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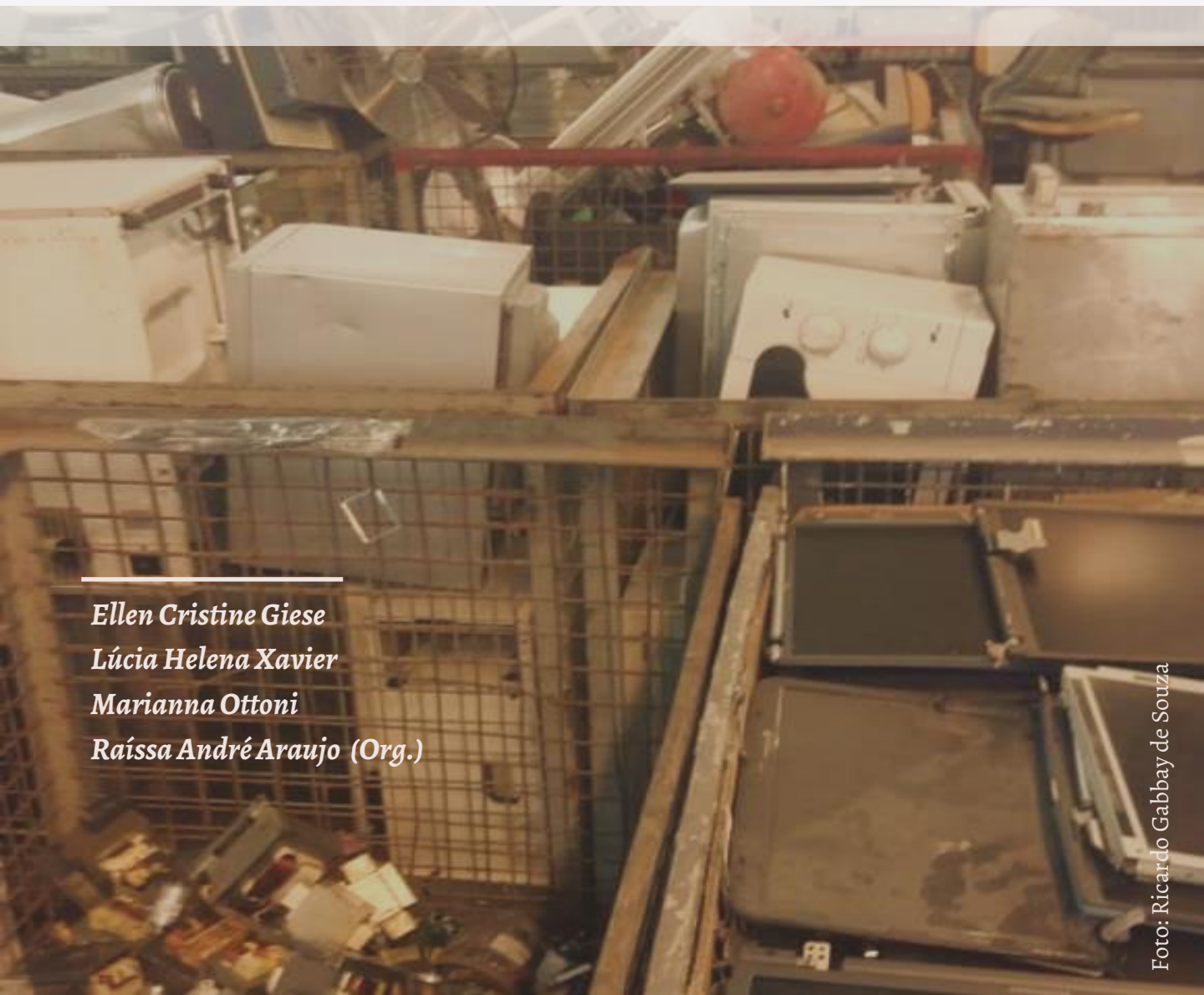
COOPERATIVES AND E-WASTE MANAGEMENT IN BRAZIL



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PREFACE

Electronic waste, WEEE, has the potential to become important secondary sources of metals and valuable materials, in a way complementary to the production obtained with traditional mining. While this depends on the richness of the subsoil, the mining of a mineral deposit, the so-called urban mining seeks the use, by recirculation or recycling, of resources of the "subsoil" resulting from the disposal of products and materials after consumption. The recovery of secondary raw materials is in line with the principles of the Circular Economy and with some of the Sustainable Development Goals defined by the UN.

In 2019, according to UNU/UN, Brazil generated 2.1 Mt. of WEEE, about 4% of a global total of 53.6 Mt. By way of comparison, the U.S. generated 6.9 Mt. and China, 10.1 Mt. In terms of value, weee generated in Brazil annually would be worth US$ 2.3 billion if fully recovered. The highlight among metals contained in WEEE is gold (something like 25 tons per year), followed by copper and other metals.

Only 17.4% of WEEE were recycled worldwide in 2019; countries have reached more than 50%. In Brazil, it is only 2%, with the other 98% possibly being smuggled and/or disposed of in landfills. So there's a huge space to move forward. In this context, considering the social characteristics of the country, the participation of cooperatives and waste pickers in the collection and selection of WEEE for referral to recyclers constitutes an important activity to be supported, because it brings unequivocal social, environmental and economic benefits.

This publication aims to clarify and guide the creation and management of the several dozen cooperatives in the country that focus on WEEE, already established or in the process of formalization, being useful also for the recyclers of these wastes. The book results from a project very well conducted by CETEM researchers Ellen Giese and Lúcia Helena Xavier, with the important participation of the scholars Marianna Ottoni and Raíssa Araujo, and also had the collaboration of researchers from UFRGS, UFRJ, UNESP, University of New South Wales (UNSW) and the LaWEEEda Project.

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Metallurgical Engineer
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Former director of CETEM

PRESENTATION

This report is a contribution for e-waste recyclers in Brazil and their potential customers to access information about recycling cooperatives and associations, as a way to support the secondary resources mining.

Several countries have policies aimed at the efficient management of secondary resources and thus contribute to the circular economy. In Brazil, the National Solid Waste Policy (PNRS) is the main regulatory instrument that guides and strengthens the performance of waste pickers as one of the agents working in Reverse Logistics Systems (SLR).

In this book it will be possible to know the aspects that involve the actions of waste pickers, the importance of cooperatives and the recycling of electronic waste, with emphasis on the reality of our country.

We propose the compilation of this knowledge and dissemination to improve the operationalization of the management of electronic waste in the country, focusing on the performance of cooperatives. Thus, approaches to legislation, regulation, safety, health, operationalization and value are presented.

The information is presented by topic and interactively. By accessing the hyperlinks, you will be able to learn more about the topics covered.

We propose an approach focused on understanding the performance and solutions that involve recyclers, focusing on the performance of waste pickers. Thus, we aim to highlight important points for the creation of positive synergies for both parties, enabling solutions for a circular economy.

Enjoy the e-book and good reading!

SUMARY

1. INTRODUCTION

The reuse of materials and products after consumption has gained space in different areas. In academia, with the contribution in innovative solutions, in the productive environment, with the recovery of material and products post-consumption, and, in general, in society, with the individual contribution to selective collection, for example. Recycling goes beyond the borders we know. Cups made from cassava starch, pairs of glasses produced by means of discarded toothpaste packaging and reused wooden-based watches are examples of the modernities of the remanufacture of post-consumer products.

Different motivations have contributed to the search and dissemination of sustainable solutions for waste management. An example is the structuring of legal and normative instruments. The National Solid Waste Policy (PNSR) established the responsibility for the implementation of selective collection systems from public cleaning services, but even today, ten years later, municipalities face financial, logistical and operational limitations for selective collection.

The management of electronic waste (WEEE), in turn, has been carried out in Brazil from the integration between the activities of associations, cooperatives, recycling companies and social mobilization with the delivery of waste in voluntary delivery points (PEVs). As defined by Decree No. 10,240/2020, in Article 48, "Each Municipality served by the reverse logistics system in Annex III shall install at least one point of receipt per twenty-five thousand inhabitants." The target began this year 2021 and continues until 2025 to reach all municipalities.

The reverse manufacture of electronic equipment brings many opportunities, in addition to ensuring the generation of income for workers. The activity of recyclers and recycling cooperatives consists in the intermediation of the collection, segregation and storage of WEEE. The DATARE project, which aims to create a database of the WEEE chain in Brazil, identified almost 300 recyclers working in the segment in the last year.

2. THE PERFORMANCE OF WASTE PICKERS

The history of solid waste management in Brazil is based on the performance of waste pickers. Organized (or not) in associations and cooperatives, waste pickers represent the driving force of collecting, segregating and forming minimum lots for the environmentally appropriate disposal of different categories of waste.

Waste pickers and waste pickers represent an invaluable contribution to the reverse logistics of materials in Brazil and to the gradual implementation of the Circular Economy in the country. In many Brazilian cities, waste pickers are the only agents doing the work of separation and routing of waste, being responsible for almost half of the selective collection in Brazil.

Despite numerous challenges for the performance of waste pickers, some important achievements have been achieved over time. The performance through associations and cooperatives collects a set of learnings of significant value that needs to be analyzed, improved and transmitted. In particular, in the segment of electronic waste, an area still little explored and that requires special attention to reach all the potential it can offer.

ATTENTION!

For more information on the concept circular economy, see the e-book Economia Circular e Mineração Urbana: Resíduos de Equipamentos Eletroeletrônicos.

3. WHAT ARE COOPERATIVES?

•Cooperatives are organizations composed of members of a given economic or social group that aim to perform, for common benefit, a certain activity.

•An electronic waste recycling cooperative, for example, is an entity, such as a non-profit company, concentrating its work on the collection, selection and final disposal of electronic equipment after consumption.

•This entity differs from a company by not targeting profits, but rather the satisfaction of the economic needs of its members. On the other hand, it follows the same model when related to the performance with customers, to the point that its services should be valued and budgeted precisely.

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Tabela 1. Características das cooperativas

Free and voluntary participation	Cooperatives are open from anyone able to use their services.
Democratic management	A member = one vote. Thus, all members participate in the formulation of policies and decisions in the company.
Economic participation	Every member must contribute to the cooperative's assets. The use of this patrimony will be decided democratically.
Autonomy and independence	The cooperative must remain autonomous, even if it makes partnerships or makes use of the external capital.
Education, training and information	The cooperative should contribute to the education, training and information of its associates and society in general.
Cooperation	Cooperatives should work together to strengthen the movement at the local, regional, national and international levels.
Interest in the community	Policies for the development of the community in which the cooperative is inserted should be carried out.

4. THE IMPORTANCE OF COOPERATIVES

PAPER NOT REVERSE LOGISTICS SYSTEM

Cooperatives collect and/or receive their waste, screen and refer to recyclers. As a matter of time, cooperatives become suppliers of raw materials.

ATTENDANCE TO DIFFERENT AUDIENCES

Individuals can be served through PEVs management, door-to-door collection, receipt at head location, or in case of contracts for large volumes. Legal entities and large generators, in turn, must carry out collection and receipt contracts for correct destination.

MUNICIPAL WASTE MANAGEMENT

Many municipalities do not have selective collection, not even the ability to sort waste. In this case, cooperatives can envision the possibility of acting in these areas, being partners of the municipalities.

SOCIAL ROLE

Most of the cooperative members are people in vulnerable situations and cooperatives provide better labor conditions when compared to those of self-employed waste pickers.

REDUCES SHIPMENT OF WASTE TO LANDFILLS

Waste received by cooperatives, when used and non-hazardous, is sold to recyclers, where they may become other products. Without the activities of the cooperatives, most of the waste would tend to be destined to landfills, reducing its useful life and making its use unfeasible, besides being potential causes of environmental contamination. Due to the actions of cooperatives, this inadequate destination is avoided, because the materials are valued, besides collaborating to reduce the exploitation of raw materials directly from nature, as well as generate jobs and income.

DIFFERENT SERVICES

Cooperatives can perform PEVs management, waste collection, consulting, waste management, training, among others.

WHY TO HIRE A COOPERATIVE?

1. Mandatory destination by direct contracting with an organization providing services by national legislation.

2. Cooperatives should be seen as environmental service providers. Like companies, cooperatives have transportation, labor and material disposal/disposal costs. In general, the sale of materials does not exceed costs, demanding the collection for the service. In this way, the value of the service provided can be agreed between the parties.

3. Due to the demands of contractors, more and more cooperatives are formalizing, fulfilling the requirements and documents necessary for the service. From allowances to manifesto issuance, the future perspective is for increasingly competitive cooperatives. It is always valid to verify the procedures performed by the organization and whether they are in accordance with the documentation presented and procedures established by the contracting generators.

4. The social role of recyclable cooperatives stands out, generating employment and income for people in a state of social vulnerability and contributing to waste management.

5. Decree No. 5,940/2006 establishes the allocation of their recyclables to cooperatives by federal public agencies, which can be expanded to electronics, if cooperatives comply with the requirements. The service provided, in this case, is not funded by the public company.

SERVICES PROVIDED BY COOPERATIVES

Management of voluntary delivery points (VDP)

Collection, receipt and disposal of recyclables

Collection, receipt and disposal of electronics

Data destruction

**Collection and receipt - Collection occurs when the cooperative removes the material from the contractor or PEVs. Upon receipt, the contractor is responsible for delivering the material to the cooperative's head office.*
**The destruction of tags and data can be specified in contract, ensuring that the data will not be available for access.*
**The regulation of the activities of cooperatives is done nationally. Although the PNRS encourages the performance of waste pickers in the reverse logistics system, they are not authorized to act at all stages of the destination of WEEE in all Brazilian states.*

5. HOW TO START A COOPERATIVE?

For the beginning and regularization of the cooperative, it is mandatory to hire the services of an accountant and a lawyer, and follow the steps:

1. Choose the area of operation of the cooperative.
2. Gather 7 individuals (or more), that is, 7 records of individuals (CPF) who will make up the cooperative at the beginning. The cooperative society is constituted by resolution of the General Assembly of the founders, contained in the respective minutes or by public instrument (art.14, Law No. 5,764/1971).
3. Drafting the statute and register it in a registry office.
4. Formation of Social Capital (needs the support of an accountant), which serves to enable the provision of services. The cooperative must specify what are the minimum facilities and equipment for the beginning of the operation in order to be able to calculate the value with which each one must contribute at the time of the formation of the cooperative.
5. Formalize the cooperative (needs the support of an accountant).

THE STATUTE SHALL CONTAIN:

IDENTIFICATION OF THE COOPERATIVE
Name, company, term of duration, area of action, object of the company, setting of the fiscal year and the date of withdrawal of the balance sheet.

GENERAL STANDARDS AND RULES OF THE COOPERATIVE
Rights and duties of members, nature of their responsibilities and conditions of admission, dismissal, elimination and exclusion of cooperatives and employees, and rules for representation, limited or unlimited liability of members.

FINANCIAL STANDARDS AND RULES OF THE COOPERATIVE
Minimum capital, value of the share, minimum of quotas to be subscribed by the member, mode of payment, conditions of withdrawal in cases of dismissal, elimination or exclusion. Settlement process. Mode and process of disposal or taxation of real estate.

ASSESSMENT OF LOSSES OF THE COOPERATIVE
Form of losses return to associates or apportionment of losses determined.

RULES, RULES AND ADMINISTRATIVE BODIES OF THE COOPERATIVE
Mode of administration and supervision, establishing the respective bodies, definition of their attributions, powers and functioning, active and passive representation of the company in court or outside it, term of office and process of replacement of administrators and tax advisors.

COOPERATIVE ASSEMBLIES
Formalities for the convocation of the general meetings and most of them required for their installation, validity of their deliberations, the right to vote is forthose who have a particular interest in them without depriving them of participating in the debates.

STEPS TO THE IMPLEMENTATION OF A COOPERATIVE

THE GROUP:
The first step is to bring the group together. After meeting these people with the same goal, the ideal is to look for the OCB System (present in all states) to know if it is aligned with cooperative principles and if there are other cooperatives doing the same procedures. The terms of link of the members is defined in the Law No. 12,690 of July 19, 2012.

BUSINESS PLAN:
For the cooperative to obtain all the necessary documentation to start acting, it is essential a professional study of its economic and social viability, which will point out, for example, the cost that the cooperative will have to constitute and, mainly, to maintain itself.

RULES:
Once the business plan has been defined, the group of founders must draw up a proposal for a statute for the cooperative, which must be voted on and approved by a majority. This document should contain the basic information of the company, such as the address of the headquarters, the distribution of quotas, the policy of entry and exit of the members, the rules of election of the board, etc.

FOUNDATION OF THE COOPERATIVE:
Once the business plan has been defined, the group of founders must draw up a proposal for a statute for the cooperative, which must be voted on and approved by a majority. This document should contain the basic information of the company, such as the address of the headquarters, the distribution of quotas, the policy of entry and exit of the members, the rules of election of the board, etc.

FORMALIZATION OF THE COOPERATIVE:
After the Constitution Assembly, the cooperative already exists, but is not yet authorized to act in the market. For this, two records are needed: one from the Internal Revenue Service and the other obtained from the Commercial Board of your municipality. It is the famous CNPJ, required by law of every Legal Entity. In the case of cooperatives, this record depends on the delivery of other documents described later.

Required documents

The definition of the set of documents required for the verification of the performance of cooperatives may vary in relation to the requirements of the states or municipalities in which it is located and also in relation to the intended purpose. In this way, it follows the minimum set of documents that can be requested for the desired verification:

List of documents:

- ☑ Minutes of constitution or Act of possession or appointment of the legal representative and name of the members
- ☑ Social status
- ☑ Identity (RG) and CPF of the members and the legal representative
- ☑ CPF or CNPJ of the applicant (CPF for Individual Applicant and CNPJ for Legal Entity)
- ☑ General Registration of Real Estate (RGI) with shipping date less than 6 months or Certificate of Foreground and/or Assignment of Use and/or Lease Agreement or Rental Or Lease, or similar
- ☑ City hall permit for establishment
- ☑ Environmental License or non-enforceability certificate, as applicable
- ☑ License of the Fire Department
- ☑ License or waiver of the transport license
- ☑ Ibama Federal Technical Register

The importance of verifying the specific requirements for environmental agencies of the state or municipality is emphasized here. This list may be reduced or expanded due to the requirements of procurement processes by public or private companies.

6. LABOR UNION

For the strengthening of cooperativism in Brazil, it is very important that cooperatives have their rights and duties represented. This representation is due to the articulation of employers in trade unions, federations and confederations (Federal Constitution of 1988).

NATIONAL COOPERATIVE LEARNING SERVICE

SESCOOP

ADDRESS:
SAUS Qd. 4, Block "I", Ed. Casa do Cooperativismo - Setor de Autarquias Sul - Brasília-DF CEP: 70.070-936

OFFICE HOURS:
Monday to Friday, 09:00 to 12:00 and 1:00 pm to 6:00 pm

PHONE(S):
(61) 3217-2100 / (61) 3217-1504

E-MAIL:
sescoop@sescoop.coop.br

The learning arm of cooperativism was born in 1998, with the purpose of contributing to the development of the cooperative system, using strategies and actions of monitoring, professional training and social promotion.

SESCOOP is present throughout the country, being composed of the national unit, the 26 state units plus the district unit. Guides and accompanies cooperatives, striving for the preservation of cooperative doctrine. It offers programs aimed at improving management, in accordance with legislation.

In all state units, cooperatives have access to training actions that meet their demands, in addition to having teaching materials and technical, accounting, financial and organizational management guidance, designed according to their needs.

Social promotion prioritizes the integration and well-being of members, their families and workers in cooperatives. Through actions and programs, it contributes to diagnose and propose activities that make the environment more pleasant and provide quality of life and happiness for people.

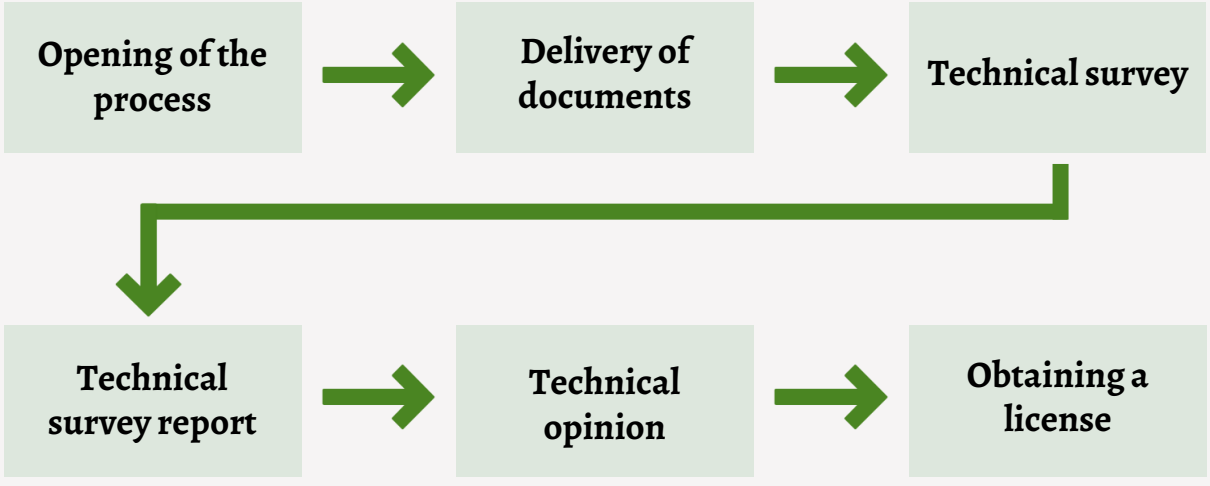
7. LICENSING

Environmental licensing is a legal requirement and has different degrees of requirement according to regulations in states and municipalities.

For example, in the state of São Paulo, it has regulated waste management in accordance with pnrs requirements. Since October 2019, through Board Decision No. 114/2019, the Environmental Company of the State of São Paulo (CETESB) and the entities of waste pickers of recyclable materials (cooperatives and associations) must act through a Term of Commitment to the Sector Agreement. Such entities must still be registered in the State System of Online Solid Waste Management (SIGOR/Recycling Module) to be considered in reverse logistics targets.

In the state of Rio de Janeiro, the State Licensing System and other Environmental Control Procedures (Selca) are in place to carry out the licensing system. In this state, declarations of non-enforceability of environmental licensing are also attributed by the State Institute of the Environment (INEA) for 609 activities exempt from licensing in the state. The system is computerized and integrated with the Business Registry of the Commercial Board of the State of Rio de Janeiro (Jucerja). Since May 21, 2021, the digital platform for issuing statements is available through the link: http://www.inea.rj.gov.br/inea-licenciamento-pos-licenca-e-fiscalizacao/

ENVIRONMENTAL LICENSE APPLICATION STEPS



Source: Adapted from Alencar (2017)

8. Financial Planning

For structuring any business model, it is essential to structure a financial plan that considers the annual budget with the respective receipts and payments. In reverse logistics management there is one factor that often makes accounting organization more complex: the unpredictability of the availability of material for processing and marketing. Thus, it is recommended to consider more conservative or pessimistic scenarios for financial planning.

For this, you must consider the costs (deployment, fixed and variables) and entries (financing, sale of material, etc.). The knowledge of the tax base that focuses on the segment is of great relevance as well. Therefore, it is necessary to analyze the specificities of each state or municipality. A common misconception is the interpretation of profit. Conceptually, cooperatives are non-profit entities. However, cash flow may allow positive balance that is reversed in favor of the co-members.

Reinforcing that the main difference between association and cooperative is the fact that only the cooperative has social capital, which enables financing in financial institutions. Although both entities are collaborative among their members, only the cooperative allows economic advantage. The National Cooperative Policy was established through Federal Law No. 5,764 of 1971.

Fiscal and Tax Data

The processing of recyclable waste is equivalent to the National Classification of Economic Activities (CNAE) 3831-9/99 – Recovery of various materials and scraps. Despite the wide diversity of materials resulting from the processing of electronic equipment, this CNAE code is widely used to indicate processing.

The performance of cooperatives may vary due to their activity. Few cooperatives operate exclusively in the WEEE segment and, therefore, also process various recyclable materials or provide services. Thus, cooperatives may have a differentiated tax and tax incidence due to activity or location. Legal instructions vary by state and even by municipalities.

FEES AND TAXES

IRPJ - CORPORATE INCOME TAX

In the actual profit (annual calculation, made by the comparison between revenues and expenses), the Income Tax will focus on the actual profit, that is, on what results from the operation "revenues - expenses" observed some legal restrictions on expenses considered indeductible. In the presumed profit (quarterly calculation, in which federal taxes will focus on a portion of the revenue, on account of the expenses being irrelevant in this tax regime), the Income Tax will focus on a portion of the revenue, which may vary according to the activity (8% for sales of goods and 32% for the provision of services). The rates do not vary according to the tax regime (real profit or presumed profit) and are: (15%) + (10% on the portion exceeding R$ 20,000.00 per month) (FUNDACIÓN AVINA, 2013).

CSLL - SOCIAL CONTRIBUTION ON NET INCOME

In actual profit, CSLL will focus on actual profit (result of the "income-expenses" operation). In the presumed profit, CSLL will focus on a portion of revenue, which may vary by activity (8%, 12% or 32%). The rate does not vary according to the tax regime (real profit or presumed profit) and is 9% (FUNDACIÓN AVINA, 2013). As of 01.01.2005, cooperatives in relation to cooperative acts do not suffer a tax incidence of the Social Contribution on Net Income - CSLL, as established by Articles 39 and 48 of Law 10,865/2004 (CATAFORTE, 2015).

IPI - TAX ON INDUSTRIALIZED PRODUCTS

Cooperatives of waste pickers of recyclable materials are not subject to IPI, because this tax focuses only on production or manufacturing activities of goods sold to third parties, which does not occur in this type of cooperative. However, there is currently a presumed credit benefit for industries that use as raw material solid waste purchased from cooperatives consisting exclusively of waste pickers (CATAFORTE, 2015).

ISS - SERVICE TAX

The Service Tax (ISS) is due to the Municipality where the cooperative or the Municipality where the service is provided, depending on the service. By providing taxable services (collection and transportation of waste, mischaracterization, among others, duly licensed), the cooperative will be subject to the ISS, in accordance with the municipal legislation in which it carry out operations (CATAFORTE, 2015). THE ISS will focus on the total value of the service provided by the cooperative to third parties, considering the variation of the rate between 2% and 5% (FUNDACIÓN AVINA, 2013).

ICMS - TAX ON MOVEMENT OF GOODS

When there is movement of goods or provision of taxable services, the cooperative will be subject to ICMS, in accordance with the state legislation in which it carry out the operations (CATAFORTE, 2015). The ICMS is a state tax, focusing on the sales of goods to third parties (i.e., non-cooperative acts), as well as all other taxes, except the PIS–Payroll. Because this tax is of a non-cumulative nature, the cooperative that is a taxpayer may record in its accounts a "credit" of the ICMS amounts already paid in the previous stage of circulation of the goods by the suppliers of the cooperative, and such credit is lowered from the value of the ICMS calculated at the end of each month. Rates vary from state to state and by type of operation, either internal or interstate, but are generally between 17% and 18%. In the state of Rio de Janeiro, the standard internal rate is 20%, 18% of which is ICMS and 2% for the State Fund to Combat Poverty and Social Inequalities (FECP), an additional 2% of the ICMS, calculated on the total value of the merchandise, as provided for in Article 2 of Law No. 4056/02. In the interstate shipment of goods to the non-taxpayer iCMS final consumer, established in RJ, the FECP must be collected in full for the state of RJ (SEFAZ, without date).

PIS - SOCIAL INTEGRATION PROGRAM

Unlike other taxes (IR, CSLL, ISS, ICMS), the contribution to the Social Integration Program (PIS) is also paid by cooperatives that perform only cooperative acts (between cooperatives and their associates to achieve social objectives). In this case, it focuses on the payroll with a rate of 1% (PIS-Payroll of Salary) (FUNDACIÓN AVINA, 2013).

For cooperatives that perform non-cooperative acts (resulting from operations with third parties, as is the case of cooperatives of waste pickers of recyclable materials), the contribution to the PIS also focuses on monthly invoicing (PIS-Billing). In this case, you can calculate the basis for calculating the contribution (monthly invoicing) excluding the amounts passed on to the cooperative members arising from the marketing of products delivered by them to the cooperative. The PIS-Billing must be calculated by applying the 0.65% rate (with the exception of agricultural and consumer cooperatives, whose rate is 1.65%) (FUNDACIÓN AVINA, 2013).

***OBSERVATION:**

The incidence of PIS and COFINS is suspended when the sale is made to legal entities that ascertain income tax based on the Real Profit of materials classified in positions 39.15 (plastic), 47.07 (cardboard), 70.01 (glass), 72.04 (iron or steel), 74.04 (copper), 75.03 (nickel), 76.02 (aluminum), 78.02 (lead), the Tax Incidence Table on Industrialized Products - TIPI, and also for other metal waste and waste listed in Chapter 81 of Tipi, Law No. 11,196/2005 (Art. 47 and 48). The Cooperative must inform in the field "Additional Data" of the Invoice the observation: "Sale with suspension of contributions to PIS /COFINS in accordance with Article 48 of Law 11.196/2005" (CATAFORTE, 2015).

COFINS - CONTRIBUTION TO THE FINANCING OF SOCIAL SECURITY

Although the courts argue that cooperatives would be exempt from COFINS in terms of cooperative and non-cooperative acts, the legislation interpreted by the Federal Tax Authorities is in the sense that it would focus on the rate of 3%, applied on monthly invoicing from non-cooperative acts (FUNDACIÓN AVINA, 2013; CATAFORTE, 2015).

REVENUE

FINANCING:

Since the association is a non-profit entity, but of economic interest, it has the possibility of consolidating its cash flow from economic incentive initiatives, such as the financing claim.

SALE OF MATERIAL:

The value of the material varies between regions and over time, according to the market. Cempre's website has information about recyclables.

REVERSE LOGISTICS CREDIT:

Recyclable waste can be reversed in credit by initiatives in different sectors, especially in the packaging recycling sector.

Deployment costs

ACQUISITION OR LEASE OF THE SITE:
In this place, will work the administrative, cafeteria, social (bathrooms, warehouse and dressing room) and operational sectors. Being the last composed of the activities of receiving, separating, disassembly, pressing (when necessary) and storage for later transport. From the above, there is a need for a wide and airy place. This cost may involve buying - which is quite rare because of the amount involved - or the lease. In relation to the rent, the real estate companies practice contracts with payment of up to three months of rent (in the form of deposit) or hiring an insurance.

RENOVATION WORKS / ADAPTATION OF THE SITE:
For the operations developed.

COMPANY OPENING PROCESS:
Paymentof fees, issuance of documents, costs with notary and contracting of accounting and legal services.

ENVIRONMENTAL LICENSING:
Costs with the licensing process.

TRANSPORT OF MATERIALS:
Vehicle acquisition is often necessary to carry bales for recyclers, and is also used to transport large volumes of materials to the cooperative. Ideal for it to be a small truck.

PURCHASE OF EQUIPMENT:
The hydraulic press is fundamental for reducing the volume of materials;
Mill, crusher, load lifts and conveyors;
Bench for disassembly of electrical and electronic equipment;
Personal protective equipment such as boots, gloves, goggles, masks and uniforms;
Fans, for thermal control;
Hoods for activities with gases, vapours and particulates;
Industrial scales;
Tools and electrical equipment for the dismantling of equipment.

FOR THE CAFETERIA:
It is necessary to buy tables, chairs and refrigerator. If meals are prepared on site, a stove should be included.

FOR THE ADMINISTRATIVE SECTOR:
Computer
Tables
Chairs
Multifunctional Printer
Telephone
Administrative software

MARKETING COSTS:
Creation of a logo
Website creation

WORKING CAPITAL:
Until the business manages to generate revenue, the cooperative needs an initial capital to cover the costs.

Summary of key costs

Fixed Costs

Expenditure that does not change with the volume of production

Personnel costs

Service costs:

- Broadband
- Fixed and mobile telephony
- Accounting
- Site rental or purchase financing

Taxes and fees:

IPTU

Vehicle IPVA

Property and truck insurance

Fire rate

Food (cooperative):

Materials:

- Site cleaning
- Personal hygiene

Disposal of hazardous material

Variable Costs

Costs that fluctuate as the company's activity increases

Fuel, tires and lubricant for truck

Hora extra

Overtime pay in times of higher demand or to cover the work of estranged employees

Temporary hiring

Hiring of staff in times of greater activity

Office supplies

Bills

Electrical energy
Water and sewage

Isolated Costs

Equipment and furniture are depreciated, requiring exchanges or repairs of the parties

Minor repairs:

At the property

No asphalt

Maintenance and replacement of parts:

Truck

Machinery and equipment

Furniture

Personal protective equipment

9. Electronic Waste

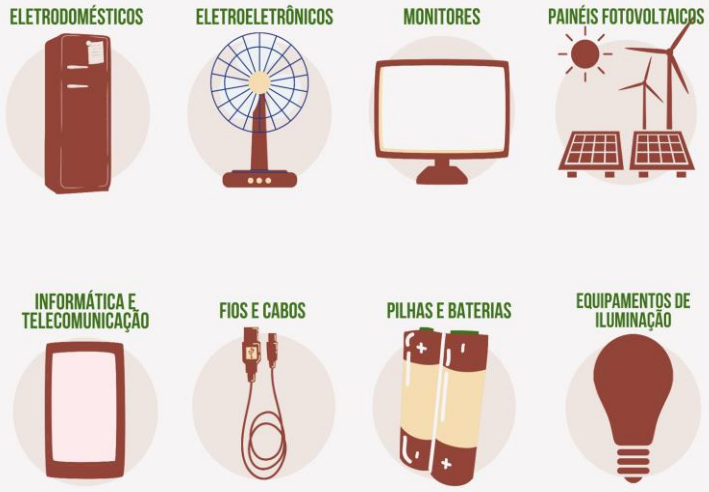
ELECTRONIC WASTE = WEEE

WEEE are defined as waste resulting from energy-demanding equipment for its operation.

The literature points to two types of WEEE classifications in Brazil

ABINEE, with a greater focus on the producer market, divides WEEE as products of white line, brown line, blue line and green line.

Xavier et al. (2020) show a categorization of REEE more focused on the market of reuse and recycling, bringing 8 categories, which was based on the definition of the European Directive.



Why Properly Manage REEE?

COMPOSITION

WEEE contain hazardous substances (heavy metals, flame retardants). Its processing can also generate the formation of toxic substances (dioxins and furans). On the other hand, they have materials with high value (precious metals, etc.).

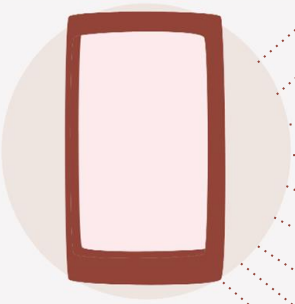
QUANTITY

WEEE has accelerated annual growth, especially due to the increasing demand for electronics. The consumption of these products tends to be pulverized, as well as the generation of WEEE. The lifetime of these equipment is progressively shorter.

PECULIARITIES

Electronic products have various shapes, sizes and purposes, implying different techniques of reuse and recycling. Still, many Brazilians keep their obsolete electronics at home, instead of referring them to Reverse Logistics.

WHY WORK WITH WEEE?



- Concentration of value metals
- Higher value of the parts for recycling (printed circuit boards, HD, etc.) when compared to common waste (cardboard, plastic, glass and metal)
- Possibility of repair/repair for sale
- Possibility of sale as spare parts and reconditioning
- Typology aggregated to other materials
- Great generation for technological advances
- Complementary income to recyclables
- Market differential
- Expanding Reverse Logistics System

DIFFICULTIES WORKING WITH WEEE

1. The unenforceable certificate only allows collection without disassembly
2. When opened, it becomes dangerous material and needs licensing for this typology (Class 2). For those who use the certificate, need to change to the environmental license, and those who have an environmental license, should ask for the registration.
3. It has hazardous compounds that can have health and environmental risks. To reduce these risks requires specialized training.
4. Cost of deploying new infrastructure

Foto: Lúcia Helena Xavier

10. LAWS AND STANDARDS

LAW No. 9,605, OF FEBRUARY 12, 1998 - ENVIRONMENTAL CRIMES LAW
It provides for criminal and administrative sanctions arising from conduct and activities harmful to the environment, and provides other measures.

DECREE No. 5,940, OF OCTOBER 25, 2006
It establishes the separation of recyclable waste discarded by the organs and entities of the direct and indirect federal public administration, at the generating source, and its destination to the associations and cooperatives of waste pickers, and provides other measures.

LAW No. 12,305, OF AUGUST 2, 2010
Establishes the National Solid Waste Policy; amends Law No. 9,605 of February 12, 1998; and makes other arrangements.

DECREE No. 7,404, OF DECEMBER 23, 2010
It regulates Law No. 12,305 of August 2, 2010, which establishes the National Solid Waste Policy, creates the Interministerial Committee of the National Solid Waste Policy and the Advisory Committee for the Implementation of Reverse Logistics Systems, and provides other measures.

DECREE No. 9,177, OF OCTOBER 23, 2017
It regulates Article 33 of Law No. 12,305 of August 2, 2010, which establishes the National Solid Waste Policy, and complements articles 16 and art. 17 of Decree No. 7,404 of December 23, 2010 and provides other measures.

DECREE No. 9,373, OF MAY 11, 2018
It provides for the disposal, disposal, transfer, disposal and final disposal of environmentally appropriate movable property within the scope of the direct, municipal and foundational federal public administration.

SECTOR AGREEMENT FOR THE IMPLEMENTATION OF A REVERSE LOGISTICS SYSTEM FOR ELECTRONIC PRODUCTS FOR DOMESTIC USE AND ITS COMPONENTS
Structuring, implementation and operation of reverse logistics system of electronic products and their components of domestic use placed in the domestic market.

DECREE 10.240, OF 12 FEVERIRO 2020
It regulates item VI of art. 33 and art. 56 of Law No. 12,305 of August 2, 2010, and complements Decree No. 9,177 of October 23, 2017, regarding the implementation of reverse logistics system of electronic products and their components for domestic use.

NBR 10.004/2004 - SOLID WASTE CLASSIFICATION
This Standard classifies solid waste as to its potentials to the environment and public health, so that it can be managed properly.

NBR 16.156/2013 - WASTE OF ELECTRONIC EQUIPMENT: REQUIREMENTS FOR REVERSE MANUFACTURING ACTIVITY
The ABNT NBR 16156 standard is applicable to organizations that carry out activities of the reverse manufacturing chain of electronic waste (WEE) and establishes requirements that allow the development of competencies for the structuring of a management system aimed at controlling and mitigating the occurrences of aggressions to the environment and workers involved in the recycling processes of REE. In addition, it deals with specific requirements related to liability for hazardous substances, traceability of waste received and mass balance up to disposal.

NBR 15.833/2018 - REVERSE MANUFACTURE: REFRIGERATION APPLIANCES
This Standard establishes the procedures for transport, storage and dismantling with reuse, recovery of recyclable materials and final disposal of waste from refrigeration appliances.

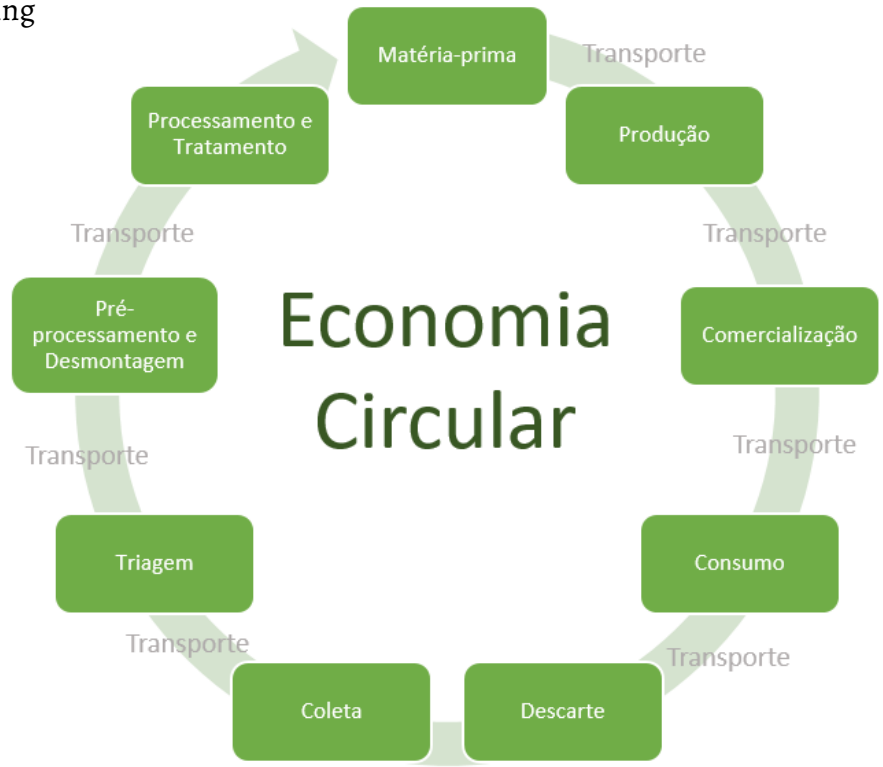
11. Reverse Logistics

According to the PNRS, reverse logistics can be defined as "an instrument of economic and social development characterized by a set of actions, procedures and means aimed at enabling the collection and refund of solid waste to the business sector, for reuse, in its cycle or in other production cycles, or other environmentally appropriate final destination".

Reverse logistics aims to collect and reinsert post-consumer products into the production chain, generating social, environmental and economic benefits. From a perspective within the Circular Economy, reverse logistics can be understood as an intrument with the purpose of making a system achieve higher degrees of circularity and achieve urban mining goals for the recovery of raw materials from secondary resources.

BENEFITS

- Proper disposal of waste;
- Inadequate provisions that lead to environmental contamination and health risks are avoided;
- Prevents the stocking of landfills, causing them to increase their useful life;
- It enables other forms of use (Remanufacturing, reconditioning, recycling, etc.);
- Generation of employment and income;
- Financing of materials collection and transportation services;
- Provides materials to be sold by cooperatives and waste pickers;
- Enables raw materials for remanufacturing, reconditioning and recycling organizations.



Art: Raíssa André de Araujo

The reverse logistics of WEEE has become mandatory since the PNRS (2010), but for its structuring it was necessary to prepare the sector agreement. The call notice was only launched in 2013 and the sector agreement (link) signed in October 2019.

According to the document manufacturers, importers, distributors and traders are required to structure and implement the SLR, and can be operationalized by management entities. The electronics provided are those of domestic use up to 220V.

The steps of reverse logistics may be carried out by a natural or legal person who is legally able to carry them out, through agreements, being remunerated by the responsible parties or through the managing entity.

In January 2021 began the second phase of the sector agreement, which include the qualification of service providers, communication plan and environmental management, and installation of receiving and consolidation points. Such steps are required to initialize the system operation.

The participation of cooperatives and associations of waste pickers of recyclable materials are encouraged, provided that they are legalized and empowered in the SLR, and have a legal instrument for the provision of service signed between them and the companies or management entities.

The collection targets are 1% (2021), 3% (2022), 6% (2023), 12%(2004) and 17% (2025), by weight for products put on the market in 2018, reaching 400 cities throughout the country.

CHALLENGES AND DIFFICULTIES

The generation of household waste is decentralized, generating small amounts in each residence.

If house-to-house collection was required,the costs would not be worth the value of selling materials. Thus, actions are needed that take these wastes to consolidation points, creation of voluntary delivery points (PEVs) and campaigns for example, which reduce routes and transportation expenses.

Combining routes for different customers is one of the most efficient ways to reduce cost. Due to the high cost of fuel, vehicle maintenance, labor, documentation and other expenses, it is necessary to make a budget that is consistent and does not generate losses.

Another point is the periodicity of arrival of materials, which is not usually a difficulty with recyclables in general, since they are generated daily/ periodically, but with electronics.

12. Environmental Services

PROVISION OF SERVICES IN THE REVERSE LOGISTICS CHAIN OF ELECTRONICS: WHAT IS REQUIRED OF A COOPERATIVE?

When able to operate in the reverse logistics market of electronics, cooperatives can perform basically the following services: management and implementation of voluntary delivery points (PEVs), collection, segregation, mischaracterization, destination and proper final disposal of electronic components.

MANAGEMENT AND IMPLEMENTATION OF VOLUNTARY DELIVERY POINTS OF ELECTRONICS

In the state of Rio de Janeiro, the management and implementation activities of voluntary delivery points do not require licensing, fitting the guidelines of the National Solid Waste Policy and INEA Resolution No. 183 of July 2019, which provides for the unenforceability of environmental licensing for voluntary delivery points of reverse logistics. For other regions of Brazil, we should consult the local legislation on the subject.

The VDPs management service is mainly characterized by the maintenance of the operational conditions, which are paramount for the realization of the disposal of electronics through individuals. In addition, the service supports the collection activity, which inserts the residual into the reverse chain.

Data management is also important in this scenario, since the responsible manager must quantify the typology of residue deposited in the ENP and its quantity, which is unit or weight. The main customers for this type of service are retail or wholesale companies, due to their prominence before the law that defines them as actors who share the responsibility of the reverse logistics chain. Service pricing can be established by point-to-point managed, predicting the complexity of important factors such as site maintenance and access, and data management.

THE REQUIREMENTS FOR PERFORMING THIS TYPE OF SERVICE ARE NORMALLY RESTRICTED TO:

Service contract;
Operating License;
AVCB (Fire Department Survey Auto);
Certificate of registration of legal entity;
Negative Certificate of Debts Related to Federal, State and Municipal Taxes;
Proof of payment of the INSS;

Federal Technical Register with IBAMA (CTF);
Issuance of Municipal Electronic Invoice (ISS of 5% depending on the municipality), the CNAEs most indicated for the execution of this type of activity are 70.20-4-00 (Consulting activities in business management, except specific technical consulting) or 74.90-1-99 (Other professional, scientific and technical activities not previously specified).

COLLECTION OF ELECTRONIC WASTE

After being disposed of and stored temporarily in an appropriate place, the transport of waste must be done in accordance with the provisions of the competent state agency. It is important to note that road handling of waste for recycling is an activity subject to licensing in some states.

The transportation of electronics is one of the essential links to realize the reverse logistics of this type of waste, where only with the safe execution of the activity it is possible to ensure that the discarded material reaches the final destination site and can receive the appropriate treatment.

In addition to strict control over the fleet, the cooperative must pay attention to the issuance of all the necessary documentation to the process, such as the Waste Transport Manifest (MTR). Some states have their own MTR control, however, the National Solid Waste Management Information System (SINIR) has made this technology available throughout Brazil, encouraging the registration of waste transported on a national scale.

The main customers for this type of service are public and private companies that have electronics for disposal and value a sustainable destination. The managing entity, which represents the associations of industries producing electronics can also request the transport of waste, since it is responsible for this link of the reverse logistics chain of its companies.

Usually, the transport service is related to the segregation of components and their destination, since many companies hire the cooperative so that the collected material is directed to recycling. Therefore, pricing can be conducted in an integrated manner, including transport costs; triage; disposal and proper final disposal of waste.

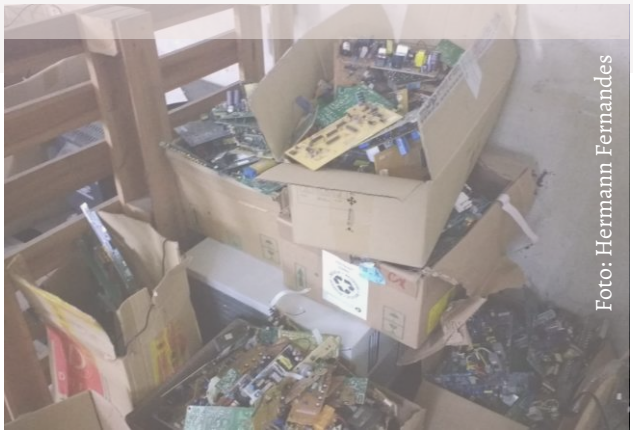


Foto: Hermann Fernandes

IN ADDITION TO THE ABOVE REQUIREMENTS FOR THE MANAGEMENT OF VOLUNTARY DELIVERY POINTS, THE TRANSPORT OF WASTE REQUIRES SOME OTHER REQUIREMENTS:

- Transport license, where applicable*;
- ANTT;
- Certificate of conformity of the vehicle fleet (in the case of its own fleet);
- Waste Transport Manifest (MTR) - code 200136: Electronic products and their components out of use not covered on 20 01 21, 20 01 23 or 20 01 35;
- Issuance of Municipal Electronic Invoice (ISS of 5% depending on the municipality), the CNAE most indicated for the execution of this type of activity is that of group 38.11 (Waste collection).

* The Normative Instruction No. 24, of November 21, 2019 of IBAMA points out that the Environmental Authorization for the Transportation of Hazardous Products does not apply for the transportation of electronic products and their discarded components, electronic waste and non-hazardous electronic waste waste subject to reverse logistics.

Foto: Hermann Fernandes

SEGREGATION AND DECHARACTERIZATION OF ELECTRONIC WASTE

After being collected, the material goes through a process of disassembly, separation and classification, to be subsequently forwarded to recycling. The electronic decharacterization service is the responsibility of the cooperative, which must ensure the protection of the brand, technology and data contained in post-consumer products.

Throughout the process, the cooperative members who perform the operational part must pay to the dangerousness of each type of electronic waste. Substances such as lead, arsenic and mercury are present in this type of residue, increasing the risk of the labor activity performed.

Data protection is also a very important part of the process, as companies do not want to expose their sensitive information and customer data. The General Data Protection Law reinforces the need for the mischaracterization of electronics when it determines governance standards for the processing of personal data and preventive security measures.

The main customers for this type of service are public and private companies that wish to dispose of their unusable electronics; electronics industries that present lots of products in non-conformity; management body representing the association of industries.

Pricing can be performed by unit or batch of electronic waste, according to the complexity of segregation and mischaracterization. To guarantee the service, it is also necessary to produce a report that presents information and images of the mischaracterized equipment.

IN ADDITION TO THE DOCUMENTATION REQUIRED IN THE PREVIOUS STEP, SEGREGATION AND MIScharacterization SERVICES REQUIRE:

- Operating license;
- PPRA (Environmental Risk Prevention Program)
- PCMSO (Occupational Health Medical Control Program)
- Emergency Response Plan
- Fire prevention and fighting program (brigade and first aid)
- Records of maintenance and recharging of fire extinguishers and hydrants
- Documentation related to the disposal/ disposal of electronic waste
- Issuance of Municipal Electronic Invoice (ISS of 5% depending on the municipality), the CNAE most indicated for the execution of this type of activity is that of group 38.3 (Recovery of materials).

PROPER DISPOSAL AND DISPOSAL OF ELECTRONIC COMPONENTS

With the segregation process it is possible to add value to the electronic components. This stage is of paramount importance in generating income within cooperatives, since most survive from the commercialization of waste.

To make the sale of components to recyclers is important to observe the buyer's documentation, observing all the legal principles of the trading partner. The company must be licensed and able to carry out the final destination process.

The main customers at this stage are exporters of waste, since they achieve better values in the act of commercialization. It should be noted that the price of electronics (printed circuit boards, memory, HD, processor, among others) can be up to 10 times higher than aluminum for example, so research on the market is essential to find the best buyer. This step requires the cooperative to issue a state product invoice, which focuses on the ICMS. The NCM code used for the commercialization of electronics is the 71129900 for various electronic scraps.

Electronics can be widely used, but the cooperative is also responsible for the tailings generated during the segregation process. For its correct destination, a hazardous waste disposal service must be contracted, since much of what is not marketed fits this category. Both for the disposal of valuable components and for the disposal of hazardous waste, an audit of the service provider is required.

In addition to electronic components, this type of waste can contain metals such as iron, aluminum and copper, which can be commercialized. It is also worth noting the existence of plastic used as a carcass, mostly composed of ABS.

THEREFORE, THE DOCUMENTS REQUIRED FOR THESE STEPS ARE:

- State Registration
- Product Invoice Issue
- Audit in service providers

In addition to this standard documentation required by most companies, some others may also be requested as certification ISO 14.000 and R2 certification.

Foto: Hermann Fernandes

13. Service Budget

POINTS TO BE CONSIDERED:

1. Amount/Volume of Waste to be collected
2. Material quality
3. Sales value of waste (estimated profit)
4. Destination value of hazardous (estimated cost)
5. Transportation expenses: fuel, tolls and the possibility of other services on the same route
6. Labor required (number of members)
7. Time of realization
8. Taxation

The more specialized and formalized the more valued your service should be. For the realization of a service an entire infrastructure and training are behind, which should be considered in value. The cooperative should have a vision of the company and be treated as such, but always keeping the focus on its cooperative.

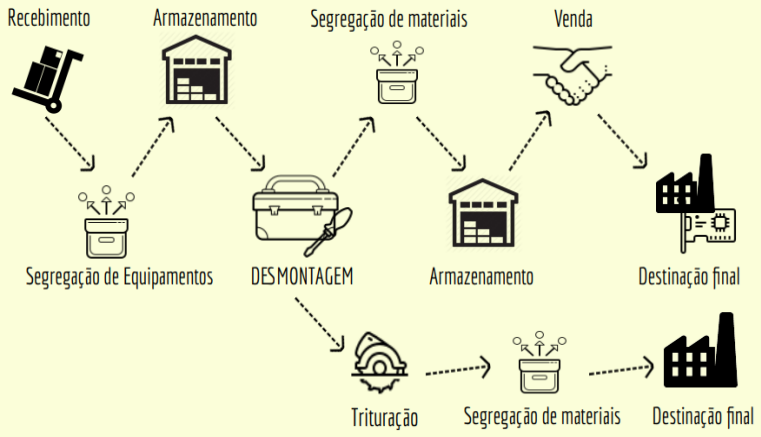
14. INTERNAL MANAGEMENT

Determined to work with electronic waste is necessary the knowledge of the different types of services that can be performed, their main characteristics and the necessary requirements. With this, it is possible to define in which of them the cooperative is able to act and/ or which intends to achieve in its goals.

MANAGEMENT STEPS

Reverse Logistics of Electronic Waste has become fundamental, in view of the growing problem of toxicity and greater generation of these wastes, in addition to the extraction of essential raw materials for the industry. To start the cycle whose focus is return of the secondary raw material to the production lines is necessary a whole scenario of integrated management of this typology of waste, composed of different actors.

The process begins with the return of waste by the consumer at the end of its life cycle and, finally, its treatment occurs through stages of testing, sorting, disassembly, recycling and final disposal. The cooperatives work directly in this process, assisting in the collection, treatment and disposal of waste to the recyclers. Its operation can occur according to the **following steps:**



Fonte: https://www.cetem.gov.br/livros/item/download/2887_7d39a3620c4ca388c8b40c1dea6f7fb4

Collection » Transport » Receipt » Storage » Triage » Disassembly » Final Destination

FLOW OF (R)EEE FOR REPAIR AND REUSE (SHORT CYCLE):

Receipt → Balance/Registration → Pre-Screening → Inventory for Test/Repair → Test/Repair → Stock for Reuse + Stock for Disassembly + Component Inventory + Hazardous Storage → Balance/→ Record

REEE FLOW FOR DISASSEMBLY (LONG CYCLE):

Receipt → Balance/Record → Pre-Screening + Test/Repair → Inventory for Disassembly → Disassembly → Component Inventory + Hazardous Storage → Balance/→ Record

Layout for cooperatives

The proposed layout applies to cooperatives that receive up to 5 tons of WEEE per month. These should act in an operational area of approx. 60m2. It is suggested an extra receiving and shipping area between 15-20 m2.

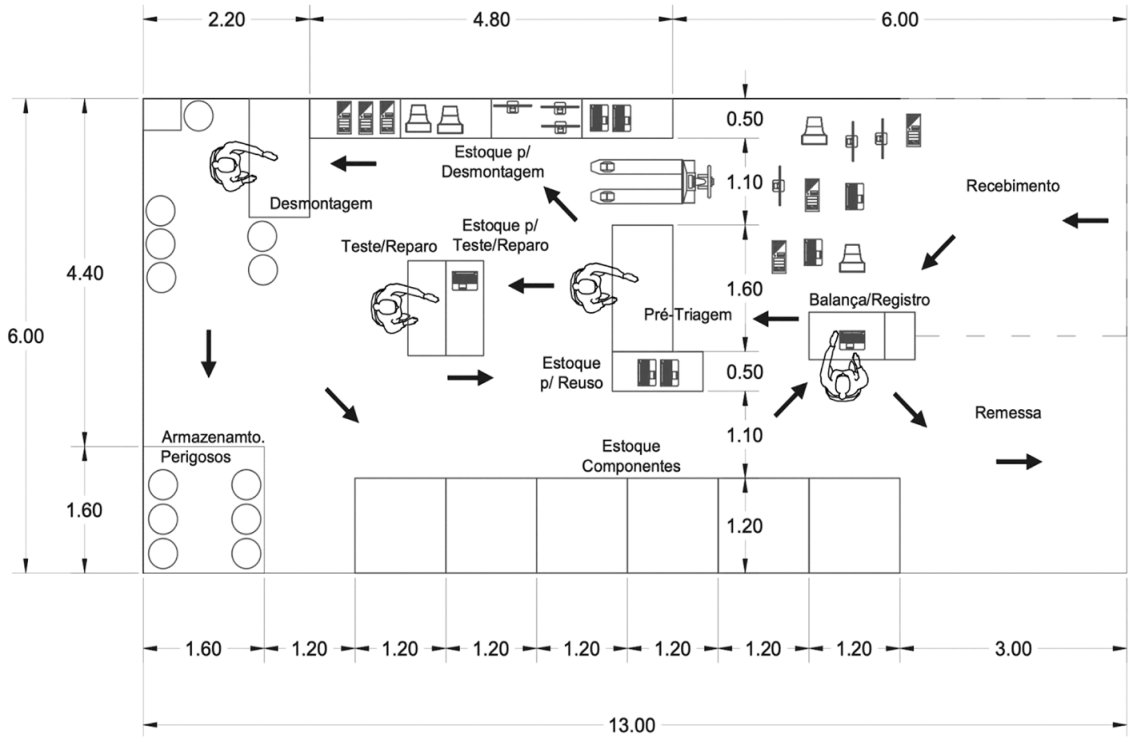
The process flow has the proposal of making a short cycle and a long cycle along the plant, both in the form of "C", in order to avoid crossings in the movement of materials and people. The process begins with receiving WEEE shipments, weighing and registration, and pre-sorting. The pre-screening aims to make a visual inspection of the RECEIVED WEEE, separate by types of devices, and to allocate according to the following criteria: devices for reuse and resale; disassembly apparatus; appliances of no interest for disassembly (sold separated by type, or as mixed scrap).

The short cycle refers to pre-screened devices, which have interest for testing and repair, reuse and resale. The long cycle refers to pre-screened or defective appliances, which must be disassembled for the disposal of their components.

The Test and Repair cycle is optional if there is a specialized technician to do so. If not, the operational and storage area can be enlarged to perform only the disassembly cycle.

For a monthly demand of up to 5 t of WEEE the disassembly can operate with a reduced team, with only one station and one worker specialized in disassembly. The other members can act in the administrative, registration and control functions, or in internal and external logistics activities.

In both cycles, it is essential to weigh, record and control both in the incoming flows (WEEE received), as in the output (resale/reuse equipment, components for sale, hazardous waste, tailings). This process guarantees compliance with several requirements of NBR 16.156/2013, which regulates the management of reverse manufacturing of WEEE, and is adopted as a reference for the performance in formal reverse logistics systems.



Author: Prof. Dr. Ricardo Gabbay de Souza (ICT-UNESP)

Collection

PEVS

Voluntary Delivery Points are waste collection containers that can be strategically located to attract the largest contingent of people. There is no need for proof issued to the user who has discarded or equipment.

ADVANTAGES

Wide access, the structure is free to access the public in the region;

The population can discard at any time (under limitation of the installation point);

Enp housing is a good option to disclose the waste problem and generate an environmental education movement and greater adherence to disposal;

No licensing needed.

DISADVANTAGES

Well-structured transport logistics is required, as it runs the risk of the container filling and no longer has the capacity to receive new waste;

The structure needs to be well designed or monitored so that only the responsible person has access to the contents post-deposit;

It is not an ideal method for large quantities or large waste.

How to apply?

Its allocation is usually made in private buildings that have great movement, requiring authorization and agreement with the head of the locality. It is necessary to own or rent a transportation service to remove the deposited waste.

CAMPAIGNS

It consists of the realization of "events" of collection, either in a specific general access place, which public case requires authorization from the municipality, or for an exclusive public, as is the case of environmental education events in schools, which take place in partnership with the organization.

ADVANTAGES

Because it is an exposed and open access structure, it can draw the attention of the population, besides serving as an element of environmental education.

Receiving large volumes at once

DISADVANTAGES

It has no regularity of collection, being sensitive to the availability of the population during the collection period;

Need for campaigns to publicise the event

How to apply?

After defining the place of application, it is necessary authorization of the responsible (be it the municipality or some private institution). In addition, you have to create the structure so that the waste received is not exposed and immediately after collection transported to a fixed storage location. It usually occurs through partnerships with other organizations in events, such as commemorative dates.

DOOR TO DOOR

Collection of waste in the population's home, through the definition of specific routes and frequencies.

ADVANTAGES

The fact that there is no displacement by the population may cause greater participation in the disposal;

DISADVANTAGES

The transport structure and routes need to be well structured so that there are no financial problems due to low return;
There should usually be external financial support for large routes (e.g. City Halls).

How to apply?

This system occurs through the definition of specific days and times in which the cooperative spends collecting waste from the population in their homes, and can also be done upon request of the population. The transport of waste can be carried out manually or requiring cars, which need to vary according to the forecast of collection and size of waste.

The success of the collection systems are based on the adherence of the population, however, even within the group that understands that electronic waste is dangerous, many do not know where to allocate. In this way, disclosure is essential and several tools can help with this.

REQUEST (DEDICATED TO LARGE ORGANIZATIONS)

The methods mentioned later are more dedicated to the collection of individuals that occur on a smaller time scale. However, much of the waste derives from corporations that make use of electronics, either in their production process or in their administration. In this way, it is necessary that the cooperative has a system of scheduling and requesting this type of service, ensuring the necessary infrastructure and terms.

ADVANTAGES

Collection of large volumes at once;

DISADVANTAGES

Document requirements for formalization and compliance with environmental standards
The process until the closing of the agreement can be time consuming

How to apply?

The process begins with the contractor contacting the cooperative, informing classification and quantity of waste, in addition to other bureaucratic liability factors (location, responsible, contacts and etc.), from this the cooperative can prepare the transport vehicle safely and adequately. A service order is issued and, after collection, a Certificate of Disposal of Waste, which is a document issued by those who will allocate in order to attest to the act. For legal entities, the issue of waste manifest is necessary.

TRANSPORT

For the waste already disassembled and screened, as is the case of the waste obtained after the disassembly by the cooperative, the license to transport hazardous waste is mandatory.

PARAMETERS TO BE CONSIDERED:

The route should be designed in a way that is efficient. If possible, create routes that serve different customers, avoiding larger paths for individual trips.

Transportation is one of the highest costs, so if the sales value of the waste does not cover its costs, these must be collected and settled in contract by the customer.

Have in possession all necessary documentation if any inspection is carried out by the traffic or environmental agency.

RECEIPT

The receipt includes the removal of the material from the vehicle where it was transported and control of information. In the cooperative, it is indicated the weighing and recording of the main characteristics of the load (weight, products, quantities, source, etc.). Upon receipt, waste is stored safely at work and environmentally until an evaluation is carried out for reuse, repair, reconditioning or disassembly.

EVALUATION (TESTING)

After receiving and weighing the residue, it is necessary to evaluate its status through functionality tests. That is, steps whose focus is to evaluate whether the residue can still function when supplying electric current, if not, it is tried to understand what the problem is and which components can be used in order to avoid its disassembly and make its trade as a part.

Foto: Ricardo Gabbay de Souza

Repair and Reuse

Reusing FUNCTIONAL COMPONENTS of WEEE can be a more cost-effective way to take advantage of equipment than just segregating and selling your parts as scrap, as in the example below:

Computer disassembled and sold for recycling:
R$ 10 to R$ 30;
Memory combs: R$20 to R$100 each;
CPU: R$60 a R$200;

And the difference between scrap and functional parts values is even greater for smaller equipment such as notebooks, mobile phones and mini PCs.
To enable reuse, you need to:
Properly disassemble the equipment
Perform tests on the parts, which often depends on few resources.
It may be even more feasible if the cooperative also does WEEE repair, because this allows a faster output for the parts and so many more components can also be used.

TIPS TO FACILITATE REEE REPAIR:
Make a faster screening of equipment that has more chance of repair and reuse of parts;
Clearly define which types of equipment will be repaired (each type requires specific tools and procedures)
Avoid equipment that relies on very specific parts, chargers, batteries, or consumables (such as printer cartridges) if not received with the necessary parts.

E-WASTE REPAIR CAN REQUIRE:
A bench reserved for this work with good lighting and with some sockets;
A cabinet to store in an organized way parts that are working;
Cleaning brushes, preferably antistatic;
A vacuum cleaner (does not need to be strong, it is preferred to have a quieter);
Some simple tools (screwdrivers, pliers, etc.) to open the type of repaired equipment;
Multimeter;
Soldering iron.

HEATING EQUIPMENT

COMMON DEFECTS:
Fuses and thermofuses burned
Thermostat not working
Broken wires
Resistance broken

CONSUMABLE MATERIALS:
Wires, fuses, thermofuses, thermostats, resistors
Connectors found in electrical materials stores

COMPUTERS AND NOTEBOOKS

COMMON DEFECTS:
Dirt on contacts in memory and other components
Defects in components: memory, power supply, battery, etc.

CONSUMABLE MATERIALS:
Spare parts
Contact cleaner
Thermal paste

PLASMA TVS, LCD AND LED

COMMON DEFECTS:
Burned LEDs
Defective fountain
Model-specific issues

CONSUMABLE MATERIALS:
Leds
Specific plates and components

SPECIFIC TOOLS:
Placas de teste

ARMAZENAMENTO

STORAGE:

Depending on the processing capacity and demand of the cooperative, the waste is stored until the time of its disassembly. It is necessary to take into account that when damaged and have their structure broken in some way, electronic waste tends to release toxic components in the environment, so storage has to be thought of to avoid such occurrence. In addition, material falls and breaking of parts such as glass can generate a risk to the health of the cooperative.

- *WEEE shall be separated by the type of material and hazard involved;*
- *They must be stored in such a way as not to provide a risk to the health of the cooperative and to the environment;*
- *The storage area must be closed, covered and have a waterproof surface*

SOME POINTS TO CONSIDER:

Grouping the residuals into groups it is easier to know what sensitivities cannot be exposed;

The storage location needs to be well indicated and organized, the medium and more resistant waste can be grouped into bags or containers;

It is essential that they are not exposed to corrosive or weathery environments, so the rental needs to be covered, waterproof and insulated floor;

Care for smaller waste is necessary so that dissipation does not occur. Therefore, they can be reserved in smaller containers and left in sight, always covered;

When depositing a breakable and/or sensitive residue with others in the same group, caution is exercised with handling so as not to trigger breakage or damage (extreme care with lamps that release toxic substances when broken);

Keeping the place organized facilitates the movement of the site, location of specific loads and consequently increases the speed of the steps.

For the proper functioning of the storage area, it is necessary to:

Structures that ensure the clearance of the ground, such as cages with feet or pallets, so that no equipment is damaged due to the wet floor.

Equipment that may offer mercury leakage, such as laptop lamps and flat-screen monitors, should be especially careful, avoiding damage or breakage.

Storage of batteries, capacitors and LCD displays

Storage of lamps

DISASSEMBLY

There are basically two ways to start processing electronic waste: a manual disassembly or a mechanized processing (grinding/grinding equipment and separation of materials). For cooperatives, manual disassembly is the most indicated. Some types of WEEE (Computers, Printers, Mobile Phones, Power Tools, Appliances, Electroportables, among others) can be manually disassembled to separate materials (steel, aluminum, copper, plastics, ...) and sell them as scrap.

However, other components such as printed circuit boards, Hard Prints, batteries, capacitors, cathode ray tubes (TV/tube monitor), fluorescent lamps and printer cartridges should NOT be disassembled/processed in cooperatives. These components should be sent to companies specialized in their treatment, as they contain toxic materials in their composition (e.g., Pb, Cd, Hg, among others).

DISASSEMBLY OR MISCHARACTERIZATION:

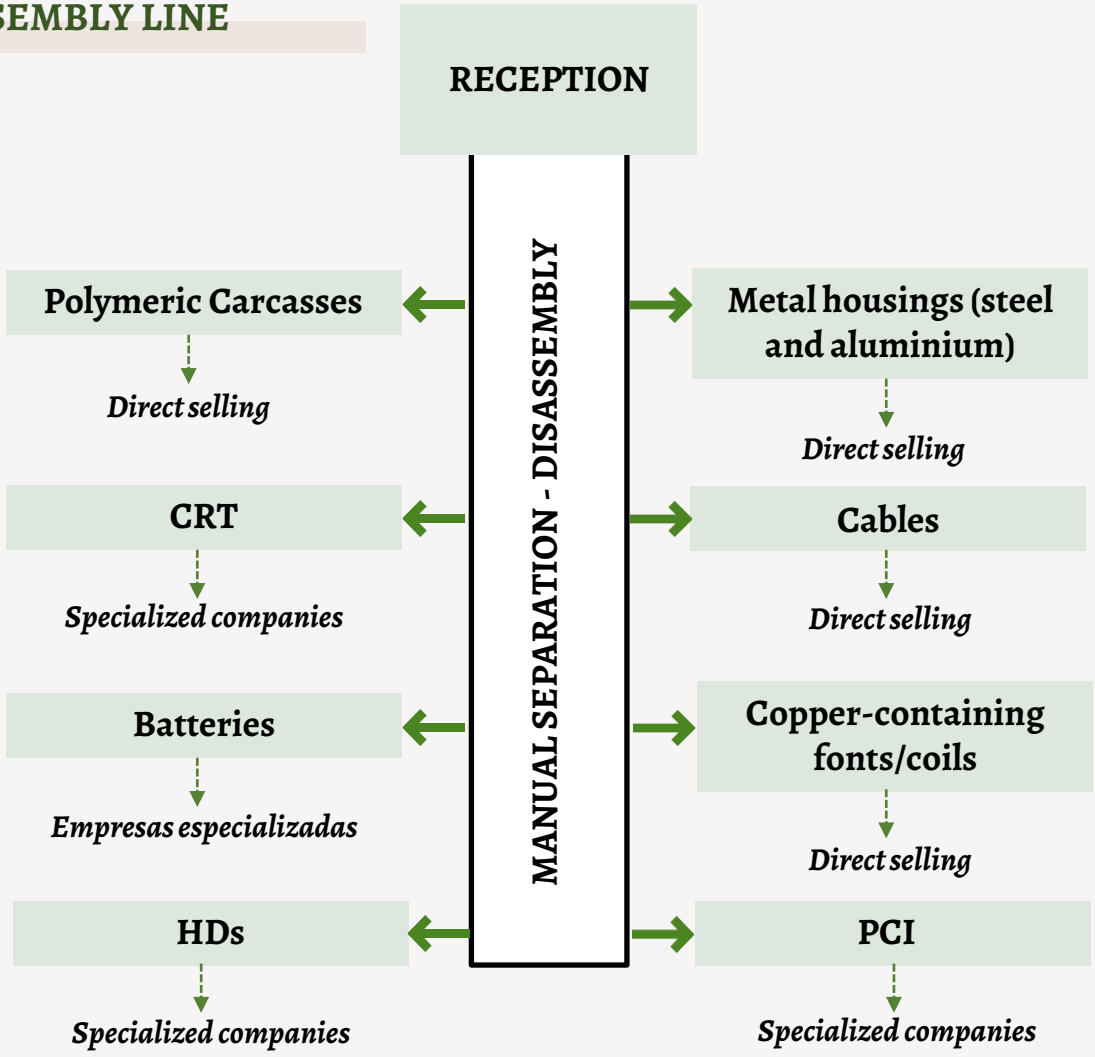
In accordance with decree 10.240/2020 and the ABNT NBR 16146/2013 standard, which refer to the management of WEEE, it is mandatory of the reverse manufacturing process to guarantee the protection of data and user identification, in this sense, mischaracterization enters. The procedure needs to take place safely and successfully before moving to the reuse/recycling/final arrangement phases. Following the same orientation, the disassembly process is a little more complex, so there are some indications for its realization:

The environment must contain a long bench, be well lit, ventilated, covered and have waterproofed floor;

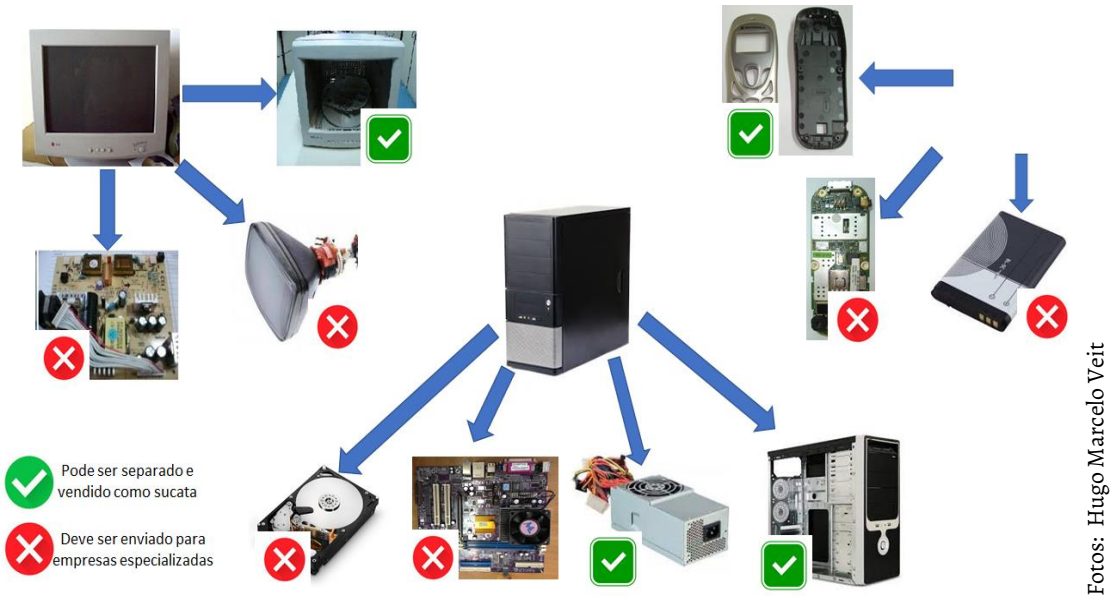
Those involved need to wear personal protective equipment and have specialized knowledge in what they are doing;

- A well-organized workbench, through separate workstations and tools for the types of WEEE to be disassembled, brings more optimization and security;
- The work area and contact can be covered with EVA plates or other other material to prevent surface wear and electrostatic charges;
- WEEE can be separated by type to facilitate the process and execution of the steps;
- The tools will assist in the separation of waste components, and it is necessary that you already have a designated place to allocate each material: metals, plastic, glass, in addition to possible components (which vary by type of WEEE), some of which: cables, plates and etc.;
- All processes that involve physical alteration of the WEEE need to occur in a safe, isolated environment, with access only with the proper PPE, and the steps that most require caution and experience of the cooperative members, considering that performed incorrectly can bring several health problems.
- Electronic waste has many peculiarities and different components, so in some cases they need to be classified and evaluated separately. In the case of The NBR 15833/2018 the focus is refrigeration devices, providing about the implementation of reverse manufacturing for this CLASSIFICATION of WEEE.
- For more information, see the Guide to Disassembly of waste of electronic equipment (CETEM, 2020).

DISASSEMBLY LINE



WHAT IS SCRAP ON COMPUTERS AND MOBILE PHONES?



Fotos: Hugo Marcelo Veit

15. POTENTIAL RISKS

Table 2. Key elements that offer potential risk to workers and the environment

ELEMENTO	EQUIPAMENTO (EXEMPLOS)	ALGUNS RISCOS
Aluminum (Al)	Especially in fountains, cables and boards	Neurological disorders, seizures, dementia
Berillium (Be)	Microwave capacitors	Chills, fever, cough, painful cough
Lead (Pb)	Acid lead batteries (notebooks)	Weakness, irritability, nausea, abdominal pain with constipation and anaemia
Cobalt (Co)	Lithium cell batteries	Decreased ventilatory function, nausea, vomiting, diarrhea, liver damage and allergic dermatitis
Copper (Cu)	Especially in cables and wires	Nausea, vomiting, diarrhoea, kidney failure, abdominal pain, dizziness, shorthand
Iron (Fe)	Printed Circuit Boards (PCI)	Blood clotting disorders, abdominal discomfort, lethargy and fatigue
Mercury (Hg)	Bimetallic thermostats in coffee machines	Severe pain, vomiting, bleeding gums, bitter taste in the mouth, burning in the digestive tract, severe diarrhea
Nickel (Ni)	Rechargeable notebook batteries	Burning and itchy sensation in the hands, redness and rash on the fingers and forearms, pneumonia
Silver (Ag)	"Motherboard" of computers	Bone marrow insufficiency, pigmentation of the skin, nails and gums

PERSONAL PROTECTIVE EQUIPMENT (PPE)

SAFETY GLASSES:
When using hammer or removing cartridges/toners

BREATHING MASK:
Protects against dust from CRT printers and tubes

SAFETY GLOVES:
Adjustable, protective without loss of touch

UNIFORM / AVENTAL:
Protects against fragments in disassembly

SAFETY SHOES:
Protect against tool fall

- The production unit should provide cooperatives free of charge and should promote awareness of the use of EPIs;
- When handling/dismantling hazardous waste from WEEE, the worker MUST use EPIs!
-

Often, working conditions in cooperatives expose workers to unhealthy conditions at risk of contamination by microorganisms and exposure to hazardous metals such as cadmium metals (Cd), lead (Pb), mercury (Hg) and nickel (Ni) (Souza, 2015; Ferron, 2015; Rodrigues & Dias, 2017), contact with disease-transmitting animals and sharp objects and ergonomic hazards due to heavy work.

Because of the occupational risks to workers' health, the collection of urban waste is classified as an activity with the maximum degree of unhealthiness (NR 15). Federal law No. 12,690/2012 establishes the obligation to comply with health and safety standards of workers organized in cooperatives. The evaluation of SMS indicators can help in meeting health and safety standards and in protecting the health of cooperative workers.

SAFETY, HEALTH AND ENVIRONMENT INDICATORS

Table 3 points to some indicators for ensuring good practices in terms of safety, health and the environment in waste pickers' cooperatives.

Table 3. Some indicators of good practices in safety, health and the environment in waste pickers' cooperatives

SAFETY	HEALTH	ENVIRONMENT
EPI CONTROL: Equipment needed Purchased equipment EPIs distributed among cooperatives EPIs: service life, utilization rate, maintenance and hygiene dates	**EXAMS:** Routine examinations Specific examinations in case of accidents at work	**NATURAL RESOURCES:** Water consumption Energy consumption
ACCIDENTS: Quantitative Causes Impacts Mitigating actions applied Preventive actions applied	**OBSERVATION:** Routine examinations Even if there is no obligation, the NR-7 (Occupational Health Medical Control Program) is indicated as a standard	**GREENHOUSE GAS EMISSIONS:** Fossil fuel consumption
FIRE PROTECTION: • Number of fire extinguishers installed • Recharge validity • Trained cooperatives • Emergency signaling • Escape routes •		**RISK OF CONTAMINATION OF SOIL AND GROUNDWATER:** Amount of waste generated forwarded for proper disposal Separation, safe storage and proper disposal of hazardous waste

RISKS FOR COOPERATIVES IN E-WASTE MANANGEMENT

There are several risks present in the activities carried out by cooperatives to the work environment of cooperatives, especially when working with WEEE. Table 4 defines and gives examples of the main types of existing risks.

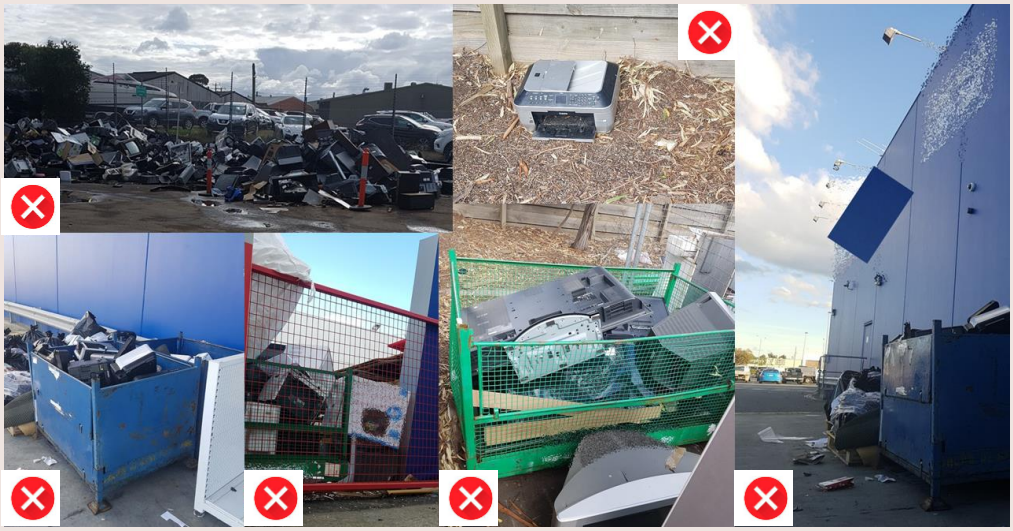
Table 4. Main risks to workers and the environment of activities in a waste pickers' cooperative

RISCOS	CARACTERÍSTICAS	EXEMPLOS
Accidents	Incorrect use of PPE and work tools can put the worker in a situation that can affect his or her physical integrity.	Equipment fall
		Risk of explosion of some components that make up THE WEEE
		Incorrect use and/or lack of EPIs
Biological	They are defined by the presence of potentially infectious agents such as viruses, bacteria and fungi.	Lack of cleaning of the desktop
		Contamination arising from the origin of the WEEE
Ergonomic	Any factors that may infer in the psychophysiological characteristics of the worker, affecting their health.	Inadequate height of the disassembly table;
		Repetitive efforts in the processes of disassembly of WEEE;
		Use inappropriate tools to disassembly the WEEE.
Physicists	They are related to the various forms of energy to which workers can be exposed.	Lack of maintenance of tools;
		Incorrect use and/or lack of EPIs;
		Lack of lighting and ventilation in the work environment.
Chemists	These are the effects of chemical agents that can penetrate the worker's body.	Risk of contamination from the paints present in the WEEE;
		The lack of EPIs for the handling of certain components.

POTENTIAL RISK IN STORAGE

- [x] Always store in a covered place, protected from rain, and avoid contact with the ground
- [x] Store in a place isolated from the movement of people and animals

EXAMPLES OF HOW NOT TO STORE!



Fotos: Pablo Dias

POTENTIAL RISK IN SORTING AND DESTINATION

SORTING/CONSOLIDATION OF CARGO:

In this pre-destination/final disposal phase, the materials of the previous stage are added to batches whose purpose is to sell to recyclers or to be available in licensed landfills. In addition to the separation of materials that will not be passed on for processing. Here it is necessary to understand that the residues already having their structure altered (and exposed) are considered Class I, therefore, they need to be stored according to the standards of NBR 12235/1992. This is, in covered places and stored containers (bags or containers) that are not subject to climatic or chemical effects (corrosion), away from areas of great movement (JUNIOR, 2018) (ABNT 10004) (ABNT 12235).

DESTINATION AND FINAL DISPOSAL:

With materials separated by type they can be destined for companies specialized in recycling and thus close the reverse logistics cycle with the reuse of secondary raw material. The entire collection and sale agreement needs to be settled with the company, ensuring the issuance of a manifesto and sales invoice and the maintenance of an organized system of documentation and traceability of the waste. The destination occurs both for the grouped materials (metal, plastic and etc.), as well as for the components (cables, PCI, among others). However, contaminated/toxic parts, effluents generated or what cannot be reused in any way will be destined for a treatment or final disposal in licensed landfill, ending the product cycle (JUNIOR, 2018).

Based on the results of the indicators, the cooperative can develop an action plan, including goals, deadlines, actions and indication of those responsible for improving indicators that need improvement. The action plan can be organized into a sustainability matrix as the example in Table 5:

Table 5. Example of sustainability matrix for cooperatives from some indicators

INDICATOR	RESULT	META	DEADLINE	ACTIONS	RESPONSIBLE
Tailings rate	Unfavorable (needs improvements)	Reduce tailings rate	6 months	Active search of companies to commercialize greater diversity of segregated recyclables	Names
Organization training	Very unfavorable	Increase the training of cooperatives	90 days	Offer training courses	Names
Use of natural resources	Adverse	Reduce water consumption supplied by the Supply Company	30 days	Implement a rainwater collection system for use by the cooperative	Names

There are guidelines that guide the health and safety requirements of work in the operations of cooperatives for the reverse manufacture of waste electronic equipment. Table 6 shows the main rules applicable to these operations.

Table 6. Standards applicable to the activities carried out in waste pickers' cooperatives that operate in reverse manufacturing

STANDARDS		OBJECTIVES
NBR 14009/1997	Machinery safety - Principles for risk assessment	Provide the information necessary for decision-making in machinery safety and the type of documentation for the analysis of risk assessment during their useful life.
NBR 10004/2004	Solid Waste - Classification	Classify solid waste as well as its potential risks to the environment and public health in order to carry out its management properly.
NBR 12235/1992	Storage of hazardous solid waste	Define the conditions required for the storage of hazardous solid waste in order to protect public health and the environment.
NR 6/1978	Personal protective equipment	It aims to train and guide workers when the need and correct use of PPE, in order to ensure their safety and physical integrity.
NR 15/1978	Unhealthy activities and operations	Describes the unhealthy operations, activities and agents present in the work activities.
NR 15/1978 - Annex 1	Unhealthy activities and operations	Tolerance limits for continuous and intermittent noise.
NR 15/1978 - Annex 2	Unhealthy activities and operations	Tolerance limits for impact noises.
NR 15/1978 - Annex 3	Unhealthy activities and operations	Tolerance limits for heat exposure.
NR 15/1978 - Annex 8	Unhealthy activities and operations	Criteria for characterization of the working condition resulting from exposures to vibrations of hands and arms and full body vibrations.
NR 15/1978 - Annex 11	Unhealthy activities and operations	Chemical agents whose unhealthiness is characterized by tolerance limit and inspection in the workplace.
NR 15/1978 - Annex 13	Unhealthy activities and operations	List of activities involving biological agents. Identification of situations of dangerousness existing in the work environment.
NR 15/1978 - Annex 14	Unhealthy activities and operations	List of activities involving biological agents. Identification of situations of dangerousness existing in the work environment.
NR 16/1978	Hazardous activities and operations	List of activities involving biological agents. Identification of situations of dangerousness existing in the work environment.
NR 17/1978	Ergonomics	Establish the parameters that allow the adaptation of working conditions in order to provide maximum comfort, safety and efficient performance.
NBR ISO 31000/2018	Risk management - Principles and guidelines	It aims to establish the principles, criteria and methodology for risk management in work environments.
NR 9/2021	Evaluation and control of occupational exposures to physical, chemical and biological agents	It establishes measures aimed at eliminating, reducing or controlling these risks in order to preserve the physical and mental integrity of the worker.

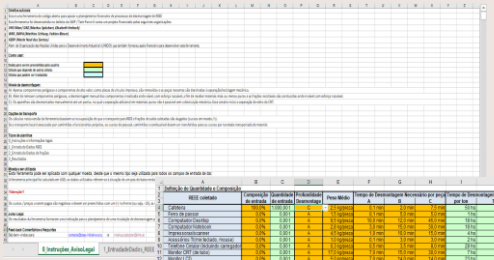
16, Introduction to StEP

StEP is a business plan calculation tool for the Area of Electronic Waste that, from the information entered, can evaluate a scenario for 3 possible levels of disassembly, and thus help to decide which would be the most profitable way according to the reality of each company.

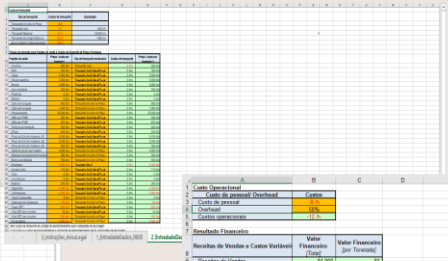
A - Superficial | **B - Medium** | **C - Deep**

For the introduction to the StEP tool, we will use its version called KalkTool-DRZ (*). The tool consists of a spreadsheet with 4 tabs, the first being a presentation, with some characteristics and legal guidelines. The others have editable tables that will be detailed below.

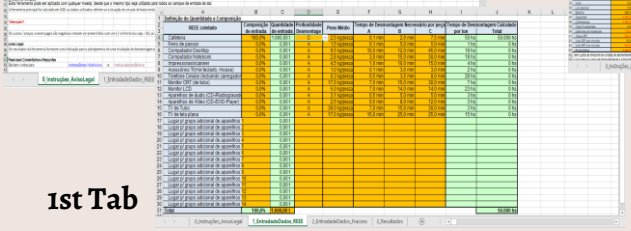
Presentation Tab



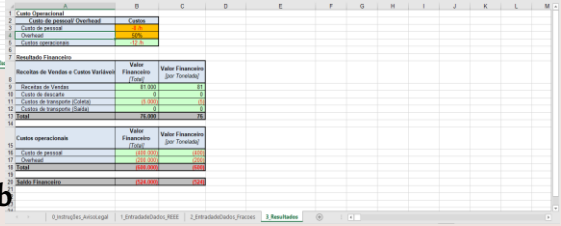
2nd Tab



1st Tab



3rd Tab



step
solving the e-waste problem

(*) These data of the output composition after the disassembly of the equipment come from a campaign carried out by the Drz Disassembly and Recycling Center in 2013, in which the composition of 13 groups of more relevant/recurring equipment such as computers, notebooks, mobile phones, screens, etc. was evaluated.

PLANILHA STEP

Consider the following incoming WEEE load scenario:

Audio devices
600 kilos

Cell phone
300 kilos

Notebook
1 ton

LCD Monitor
800 kilos

Desktop (cabinet)
1.5 tons

Mouse and keyboard
500 kilos

TV\CRT Monitor
3.5 tons

Printer
1.8 tons

Swithed to spreadsheet

Definição de Quantidade e Composição

REEE coletado	Composição de entrada	Quantidade de entrada	Profundidade Desmontagem	Peso Médio	Tempo de Desmontagem Necessário por peça A	B	C	Tempo de Desmontagem Calculado por ton	Total
Computador Desktop	15,0%	1,50 t	C	9,5 kg/pieza	10,0 min	12,0 min	45,0 min	79 hs	118 hs
Computador Notebook	10,0%	1,00 t	B	2,8 kg/pieza	3,0 min	15,0 min	30,0 min	89 hs	89 hs
Impressoras/scanner	18,0%	1,80 t	A	4,5 kg/pieza	1,0 min	10,0 min	15,0 min	4 hs	7 hs
Acessórios TI(mix teclado, mouse)	5,0%	0,50 t	A	1,0 kg/pieza	0,1 min	3,0 min	3,0 min	2 hs	1 hs
Telefone Celular (Incluindo carregador)	3,0%	0,30 t	C	0,3 kg/pieza	0,5 min	3,5 min	8,0 min	444 hs	133 hs
Monitor CRT (de tubo)	35,0%	3,50 t	C	17,0 kg/pieza	7,0 min	15,0 min	30,0 min	29 hs	103 hs
Monitor LCD	8,0%	0,80 t	C	5,0 kg/pieza	7,0 min	14,0 min	14,0 min	47 hs	37 hs
Aparelhos de áudio (CD-/Radiogravador	6,0%	0,60 t	A	3,1 kg/pieza	0,5 min	5,0 min	5,0 min	3 hs	2 hs
Aparelhos de Vídeo (CD-/DVD-Player)		0,00 t	A	2,5 kg/pieza	0,5 min	8,0 min	12,0 min	3 hs	0 hs
TV de Tubo		0,00 t	A	39,0 kg/pieza	7,0 min	15,0 min	30,0 min	3 hs	0 hs
TV de tela plana		0,00 t	A	17,0 kg/pieza	15,0 min	25,0 min	25,0 min	15 hs	0 hs
Lugar p/ grupo adicional de aparelhos 1		0,00 t							
Lugar p/ grupo adicional de aparelhos 2		0,00 t							
Lugar p/ grupo adicional de aparelhos 3		0,00 t							
Lugar p/ grupo adicional de aparelhos 4		0,00 t							
Lugar p/ grupo adicional de aparelhos 5		0,00 t							
Lugar p/ grupo adicional de aparelhos 6		0,00 t							
Lugar p/ grupo adicional de aparelhos 7		0,00 t							
Lugar p/ grupo adicional de aparelhos 8		0,00 t							
Lugar p/ grupo adicional de aparelhos 9		0,00 t							
Lugar p/ grupo adicional de aparelhos 10		0,00 t							
Lugar p/ grupo adicional de aparelhos 11		0,00 t							
Lugar p/ grupo adicional de aparelhos 12		0,00 t							
Lugar p/ grupo adicional de aparelhos 13		0,00 t							
Lugar p/ grupo adicional de aparelhos 14		0,00 t							
Total	100,0%	10,00 t							490 hs

0_Instruções_AvisoLegal | 1_EntradadeDados_REEE | 2_EntradadeDados_Fracoes | 3_Resultados

Next steps:

1. Registering REEE
2. Recording costs and revenues
3. Checking results

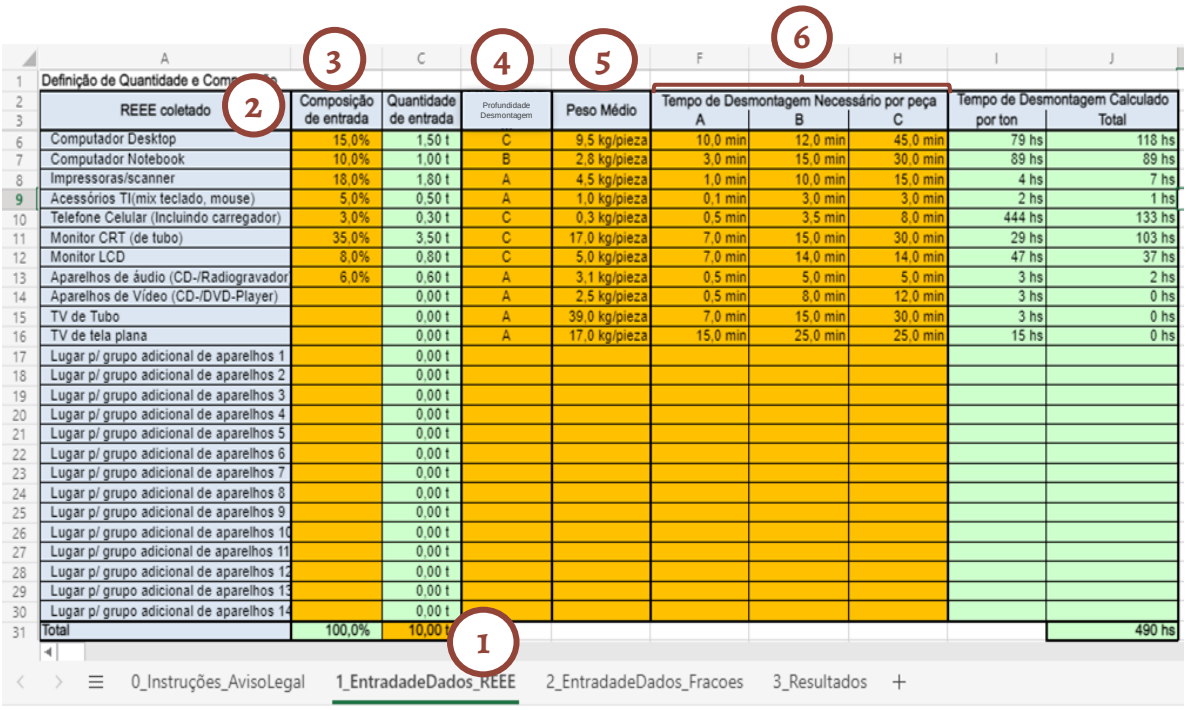
STEP SPREADSHEET: REGISTERING REEE

Start with the *"1_EntradadeDados_REEE"* tab, respecting the orientation of the caption:

Data to be filled by the user

Calculation that depends on other cells

Cells that can be translated and customized



	A	C	E	F	H	I	J
1	Definição de Quantidade e Com...						
2	REEE coletado	Composição de entrada	Quantidade de entrada	Profundidade Desmontagem	Peso Médio	Tempo de Desmontagem Necessário por peça A	B	C	Tempo de Desmontagem Calculado por ton	Total
6	Computador Desktop	15,0%	1,50 t	C	9,5 kg/pieza	10,0 min	12,0 min	45,0 min	79 hs	118 hs
7	Computador Notebook	10,0%	1,00 t	B	2,8 kg/pieza	3,0 min	15,0 min	30,0 min	89 hs	89 hs
8	Impressoras/scanner	18,0%	1,80 t	A	4,5 kg/pieza	1,0 min	10,0 min	15,0 min	4 hs	7 hs
9	Acessórios TI(mix teclado, mouse)	5,0%	0,50 t	A	1,0 kg/pieza	0,1 min	3,0 min	3,0 min	2 hs	1 hs
10	Telefone Celular (Incluindo carregador)	3,0%	0,30 t	C	0,3 kg/pieza	0,5 min	3,5 min	8,0 min	444 hs	133 hs
11	Monitor CRT (de tubo)	35,0%	3,50 t	C	17,0 kg/pieza	7,0 min	15,0 min	30,0 min	29 hs	103 hs
12	Monitor LCD	8,0%	0,80 t	C	5,0 kg/pieza	7,0 min	14,0 min	14,0 min	47 hs	37 hs
13	Aparelhos de áudio (CD-/Radiogravador	6,0%	0,60 t	A	3,1 kg/pieza	0,5 min	5,0 min	5,0 min	3 hs	2 hs
14	Aparelhos de Vídeo (CD-/DVD-Player)		0,00 t	A	2,5 kg/pieza	0,5 min	8,0 min	12,0 min	3 hs	0 hs
15	TV de Tubo		0,00 t	A	39,0 kg/pieza	7,0 min	15,0 min	30,0 min	3 hs	0 hs
16	TV de tela plana		0,00 t	A	17,0 kg/pieza	15,0 min	25,0 min	25,0 min	15 hs	0 hs
17	Lugar p/ grupo adicional de aparelhos 1		0,00 t							
18	Lugar p/ grupo adicional de aparelhos 2		0,00 t							
19	Lugar p/ grupo adicional de aparelhos 3		0,00 t							
20	Lugar p/ grupo adicional de aparelhos 4		0,00 t							
21	Lugar p/ grupo adicional de aparelhos 5		0,00 t							
22	Lugar p/ grupo adicional de aparelhos 6		0,00 t							
23	Lugar p/ grupo adicional de aparelhos 7		0,00 t							
24	Lugar p/ grupo adicional de aparelhos 8		0,00 t							
25	Lugar p/ grupo adicional de aparelhos 9		0,00 t							
26	Lugar p/ grupo adicional de aparelhos 10		0,00 t							
27	Lugar p/ grupo adicional de aparelhos 11		0,00 t							
28	Lugar p/ grupo adicional de aparelhos 12		0,00 t							
29	Lugar p/ grupo adicional de aparelhos 13		0,00 t							
30	Lugar p/ grupo adicional de aparelhos 14		0,00 t							
31	Total	100,0%	10,00 t							490 hs

0_Instruções_AvisoLegal | 1_EntradadeDados_REEE | 2_EntradadeDados_Fracoes | 3_Resultados

SEQUENCE OF USE:

1. The first information is the amount received by the cooperative (always register in tons).
2. The "COLLECTED WEEE" column is named after the items. It can also be entered the name of other equipment.
3. In the column "input composition" you must place the percentage quantity of each type of WEEE and in the column "Input quantity" will automatically appear the quantity in tons .
4. In the "Disassembly Depth" column, one of the 3 disassembly levels (A, B, C) for each product must be chosen.
5. Column E associates the average weight with WEEE collected per item.
6. In the "A, B, and C of the Disassembly Time required per part" columns, we will define the average expected time at each of the 3 disassembly levels.

STEP SPREADSHEET: RECORDING COSTS AND REVENUES

In this tab, *"2_Entradasde_Fracoes"*, there are two tables.

1st Table: References of transport costs.

1. In the column "Transportation Cost" you must place your operating cost for the transport. This data is very important and changes according to the location and the sales opportunity of each cooperative.
2.

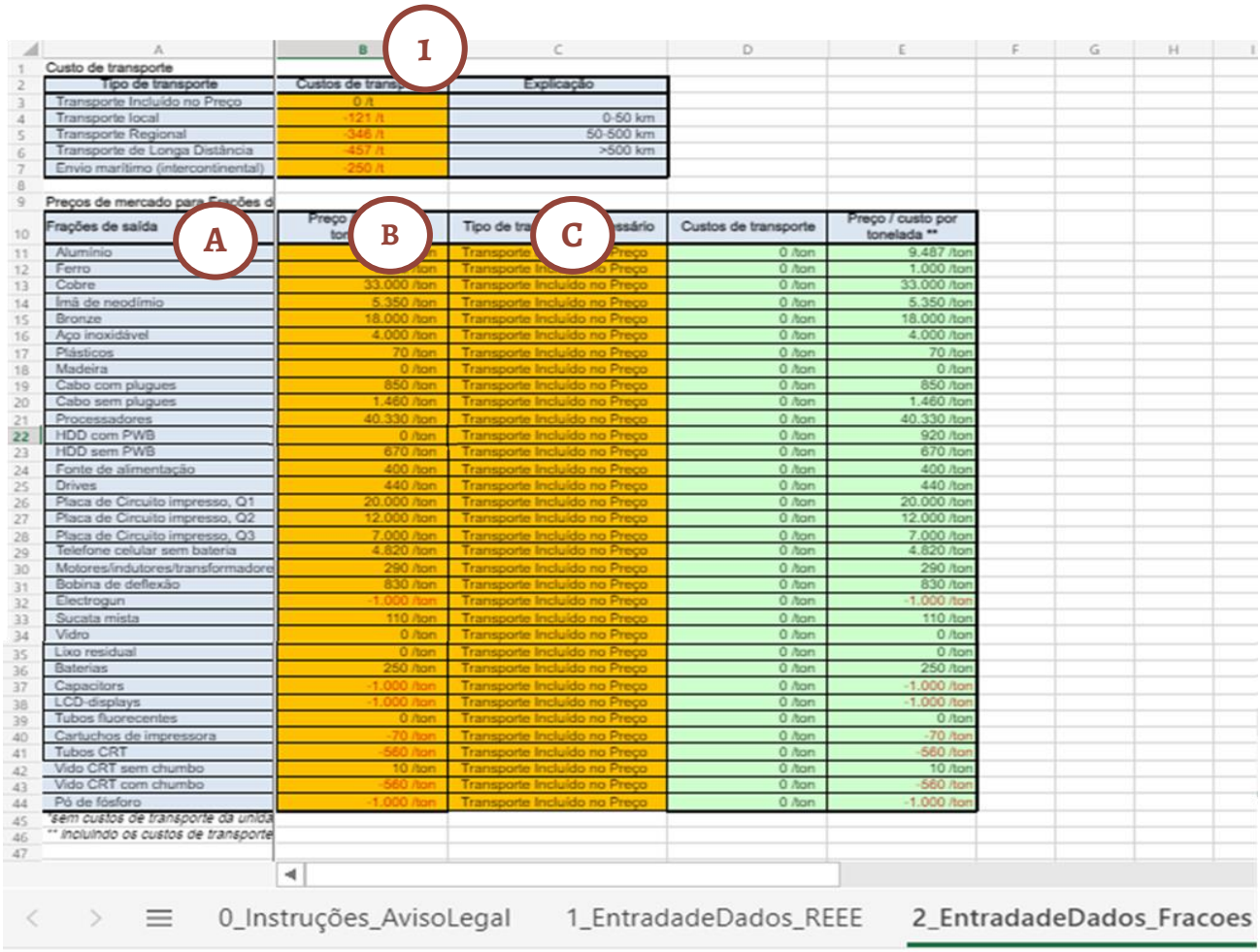
Second. Table: Market prices for sale of the benefited fractions and disposal cost.

A. In the column "Output fractions" we have the names of the materials obtained by separation and disassembly.

B. In the column "Price / cost per ton *" we will put the amount per received on sale or paid to discard referring to the ton of this material.

C. In the column "Transport type required" we will choose the type of transport, according to the types that we set the costs in the first table.

D.



STEP WORKSHEET: CHECKING RESULTS

In the "***3_Results***" tab, there are 3 tables.

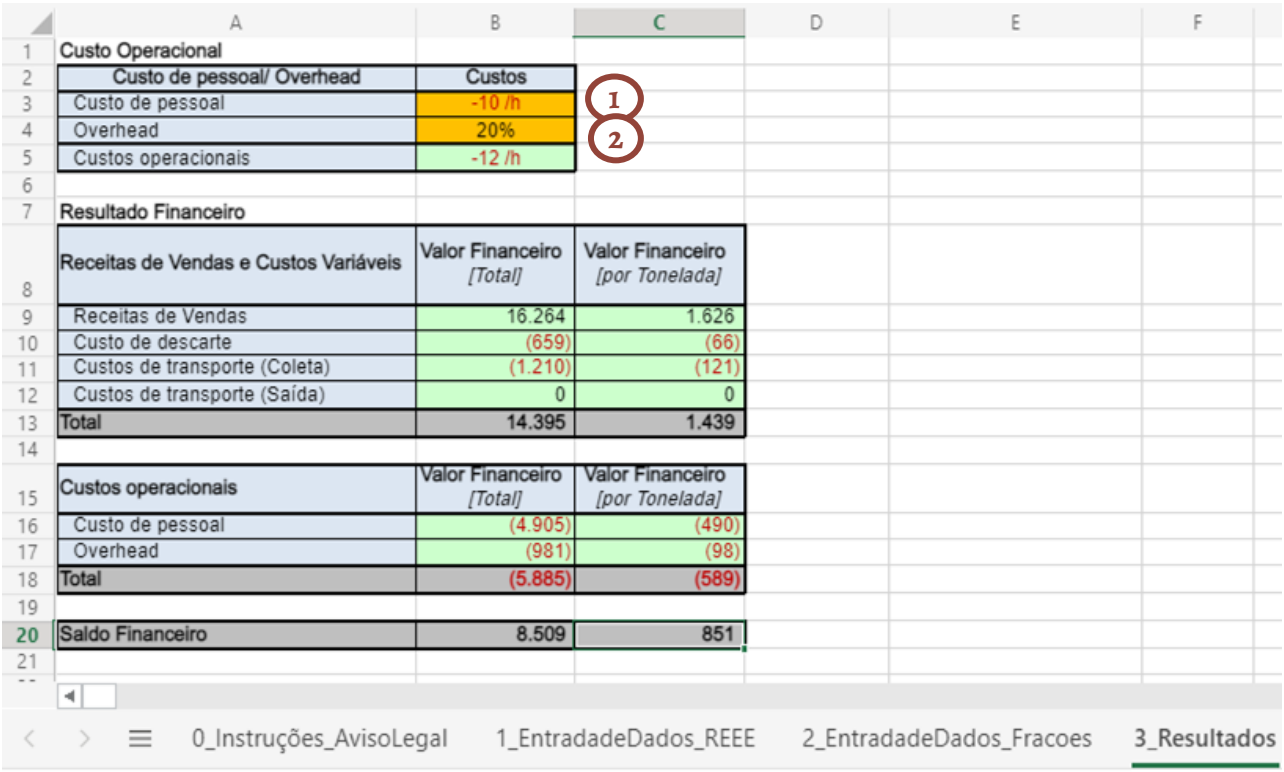
1st Table: Operating Cost

1. Fill in the "personnel cost". This is the direct cost of working hours.
2. Fill in the "Overhead", which is the indirect percentage spend on the personnel cost.

The following tables show your cooperative's financial estimates, i.e. the financial balance, based on the revenues and costs reported in the previous tabs.

These results present an idea of the final financial income and allow the manager to decide which level of disassembly (A, B, C) is more interesting in relation to the scenario presented.

The manager can simulate other scenarios, with different levels of disassembly, costs and revenues, until he finds the scenario that brings the largest financial balance to the cooperative.



	A	B	C	D	E	F
1	Custo Operacional					
2	Custo de pessoal/ Overhead	Custos				
3	Custo de pessoal	-10 /h	1			
4	Overhead	20%	2			
5	Custos operacionais	-12 /h				
6						
7	Resultado Financeiro					
8	Receitas de Vendas e Custos Variáveis	Valor Financeiro *[Total]*	Valor Financeiro *[por Tonelada]*			
9	Receitas de Vendas	16.264	1.626			
10	Custo de descarte	(659)	(66)			
11	Custos de transporte (Coleta)	(1.210)	(121)			
12	Custos de transporte (Saída)	0	0			
13	Total	14.395	1.439			
14						
15	Custos operacionais	Valor Financeiro *[Total]*	Valor Financeiro *[por Tonelada]*			
16	Custo de pessoal	(4.905)	(490)			
17	Overhead	(981)	(98)			
18	Total	(5.885)	(589)			
19						
20	Saldo Financeiro	8.509	851			
21						

0_Instruções_AvisoLegal | 1_EntradadeDados_REEE | 2_EntradadeDados_Fracoes | 3_Resultados

17. LOCATION OF COOPERATIVES

The following map schematically illustrates the location of the main waste pickers' cooperatives active in e-waste management in Brazil.

**Este mapa é meramente ilustrativo, não apresentando informações georreferenciadas.*

BAHIA

CAEC:
(71) 3275-7815 (71) 98779-9133

CANORE:
(71) 3346-3050 (71) 98868-2770

CAMAPET:
(71) 3313-5542 (71) 98899-5542

COOCREJA:
(71) 3305-9327 (71) 99901-0563

CEARÁ

RECICLANDO VIDAS:
(85) 3275-7815

UNIÃO DOS CATADORES JARDIM IRACEMA:
(85) 98787-3930

RECICLANDO:
(85) 3275-7815

SERVILUZ:
(85) 98708-6762

DISTRITO FEDERAL

LIXO ELETRÔNICO BRASÍLIA:
(61) 98513-9817

RECICLA BRASÍLIA:
(61) 99917-2501 (61) 96562-8447

RECICLE A VIDA:
(61) 3373-1810

COOPERE:
(61) 98647-8330 (61) 99636-3498

MINAS GERAIS

COOPERU:
cooperu.umuarama@gmail.com
(44) 3624-8068 (44) 98411-1020

RECICLABOM:
(37) 99836-4777

PARAÍBA

COTRAMARE:
cotramare@yahoo.com.br
(83) 98700-1416

COOREMM:
(83) 98722-1807

ASCARE:
coopagres@yahoo.com.br
(83) 2178-0264

PARANÁ

RECICLAR É VIVER:
(41) 99817-3309

COOPERNORTE:
(44) 99743-1272

PERNAMBUCO

COOCARES:
coocares@gmail.com / lindacireciclacao@yahoo.com.br
(81) 3541-9332

PRÓ-RECIFE:
catadores.pe@gmail.com
(81) 98571-3503 (81) 99563-8923

COOPAGRES:
coopagres@yahoo.com.br
(81) 986226100 / (81) 30340664

RIO DE JANEIRO

COOPAMA:
luicoop@gmail.com
(21) 3215-7030

COOPER ECOLÓGICA:
coopecologicagramacho@gmail.com
(21) 3580-8282 / (21) 97034-2139

COOTRABOM:
cootrabom.recicla@yahoo.com.br
(21) 97444-9906

COOPERATIVA ELIZABETH:
(24) 3339-4256 / (24)99828-9341

COOPERATIVA COOP CLEAN:
(22) 2622-1338 / 3852-7886 / 99218-0690

COOP CÉU AZUL (E-LIXO):
contato@e-lixo-rj.com.br
(21)34742901 (21) 98390-0666

COOPERATIVA FOLHA VERDE:
folhaverde.vr@gmail.com
(22) 99738-7874

COOPERTRONI:
lixoeletronico2019@gmail.com
(21) 97261-1990 (21) 96402-0140

COOPERATIVA PINHEIRAL EM AÇÃO:
(24) 99816-5178

RIO GRANDE DO NORTE

COOPCICLA:
coopcila@gmail.com
(84) 3232-8814

COOCAMAR:
severinolima@yahoo.com.br
(84) 3232-8812 (84) 99104-2203

RIO GRANDE DO SUL

COOPERTEC:
demetrio.coopertec@gmail.com
(51) 99756 9565 / (51) 98115 1609 / (51)982051070

COOPERATIVA PAULO FREIRE:
(51) 98485-6773

RONDÔNIA

COOCAMARJI:
http://www.reciclajipa.com.br/coocamarji
+55 69 9956-1294

ASSOCIAÇÃO ARES DE RECICLAGEM:
(69) 8435-7069

RECICOOP:
(69) 8415-9514

SÃO PAULO

COOPERMITI:
contato@coopermiti.com.br
(11) 3666-0849

COOPERTECH:
coopertechresiduos@gmail.com
(12) 982726264 / (12) 33083041

COOPERATIVA VIVA BEM:
http://www.coopervivabem.com.br
(11) 3644-6867 (11) 3644-7532

COOPER GLICÉRIO:
cooperativacoopergliceriо@gmail.com
(11) 2771-3332

COOPAMARE:
coopamare@gmail.com
(11) 3064-3976 (11) 3871-2688

RECIFAVELA:
recifavelacml@yahoo.com.br
(11) 98046-3790

COOPERNOVA:
atendimento@coopernovacotia.com
(11) 4243-1810

KOMBOSA SELETIVA:
kombosaseletiva@outlook.com.br
(11)94800-5316

CEDIR - DISPOSAL AND REUSE CENTER OF COMPUTER EQUIPMENT:

CEDIR has been installed since December 2009 in the University City, University of São Paulo (USP), where it implements practices of reuse and sustainable disposal of electronic waste. The project ensured that the material used by USP was disposed of properly and could be reused by social projects.

The Center has several objectives to increase the recycling and reuse of these discarded equipment, ranging from the stages of receipt, classification and decharacterization of waste to the guarantee of sustainable disposal. In addition, there is an academic motivation for the work, in order to be carried out studies in the area and monitoring the viability of the center. Furthermore, there are also actions aimed at training waste pickers to deal with the area of electronic waste collection, which, if handled incorrectly, can have consequences for human health and the environment.

With the passage of time of its performance, the project has appeared several times in the media and has managed partnerships with local companies. CEDIR has waste treatment lines that are based on the concepts of circular economy, so that the waste received is first evaluated according to its functionality, and can then be repaired for new use or disassembled so that usable parts give rise to new devices. Moreover, in general, the electronics obtained are part of a loan system for social entities. This ensures that less waste will end up in dumps and landfills, and have its economic value maintained.

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Foto: Marcos Santos/USP Imagens

FEDERAL UNIVERSITY OF CAMPINA GRANDE AND INSTITUO ALPARGATAS:

The Alpargatas Institute was founded in 2003, with the objective of promoting initiatives that value social responsibility, educating society based on sustainability and aligned with the Sustainable Development Goals (SDGs). In 2020, through the coronavirus global pandemic, the institute promoted the project "A Computer Note 10", in partnership with the City Hall of Campina Grande, through the Department of Education (Seduc), the Federal University of Campina Grande (UFCG), through the Laboratory of Agro-environmental Technologies (LTA) and the Center for Research, Development and Innovation in Information Technology, Communication and Automation (VIRTUS). The project aims to recover computers and notebooks so that they could be used by students of remote education.

The process consists of receiving the device that will be restored. After this step, the recipients of the equipment are selected, and while the use occurs, the project will support for possible repairs and failures of the equipment. Kits can be delivered to teachers and students. This initiative has already benefited 24 teachers (reaching more than 1150 students who depend on them) and 29 families. The institute made the donation of 279 computers, in addition to following the collection of more devices.

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Foto: Hermann Fernandes

Final considerations

Brazil recycles only a very small portion of its generated electronic waste, and this is a potential market that can move about US$2.3 billion a year. That is, there are many opportunities to transform waste into material and financial resources. And, also, there are promising business models with implementation potential from the reverse logistics system required by Decree 10.240/2020. Therefore, the Circular Economy and Urban Mining are a path of no return towards a sustainable future.

Recycling cooperatives are essential in the reverse manufacture of electronic equipment and play a key role in the reverse logistics of WEEE. For all the strength and capacity of cooperativism, we want you to be motivated to learn more about this world-renowned business model and come to be part of the management of WEEE in Brazil.

See you soon!

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Realização:

Colaboração:

Apoio: