

Desmaterialization: looking for the system and implications for sustainability

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The purpose of this paper is to analyze the ways in which the private sector can contribute to the management of value chains and partnerships with other stakeholders to create positive results in the dismantling of vehicles. Year after year Brazil presents record sales indicators for passenger vehicles. In September 2022, there were 114,089,246 vehicles in circulation (Denatran, 2022). The consumer society creates a need to dispose of products (Guo et al., 2022) that have a programmed obsolescence (Monti et al., 2023) or are replaced by the desire to acquire the launch, the novelty, the most current version of the products. different types of vehicles (Karagoz et al., 2020). In this scenario, the vehicle dismantling sector occupies a prominent position, by transforming waste into raw material (Chaabane et al., 2021), as well as the government's role in the regulation, inspection and monitoring of the sector (Yu et al. , 2020). It is a sector that moves many businesses, generates many jobs and sends many parts for appropriate purposes. Repair, reuse and recycling (D'Adamo et al., 2022) are practices that are already internalized in the vehicle dismantling segment and drive a dynamic automotive parts market. These are practices that are developed with a focus on the economic value that the asset still has, given that end-of-life vehicles represent an important flow in terms of volume and material content. From the perspective of the circular economy, this logic has multiple opportunities, namely, life cycle extension (De Almeida & Borsato, 2019), dematerialization, reuse, recycling (Sadik-Zada et al., 2018), privileging the use of renewable resources (D'Amo et al., 2020).

The justification for carrying out the study is associated with the number of vehicles that are dismantled each year, the valuable materials involved, environmental issues, waste streams (Krishna Mohan, & Amit, 2021), the technological development of cars and processing technologies. These are elements that drive the adoption of circular economy principles. Through the principles of circular economy (Soo et al., 2019), the practices of reuse, recycling (Danthinne & Picard, 2022), resource recovery contribute to the improvement of energy savings and resource depletion (Zhou et al., 2019). The study will be carried out in southern and central western Brazil. Secondary data will be consulted from the Traffic Department (DETRAN) and in-depth interviews with scrapyards owners and managers. The selection criteria for interviewees will be non-probabilistic, with priority given to entrepreneurs located in cities with a population of over 100,000 inhabitants. After the interviews, the full transcription, categorical analysis and presentation of the results will be carried out in the form of narrative, summary tables and figures that illustrate the flow of the process.

Preliminary results indicate that it is a complex sector, where informality is present. Little has evolved over the last few years to transform the dismantling sector. The dismantling operational systems allow the inclusion of improvements for a better use of end-of-life vehicles. The inclusion of good practices associated with the integrated management of the stakeholders that work in the dismantling production chain and the bodies that regulate the sector, can generate gains in value generation, productive efficiency, competitiveness and environmental performance. It serves a promising logistical and financial market. The process encompasses the documental process and the operational process. With regard to the documental process, it involves the verification of the registration and registration of each vehicle and notification of the processes of final disposal of it. With regard to the operational process, it involves carrying out the physical analysis, decontamination, disassembly, classification, identification, marketing of parts in conditions of reuse through the issuance of a technical report, compaction, transport of the remaining waste for proper disposal, crushing, recycling, destination of residues and tailings for energy use or for landfill. These last two steps are carried out in steel companies. At the same time, the vehicle is registered in the cadastral system. Agents, entities and companies involved in dismantling, salvaging, recycling and trade activities represent strategic stakeholders who need harmony, collective goals and clear communication between the parties to generate fruitful results. Likewise, manufacturers, assemblers, importers, owners, government and inspection entities need to get involved in order to fully enable circularity. The shared responsibility between the producer and the user and insurance companies (who own the vehicle at the end of its useful life) are essential for the proper disposal of the vehicle at the end of its life.

The renewal of the vehicle fleet and the recovery of ferrous materials are relevant aspects that directly impact the environmental dimension and people's health. Intake of waste contaminates water sources, generates pollution and reflects on public health costs. They also have impacts on the economic dimension, due to the financial return that the sale of parts generates. However, it is still necessary to create a culture of commitment to

the final disposal of useful life and even change the stigma of dismantling to a valuation of the professionals who work there. Specialized vehicle recovery and recycling centers can be accelerated to gain notoriety through tax incentives and tax breaks for users who propose to use parts from this dismantling and shredding ecosystem. Above all, thinking about and planning new vehicle models with design for disassembly will greatly contribute to achieving fruitful results in the dematerialization and dismantling chain of end-of-life vehicles and the internalization of the circular economy in this cycle.

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