. **Energy Policy**, [*s. l.*], v. 39, n. 6, p. 3496-3502, 2011.

LOUREIRO, S. M.; ROVERE, E. L. L.; MAHLER, C. F. Analysis of potential for reducing emissions of greenhouse gases in municipal solid waste in Brazil, in the state and city of Rio de Janeiro. **Waste Management**, [*s. l.*], v. 33, n. 5, p. 1302-1312, 2013.

MAHLER, C. F. (org.). **Lixo Urbano**: o que você precisa saber sobre o assunto. Rio de Janeiro: FAPERJ, 2012. 192p.

MAIELLO, A.; BRITTO, A. L. N. P.; VALLE, T. F. Implementação da Política Nacional de Resíduos Sólidos. **Revista de Administração Pública**, Rio de Janeiro, v. 52, n. 1, p. 24-51, 2018.

MARSHALL, R. E.; FARAHBAKHSH, K. Systems approaches to integrated solid waste management in developing countries. **Waste Management**, v. 33. p. 988-1003, 2013.

MNCR - Movimento Nacional de Catadores de Materiais Recicláveis. **O movimento.** Available at: http://www.mncr.org.br/sobre-o-mncr. Accessed on: Mar. 22, 2021.

MORIN, E. **Educação e Complexidade**: Os sete saberes e outros ensaios. 6. ed. São Paulo: Cortez, 2013.

MOURA, Larissa; LANDAU, Elena Charlotte; FERREIRA, Adriana de Melo. Doenças Relacionadas ao Saneamento Ambiental Inadequado no Brasil. *In*: LANDAU, Elena Charlotte, MOURA, Larissa (ed.). **Variação Geográfica do Saneamento Básico no Brasil em 2010**: domicílios urbanos e rurais. Brasília: Embrapa, 2016.

PIMENTEIRA, Cicero A. P. **Gestão integrada de resíduos sólidos no Rio de Janeiro**: impactos das decisões dos gestores nas políticas públicas. 2010. Tese (Doutorado em Ciências e Planejamento Energético) — Coppe/Programa de Planejamento Energético, Universidade Federal do Rio de Janeiro, Rio de Janeiro, 2010.

RIBEIRO, Julia Werneck; ROOKE, Juliana Maria Scoralick. **Saneamento básico e sua relação com o meio ambiente e a saúde pública**. 2010. 28 p. Trabalho de Conclusão de Curso (Especialização em Análise Ambiental) – Faculdade de Engenharia. Universidade Federal de Juiz de Fora. Juiz de Fora, 2010. Available at: http://www.ufjf.br/analiseambiental/files/2009/11/TCC-SaneamentoeSa%C3%BAde.pdf. Accessed on: Jan. 15, 2021.

RODRIGUES, G. L.; FEITOSA, M. J. da S.; SILVA, G. F. L. da. Cooperativas de reciclagem de resíduos sólidos e seus benefícios socioambientais: um estudo na Coopecamarest em Serra Talhada-PE. **Revista Metropolitana de Sustentabilidade**, [*s. l.*], v. 5, n. 1, p. 18, 2015.

SÃO GABRIEL DA CACHOEIRA. **Plano municipal de gestão integrada de resíduos sólidos**. 2012. Available at: https://www.sema.am.gov.br/wp-content/uploads/2024/04/PMGIRS-SAO-GABRIEL-DA-CACHOEIRA.pdf. Accessed on: Mar. 5, 2021.

SÃO GABRIEL DA CACHOEIRA. Governo municipal. **Decreto n° 006/2021 de 08 de fevereiro de 2021**. 2021. Dispõe sobre a regulamentação da destinação do resíduo seco, papelão, do estabelecimento comercial até o ponto de coleta, e dá outras providências. Available at: https://diariomunicipalaam.org.br/. Accessed on: Mar. 5, 2021.

SES-AM - Secretaria Estadual de Saúde do Amazonas. **Amazonas reduz em 20% casos de malária**. Available at: http://www.saude.am.gov.br/visualizar-noticia.php?id=5117. Accessed on: Mar. 5, 2021.

SNIS - Sistema Nacional de Informações sobre saneamento. **Diagnóstico dos Serviços de Água e Esgotos** - 2017. Sistema Nacional de Informações sobre Saneamento, 2017. Available at: http://snis.gov.br/diagnostico-anual-agua-e-esgotos/diagnostico-ae-2017. Accessed on: Jan. 15, 2021.

VALADÃO, M. A. P.; SILVA, R. A. da. Política Nacional de Resíduos Sólidos: Analisando os Direitos Coletivos e Difusos dos Catadores de Materiais. **Ambiente & Sociedade**, São Paulo, v. 27, 2024. Available at: https://www.scielo.br/j/asoc/a/7gSGwJXYc77J3XMxYhNQZxH/?format=pdf&lang=pt. Accessed on: Mar. 5, 2021.

Marcelo Côrtes Silva

✉ celocs@gmail.com

ORCiD: https://orcid.org/0000-0002-6194-9549

Estefany Padilha da Silva

✉ estefanypadilha234@gmail.com

ORCiD: https://orcid.org/0009-0005-2956-1025

Quedma Karolayne Otero Azevedo

✉ oteroquedma03@gmail.com

ORCiD: https://orcid.org/0009-0008-0665-4773

Taynara Gonçalves Almeida

✉ taynaragoncalves234@gmail.com

ORCiD: https://orcid.org/0009-0005-1769-0874

Paulo José da Silva Nascimento

✉ paulo.silva@ifam.edu.br

ORCiD: https://orcid.org/0009-0009-3147-2987

Pedro Moreno Feio de Lemos

✉ pedromflemos@gmail.com

ORCiD: https://orcid.org/0000-0002-2094-1620

Submitted on: 22/10/2023
Accepted on: 19/09/2024
2025;28:e00164

AMBIENTE & SOCIEDADE 25 anos 25 años 25 years

SciELO

Recicláveis em São Gabriel da Cachoeira: possibilidades de maior desenvolvimento socioambiental no Alto Rio Negro

Marcelo Côrtes Silva
Estefany Padilha da Silva
Quedma Karolayne Otero Azevedo
Taynara Gonçalves Almeida
Paulo José da Silva Nascimento
Pedro Moreno Feio de Lemos

Resumo: A gestão de resíduos tem se tornado tema de primeira linha para a sustentabilidade ambiental, propiciando debate e estruturação de diversas políticas públicas que atuam no desenvolvimento local, regional e nacional. No Brasil, os catadores de materiais recicláveis exercem fundamental papel na gestão de resíduos sólidos, sendo os principais agentes ambientais responsáveis pelo reaproveitamento de resíduos e sua consequente destinação correta, o que favorece aspectos ambientais, sociais e econômicos. O artigo analisa o papel dos catadores de recicláveis em São Gabriel da Cachoeira, município mais indígena do Brasil, localizado no Alto Rio Negro, interior do estado do Amazonas. Através de análise documental, literatura de referência na área e de informações obtidas junto aos órgãos municipais, o artigo traça um panorama atual sobre a destinação de resíduos recicláveis no município, discute a importância das ações para o desenvolvimento local e direciona possibilidades para a qualidade de vida no Alto Rio Negro.

Palavras-chave: Gestão de resíduos sólidos; reciclagem; catadores de materiais recicláveis; desenvolvimento local; Alto Rio Negro.

São Paulo. Vol. 28, 2025

Tema em Destaque: Amazônia

AMBIENTE & SOCIEDADE 25 anos 25 años 25 years

SciELO

Reciclables en São Gabriel da Cachoeira: posibilidades de mayor desarrollo socioambiental en el Alto Rio Negro

Marcelo Côrtes Silva
Estefany Padilha da Silva
Quedma Karolayne Otero Azevedo
Taynara Gonçalves Almeida
Paulo José da Silva Nascimento
Pedro Moreno Feio de Lemos

São Paulo. Vol. 28, 2025

Tema Destacado: Amazonia

Resumen: La gestión de residuos se ha convertido en un tema clave para la sostenibilidad ambiental, promoviendo la estructuración de políticas públicas que influyen en el desarrollo local, regional y nacional. En Brasil, los recicladores desempeñan función clave en la gestión de residuos sólidos, siendo los principales agentes ambientales responsables de la reutilización de residuos y su correcta disposición, favoreciendo aspectos ambientales, sociales y económicos. Este artículo analiza la función de los recicladores en São Gabriel da Cachoeira, el municipio más indígena de Brasil, ubicado en el Alto Rio Negro, interior del estado de Amazonas. A través del análisis documental, la literatura de referencia en el área y la información obtenida de las autoridades municipales, el artículo presenta una visión actual sobre la disposición de residuos reciclables, discute la importancia de las acciones para el desarrollo local y señala posibilidades para mejorar la calidad de vida en el Alto Río Negro.

Palabras-clave: Gestión de residuos sólidos; reciclaje; recicladores; desarrollo local; Alto Rio Negro.