

# Analysis of the Paths covered by discarded tires in rubber stores of Manaus City: Market Niche alternatives for this Pneumatic Waste

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**Abstract**— The evolution of consumerist tendencies of the human being, always seeks to satisfy their needs with new products, and has significantly impacted all segments related to human behavior and their interference within biological cycles has significantly impacted all segments related to human behavior and their interference within biological cycles has increasingly dispartated the curiosity of the specialists in the most varied areas of knowledge. Oil products have never been more abundant because of their features and significant cost. Tyres are one of these consumerist aspects, which stands out in Brazil for the efficiency in the collection and reuse of this liability, in other processes by industry and with effective performance of organizations linked to the sector for logistics efficiency Reverse. Here we show and describe the behavior of small service providers that have a significant role in the segregation and direction of pneumatic waste. In order to understand its realities and present its possible potency in the continuation of the unit value of the tyre so that it becomes not only a good practice of reverse efficacy but also in a facilitating activity in the destruction of income among the population with lower income and low schooling, through an interpretation of environmental laws that guide the activity, demonstrative tables and graphs that present the reality of a week in the routine of rubber stores in the city of Manaus.

**Keywords**— Solid waste; reverse logistics; sustainability.

## I. INTRODUCTION

After the industrial revolution in the 19th century, there was an increase in consumption of industrialized products. Parallel to this growth, came the need for large-scale production, in addition, there was a change in the profile of solid waste production discarded by the population (LEAL et. al., 2008; PEREIRA and CURI, 2012). In the study of (VIVEIROS et. al., 2015), the author shows that the decades that followed the industrial revolution, the thought was that natural resources were unlimited and was not thought of controlling these resources.

With the reduction of natural resources, scarcity of raw materials in some sectors of industry and the increase in the volume of waste produced, new perspectives are pointed out as a solution to this problem, such as the development of mechanisms to reduce environmental impacts caused by the disposal of solid and liquid waste (PAULIUK and HERTWICH, 2015; ZURBRÜGG et. al., 2012). This issue is even more worrying in third world and

emerging countries, where the lack of financial resources and public policies prevent efficient waste treatment.

In Brazil, the Law of the National Solid Waste Policy (PNRS) was created in 2010, which addresses the main environmental, social and economic problems arising from inadequate solid waste management (DEMAJOROVIC and MIGLIANO, 2013). Studies have shown that despite the emergence of PNRS, the business sector still finds it difficult to apply reverse logistics models to its products (STOCK and MULKI, 2009).

Enumerates are sustainable initiatives, which seek to mitigate the effects of human behavior, related to their rampant consumption, motivated by corporate strategies to expand into a consumer market and frenzied of the new times. This behavior is driven by growth policies; especially in developing countries, which tend to compensate for years of stagnation and see in new technologies these possibilities (MULHA, 2006; TINOCO, 2006; SHIBAO, 2010).

Thus, the main factor acting in the increase in the amount of waste arises, but against departure, a range of possibilities to be used in the treatment of this problem.

Making a potential by-product issue with an ecologically correct strand, with the aim of reducing the costs of exploring new raw materials and producing new products (SOUZA, 2009; GONÇALVES and TEODÓSIO, 2006).

Above all, practicing initiatives that require a change of behavior in relation to the discarded tire always seeking to convey environmentally committed actions to sustainability, integrating society in a way that realizes the importance of valuation of this liability by making the rubber store business an incubator of sustainable practices and businesses (INSTITUTO AKATU, 2017; CAMAROTTO, 2009).

Other experiments showed that the amount of rubber stores accompany the exponential growth of metropolitan cities in the country. The city of Manaus naturally follows this trend, due to its similarities with emerging metropolises, which is related to the increase in the vehicular amount of recent decades (XIMENES, 2008). Nevertheless, the amount of materials generated and the place where they are produced do not present a pattern, showing that regions with a high number of establishments are associated with the socioeconomic profile of the region.

Some experiences similar to that developed by Carvalho (2018), in the city of Humaitá in Amazonas. The author related sustainable practice and waste management as essential tools for the development and improvement of the quality of the communities involved in the processes of dealing with their waste. During his work, we had the opportunity to disseminate the concepts and regulation of sustainable businesses, thus obtaining an overview of the effective efficiency of activities and the functioning of reverse logistics (CARVALHO et. al., 2018; SILVA et. al., 2017).

In this new opportunity the work seeks to show an initiative to observe the existence or not of the reverse logistics process for the tires discarded in small rubber stores in the city of Manaus. Thus, it was an opportunity to formulate issues relevant to this theme, which is part of the percentage of residue that participate, of the reverse policies of large importers and distributors of tyres in Brazil. With the prospect of consolidating a reality analogous to what happens to the aluminum can market throughout the country.

## II. METHODOLOGY

This work shows the relationships that occur between vehicle users, rubber stores, and disposal. The methodology was applied in the neighborhoods São José, Cidade Nova, Coroado, located in the east of the city of Manaus / AM, as shown in Figure 1.

For the development of this study, on-site visits were made in the period of two months (September and October 2019). During the visits, the weekly routine of 3 rubber stores per patio was monitored. The objective of following the routine was to check the state to which the tires are discarded; whether they are recoverable (maintenance); otherwise if the disposal will be with the exchange for the steppe or for some other specific reason inherent to the patio. Also, from this action it was possible to analyze the destination of waste. After this, estimate the volume of waste per captas generated in a certain time and path; with the nominal description through graphs and tables of these volumes by previously selected patios and described in Table 1.

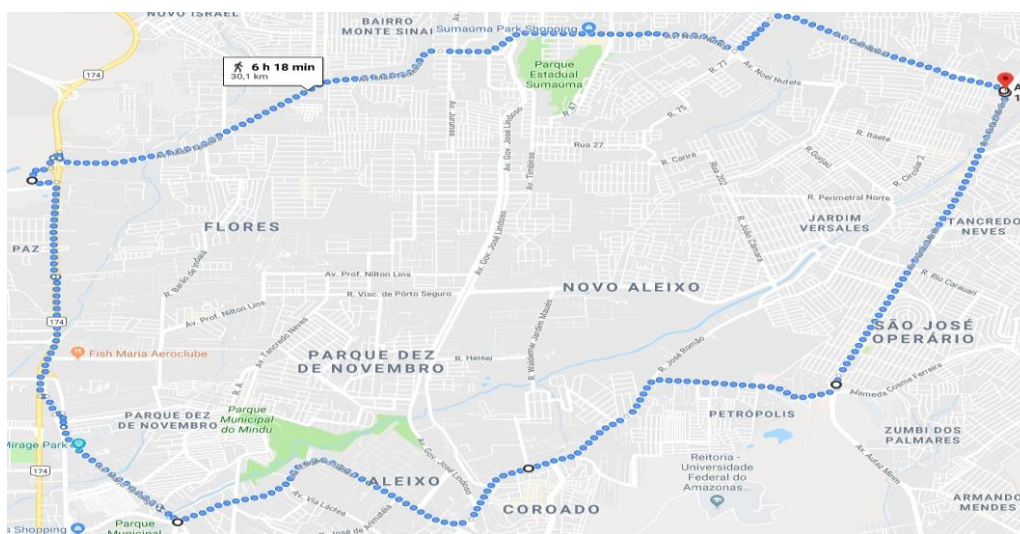


Fig.1: Dotted blue line shows the location of the study area

Due to the variability in the number of rubber stores, the three chosen by patio, we tried to standardize the

number of locations for the analysis, in order to seek a uniformity in the number of parameters analyzed by

establishments in each route. Thus, the chosen routes shown in Table.1 are: Al. Cosme Ferreira (A.C.F), Av. Altaz

Mirim (A.M.M), Av. Camapuã (A.C), Av. Noel Nutels (A.N.N), Av.Torquato Tapajós (A.T.T).

Evolução no cumprimento da meta de destinação nacional pelos fabricantes de pneus (2009 - 2017)							
2009/10	2011	2012	2013	2014	2015	2016	2017
105,88%	101,79%	105,31%	106,93%	106,98%	101,17%	100,09%	101,78%

VOLUMES DESTINADOS - DE 2000 A 2017 (EM MIL TONELADAS)



Fig.2: Target of national destination by tyre manufacturers from 2009 to 2017.

Source: IBAMA (2018).

Table 1 services in rubber stores in the city of Manaus.

STUDY AREA CONTAINING REFERENCE RUBBER STORES. ( values for a weekly journey )																								
Rubber ware	Patio	Zon e	Exchange(mant.)							Disposal							Recovery							Total
			S	T	Q	Q	S	S	D	S	T	Q	Q	S	S	D	S	T	Q	Q	S	S	D	
B1	A.C.F	L	5	4	1	2	0	6	8	0	1	0	0	2	0	0	5	2	4	1	3	6	2	46
B2			5	2	0	1	2	1	4	3	0	1	0	0	1	0	2	2	1	2	0	3	2	32
B3			7	1	1	2	2	1	2	1	0	0	2	0	1	0	1	1	2	2	1	1	2	30
B1	A.A.M		8	3	2	2	2	2	1	0	0	1	0	3	0	0	7	2	1	2	1	3	2	42
B2			5	3	2	2	2	2	4	1	0	0	1	1	0	0	2	1	0	2	2	2	2	34
B3			7	1	1	1	1	2	1	2	0	0	0	1	1	0	4	1	2	1	2	1	3	32
B1	A.C	N	4	2	2	2	1	2	2	0	0	0	1	1	0	1	1	1	2	2	1	3	2	30
B2			3	1	3	2	1	2	1	1	1	0	0	1	0	0	1	3	1	1	1	2	0	25
B3			2	0	1	4	2	2	1	1	0	0	0	0	1	0	1	2	1	1	2	2	2	25
B1	A.N.N		7	1	2	2	1	3	2	0	1	0	0	1	2	0	1	3	1	1	1	2	3	34
B2			6	2	2	3	1	2	2	1	0	0	0	2	0	1	1	0	0	2	2	1	1	29
B3			3	2	2	2	1	1	2	1	2	0	0	0	0	1	1	1	0	1	0	1	2	23
B1	A.T.T	O	2	2	1	1	2	2	3	0	1	0	0	2	0	0	1	0	2	0	0	1	1	21
B2			7	2	0	2	1	2	3	0	0	0	0	1	0	0	2	1	2	2	1	0	0	26
B3			8	3	1	2	2	1	2	2	0	1	2	0	0	0	1	2	0	1	1	0	0	29

In addition, questionnaires containing questions related to the routine of the services provided by each

establishment were used in a period of 24 hours. The geographic coordinates of each rubber store were inserted

in ARQGIS (version 10.3), which provided the geo-referenced images of the study area.

Among the questions elaborated and applied in the establishments, we highlight the destination of the useless tires discarded in the workshop. A surprising fact during the application of the questionnaire, it was noticed that small establishments participate in reverse logistics idealized and

practiced by large importers and manufacturers of tyres. Despite its structure in many cases, it is a backyard background business, and they mostly have neither documentation or legal authorization to work as a service provider. And that agrees with the figures presented in the 2018 IBAMA tyre report, in compliance with Conama Resolution N°. 416/09.

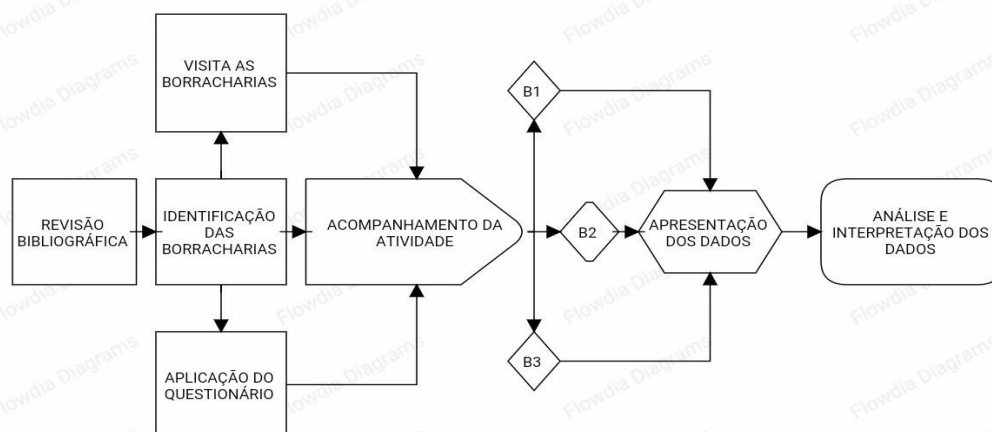


Fig.3: Descriptive flow chart of on-site actions in the study area.

### III. RESULTS

In this section will be shown the results of the work on the reverse logistics of rubber stores in a neighborhood of the city of Manaus / AM. It was observed that the points of the highest number of services are located in the east of Manaus; Al. Cosme Ferreira (A.C.F) and Av. Altas Mirim (A.A.M), as shown in Figure 4. These roads have more intense traffic, which was observed all along the road, and

thus a high density of rubber stores as soon as it is routed. If we consider the volume of waste collected, we could denote a unit value and thus the monetary gain to each insertable tyre. Establishing unit value, it would be possible to use it as a mechanism for transferring income, since the executors of the activity are mostly people with low schooling, that has in the office its principal or if not the only source of income.

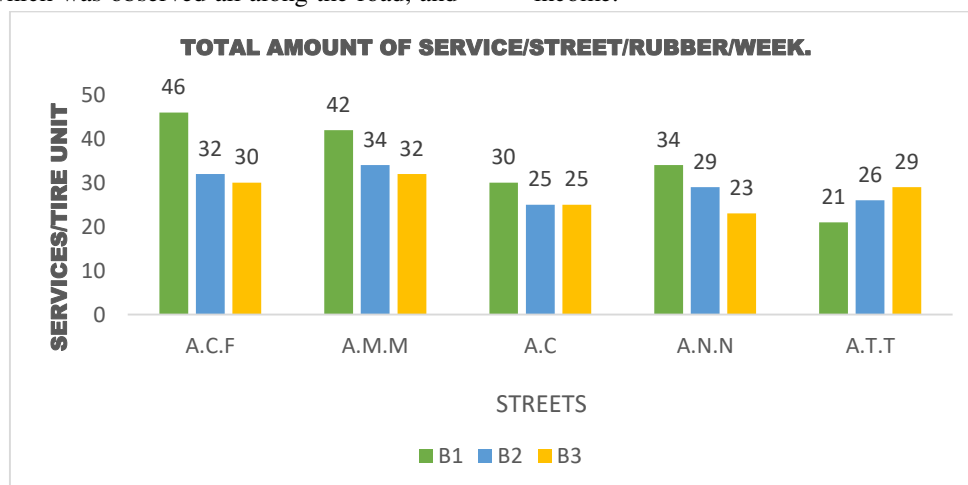


Fig.4: Total services per street in the week.

In the other areas of the city there is a greater uniformity in the routines of rubber stores, this is due to the fact that the establishments are not geographically concentrated, as happens in the east of the city.

Regarding the amount of services performed shown in Figure 5, they are very significant revealing the importance of rubber stores as an insertable tire capture tool,

avoiding becoming a public health problem and a liability that later would demand large investments for its mitigation.

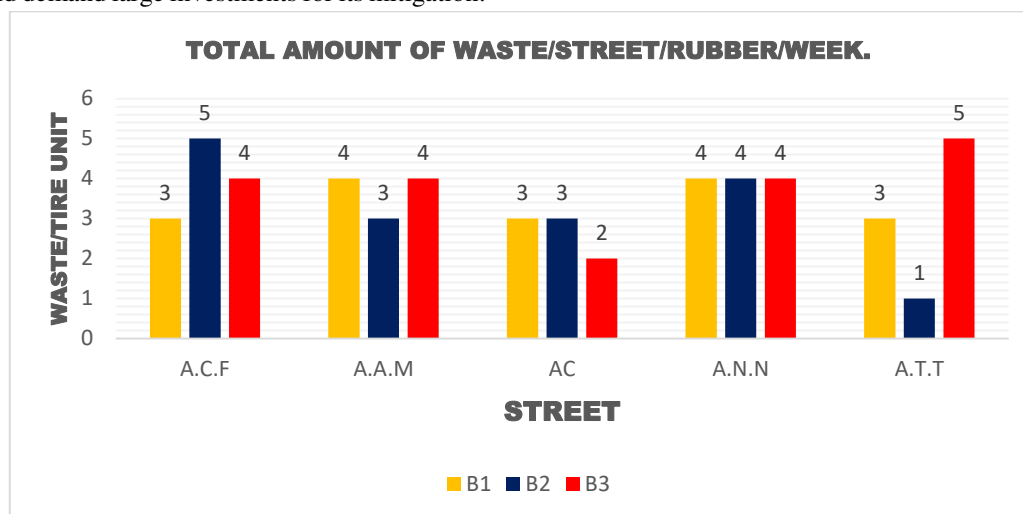


Fig5 : Total waste generated per establishment in the study.

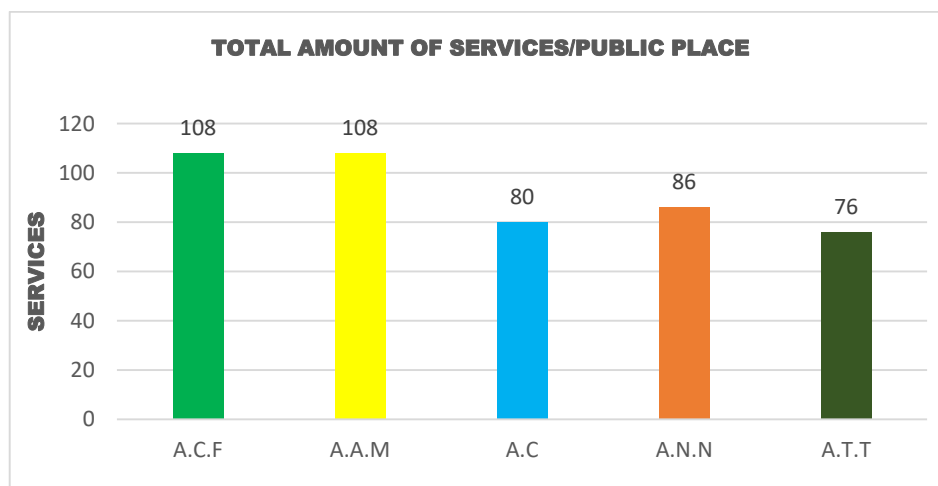


Fig.6: Total amount of waste generated per week in each street.

And finally, with the information shown in Figure 5, it is possible to verify that the waste generated is not entirely despicable. According to the information obtained weekly, it would be possible to obtain a constant volume generated by a rubber store of 208 unit / month, and also, 2496 units / year.

If we consider that the city of Manaus now has approximately 50 rubber stores officially registered and visible by Google tools, it will be possible to measure in a simplified way, a total per establishment of 124,800 units/year. Also, according to the manufacturer's specifications the average weight of each tyre is between 5.5 and 7.0kg. Considering the cartons from the lowest weight (5kg), it will be possible to obtain an amount of 624,000kg/year (624Ton/year). This demonstrates a promising construction of sustainable business and income transfer.

The results observed in this study show that urban growth, the difference in the level of environmental awareness, the differences in infrastructure, and lack of scope of reverse logistics policies are determinant to characterize efficiency initiatives, semelante to those presented by Carvalho (2018).

#### IV. FINAL CONSIDERATIONS

During the monitoring of rubber routines, we observed that there is an awareness of the basic concepts of reverse logistics. This awareness comes from the disposal of waste generated, as in the effective action of reverse logistics plans designed and practiced by the organized institutions of producers, importers and resellers of tyres in headbutt by the recycling. In fact, the collection work has its relevance, but it would be interesting to use this potential to foster the waste business in the city, decentralizing the



collection activity and giving infrastructure, so that small entrepreneurs manipulate the process of production of the raw material of the liability, and for them to take the head of the initiative and consolidate the market for pneumatic waste in the city, in order to become a reference in the management of solid waste and Sustainable business.

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