LUMEN ET VIRTUS

Reverse logistics associated with the objectives of sustainable development and environmental education

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ABSTRACT

Reverse logistics presents an interrelationship with the Sustainable Development Goals (SDGs), and both must be supported by environmental practices whose guidelines are inserted into Environmental Education (EE). Based on this, the objective of this review was to identify the forms, internationally and nationally, about the practices of this type of logistics, based on the goals numbers 2, 3, and 4, 6 and 12, 14 and 15, and EA. The method employed was a systematic literature review, with quantitative and qualitative coverage, and observational nature. The period for literature selection was between 1997 and 2022. The data obtained and analyzed indicated that, internationally, the logistics under study present two obstacles: the stakeholders and the different views about what eco-friendly packaging is. In the national territory, the structure for reverse logistics has not yet been implemented by the triad government, companies and consumers because the first component presents legislations only for the second component, however, in the case of LR, there is no specificity for the practice at home, as well as an incipient number of voluntary delivery points and, finally, the economic context, because there are retail outlets, started to profit from packages that could be destined to reverse logistics, but do not do so. Moreover, in the case of Electro-Electronic waste, there is no environmental incentive for computers, notebooks, among others, to be destined to the LR, so the owners, when they realize the obsolescence of these devices, discard them in inappropriate places such as rivers.

Keywords: Solid waste, Environmental impacts, Human and Environmental health, Reuse.

INTRODUCTION

> Yesterday I saw a bug/ In the filth of the yard/
> Scavenging for food among the debris/When it found something/
> Unexamined and unsniffed/ Gobbled it up with voracity/
> The animal was not a dog/Not a cat/Not a mouse
> The creature, my God, was a man!
> (Manoel Bandeira - The Animal, 1948)

Human behavior first with the disposal of waste is not recent history as can be seen in the poem by Manoel Bandeira (1886-1968). 79 years later, the concern with solid waste, especially urban waste, gained notoriety from the global concern with the environment, since the Club of Rome in 1972, due to the negative consequences that environmental impacts cause on human health (FERNANDEZ, 2012; MARCHI, 2011). This is since contemporary society is highly consumerist, especially of what it does not need, and often discards what is obsolete, or worn out, in inappropriate places as "garbage" (FERNANDES; SILVA; MOURA, 2016).

But the concern with garbage (not everything is garbage) is not recent, since, in Brazil, it dates to the time of the Empire, nineteenth century, year 1880. In that year, D. Pedro II, signed Decree No. 3.024 which, in its core, determined the public cleaning, via garbage collection, in the then city of São Sebastião do Rio de Janeiro. Those hired for such execution were the Gary brothers, which gave rise to the current name of "gari" (ALVES et al., 2012). To assist the garbage collectors, there is the action of the "trash catatodes", not of garbage, but of materials that generate income for them, reduce the volume destined to the still open-air dumps, or popular "dumps" that, indirectly contribute to the recycling occurrence, and is one of the forms of occurrence of reverse logistics (SOUSA; PEREIRA; CALBINO, 2019; SOUZA; PEIXOTO, 2017).

In this view, LR can be seen as an inverted channel, because it adopts the practice of recycling after consumption of what can be reused and, in this bias, it would be limited only to households. However, the range of players involved in this process expands this range and places it in a much more extensive Holos (FULLER; ALLEN, 1997). In this context, it encompasses then, the purchase, transportation, and packaging (CARTER; ELLRAM, 1998), which involves two more actors: marketing and management, and operates in three phases: strategic, tactical, and operational (BRITO; DEKKER, 2002).

To understand the after-sales LR, one must understand that it is tied to the areas of planning, operation, and control, as to the physical flow, in addition to associating information of the products already sold, both unused and those with little use (SILVA; FERNANDES; ROSALEM, 2016). In Brazil, the National Solid Waste Policy (NSWP), Law No. 12.305 (BRASIL, 2010), the LR is defined as one of the tools to contribute to the involvement, both economic and social based on

actions aimed at the collection and reinsertion of SR in the production process, from a Guiding Committee, a term of commitment or regulation by the Public Authority (MMA-SINIR, 2018).

Among the many packages that are discarded in inappropriate places and that are currently linked to LR are the glass and plastics (ACOORSI; VERSARI; MANZINI, 2015), tetra pack (COELHO, 2018; KRABOYACI et al., 2017; MARTINEZ-BARRERA et al., 2017); plastic and paper (MARTÍNEZ et al., 2017). Other discards, such as those of unserviceable products, with expired or unexpired expiration dates, are also already under LR control such as: medicines (AURÉLIO; HENKES, 2015; LUNA; VIANA, 2019), and tires (LAGARDINHOS; TENÓRI, 2013; ZAMPIER; HENKES, 2018).

All these "controls", are associated with the 17 sustainable development goals (SDGs), managed by the United Nations (UN), in the document entitled "Making Peace with nature: a Scientific Blue print to Tacke the climate, biodiversity and pollution emergencies (UN, 2021)" that food, water and energy, must be transformed so that they meet, not only the growing needs in the current generation, but that they can, in a resilient and environmentally friendly way, meet the other subsequent generations.

Goals 2, 3, and 4, 6 and 12, 14 and 15, align with the LR guidelines, in several aspects, such as, for example, in No. 2, goal 2.3, and No. 12, sustainable agriculture (sustainable production) is the focus, therefore, the no residual disposal on the soil and the occupation of areas already altered for the promotion of agriculture, may be a way to achieve this goal. As LR deals with the reuse and reuse of these packages, especially those that contained chemical compounds and, after analysis of their components, apply them for other purposes such as, ornamental objects and landscaping (PALHARES et al., 2018; TAUFIK et al., 2020).

As for goal No. 4, the association is even more evident because formal education should be associated with Environmental Education (although it does not appear in any of the goals of this goal), because the more environmental agents come from the spaces of formal education and integrate with the informal ones, the greater the network of environmental conservation and the higher the sensitivity to use the environment in a rational way, and promote the maintenance of it for future generations (MENEZES; MIRANDA, 2021; MOREIRA; SANTOS, 2020). In Brazil, Environmental Education (EE) is regulated by Law No. 9.795 (BRASIL, 1999), which established the National Policy for Environmental Education (NPEE), to meet the requirements of articles 225 and 22 of the Federal Constitution (BRASIL, 1988). In article 3, section III, the National Environmental System (SISNAMA), the guidelines for environmental actions are its competence. This Education can be formal and non-formal.

These two lines of EE, when well employed, can increase environmental sensitivity, if there is the practice of one of the goals of the SDG (no. 4), because behavioral skills, regardless of the level

of education, generate environmentally responsible individuals, whether at local, national, or global level (HEMPE, L.; HEMPE, C., 2015). This is because the EE is associated with LR, when we observe the anthropocentric model that characterizes the current generation of consumption, and that still does not have the proper conservationist link to the environment where it lives and that surrounds it, because when it disposes of solid waste in the environment, regardless of the reason for this act, it has no perception of the impact it causes both for itself and for the environmental triad: water, air and soil (DIAS, 2021; VAZ, 2012).

All these problems and arguments justified this study and increased its relevance, as well as contributed to the construction of the objective that was to analyze quantitatively and qualitatively the publications as the application of reverse logistics, both internationally and nationally, and how this contributes to sustainability, based on Environmental Education.

METHODOLOGY

The method applied was the systematic literature review (SLR) because it sought a synthesis of available information (PEREIRA; GALVÃO, 2014). The nature was the basic, in view of the generation of new knowledge on the subject; the approaches were: 1. quantitative descriptive because it was studied the cause-effect relationship; 2. qualitative, where it was observed what the impact generated on the research focus (DALFOVO et al., 2008) that, in this case, there is Reverse Logistics (LR), Sustainable Development Goals (SDGs), and Environmental Education (EE).

To elaborate the selective descriptors, a "word cloud" was prepared (Figure 1) because in the qualitative process, the use of this resource allows an analysis of those words that present a higher frequency that stands out in the visual representation (VILELA; RINEIRO; BATISTA, 2020).

Figure 1. Word cloud with emphasis on the most frequent ones as a function of font size.



Elaboration: Authors, 2022.

To better execute this methodology, five steps were applied (Chart 1).

Chart 1. The five steps applied in conducting the methodology.

Steps	Shares	Descriptions
1	Access to Electronic platforms	Brazilian Digital Library of Theses and Dissertations (BDTD); Periodical Portal of the Coordination for the Improvement of Higher Education Personnel (CAPES); Scopus, Science Direct and Web Science, as well as repositories of federal, state, and private Higher Education Institutions (IES).
2	Filter application	2.1 For the selection of the scientific literature, the time scale was between 1999 and 2022[1].
		2.2 Three selective descriptors were used from the "word cloud": reverse logistics; sustainable development goals; environmental education, in three sections: title/title; abstract/abstract; keywords/Keywords.
3	Linking LR with other environmental issues	LR was associated with 11 terms: 1. LR x Sustainable Development; 2. LR x Environmental Education; 3. LR x Packaging; 4. LR x Management and Sustainability; 5. LR x Medications; 6. LR x Pallets; 7. LR x Tires; 8. LR x Construction Waste/Construction and Demolition Waste 9. LR x Electronic Waste; 10. LR x Solid Waste 9.; 11. LR x Supermarkets.
4	Justifications[1]	4.1. Promulgations and publications: of the National Policy for Environmental Education, Law, No. 9.795 (BRASIL, 1999); of the National Policy for Solid Waste, Law No. 12.305 (BRASIL, 2010), and the creation of Reverse Logistics, Decree No. 10.936, Ch. III, section I, art. 12 (BRASIL, 2022). Exceptions: Carter & Ellram, 1998; Fuller & Allen, 1997,pionner literature.
		4.2 Preference was given to literatures, in terms of volume, published in the last five years (2017 to 2021), and with updates from the first half of 2022.
		4.3 These associations have facilitated evolving analyses as to the application of LR in relation to other environmental issues and how this has occurred as a function of international and national environmental concerns about solid waste.
5	Statistical Analysis	For this analysis we used electronic spreadsheets contained in the Excel software, version 2013. Values inherent to frequencies (absolute and relative), mean, and standard deviation were calculated.

Elaboration: Authors, 2022.

After screening, they applied the eligibility, exclusion, and inclusion criteria, adapted from the synthesis described by Del Buono (2015) for the latter two (Chart 2).

Chart 2. The three steps for composing the methodology employed in this review.

1. Eligibility	The literature that contained at least one of the isolated association descriptors in at least one of the analyzed sections, besides the approach to reverse logistics, Sustainable Development Goals and Environmental Education, in textual concordance, directly or indirectly, and the publication period corresponded to the predetermined one, were eligible for the composition of this review.
2. Exclusion	The literature that was not published within the established time frame and/or did not present the selective descriptors, and the textual content, alone or associated with the variables, did not expose in a concrete way the actions of reverse logistics, the Sustainable Development Goals and Environmental Education, were excluded.
3. Inclusion	Literature that contained content, either alone or associated with one of the 11 variables employed, and the publication period fell within the pre-established selective guidelines, was included in the composition of this review.

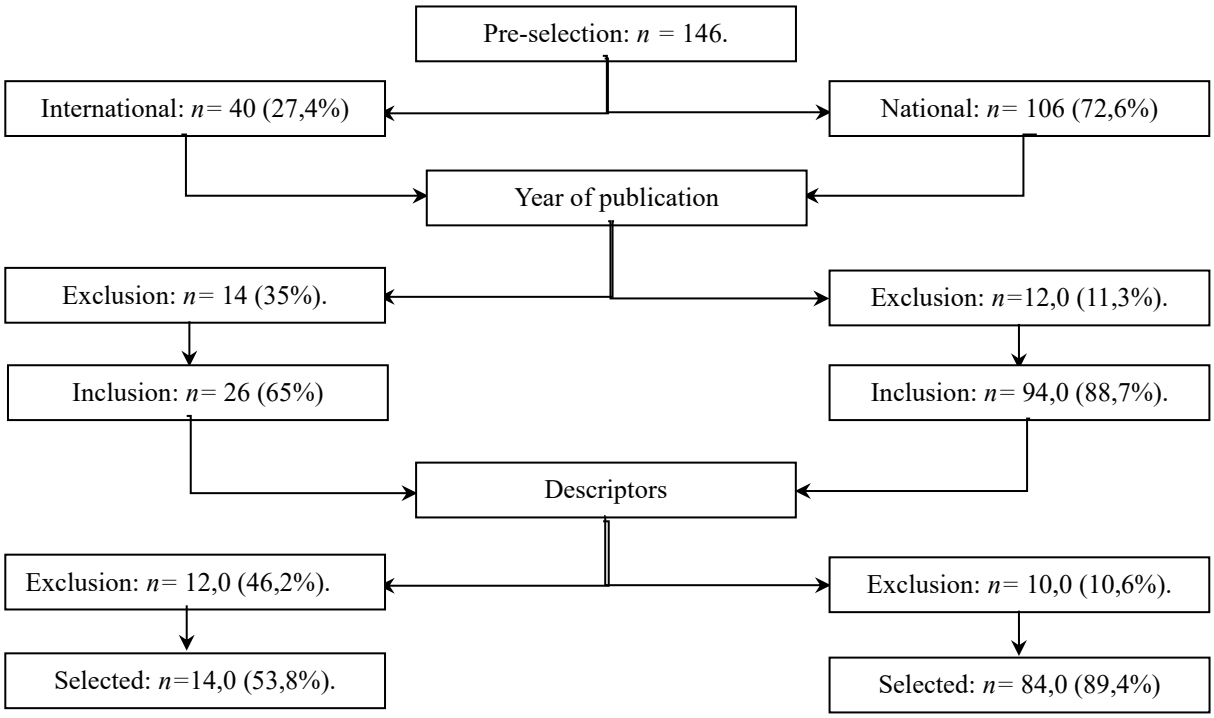
Elaboration: Authors, 2022.

RESULTS

EXCLUSION AND INCLUSION

The data obtained and analyzed indicated that of the 146 pre-selected articles in the accessed electronic databases, 98 (n = 64.3%) of them met the conditions for final selection, exclusion, and inclusion (Figure 2).

Figure 2. Data inherent to the final selection, exclusion, and inclusion of the selected literature.



Elaboração: Autores (2022).

DISTRIBUTION OF ASSOCIATIONS

The data obtained a analyzed for the distribution of associations indicated that in the national literature (7.6±4.9) was more prolific when compared to the international literature (2.3±2.0). In the former, the contents for sustainable development and Electro-Electronic waste were more prolific (Table 1).

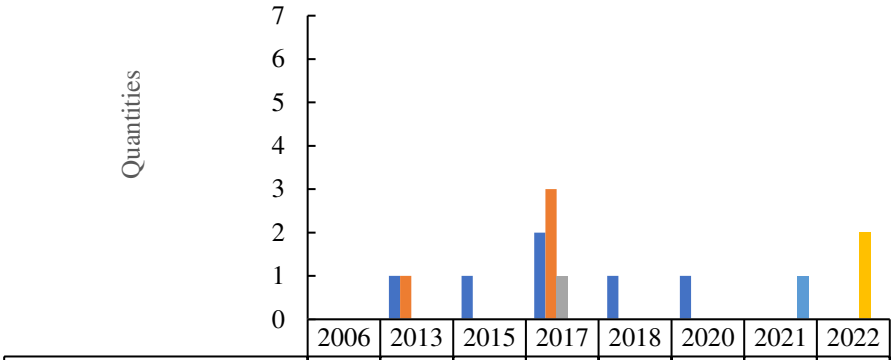
Table 1. Values for absolute frequency (fi), relative frequency (fr%), mean ( ) and standard deviation (σ) for the identified associations between reverse logistics and other environmental terms.

Associations of Reverse Logistics (LR) with...	***fi***	***fr(%)***		**±**	**σ**
Sustainable Development	18	21,4	21,4	±	1,5
Environmental Education	5	6,0	6,0	±	0,7
Packaging	9	10,7	10,7	±	0,6
Environmental Management and Sustainability	2	2,4	2,4	±	0,5
Medications	5	6,0	6,0	±	0,5
Tires	5	6,0	6,0	±	0,7
Electro-Electronic Waste	14	16,7	16,7	±	1,6
Supermarkets	6	7,1	7,1	±	0,9
Civil Construction Waste/Construction and Demolition Waste	5	6,0	6,0	±	0,5
Solid Waste	11	13,1	13,1	±	0,7
Palets	4	4,8	4,8	±	0,5

Elaboration: Authors, 2022.

As far as international literature is concerned, data indicated that packages, especially those of the tetra pack type and polystyrene terephthalate plastic bottles, in addition to unserviceable tires, were most analyzed in terms of reverse logistics. Another relevant fact was that research destined to analyze the destination of Electro-Electronic waste was scarce and sparse (Figure 3).

Figure 3. Distribution of international literatures regarding environmental issues in relation to reverse logistics.



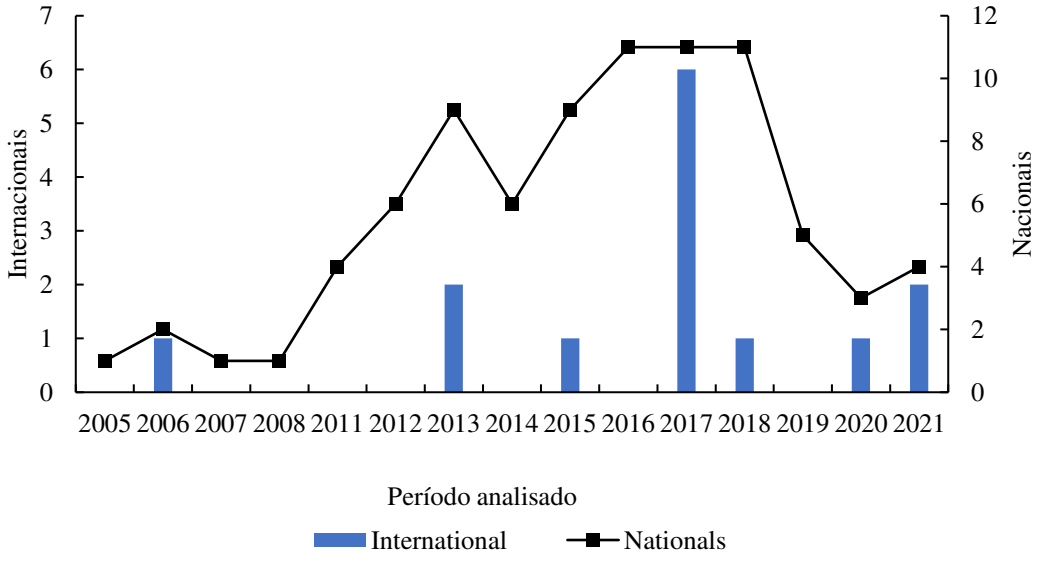
	2006	2013	2015	2017	2018	2020	2021	2022
Packaging		1	1	2	1	1		
Tires		1		3				
Super Markets				1				
Electro-Electronic Waste								2
Literatures							1	

Elaboration: Authors, 2022.

OF THE PUBLICATIONS IN THE ANALYZED PERIOD

For the pre-established time scale (1999 to 2022), the number of publications were more effective between 2016 and 2018, for the national context, and 2017, at the international level (Figure 4). It is worth noting that two of them (CARTER; ELLTRAM, 1998; FULLER; ALLEN, 1997), occurred two years before the enactment of NPEE, in Brazil.

Figure 4. Distribution of academic publications between national and international literatures.



Elaboration: Authors, 2022.

It can be seen in Figure 4, that at the national level, the period of growth of research about LR, occurred between 2008 and 2013. Soon after the stability, it went down and has remained high since 2021.

DISCUSSION

INTERNATIONAL CONTEXT

The international literatures revealed interesting contexts about reverse logistics. The first of these was related to the types of packaging that can be identified by consumers: cardboard, glass, plastics. Then, they identified cardboard packaging as the "environmentally friendly" and with the lowest degree of impact on the environment. Next was glass, and lastly plastic. For this type of packaging, most recognized it as "ecologically incorrect", but there were statements that it is "environmentally friendly" to the environment" (SIMONDI et al., 2013; TAUFIK et al., 2020).

This recognition is linked to the need for consumption and production of goods and services, from imported to local use, especially in areas where urbanization is growing (PONGRÁCZ, 2007). One such consumption whose packaging is not one-way is Ultra-high Temperature (UHT) milk. The reverse logistics of these packages, for companies, is a long-term strategy, and the practice of it, is not a facade for the practice of greenwashing. This is because such packages have composited whose base are polyesters, and that can be used from the practice of reverse logistics, and this is one of the contributions that knowledge brings to the environment, besides the substantial improvement that can provide in the supply chain, thus avoiding the practice of greenwashing (COELHO, 2018; MARTÍNEZ-BARRERRA et al., 2017).

Another factor is that the internal part, where the aluminum (Al) is contained, can be used, in areas of elevated temperatures, as a reflecting area in the external parts of the architectural units, which decreases the internal temperature and the cost of energy consumption/month. In areas where the four seasons occur, in the winter period, it allows the internal storage of heat. Tire wear, due to abrasiveness such as asphalt or cement paving, are microplastic generators, releasing to the environment an average of 0.23 to 4.7 kg/year. The main sources are truck tires, airplanes, brake wear, among others. This shows that reverse logistics should have its milestone already in direct production with research on new types of less polluting raw materials (KOLE et al., 2017; KORDOGHLI et al., 2013; RODRÍGUEZ et al., 2017).

From the point of view of retailers such as supermarkets, regardless of economic size, reverse logistics has been studied (MARTÍNEZ et al., 2017), especially about perishable food, whose life cycle is short and needs refrigeration for this to be prolonged. According to data from the Wuppertal Institute, Germany, the use of all technique called "Material input services (Material input per services), it is possible to perform the calculations to have a volume in the relationship "production of materials" and the "volume of water and air" that can be contaminated by improper disposal of waste and without the practice of reverse logistics.

About electronic waste (Waste Electrical and Electronic Equipment - WEE), comparative studies between Sweden and Egypt (EL-NAKIB, 2012), and another evaluative study in Finland

(LAHTELA; HAMOD; KÄRKI, 2022), concluded that in the first country, this type of waste has been subject to reverse logistics for decades, due to the high content of copper (Cu), plastic, lead (Pb), silver (Ag). These materials were also identified in the research conducted in Finland. But all of them are widely hazardous to the environment and human health. The second, has the title of major consumer in the Middle East, of electronics, however, still "crawling" about reverse logistics, and the so-called "green awareness", and this may identify those countries called "emerging" (KUMAR, 2022).

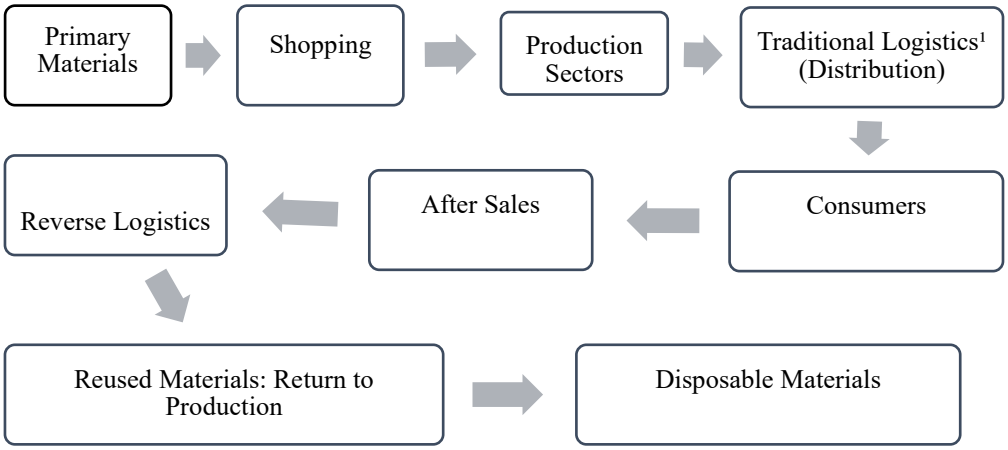
Already the practice of reverse logistics in the pharmaceutical industry, the problem is in the point of view of stakeholders is the current obstacle, spatially in the case of India (NARAYAMA; ELIAS; PATI, 2014), since the supply chain of this industry is financed by them, and that there is need to overcome three obstacles: 1. Quantity of drugs plaguing the consumer market; 2. Improving the infrastructure as to quality management in the production line; 3. Balancing the risks between stakeholders and others involved in the supply chain such as traditional logistics (e.g., packaging).

IN BRAZIL

Reverse Logistics *vs.* Sustainable Development

The national literature indicated different literary treatments as to the LR vs. DS dichotomy, in the process of flow and reflux of materials in the product-consumer relationship (Figure 5), the concern should be centered on the correct management as to equipment, since in them, there is replacement of parts due to the life cycle (MARTINS; SILVA, 2006), maintenance as to lubrication, therefore, there will be disposal of packaging or, perhaps, LR of it (COSTA; VALE, 2006; LIMA, 2008).

Figure 5. Scheme for traditional and reverse logistics.



[1] It also involves facilities; transportation; material movement; levels of integration and information system. Prepared based on Avero and Senhoras (2014).

In the national territory, the LR is still incipient when focusing on household disposal, it is still incipient for two facts: 1. There is no specific legislation for waste of this nature, since it is

inherent to the producer, but there is already a minimum portion (5.2%) of households that promotes waste segregation, which is the basis for LR (RIBEIRO, 2016; SOUZA et al., 2017). Housewives; secretaries of the home, are unaware of the content of the legislation directed to retailers of large, medium and small size. In addition, the EA currently applied in schools has not yet effectively sensitized the students, teachers, administrative staff, and outsourced services (SILVA; LEITE, DECHANDT, 2014; HEMPE, L.; HEMPE, C., 2015).

Reverse Logistics *vs.* Environmental Education

Regarding Environmental Education (EE), in vogue since the Tbilisi Conference in 1977, and LR, the former acts in the process of raising awareness about post-consumption waste, goes through actions that increase environmental sensitivity as to the basic application of the three Rs, well conducted and properly taught as a cross-cutting theme, and even interdisciplinary, to the curriculum compulsory sciences (MORAES FILHO et al., 2018; VAZ, 2012). The second, for being one of the tools of the NSWP, is dependent in a direct way on the environmental educational formation of the consumer, as well as it is supported in the objective No 4 of the ODS, whether in her school, the EE should be able to prepare the citizen to contribute to environmental sustainability, one of the purposes of reverse logistics (MOTA, 2021; MOREIRA; SANTOS, 2020).

So that there is effectively environmental conservation via EA, it is necessary that, in national schools, EA has a more effective sequence as to solid waste, environment, sustainability of reverse logistics, from the segregation of packaging of products sold in the canteens or from the homes of students and students, in addition to the teaching staff and administration, so it should not be applied superficially (BARRETO et al., 2015; SANTOS et al., 2021). But if the application of EE, in association with LR, is applied in early grades, where the formation of thought is in full development, and the perception memorizes positive and negative actions, in addition to the application of information technology, such as the Internet, can be of more value for future sustainability and conscious use of the environment in which we live, and generate, in society as a whole, greater knowledge about this relationship (PONTES et al., 2022; RONZANI, 2018).

Reverse Logistics *vs.* Packaging

The Brazilian literature under this aspect presented a well-ordered content because the National Confederation of Commerce, Goods, Services and Tourism (CNC, 2014; 2015), presented a series of guidelines contained in two booklets called "Disposal of packaging in general: guidelines for reverse logistics," whose central theme was plastic bags, whose reduction was defined in Ordinance No. 404 (BRASIL, 2012). With respect to plastic, there was exposure in the literature of extremely useful information regarding the need for proper reverse logistics. One of these reveals

that this material comes from petroleum (hydrocarbon), a non-renewable and non-degradable resource that impacts the environment and is widely used in everyday life (Chart 1).

Chart 3. Names, acronyms, and uses of plastics in Brazil.

Chemical Name	Acronym	Use	Destination after use	Numeric Identification for PET
Polyethylene terephthalate	PET	Soft drinks and mineral water	Recycling/Lixons	In triangle at the base of the bottles with number 1
High Density Polyethylene	PEAD	1. Food products (without color pigmentation: dairy products, mineral water, fruit juices. 2. With pigments: laundry detergents; hygiene and cleaning products; whiteners; motor oils	Reverse Logistics (?)/Dumps (?)	In triangle at the base of the bottles with number 2
Polyvinyl chloride	PVC[1]	Construction	Recyclable very infrequently	In triangle at the base of the bottles with number 3
Low-Density Polyethylene	PEBD	Food packaging with automatic packaging; industrial bags; garbage bags; flexible films; agricultural tarpaulins; bags; cosmetics and medication.	Reverse Logistics (?)/Dumps (?)	In triangle at the base of the bottles with number 4
Polypropylene	PP	Mold for lids; small bottles, labels for soft drink bottles; margarine jars; medicines; raffia bags; chemical products.	Reverse Logistics (?)/Dumps (?)	In triangle at the base of the bottles with number 5
Poliestireno	OS	Disposable cups; food insulators; egg carton.	Reverse Logistics (?)/Dumps (?)	In triangle at the base of the bottles with number 6

[1] Chlorine used for manufacturing comes from sea salt (57%); 43% comes from Ethylene, a petroleum derivative.
Elaborated from data contained in
https://www.faneesp.edu.br/site/portal_educacao_ambiental/documentos/walmart_embalagens_portugues.pdf

The studies on pesticide containers (MARCHESE, 2013; MECABO, 2018; SILVA et al., 2016), reported on the importance of EE for the consolidation of NSWP and, consequently, of LR, as well as the enforcement of Law No. 7.802 (BRASIL, 1989) that deals with the marketing, use and disposal of this type of packaging, but there was a detail that drew attention: farmers, mostly unaware of this law. So, it is not possible to have the agreement of the user of the agrotox regarding the proper disposal or even the practice of LR, as well as not understanding the division of responsibilities regarding this practice. To minimize such gaps, the state of Mato Grosso, due to its agricultural characteristic, with the "Clear Field Program," developed by the National Institute for Empty Packaging Processing (inpEV).

In relation to wood packaging, as in the case of Pallets, studies (MELLO; ANUNCIAÇÃO, 2015; SANTOS; DONATO; SILVA, 2018; SOARES; SILVA; MELO, 2013) have shown that these support structures are already in academic evidence. For their LR, the companies work with analysis of the input, the sorting, the repair, and the disposal of these structures, under two aspects: 1.

Economic, since the cost of individual repair is equivalent to R$ 5.00; 2. Environmental, since those that are not passive of repair, are sold to potteries and bakeries as "firewood".

As for supermarkets and the practice of reverse logistics, the focus is on cost reduction, or even, an additional alternative for revenue generation, as in the case of cardboard sales, whose values range from R$ 2,600.00/year 44,000.00 (DIAS; BRAGA JÚNIOR; MARTINEZ, 2016; SERVILHA; SANTOS, 2012), and avoid expenses with environmental fines (DIAS et al., 2016; SILVA et al., 2019). Therefore, the non-definition of the means, already the intra and intra-organizational conflicts are real, especially the profile of the consumer who frequents the establishment. In view of this, this implementation in the retail market, is still an unknown, and that the vision of costs to exercise it is still a fact among them (BRAGA JÚNIOR et al., 2020; DEMAJOROVIC et al., 2015).

Reverse Logistics *vs.* Medications

The official leadership oversees the National Health Surveillance Agency (ANVISA). Ministry of Health, and other health institutions, including retail and wholesale sales. In this sector, "health service waste" (AURELIO; HENKES, 2015) are chemical compounds in the form of lozenges, pills, syrups, whose expiration date has passed or those that have not been fully consumed. In general, they are discarded in the garbage, or in toilets, and then flushed (OLIVEIRA et al., 2022). If the pipeline captures these waters contaminated with substances from these compounds, and does not have the proper treatment for them, this can spread other pathologies in communities that are supplied with these waters (BRANDÃO, 2013).

The supply chain of this economic line, in Brazil, is not yet fully active because the concern does not start in the industry with the entry of the material - traditional logistics - but at the point of sale (retail), and only according to the expiration date and, therefore, there are no actions whose sufficiency meet the requirements of NSWP, Article 13, item I, sub-item g (BRASIL, 2010). One of the most frequent excuses for the correct implementation of LR in this sector is the excessive cost (LUNA;VIANA, 2019).

Reverse Logistics *vs.* Electrical and Electronic Waste

This residual line has four categories (ABDI, 2013): 1. white, consisting of refrigerators, freezers, stoves, clothes and dishwashers, dryers, air conditioners; 2. brown, which encompasses monitors and tube and plasma televisions, Liquid Crystal Display, (LCD), Light Emitting Diode (LED), Digital Versality Disc (DVD) and Video Home System (VHS) players, audio equipment and camcorders; 3. Blue, where there are mixers, blenders, electric irons, drills, hair dryers, fruit juicers, vacuum cleaners, and coffee makers; 4. Green, where there are desktop computers, laptops, computer accessories, tablets, and cell phones. Plus, plastics, glass, 20 or more types of heavy metal.

For this to be effectively segregated, there is a need for a functional network composed of the state, the private sector, the consumer, and the collectors. But the focus should prioritize the knowledge about the environmental behavior of the third component of this network, because when there is an offer of new Electro-Electronic equipment and his purchasing power is high, there will be exchange that, in the case of cell phones, the average varies between one and three years (PETITO, 2017), and disposal, just do not know how and where (AGOSTINHO; SILVA, 2013). One of the strategies revealed in the analyzed literatures, indicated that the creation of "Voluntary Delivery Points" (OLIVEIRA et al., 2013; OLIVEIRA et al., 2017), in the places of retail sales, but there is no support from EA, no massive disclosures in the media, therefore, low environmental sensitivity by this consumer.

This strategy can work, provided that the details still existing such as the disposal of parts with larger volumes: computers, notebooks, laptops, desktops, either at the points of resale or technical assistance are improved. Studies in this sense (EL FARO; CALIA; PAVAN, 2016; SILVA, PIMENTA; CAMPOS, 2013; SILVA et al., 2018;), indicated that among the participating elements of the LR network for REE's, there must be a HEI to better conduct the implementation process of this logistics, from the so-called Sustainable Campuses.

CONCLUSIONS

In the selected and analyzed literature for the international context, gaps were identified for the application of Logistica, such as the resistance of the stakeholders in function of the profits due to the expenses that this implantation will cause. There is no obvious environmental concern, since the extraction of raw materials involves the revolving of the soil, deforestation, contamination, and pollution of surface and underground water. In the national context, the gaps are inherent to each sector where the legislation determines the implementation and realization of LR.

This is due to a flaw in the very legislative structuring that does not assess the consumers' profile and their environmental perception, due to the inadequate disposal they now practice. One of these sectors, that of medication, only targets expiration dates, there is no massive publicity for the practice of PEV's implantation and how the consumer should use them. In the Electro-Electronic sector, such as mobile phones and computers, there is a concern only with logistics at the point of sale and on the factory floor.

Today, sales facilitate the acquisition of laptops, tablets, increasingly smaller, not only in size, but also in life cycle, which decreases the time of use, due to technological advancement and the consumer's desire to possess innovative technology. Another bottleneck is in the production of packaging whose environmental degradation is fast and effective, but without releasing contaminants

into the soil, water. Or yet, that the deployment, even with this type of packaging, is more active from massive dissemination with consumers.

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