

# REVERSE LOGISTICS: STUDIES AND COMPLEMENTATION

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**SUMMARY:** As the way to contribute to the management of goods in the pos-consumption and pos-selling points, some companies have used tools and methods that make up the reverse movement in the productive chain, which has the goal to use the maximum of useful life of materials, and for it is given a name of reverse logistics (RL). This work has the goal to present the reverse logistic situation in Brazil, as how to analyze its conceptualization and the general themes can be related with RL. Another point that will be addressed is the study of complementation of RL relate with the reverse supply chain (RSC).

## 1. INTRODUCTION

Nowadays, the way of life of biggest part of people in the world has required more and more materials and consumer goods with characteristics of last generation ([Mucelin and Bellini, 2008](#)), moderns and facilities that require only one click to obtain for what you need, and, in that way, the products present disposable conditions as an intrisecas characteristics of its production and also, this way of life imposes the power to model the human relationships in terms of quantity of acquired materials (Ortigoza and Cortez, 2009).

This sum of attitudes has provoked the increasing of waste and tailings generation available in the environment; these could return to the production chain or could be intended of the correct way, as in landfills and recycling, or even return to the production chain as raw material of second-hand.

However, the return to the production chain or even the proper management of these wastes and tailings not has been observed frequently, what is becoming the natural and anthropic environment unsustainable due to the depletion of natural resources (finite), the extrapolate of the maximum point of the incorporation of tailings – carrying capacity of Earth – and the contamination of the areas less advantaged/managed by the local governments, exposing a big part of the people in inappropriate situations to survive (Ortigoza and Cortez, 2009). Despite this problematic, it is important to remember that this new routine of consumption is responsible to create millions of jobs, and its reduction would provoke big social problems (Leite, 2012).

In that way, several strategies are elaborated and implemented in order to minimize this unsustainable generation of waste and tailing, without prejudicing the employability degree of population. Between these several strategies, the Business Logistic has improved as a tool or method that improves the reverse movement of these materials (in the end of the cycle of production) in the production chain; this process is called Reverse Logistic (RL) (Hernández, 2010), a new way of contribution to the materials management in the points of post-consumption and

After-Sales. This strategic of management of usable and unusable products which are been disposed in the environment is gaining visibility, studies and use due to a series of contribution (environments, economics, socials, politics, among others) to the society (Milano, 2013).

Besides, the mercantile system (producers and consumers) is establishing new concepts about adequacy and environmental education, what enable to improve the global competition; and that is why the organizations is modifying their production processes and investing in technologies aimed satisfaction of a big part of people who move the economic (Guarnieri et al., 2006), and also they are improving the visibility of company before the targeted marketing (Campos, 2006).

Another important point is the need for prevailing legal requirement (in environmental and social terms), nationally and internationally, which acts as methodology of compliance for the adaptation of organizations to the change and the attendance to the environmental requirements which are grounded in the current scenario and which are established by the intermediate and final consumers (Hernández, 2010), providing a strategic, viable and correct end to so many products that have substances and chemicals components harmful to the health and to the environment when they are disposed and handled in the wrong way (Milano, 2013).

In Brazil, the RL is also introduced, recently, as a tool legally binding, established in the National Solid Waste Policy (PNRS), in 2010, in its Chapter III, article 8<sup>th</sup>, clause III:

*“III – the selective collection, the **reverse logistic systems** and other tools related with implantation of shared responsibility to the cycle of life of the products;”* (Brasil,2010).

We can also observe that the ecology sensibility of population is became bigger and bigger, what promotes a series of discussion and debate about environmental responsibility of society; among the issues there is the problem of increasing of solids wastes and the difficulty of disposal them. In that way, with the goal to mitigate this scenario and their impacts, companies are positioning themselves for the news about planning and manipulation of usable and unusable wastes (Leite, 2003).

The RL has showed an important use to the health area, once it verifies, plans and implements the withdrawal of contaminated, stale and damaged products from the market (Guarnieri et al., 2006). The possibility of recovery of the materials after their using, and the reduction of costs with equipment and raw material has allowed the increasing of reverse logistic made by the companies (Campos, 2006).

Many are the factors that encourage the companies to invest financial resources and time in scientific and technologic studies, and in the practices of materials return or correct disposal of them, aiming internal and external improvements to the company, improvements of commercial visibility and best customer acceptance (Milano, 2013); however, studies has being done yet, because each material or process has its particularity, being necessary specific methods to them, in that way, the disposed goods need to present all the characteristics which were established to finish the chain of return (Leite, 2003); what can prevent or hamper the right occurrence of the return processes.

## **2. OBJECTIVE**

This work has the goal to verify the situation of reverse logistic in Brazil, analyzing the concept and the thematic related with this issue. This work also intends to elaborate a study of compensation of RL related with reverse supply chain (RSC).

## **3. METHODOLOGY**

Based on books, scientific and academic papers, news and reports, the bibliographic research allowed the registration of secondary data about several important issues in the paper, as RL, RSC,

Wastes, Public Policies; developing its characteristics in way of bibliographic revision and contributing for the creation of classifications, models and interfaces between the issues discussed.

## **4. RESULTS AND DISCUSSION**

### **4.1 Direct Logistic (DL)**

The idea of logistic arises in the military time, being its functions of acquisition, maintenance and transport of soldiers, people, materials, weapons and others (Ballou, 2006). But is as from the 50s and 60s that this term is taken into consideration under of materials distributions (Piassi, 2008), getting to be used by the big companies as method to organized the way of products and materials since the source until the final consumers (Ballou, 1993).

Over time, the term of logistic has being improved and it focuses in several concepts widespread in whole world, like the propose of Ballou (1993) which is defined as activities of circulation and storage what improves the products flowing, since the starting point – achievement of raw materials – until the final consumer, as the information circulation aiming the product rotation, in the view of admissible cost.

Christopher (1997) defined the logistic as a way of strategic management aiming the organization of acquisition, movements and storage of materials through the planning of marketing canals, in order to improve the profit in a long way, all for a low cost.

The Council of Supply Chain Management Professionals – CSCMP (2010) establishes that logistic is a process of supply chain which addresses part of the planning, implementation and control of the effective direction of flow and reverse of goods, services and information related with the starting point until the consume point with the goal to attend the needs of the consumers.

Many authors say that the logistic has still a challenge to follow in which is possible to verify the need of intern and extern integration of processes, allowing combined results, being embraced as a business competence, with the goal to create value to the consumer for the lower cost (Piassi, 2008), or it can allow that materials and information research its destination at the lowest possible cost.

### **4.2 Reverse Logistics (RL)**

Aiming reduction of waste, as well as a better use of the materials after the consumption or selling, the companies and the academics, as from the 80s, started to explore and study more intensely the thematic of Reverse Logistic (Pereira et al., 2012); it has been known as a upstream of products into the production chain (Chaves; Batalha, 2006) in all countries around the world, in the same way happens with environmental thematic in general, that also starts to gain space in the analysis, studies and conventions.

Among all the differences between direct and reverse logistic, it is observed the direction of flow and the kind of distribution from the emitter to the receiver, which can be characterized, in the DL, as a pulverized distribution, once it passes from one supplier to several consumers; and to the RL, as a distribution of centralization, because the several consumers are transferring the products to the original companies, partnerships and recycling companies (Chaves, 2009).

Through so many definitions about reverse logistic which are been discussed and studied yet, we can highlighted the elaborated by Council of Supply Chain Management Professionals – CSCMP (2010), which reverse logistic is a specialization of logistic, whose focus is in the circulation of management of products and resources After-Sales or post-consumption (see Figure 1).

BRASIL (2010) defined RL as a tool allows the collection and the return of the solids wastes to the companies, which execute the reuse of the materials in their products cycles or adjacent cycles; or make the correct destination of collection materials.

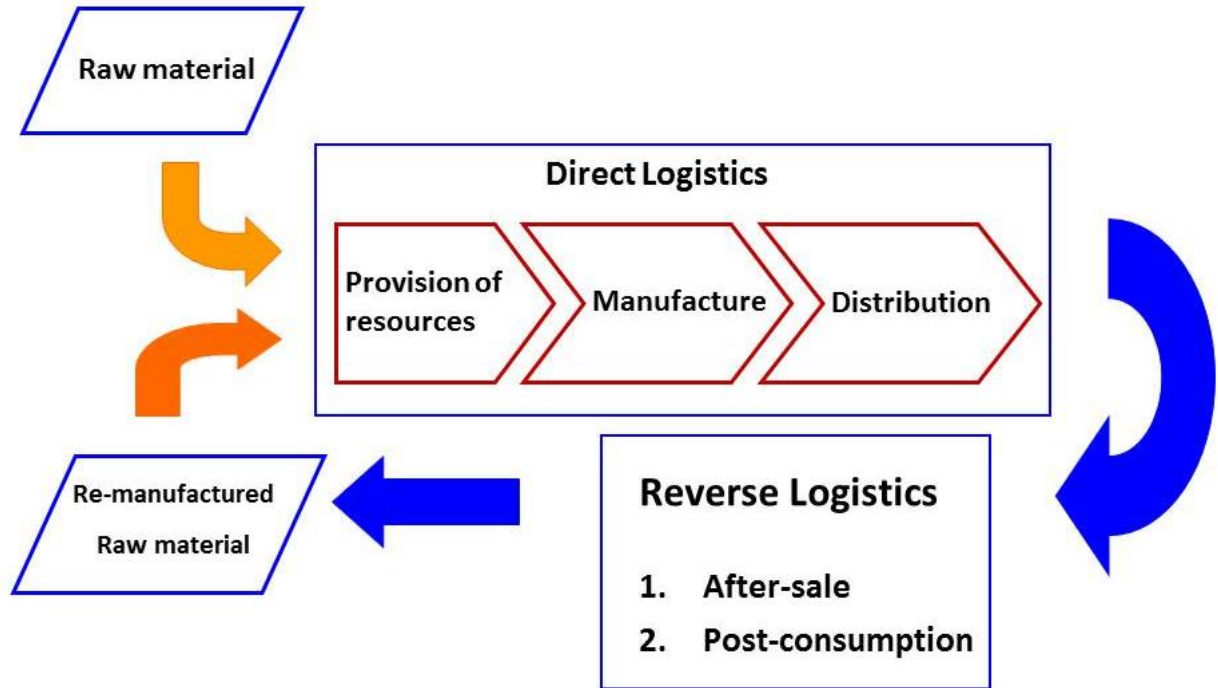


Figure 1- Integration of Logistic – Direct and reverse  
Source: Adapted from LACERDA (2003)

According to Leite (2003), RL plans, produces and controls the movement of return from the After-Sales and post-consumption products to the productive cycle, and also its information, through the distribution reverse canals, what aggregates to the materials several values; the author also presents how the equating of several processes and flows occurs after the end of materials life; and for this process of return to the supply chain, several activities should be performed, since the collection of materials, separation, packaging and shipment of the used, damage or obsolete items of selling points (Steven, 2004 *apud* Chaves and Batalha, 2006) or collection points of post-consumption until the reverse distribution canals.

The distribution canals – steps (movements, stocks of goods, processing of request of final products) after the end of production which goes since the sale of goods until the final consumer, person or entity (Bezerra, 2009) – have the reverse ways that complete the study about RL and which can be described as distribution reverse canals (DRC).

The DRC's are the following steps to the use of goods by the final consumers that have the goal to aggregate value to the returning goods or disposed one for what it can return to the secondary market (Chaves and Batalha, 2006), to the production chain or being correctly destined (Bezerra, 2009), and, in general, they can be: Cutting up, Recycling, Final Correct Disposal, Re-selling and Return to the supplier (see Figure 2).

Leite (2003) describe the DRC's as:

- The resale and the return to the supplier are ways of reintegration into the productive cycle of products which are with high stock levels, being consigned, being maturing or presenting defects or low quality; they are returned to the cycle and follow to the secondary markets or they are send to others steps of DRC's."
- The recycling is a process of retired of constituting materials of products, with the goal to change them into secondary raw materials which are incorporate in the productive system again.
- The cutting up is a process of disassembling which are extracted from the products the components in using conditions or remanufacturing and send to the market of used items.

- The final dispose is the final destine of products which not have conditions of upgrading–landfills to natural consume of materials or incineration that allows the extract energy of materials – available to the environmental, economic and social point.

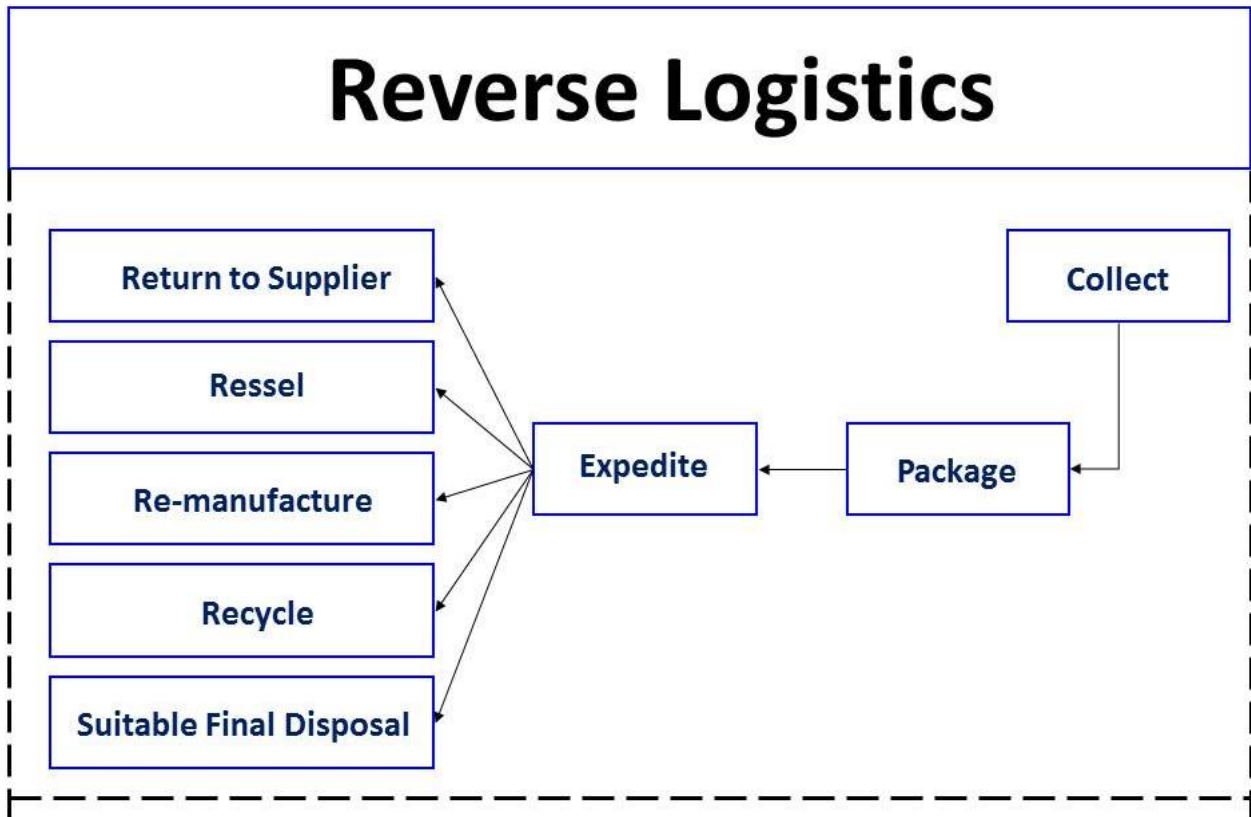


Figure 2 – Division of RL and Distribution Reverse Canals  
Source: Adapted from LACERDA (2003)

The DRC's are steps of destination of the worked products in the RL, according to Leite (2003) are subdivided in two ways: After-Sale and post-consumption, the last is the focus of this paper.

The RL of post-consumption operates through the lifetime of products – time that materials have satisfactory characteristics of use, since its production until the disposal (Roque and Moreno-Junior, 2005) –, passing by good conditions of post-consumption.

However, for this study, the lifetime of products will characterize the materials, being subdividing into following categories:

- Disposal goods: materials that present their lifetime between weeks and six months. For instance: packaging, diapers, toys, batteries, and others.
- Durable goods: materials that present their lifetime ranging between years and some decades. For instance: cars, electrical appliances, air planes, and others.
- Semi-durable goods: materials that present their lifetime ranging between months and two years. For instance: batteries, lubricating oils, and others.

The goods mentioned losing their value to the original consumer after their using; however, they can present characteristics that still can aggregate value, passing to the secondary market until their lifetime ends; if their lifetime be exhausted they should be destined to the correct locals (Piassi, 2008).

The RL of After-Sale manages the procedure and information of disposal, durable, or semi-durable goods, which present reduced use or no using – still into the production chain or with the



final products – been returned due to wearing, defects, failings, or even mistakes in the order processing (Ortiz, 2011), returning to the direct productive cycle. The main goal of After-Sale of RL is to aggregate value to the product that passes through the return process. Initiatives like specific contracts or own actions of companies to serve the clients have facilitated the reintegration of goods returned to the several parts of the productive chain (Leite, 2003).

The repercussion and the use of After-Sale of RL has increased, and the moderns companies use these process to obey the laws, recovering the aggregated value of products, increasing the image and corporate marketing, and also to show the differences among the offered services (Leite, 2003).

The destination given to the products of After-Sale, according to the characteristics of return, according to Leite (2003) are: sale in the primary market, repair and fixing, donation, cutting up, remanufacturing, industrial recycling, final dispose; these ways will give the right destination to the products, in order to enjoy the lifetime of products until the point just has residual energy.

### **4.3 Reverse supply chain (RSC)**

As these work involving the perception of several links between the organizations in order to occur the right disposal of materials, it is necessary knowledge more specific about management of supply net that allows the materials and information have routing and generating the expected result.

The supply chain can be described as a network which has information, materials, pieces, people, ideas from suppliers and consumers (Slack, 2004), connecting the manufacture, distribution centers, wholesale and retail (Sinnecker, 2007), satisfying, in that way, all the productive chain and generating feedbacks of each executed step.

According Hadley (2005) *apud* [Talamini et al. \(2005\)](#), supply chains are structures of support that serves to assist strategies analyses and achievement of goals elaborate by organization.

The supplies chains consist of all the organizations that have some kind of participation of productive process, however, each chain will have its specificity and size according to complexity of productive cycle. The components of chain can be characterized as primaries and support. The primaries members are the organizations that execute management and techniques operations of materials change into specific goods to the market, to the consumers. The members of support are companies that offer subsidies, as a tools, sources, knowledge, to the productive cycle and even being of basic order in processes, because they not executed the changes, they not are present in the aggregating of value of the produced goods. As from this definition of members, is possible demarcate the points of source and consumption. The point of source occurs where the old members are identified as support; the point of consumption occurs where there is not more aggregating of value to the produced goods, in other word, there is its effective consumption ([Talamini et al., 2005](#)).

The chains of supplies have the goal to satisfy the final consumers, including their needs and expectations; searching for strategies to obtain and retain the final consumers, considering the existence of a company code that can management projects to obtain these consumers; and efficient management in all productive chain, in order to correct and prevent “bottlenecks” in the productive chain (Slack, 2004), generating structural, techniques and economic improvements, with reducing temporal and financial spending.

Therefore, is important to know, locate and management the supply chain to promote continuing improvements at all participated companies, and also facilitate directs and reverses logistic processes.

### **4.4 Reverse Logistics in Brazil**

The responsibility for waste management in Brazil has its origin in 1988, with the promulgation of the Federal Constitution, which, being the maximum legal order of the Union, brings in its context

the shared duty of citizens, in all spheres (public and private), to maintaining a balanced and available environment to present and future generations (Yoshida, 2012).

With the promulgation of Law 12,305 of August 2<sup>nd</sup> 2010, the National Solid Waste Policy (PNRS) presents the major and necessary decisions so what the management be regulated and required in all spheres of action of society, from large centers to the home of every citizen, and also intensifying the Article 4 of the National Environmental Policy and Principle 16 of the Rio Declaration on Environment and Development in 1992, where is observed the issue of principle of polluter pays, in which the polluter bears the environmental costs due to impacts, and costs of protection and use of environmental resources (Juras and Araújo, 2012). The PNRS presents the RL as a tool of strong impact on the public and private environment, with measures of implementation and structure action, studied and worked into the Environment Ministry - MMA. The ministry has set up a steering Committee for the Implementation of Reverse Logistics Systems responsible for sectoral agreements, terms and regulations, moreover, it also presents five technical groups covering the following themes: 1) Disposal of Medicines, 2) Packaging in general, 3) Electronics, 4) Packaging of lubricating oils and residues, 5) fluorescent lamps, steam, and sodium and mercuries and mixed light; groups that study the development and viability of the agreements (see Figure 3).

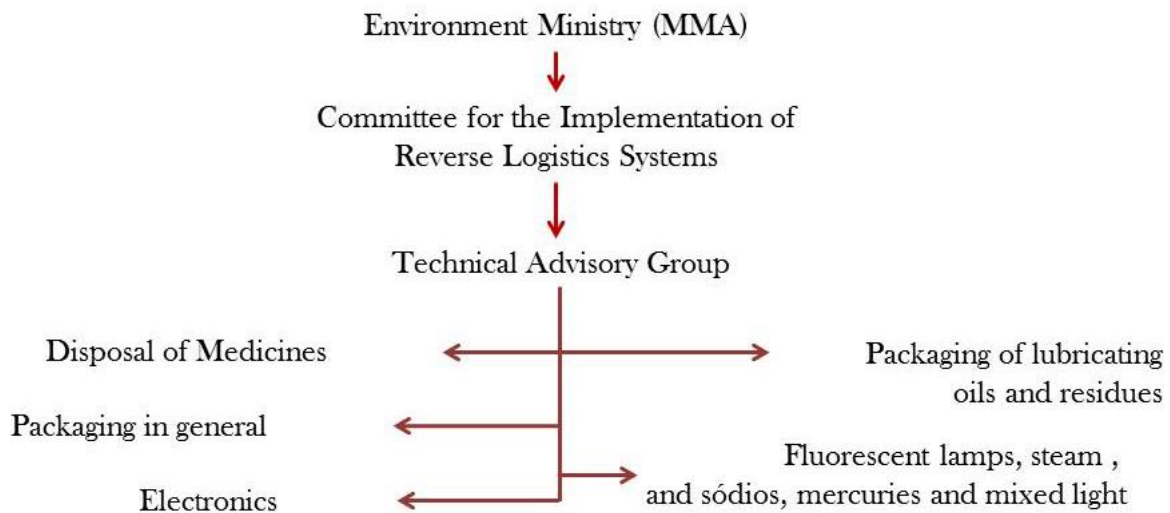


Figure 3. Diagram of structuring the RL within the MMA.

The decree n°. 7404 of 2010, which regulates PNRS, presents descriptive actions which are shared between public and private sectors that can be developed and applied in order to implement the instrument of RL in different production chains in Brazil.

There are three methods of action: sectoral agreements, Statement of Commitment and Rules. These three methods are coming from the government actions with companies involved (see Figure 4), however, only the sectoral agreements can be requested by the private sector, which should provide a descriptive and well-crafted agreement under the existing rules in Art 23<sup>th</sup> of this decree (see Figure 5).

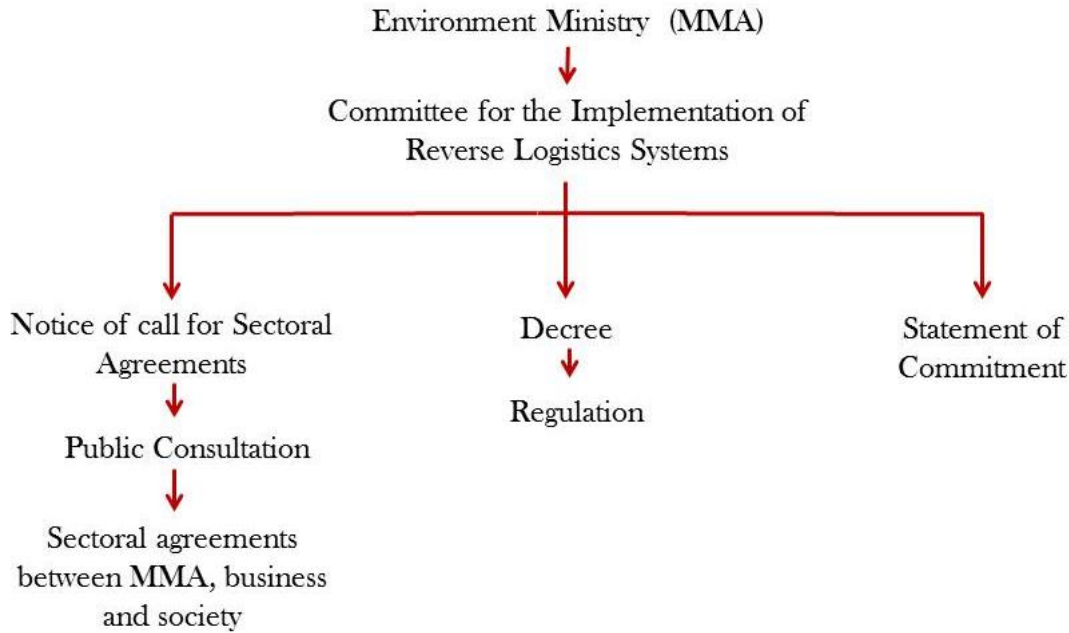


Figure 4. Methodologies for implementing of reverse logistics by the government.



Figure 5. Structure of the requests made by the private sector.

Sectoral agreements are formal initiatives in contract format established between the government and other manufacturers aimed at management and shared responsibility on waste (Soler et al, 2012). The agreements elaborated by the government must be presented as follows (Art. 21<sup>th</sup>):

*"I - products and packaging which will be the subject of reverse logistics as well as the stages of the life of the products and packaging that will be inserted in that logistics; II - the calling of the parties, according to the specificities of the products and packing materials referred in the item I; III - the deadline for submitting a proposal the business sector sectoral agreement, subject to the minimum requirements set forth herein and in the announcement; IV - the methodological guidelines to assess the social and economic impacts of the implementation of reverse logistics; V - the territorial scope of the sectoral agreement; VI - other requirements that must be met by the*



proposed sectoral agreement, according to the specificities of the products or packaging object of reverse logistics "(Brasil, 2010).

However, if they were the originals of private enterprise, they must follow these requirements (Art. 23<sup>th</sup>):

*"I - indication of the goods and packaging object sectoral agreement; II - description of the stages of the life cycle in the reverse logistics system is located, as set forth in item IV of article. 3<sup>th</sup> of Law No. 12,305, 2010; III - Description of the way of operation of reverse logistics; IV - possibility of contracting entities, cooperatives or other forms of association of recyclable or reusable materials for implementation of the proposed actions in the system to be deployed; V - participation of public agencies in the proposed actions, when they take charge in some stage of the logistics being implemented; VI - definition of forms of participation; VII - mechanisms for the dissemination of information concerning existing to prevent, recycle and dispose of solid waste associated with their products and packaging methods; VIII - goals to be achieved in the context of reverse logistics system to be deployed; IX - timeline for the implementation of reverse logistics, containing the prediction of evolution until the fulfillment of the established final goal; X - information on the possibility or feasibility of recovery of waste generated, warning of risks from handling; XI - identification of hazardous wastes present in the various proposed actions and the care and procedures to minimize or eliminate their risks and impacts on human health and the environment; XII - evaluating the social and economic impacts of the implementation of reverse logistics; XIII - description of the set of individualized and chained assignments of the participants of the reverse logistics system of collection, storage, transportation, waste and empty containers, with a view to recycling or disposal of environmentally sound process, containing the reverse flow of waste discrimination of the various steps of reverse logistics and disposal of waste generated, the used packaging or post-consumer XIV - clauses establishing the penalties in case of breach of the obligations contained in the Agreement "(Brasil, 2010).*

Until the year 2014, three sectoral agreements relating to: the disposal of medicines, pesticide containers and oils and lubricants come into force and two other bids are ongoing for the preparation of agreements: general packaging and lamps.

The terms of commitments can only be made if there is no specific regulation on industry or already signed agreement within the coverage area; and set appointments and more demanding targets that have already been signed. The regulations can be deployed validating actions reverse logistics, being served by a decree issued by the Executive Branch. The reverse logistics systems established by decree must precede public consultation with the Committee through (Brasil, 2010).

Another scope is the private sector, in other words, many organizations provide waste collection environments to give correct destination for the materials with hard or mischaracterization of little known correct destination. These companies also provide promotional materials to sensitize the population to the correct handling of materials.

## 5 CONCLUSIONS

The RL in Brazil, as the world still needs the improvement of techniques and experiences, as well as more studies and practices in public and private areas. The supply reverse chain are still poorly studied and implemented in accordance with RL, which could be a breakthrough in the sector, whereas, the RSCs facilitate analysis and feasibility studies for implementation of RL and would allow the involvement of all organizations within the product life cycle. However, both the RL and the RSC are still processes that are sprayed and deserve to be studied and recognized by all

members involved in the process, from production to the final consumer, with a return to the production chain or proper disposal.

Due to this demand, study groups and practices are interesting to take for reflection and extension of knowledge in the area of waste and reverse logistics, paths such as the training group of the Federal University of São Carlos, Brazil, which has the proposal to study more deeply the national laws on solid waste and tools, aiming to confront the techniques with local realities.

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