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Stakeholder analysis of the Mato Grosso Northwest timber industry: A perspective on solid waste

Análise dos grupos sociais de interesse do setor florestal madeireiro do Noroeste Mato-Grossense: Uma visão sobre os resíduos sólidos

Análisis de grupos sociales de interés en el sector forestal del Noroeste Mato-Grossense: Una visión sbre residuos sólidos

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Abstract

The timber industry is prominent in the Mato Grosso state, however, it generates large amounts of waste. Knowing the sectors of the society involved in the industry and their interrelationships are fundamental for developing effective public policies. The objective of this paper is to survey key social groups about how to resolve wood waste generation in northwestern Mato Grosso state. We identified stakeholders who were then classified according to their degree of power and interest. Public policies were analyzed and discussed. Sixteen stakeholders were found, of which eight were considered in the high power and interest group. The public policies discussed are generic and comprehensive, which suggests implementation challenges. We concluded that high power/interest groups are fundamental for garnering support for policies, given their vested interest in the outcome. The following were suggested: greater availability and dissemination of information; greater synergy between existing institutions and policies; focusing on priority regions; and promoting incentive mechanisms.

Keywords: Social groups; Wood residue; Public policy.

Resumo

A indústria madeireira tem papel de destaque no estado de Mato Grosso, porém gera muitos resíduos. Conhecer os grupos da sociedade envolvidos nesse setor e suas inter-relações se faz necessário para o desenvolvimento de políticas públicas eficazes. O objetivo deste trabalho foi pesquisar em diferentes grupos sociais tomadores de decisões sobre como lidar com resíduos de madeira no noroeste de Mato Grosso. Foram identificados e classificados as partes

interessadas de acordo com o seu grau de poder e interesse. Políticas públicas foram analisadas e discutidas. Dezesseis partes interessadas foram encontradas, das quais oito foram consideradas de alto poder/interesse. As políticas públicas discutidas são bastante genéricas e abrangentes, resultando em desafios de implementação. Conclui-se, portanto que os grupos de elevado poder/interesse são a base de uma coligação de suporte efetiva da política, e como investida, sugeriu-se: maior disponibilidade e disseminação de informações; maior sinergia entre as instituições e políticas existentes; concentrando-se em regiões prioritárias; e promover incentivos.

Palavras-chave: Grupos sociais; Resíduo de madeira; Política pública.

Resumen

La industria maderera tiene un papel destacado en el estado Mato Grosso, pero genera muchos residuos. Conocer los sectores de la sociedad involucrados y sus interrelaciones es necesario para desarrollar políticas públicas efectivas. El objetivo de esta investigación fue encuestar a grupos sociales claves sobre cómo lidiar con los desechos de madera en el noroeste del Mato Grosso. Identificamos y clasificamos las partes interesadas según su grado de poder/interés. Las políticas públicas fueron analizadas y discutidas. Participaron dieciséis partes interesadas, de las cuales ocho fueron consideradas de alto poder/interés. Las políticas públicas discutidas son bastante genéricas y exhaustivas, resultando en desafíos de implementación. Se concluye que los grupos de alto poder/interés son la base de una coalición de apoyo político eficaz, y siendo partes interesadas, se sugirió lo siguiente: mayor disponibilidad y difusión de información; mayor sinergia entre las instituciones y políticas existentes; centrándose en regiones prioritarias; y promover incentivos.

Palabras claves: Grupos sociales; Residuo de madera; Política pública.

1. Introduction

Natural resources are difficult to govern regulate, because both the natural environment and human societies are characterized by uncertainty, complex dynamics, natural and time-dependent variables (Berkes et al., 2003). Thus, the management of any resource would benefit from actors who agree on common rules and practices, coordinating usage, engaging in conflict resolution, negotiating various offsets, sharing information, and building common knowledge (Folke et al., 2005).

According to the National Forestry Information System (Snif, 2017), in 2016, the Brazilian forestry sector generated 2.8 billion reais and 592,656 jobs. However, forest-based industries, mainly primary processing plants such as sawmills, generate large amounts of residues. This is often due to the use of archaic production systems and old equipment and machinery, which results in low yields (Barbosa et al., 2014).

Rapid industrialization and urbanization have resulted in the generation of huge amounts of solid waste and their management has become a global concern matter (Bath et al., 2018). As these residues grow increasingly complex, the capacity for assimilation by the natural environment is reduced and further complicated by the lack of appropriate environmental and sanitary solutions for waste disposal or reuse (Farage et al., 2013).

Wood residues are classified as sawdust, shavings, wood solids, bark and others. Such waste can be used as a raw material for the production of higher value-added products such as charcoal, wooden handles, briquette, pallets, packaging, etc., or for the generation of thermal and electrical energy through direct combustion or incineration. However, these residues when generated in remote areas added to the lack of consumer market makes its reuse unfeasible (Wiecheteck, 2009).

The economic exploitation of wood has been one of the main activities in the northwest region of Mato Grosso state, Brazil. However, low efficiency in wood processing has generated large amounts of waste. This waste is damaging to the environment and represents foregone opportunity for the industry, local communities, the government and society as a whole. This situation is even more worrying in remote regions. Wood waste is becoming one of the Brazilian's greatest challenges in terms of policies and regulations in both public and private spheres (Donadelli, 2012).

According to Center of the wood producing and exporting industries of Mato Grosso (Cipem, 2014a), the lumber and furniture industries of only four cities in the northwest of Mato Grosso state generate around 14 thousand tons of waste per month.

There is a real concern for finding adequate disposal sites for the residues generated by the timber industry. This concern has been illustrated by the emergence of scientific research that analyzes the utility of these residues for the preparation of wood panels like medium density fiberboard, composting, the generation of energy, among others (Lopes et al., 2016; Gouvêa et al., 2017; Garcez, et al., 2018). However, many of these alternatives become infeasible due to the sheer quantity of residues being generated and their distance from large consuming centers.

Therefore, the evaluation of stakeholder concerns and how they relate to the impacts generated by the industry is important. Identifying their interests, influence, power and

knowledge, can assist in understanding social-environmental conflicts and challenges, and allows for the participation of civil society at the local and/or regional levels in resolving these problems.

Many nature conservation initiatives fail because they pay inadequate attention to stakeholders' interests and characteristics (Grimble & Wellard, 1997). Consequently, stakeholder analysis has gained attention and is now an integral part of many participatory natural resource management initiatives (Mushove & Vogel, 2005).

Stakeholder analysis helps to identify how social structures, created by the relationship pattern, improve or hinder governance initiatives that are failing around the world (Bodin & Crona, 2009). However, selecting groups for a more participatory process is challenging because some stakeholders may be historically marginalized from administrative decisions. This can be further complicated by the existence of conflicts between social groups. Furthermore, participatory processes tend to focus on small groups, which can lead to a lack of representativeness in the governing body (Daniels & Walker, 2001; Stringer et al., 2006).

We must identify sectors, techniques and procedures to achieve target 8.2 of the United Nations 2030 Agenda, which expresses the need to "Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors "(Onu, 2015).

According to Grimble & Chuan (1995), stakeholders are those that affect and/or are affected by policies, decisions and actions. This includes individuals, communities, social groups and/or institutions of any size. This transcends social classes, including everyone, from those that depend on the system for survival to policy makers, and other social groups that benefit from the system.

Therefore, the objective of this research is to analyze social interest groups (*stakeholder analysis*) in the context of possible solutions to the generation of residues by the timber sector of the northwestern Mato Grosso state. The purpose is to assist public policy formulation by supplying information about the relationship networks of the sector and suggesting improvement strategies.

2. Methodology

Firstly, for the initial stakeholder survey, a bibliometric analysis was carried out on documents such as scientific articles, books, book chapters, and monographs. For the "Dimensions" portal was used, specifically the "Part of the Digital Science" collection, which

includes documents published between 2010 and 2018. We searched this database for the keywords "residue" and "wood" found in titles and / or abstracts, and only articles pertinent to Brazil were used since the intention was to identify the local stakeholders.

The articles selected for reading and identifying social groups were those by the most cited authors and co-authors published in *Qualis* journals. Articles achieving a ranking greater than or equal to B1 were used. To identify and visualize citations and the interactive network of the authors, our results from searching the *Dimensions* portal were exported and analyzed with the computer program VOSviewer 1.6. Then, the most relevant articles were systematically read and possible social groups interested in the use of wood residue were established.

Afterward, the key-words "timber residue", "timber industry" and "use of waste" were searched on government, trade union, and other websites to identify which social interest groups are concerned in the matter.

Knowing that the study cannot be limited to a single evidence source, some interviews were also conducted in the form of a questionnaire with the interested social groups. The questions were both qualitative and quantitative and they are discussed in the results of this article.

The social groups were classified by the adapted methodology described in PMBOK (2013), which suggests the evaluation of the power degree and interest, by grouping the stakeholders based on their authority level (power) and concern (interests) in relation to the subject addressed.

Once stakeholders were identified, their relevant data, such as roles, interests, knowledge, perspectives, and influences levels were discussed. The possible contributions that each interested part could generate was also analyzed to suggest improvement strategies.
Finally, the main federal and the Mato Grosso state public policies concerning waste management and recovery were reviewed.

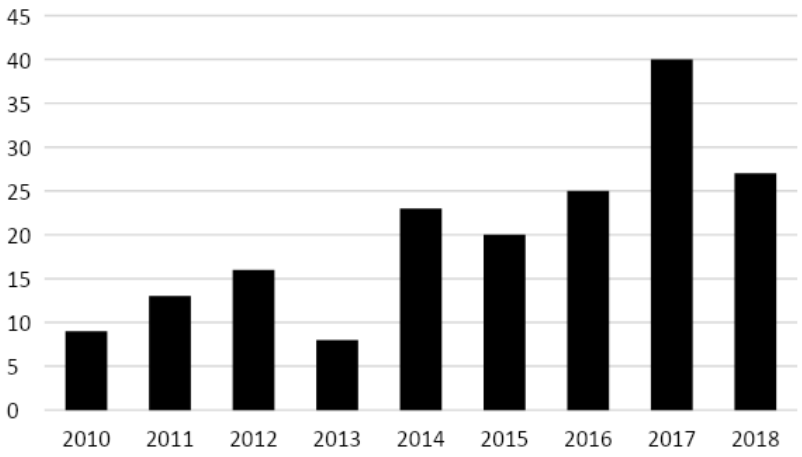
With the data collected and analyzed, some reflections and suggestions of management policies were made to solve social and environmental conflicts concerning the wood residue generated by the timber forest sector in the northwest Mato Grosso state.

3. Results and Discussion

Through the research carried out on the "Dimensions" platform, 181 documents were found related in some way to wood residue-170 of which are scientific articles published in academic journals and 11 of which are technical protocol documents.

Between 2010 and 2018 there was an upward trend in the number of publications with this theme varying between eight publications in 2013 and forty in 2017, with an average of approximately 20 publications per year, as can be observed in Figure 1.

Figure 1. Evolution of publications with the key words "timber residue" and "exploitation" between the years 2010 and 2018. Source: Created by authors.



Source: Authors.

Of the 181 documents found, 52 articles were used to locate possible stakeholders, with 5 articles by authors or co-authors most cited (Figure 2) and 50 articles in journals with the highest number of publications and with a ranking of B1 or higher according to Qualis Capes quadrennium 2013-2016 (Table 1).

It was possible to identify 8 stakeholders: thermal power plants, manufacturers of briquettes, the timber industry, the charcoal industry, CIPEM, brickyards, Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA), and Environment Department of the Mato Grosso State (SEMA-MT).

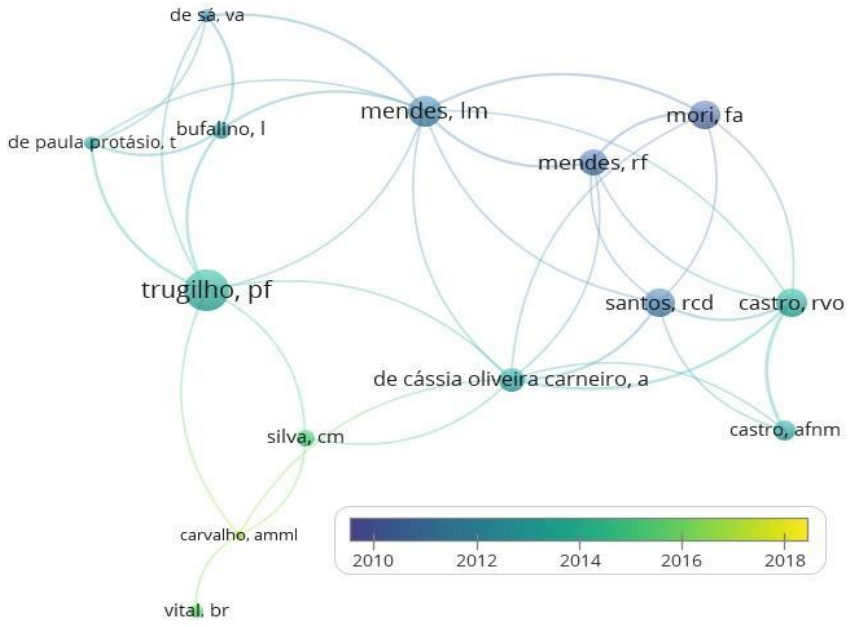
Table 1. Most published journals with results for "waste" and "wood" between the years 2010-2018.

Journal	ISSN	Publication	Ranking
*Ciência Florestal	1980-5098	16	A2
Pesquisa Florestal Brasileira	1983-2605	10	B3
Matéria (Rio de Janeiro)	1517-7076	10	B2
*Revista Floresta	0015-3826	9	B1
*Revista Arvore	0100-6762	6	A2
*Revista Cerne	0104-7760	6	A2
*Floresta e Ambiente	2179-8087	6	B1
*Ambiente Construído	1678-8621	4	B1
*Engenharia san. e ambiental	1413-4152	3	A2
E-xacta	1984-3151	3	B4

** Journals ranked B1 or higher.*
Source: Authors.

In Figure 2 we observe the interaction network, generated with the VOSviewer 1.6 software, between authors and co-authors who published at least two articles between 2010 and 2018, with the theme "waste" and "wood". The author Paulo Fernando Trugilho was the most cited and, thus, his articles were used to identify stakeholders.

Figure 2. Interactions Network between the main published authors, emphasizing those most cited.

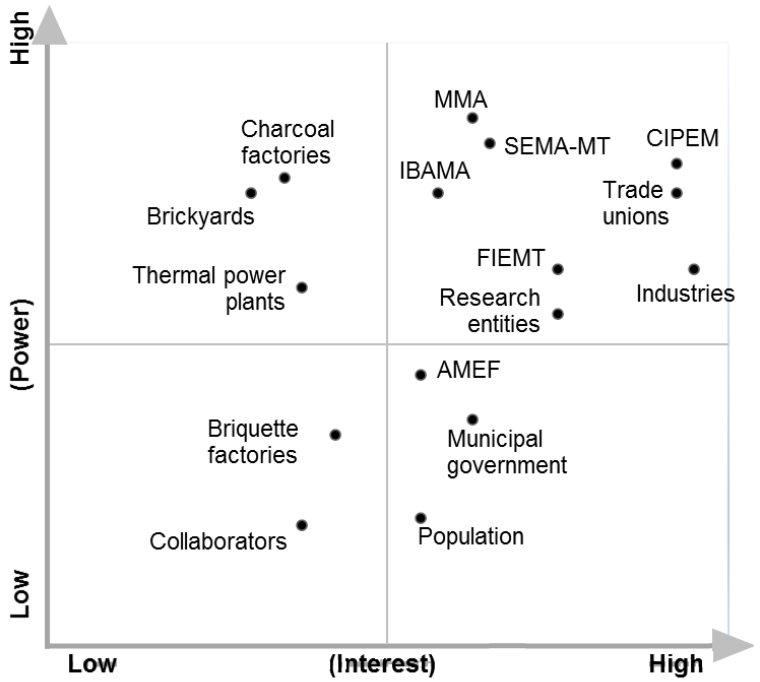


Source: Authors.

The stakeholders found in the scientific articles were the starting point for research on websites such as the State Environmental Secretariat of Mato Grosso (SEMA-MT), the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) and Ministry of Environment (MMA), which in turn gave us new leads to the websites of the Center of Wood Producing and Exporting Industries (CIPEM) and the Union of Wood and Furniture Industries of Northwest Mato Grosso (SIMNO). On the websites mentioned above, 44 news items were found using the key-words "waste", "wood" and "exploitation", 8 on the SEMA-MT site, 5 on the IBAMA site, 7 on the MMA site, 15 on the CIPEM site and 9 on the SIMNO site.

Overall, we identified 16 stakeholders, and their classification with regards to their degree of interest/power is illustrated in Figure 3.

Figure 3. Power / interest graph according to PMBOK (2013).



Source: Authors.

3.1 Stakeholders of low power and low interest (-/-)

The collaborators and the briquette factories are part of civil society and local markets, respectively. Both have local influence, because they carry out their activities locally, not surpassing the municipality limits in which they operate.

Although they may be directly affected by the daily exposure to wood residues, employees were classified as low power and low interest stakeholders (Figure 3), because in

interviews with the timber industry, they expressed little concern regarding the generation and disposal of wood residue. Furthermore, they have no authority in decision-making, neither in the industry management nor in the public policy changes. The lack of interest in this social group may be related to the lack of knowledge (disinformation) regarding the social, environmental, and even human health impacts of the waste generated by the timber industry.

As for briquette factories, more attention needs to be paid. While the timber sector recognizes the important role of briquette factories in the proper disposal of wood waste (transforming it into an input for the energy sector), briquette factories are not seen as a viable alternative due to the high implementation costs and long distances from consumer centers, which makes the business unfeasible. In the Juína municipality, located 750 km from the capital of Mato Grosso, an attempt was made to open a briquette factory. However, even receiving the sawdust for free from sawmills, it shut down because the sales logistics were impracticable. Therefore, even though the briquettes industry has great potential to repurpose wood waste, it was classified as low power, because in the studied region it is not viable given the reasons discussed above.

3.2 Stakeholders of high power and low interest (+/-)

Among the high power and low-interest stakeholders (Figure 3) are charcoal factories, brickyards, and thermal power plants. All of which are classified as market players since all are interested in wood waste as a raw material for their production. However, there is not much concern about the health and environmental problems associated with the generation and disposal of wood residues. So, they are categorized as groups of low interest. They are key parts of the waste disposal process, since they have high consumption potential, for the thermal energy production to manufacture bricks and charcoal or for the electrical energy production in the thermal power plant.

It is important to note that the plant biomass burning releases contaminants into the atmosphere. However, modern devices for effluent treatment, such as the venturi scrubber and the cyclonic separator, substantially reduce such emissions. These, along with efficient environmental controls inspections, end up mitigating such environmental impacts.

Charcoal factories and brickyards are classified as local, since the waste generated in their local municipalities satisfy their production needs. This is different from the thermal power plants that need a greater amount of waste that is usually generated in only one municipality, so they are classified as regional.

According to Cipem (2014a), the timber and furniture industries in the northwest Mato Grosso state, specifically in the municipalities of Juína, Juruena, Cotriguaçú and Brasnorte, can generate 14,030.8 cubic meters of wood residue per month. This amount could satisfy thermal power demands. Even so, there are hardly any thermal power plants in the region, probably due to a lack of government incentives.

Accordingly Wiecheteck (2009), the goal of proposing public policies for the use of wood residues, observed that at the poles of waste visited in the southeast and south of Brazil, there was at least one large wood waste consumer for energy production or for other purposes. This was not observed in the Center-West Mato Grosso state and in the North of the country.

3.3 Stakeholders of low power and high interest (-/+)

The social groups "municipal government", "population" and "Mato Grosso Association of Forest Engineers (AMEF)" were characterized as low power and high interest (Figure 3), because they do not have sufficient authority to solve the problem, but they show concern, mainly with the wood waste disposal and destination.

Both the population and municipalities are local in scope since they have an interest in solving the problem inside the municipality. The former is part of the civil society group and the latter of the Government. Because it is a government institution, municipal governments have greater power than the population, due to their organization's degree and influence with other government agencies such as SEMA-MT. Significant communication was also observed among other sectors of organized civil society such as the timber industry unions and CIPEM.

In order to optimize the development of timber companies in northwestern Mato Grosso, providing appropriate disposal for wood waste and improving the economic and environmental conditions for such disposal would be necessary. The municipal planning office of Juína (northwestern municipality of Mato Grosso) together with SIMNO set out to do just that and looked for ways to give benefits and assistance to companies that worked with wood waste (CIPEM, 2014b). In 2014, the city government donated an area near the Juína municipality, to accumulate the wood waste from the industries, to facilitate the installation of a thermal power plant (SIMNO, 2016a), but the donation was not finalized due to licensing problems for the area. Similar discussions took place in the city of Colniza.

The AMEF, which represents a regional and organized civil society, together with the CIPEM, SEMA, and Research Entities (UNEMAT and UFMT), participate in a Working Group (WG) in the Committee on the Study of Fuels Derived from Waste (ABNT/CE-177: 003.001).

This Working Group specifically studies and analyzes the use of wood residues for this purpose (Cipem, 2018), which demonstrates interest and collaboration in solving the wood waste disposal problem. In response to the questionnaire, the AMEF board stated that it has low decision-making power or the ability to influence public policy.

3.4 Stakeholders of high power and high interest (+/+)

In this group are the research entities that, besides participating in the WG of the ABNT committee, carry out research to find suitable solutions for solid waste. One such case cited by Simno (2016b) mention the Mato Grosso Federal Institute (IFMT) participation in the project to transform sawdust into organic compost to be used as a soil amender.

IFMT also participated in a research project financed by CIPEM through the Syndicate (SIMNO), intending to analyze the viability of conserving logs under sawdust. This technique is known as “log burial”. According to the logging entrepreneur’s empirical knowledge, this technique, avoids deterioration, allowing for higher yields and, consequently, less waste generation, besides the reuse of the wood waste already generated.

Thus, the research entities (Universities, Federal Institutes and others), which are part of the government's stakeholders, are fundamental parts for the development of knowledge to find new alternatives for wood residues use. They are characterized as having regional influence but can have a national and even international reach since their research can be disseminated through publications in national and international journals and can be read anywhere in Brazil and around the world. This demonstrates the power of research entities to influence possible changes in public policy.

SEMA-MT and IBAMA are government environmental agencies linked to the MMA (Ministry of the Environment). They all have a high influence on power over public policies. Among them, the SEMA-MT is the one that stands out the most. Because it has a regional scope, it manages to focus more and have greater participation in the discussions related to timber residue. It was also observed that these agencies have some interest in solving the problem. However, it is not a priority in their agendas, and collaboration would be needed to provoke greater involvement.

The Mato Grosso state Industries Federation (FIEMT), CIPEM and the Trade Unions (SIMNO, SINDILAM, SINDUSMAD, SIMENORTE, SIMANA, SIMAS, SINDIFLORA, SINDINORTE) are organized civil society entities that presented the greatest interest in solving the wood waste disposal problem. Strong involvement by the CIPEM and SIMNO is evident in

attempting to solve this socio-environmental conflict. This is backed by their compliance with the Solid Waste State Policy (Law 7,862 of December 19, 2002), which obligates the timber industry to have an appropriate waste disposal protocol.

Some steps are already being taken, such as the CIPEM participation in the ABNT Working Group (as a result of a FIEMT request), incentives for scientific research, interest in forging partnerships to solve the problem, and others already cited. In addition, SIMNO, partnering with SENAI, promoted a course called "Craftsman of Small Wood Artifacts", in which the objective was to promote the use of solid wood residues (Cipem, 2016a).

Some of the efforts carried out have brought interesting results for the sector. The experiments aimed at transforming sawdust, combined with cattle rumen (another waste product with great environmental liability) and microorganisms, into an organic soil amender (Cipem, 2016b). Currently, this research is being improved to establish a patent. This can generate income while solving a good part of the industry's environmental liabilities.

This shows the importance, influence, and power of an organized civil society in solving socio-environmental problems through the search for the common good, multiplying efforts through a network of interactions with other actors in society.

The forestry sector industries are part of the central social group in this discussion, as they are responsible for the generation of the residues in the spotlight. They are also the most concerned and interested in proper waste disposal because it is an obligation regulated by the Solid Waste State Policy (Law 7.862/02).

Forest-based entrepreneurs, analyzed in isolation, do not have sufficient impact or expressive power to act together with other social actors, but when represented by unions or associations, their power of influence and action is enhanced. However, their individual interests, knowledge, perspectives, and influence levels cannot be ignored. Therefore, a more thorough investigation was carried out by soliciting answers to a questionnaire.

Of the entrepreneurs interviewed (20), all local loggers (from Juína, Colniza, Brasnorte, Cotriguaçú, and Juruena), 85% stressed that they had trouble with suitable wood residue disposal and that the cause is the low technology employment. One example is the poor storage of the logs, which causes them to become cracked and damaged, generating low yields at the processing time. The average age of the interviewees' machines is 22 years, ranging from 10 to 40 years.

In order to solve the problem in the northwest Mato Grosso state, the entrepreneurs pointed out that a thermal power plant installation would be important for the consumption of this waste. They reiterated that many companies, such as briquettes, do not settle in the region

due to logistical impracticality. Finally, they reinforced that the industry's sawdust problem could be solved by its transformation into organic compounds and by the implementation of the "burial of logs" technique mentioned above.

In this study, 95% of the respondents said they knew the "burial of logs" technique, and of these, approximately 85% have already used it. All who used it, pointed out that it was effective for pest and disease control, which consequently improved the sawn wood yields. Therefore, generating several environmental gains, among them, eliminating the necessity of pesticides for the pests and diseases control, as about 68% of respondents use or have already used chemicals for this control.

However, the businessmen stressed that the use of the technique is not allowed by the environmental control agencies, since logs must be under the supervision of inspection and cannot be concealed as highlighted by Art. 69 of the environmental crimes law (Law 9.605 of 12 February 1998), which governs: "Art. 69. Inhibit and obstruct enforcement by the Government in dealing with environmental issues: Penalty - detention, from one to three years, and a fine. "

The IBAMA of Juína, through its representative, stressed that in some cases the inspection has accepted the use of this technique, because when it is declared by the entrepreneur the logs are unearthed and measured. He also stressed that in many cases, loggers are being dishonest and deceiving the inspectors by hiding logs without proofs of origin. In these cases, they are charged with environmental crimes. When asked how the technique could be incorporated into legislation, the IBAMA representative stated that there is no specific legislation for the case, but that it could be incorporated in an article next to State Decree 1,375/2008.

3.5 Analysis of public policies on wood residues

Considering that wood is usually a product with a longer useful life, it is observed that in general the use of this type of waste is not treated as a priority by the existing policies, where most of the elements included in public policies (Table 2) are quite generic and comprehensive and represent major implementation challenges.

Table 2. Main aspects of solid waste policies.

Jurisdiction	Legal Foundation	Primary Themes
Federal	State Policy on Solid Waste Law 12,305/10	Plan for Solid Waste
		Producers and Public Agencies Responsibilities
		Hazardous Waste
Federal	Lei de Crimes Ambientais Law 9,605/98	Sanctions and penalties for environmental crimes
		Crimes Against Flora and Fauna
State(MT)	Solid Waste State Policy Law 7,862/02	Preparation of the Solid Waste Management Plan
		Prior Authorization from the State Environmental Agency for Use, Export and Transport of Waste
State (MT)	Decree 1,375/08	Organization of Sawmill Log Yards
		Inspection of Sawmill Log Yards

Source: Authors.

Through the National and State Solid Waste Policies, the need for industrial waste regulation is evident. The entrepreneur has responsibilities and can be held accountable for environmental crimes under Federal Law 9.605/98. However, public policies do not give adequate attention to regions that lack basic infrastructure for the consumption and use of the waste generated, as is the case in northwest Mato Grosso state. This ultimately leads to environmental conflicts.

Alternatives to the use of wood waste, such as combustion for the generation of thermal and electrical energy, are not incentivized by public policies. Other uses already known and employed by the sector are not allowed by the supervisory bodies, as they do not find legal support, as is the case for the burial technique. When analyzing Decree 1,375/08, it was verified that with some changes the use of the technique could be allowed, mainly in paragraphs 6 and 7 of article 16 and paragraph 3 of article 17.

> "Art. 16 Every entrepreneur should keep his or her log yard organized.
> (...)
> § 6º The residues, the wood salvaged from the residue and seized wood must be arranged in the yard in an identifiable way and separate from other timber.
> § 7º In the case of covering of logs for the purpose of storage, the place and the material must be identified with signs, at the beginning and end, and organized in stacks. Each stack will be described in an inventory list.
> (...)"

In paragraph 6 it is clear that the waste must be separated from the wood, and in paragraph 7 it refers to the covering of logs for storage purposes, however, it is understood that this procedure is illegal.

> "Art. 17 During yard inspections, the SEMA-MT inspection team should
> (...)
> Paragraph 3 - If the inspection team encounters a disorganized log yard, which makes it difficult or impossible to gauge the individual measures of each unit, it should ask the company representative to organize the yard, so that the survey can be carried out. For this to occur, a period compatible with the work to be carried out will be defined in a common agreement between the parties and set by terms for the adjustment of conduct.
> (...) "

Article 17, paragraph 3, shows that if it is not possible to measure the logs in the yard, the owner will have to organize it within a period established in the terms for the conduct adjustment. In order to implement this technique, it is necessary, in addition to verifying its real effectiveness, to determine technical procedures for the control and supervision of logs buried under sawdust.

Techniques for improving wood processing that reduces pressure on the Amazon forest, such as "burial of logs", should be implemented, even though they may at first appear to be more difficult to monitor or to change state legislation for this purpose.

4. Final Considerations

Due to the lack of information, wood waste is considered a difficult challenge to deal with environmental liability and is not seen as an opportunity for financial return. In addition, in the northwest Mato Grosso state, due to logistics and distance from large consumer centers, the waste market and its use is negligible relative to the amount of waste produced.

The ways in which wood residues are already used in the region are insufficient to consume the waste produced. Therefore, the implementation of thermal power plants equipped with modern effluent treatment systems would be a good alternative that would meet the region’s demands. The lack of incentives and public policies makes the thermal power plant installation and operation impossible.

The technique of “burial of logs" can be a sustainable alternative for the use of waste. The adoption of this technique demands research on technological efficiency, economic viability, and appropriateness of existing legislation. Its adoption can generate innovation and/or technological product.

Stakeholders who have a high interest in collaborating with the topic and have a high influence power in decision making are the basis of an effective support policy coalition, so all efforts must be invested in ensuring that they are consulted and kept informed about the projects progress.

For the inclusion of the social groups involved and support for public policies and decision-makers, it is suggested:

a) **Increase availability and dissemination of information:** due to the existence of knowledge gaps and information lack about the alternatives for the wood waste used by stakeholders involved. There is also a scarcity of information regarding available technologies. Usually, the more information on the subject, the more pragmatic the decisions aretaken by Public Authorities regarding policy will be;
b) **Greater synergy between existing institutions and policies:** Mainly among self-interest / power groups, but also including other groups. There is a need for greater synergy between civil society groups such as SIMNO and CIPEM, and with research institutions, government agencies and market players;
c) **Focus on priority regions:** Promote the use of wood waste in priority regions, such as those that generate large amounts of this waste and are far from large consumer centers. Priority regions should be analyzed with caution because of the lack of effective public policies in these areas, results in major socio-environmental impacts.
d) **Promoting mechanisms of encouragement and incentives:** Due to the difficulty of companies to settle in the region, it is necessary to promote mechanisms of encouragement and incentives, such as financial, credit, and tax incentives.

Finally, to make better use of wood waste in the northwest region of Mato Grosso state, it is necessary to review current public policies and actions that stimulate and encourage the use of these residues. As part of the process, it is essential to continue giving due attention to the social groups that have vested interests and power in collaborating with the solution and valuing the stakeholder's knowledge.

For future scientific work it is necessary to cover larger areas of analysis to compare data. This becomes important because each location has its local and regional specificities that must be covered and discussed.

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