

# WASTE MANAGEMENT IN THE GENERATOR–COLLECTOR CIRCUIT

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**Abstract:** Waste management aims at optimal recovery through the integration of waste, starting from the essential objective of environmental protection, as well as neutralizing negative effects on the environment and preserving natural capital components. Waste recovery is carried out on a managerial basis through a system of measures, actions and viable activities, through legal and administrative levers financially supported in the long term. New business models with an approach based on protecting the environment by reducing at source in the perspective of the life cycle, bring benefits to society as a whole. Given the technological advance, it is necessary to identify and create new solutions / innovations for the management of industrial waste in order to create an industry that uses resources sustainably. The paper presents some aspects of the specific waste management activities within the generator–collector circuit under the tutelage of the competent authorities in the field of environmental protection.

**Keywords:** waste, management, management, recycling/recovery

## 1. INTRODUCTION

Waste is any substance or object that the holder throws away or has the intention or obligation to throw away.[1] Waste is both a resource of production and energy. Thus, they can be removed (from the economic circuit) or recovered (reintroduced into the circuit). Recovery involves the extraction from waste of resources that can be reused. This can be done by recycling, reuse, regeneration or any other auxiliary raw material recovery process. It is essential that recovery is achieved without endangering human health and without the use of processes or methods that can harm the environment.[2]

According to the European waste list (Decision 2000/532/EC) and GD no. 856/2002 *on waste management records and approval of the list of waste, including hazardous waste, as amended and supplemented*, waste is classified by source of generation into hazardous and non-hazardous. The European waste list includes 20 categories of waste (resulting from industrial activities (group 01–12), special categories of (group 13–16), resulting from other activities (group 17–20)) and 839 waste codes of which 405 are hazardous waste.

Priority number 1 in waste management remains reducing the amount of waste generated and, when generation cannot be avoided, to promote their use as a resource. Why resource? To achieve a higher level of recycling/reuse and safe disposal, when the situation requires it, and thus, implicitly, to minimize the extraction of additional natural resources.

This priority builds on the five-tier waste hierarchy defined in the 2008 revised waste Framework Directive, namely:

- ➡ PREVENTION (the best solution)
  - ➡ REUSE
  - ➡ RECYCLE
- ➡ OTHER FORMS OF VALORISATION (for example: energetic valorization)
  - ➡ DISPOSAL (in landfills, the last solution)[3]

In line with this hierarchy, the 7th Environment Action Program has set the following priority objectives for waste policy in the EU:

- ≡ Reducing the amount of waste generated,
- ≡ Maximising recycling and reuse,
- ≡ Limitation of incineration to non-recyclable materials,
- ≡ Limiting landfilling to non-recyclable and non-recoverable waste,
- ≡ Ensure full implementation of waste policy objectives in all EU Member States.[4]

Waste management is also the second most important factor contributing to employment growth in a green economy, according to data from the environmental goods and services (EGSS) accounts, which provide information on production (output) and export of environmental and related goods and services employment and gross value added. Environmental economics includes activities and products that serve one of two purposes:

- ≡ protection of the environment (prevention, reduction and elimination of pollution or any other degradation of the environment)
- ≡ management of resources (preserving natural resources and protecting them from exhaustion). [5][6]

An example of good practice, which takes into account all the above-mentioned particularities and which implicitly contributes to the sustainable development of society, is that of the Green WEEE International SA group (the only company in Romania with WEEELABEX operating license for the workflows of temperature-changing equipment, large equipment, mixed equipment and cathode tubes. WEEE Label of Excellence, a project funded by the European Community through the Life Plus program, through which Europe benefits from a set of rules on environmental protection and transparency in collection, logistics and recycling processes), collection and recycling company, offering a new life WEEE. Recycling processes provide rare and valuable raw materials on which the EU depends, such as gold, silver, platinum, copper, cobalt, aluminum, iron, etc. The resulting plastic is delivered to a traditional recycler in the area, who exploits it and through processing obtains a raw material that returns to the processing industry.[7]

## 2. IDENTIFIED ASPECTS IN WASTE MANAGEMENT FROM GENERATION TO COLLECTION AND IN DATA REPORTING

Key elements in environmental policies in the EU are environmentally sound waste management and the use of secondary materials they contain.[8] These elements, together with responsible management, efficiency, efficiency, environmental care and innovation, make waste management in the generator to recycler/recycler circuit, an engine that produces and benefits all economic, social and environmental levels, with positive implications at both micro and micro level.

If these targets are implemented at the level of generation waste generators, through efficient management of generated waste, through knowledge of the types of recyclable and non-recyclable waste and correct classification of the generated waste (the waste code chosen according to the specific activity of the generator producing the waste), by finding innovative/efficient/optimal separate collection solutions within the production processes and for packaging respectively (where applicable), by intelligently addressing waste from the point of view of its evidence given the recyclable and non-recyclable nature of waste, we can speak and have positive results in waste management.





However, management approaches are distinct for generators producing finished products from purchased raw materials and those using finished products for incorporation into another final product. We are also talking about plastics here. Thus, generators using plastics raw material (example: granules, etc.) to obtain another product from plastics (parts, etc.), generate a greater amount of plastics (both from raw material and scrap) and those who use plastics (parts, etc.) to incorporate it into a final, complex, or for packaging it generates a smaller amount of waste (only from scrap). Management is more complex and cumbersome for those in the first case, and for those in the second case easier.

The volume of production, the nature of production, the type of waste that can be generated, the resulting waste policy, determine these different approaches to proper waste management, which are the key to ensuring resource efficiency and sustainable growth of Europe's economies.[9]

### — Entities involved in waste management at national level

Figure 1 shows the entities involved in waste management at national level and their relations.

The scheme in Figure 1 shows the following links between the organizations involved:

- ≡ sale-purchase contract 
- ≡ service contract (collection / transport / delivery to the collector of non-recyclable waste, waste recycling services in order to achieve the recycling targets of generators stipulated by the specific legislation) 
- ≡ issue of environmental permit 
- ≡ reporting data on waste 

Efficient waste management for each of those involved (generator, collector(s), recycler/recoverer and competent institutions with competence in implementing environmental protection and environmental Fund management policies and laws) contributes to improving or at least maintaining living conditions and maintaining a healthy environment if the basic objectives are to be found, depending on the role of each in the circuit:

- ≡ prevention of waste generation,
- ≡ waste recycling,
- ≡ encouragement and support from the competent authorities in the field of economic operators working in the field of waste collection, treatment and recovery through various levers, economic and financial mechanisms for waste management (according to PNGD 2014–2020),[4]
- ≡ encouraging economic operators to find innovative solutions/strategic options related to plastics and packaging. In terms of plastic, there are three policy options: Less plastic, better plastic, no plastic.[11] Here we have the example of the manufacturer of Velux attic windows, according to the information from March

this year, replaced the plastic packaging, made of expanded polystyrene, EPS, with a unique paper-based material (cardboard with FSC certificate). This innovation contributes to a 13% reduction in carbon footprint, saving about 900 tons of plastic/year, a simpler collection of packaging waste for customers. This makes recycling more efficient and cheaper.[10]

- ≡ improving legislation by implementing the principle of involvement of all actors from producer/generator, collector, recycler/valuer, authorities and implicitly consumer.

For the legal entities on the circuit, only after the implementation of the basic benchmarks can profit be discussed. When one of these starts from profit in the waste management strategy, the importance and role of waste is dissipated and thus it can no longer be discussed about the value they bring to society (secondary raw material and protection of the planet's natural resources, located on a downward slope).

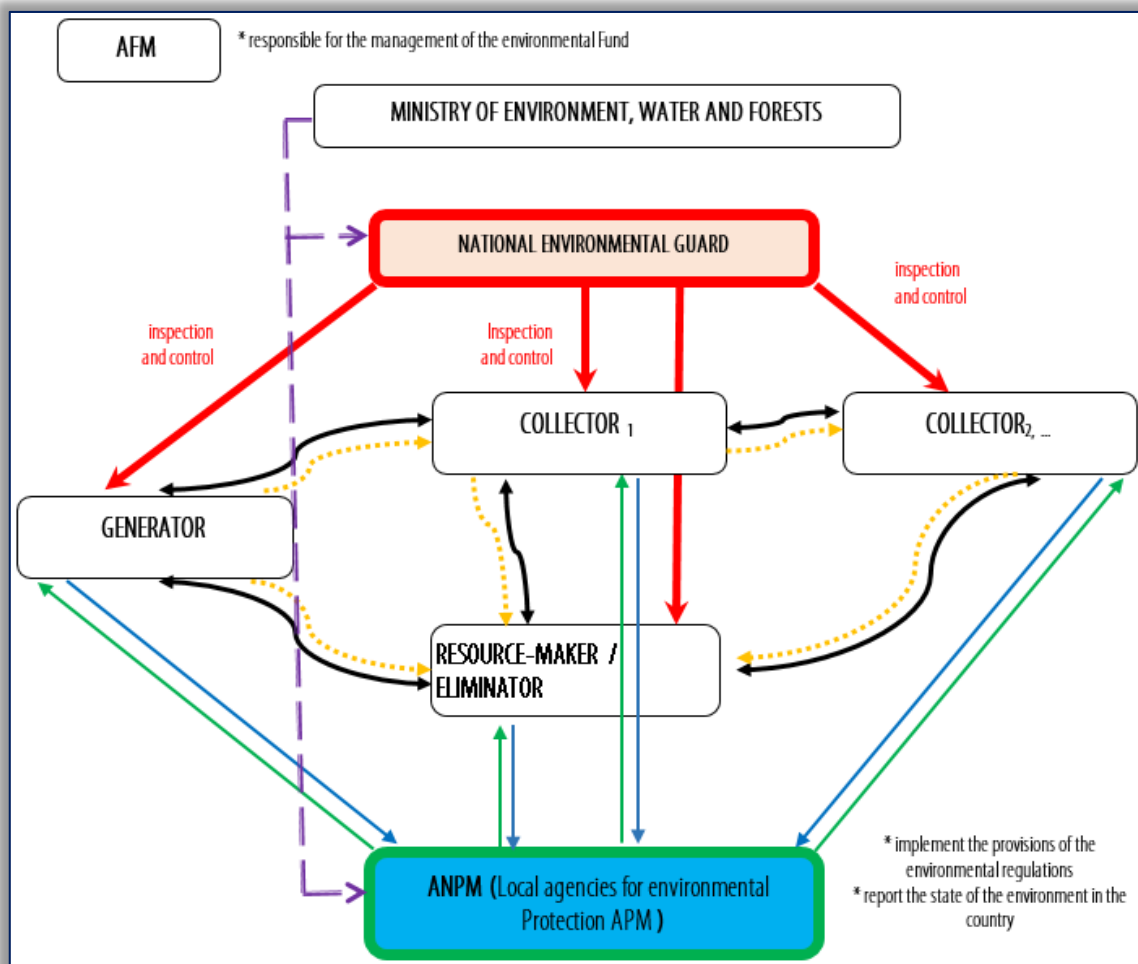


Figure 1. Relations between entities involved in waste management

- Generator and collector challenges

Care for the environment starts with the generator, which is the first link in the waste chain.

The generator starts from the idea of profit in waste management although until you get here, it is recommended to take into account the above mentioned and improve education in the field, by continuously improving the people who make decisions regarding waste management, namely those with responsibilities in the field, but also those in the management, who make the final decisions. A good education in the field contributes to a net profit higher than the original target designed because the knowledge gained from theory and especially from practice allows a correct and efficient approach to waste on both levels, namely recyclable and non-recyclable, and implicitly of the operations to which they can be subjected within the circuit, choosing also the best solutions from an economic and financial point of view with impact on profit, identifying the best solutions for sorting generated waste with minimum impact of non-recyclable or with reduction target, by taking care of recyclable waste (taking more from the sale) and thus reducing the amount of non-recyclable waste (paying less on the provision of services). There are good practice models, but there is still work to be done. There are still companies (large or large-scale, generating large amounts of waste) that, in order to reduce costs (salary ones in this case), load with additional environmental responsibilities other employees who have



the job description already loaded. But that creates a false aspect. On the one hand, the salary costs per year related to an employee with experience in the field are low compared to plus the profit value brought by the intelligent, innovative, professional management of the generated waste of such an employee.

The focus on negotiating the tariff in the provision of services for non-recyclable waste, which in the current context is on an upward trend for several reasons, determines the deviation from the waste hierarchy, the recommendation being the orientation toward efficient waste management solutions generated and finding optimal solutions for selective collection while keeping in mind the nature of the materials.

Finding a collector who has the necessary logistics and implicitly the capacity to collect and/or treat, being authorized for several waste codes, significantly reduces the waste management costs for the generator. To this is added the practical experience and direct contractual relations with experienced recyclers/recyclers in the field, from the territory of the country and beyond, and thus the entire portfolio of generated waste related to the package of commercial contracts offered by the umbrella of a single collector, respectively sale – purchase for recyclable fractions and services transport non-recyclable/hazardous waste and energy recovery of non-recyclable waste, is significantly superior from a financial point of view, contributing to the efficiency of the waste management costs than the contracts concluded with several collectors or recyclers/verifiers.

In the context of the pandemic, a new waste appeared, namely the surgical/facial mask. And here, due to the high neutralization costs and the special collection containers, the long time to collect enough quantity to be economically viable for the generator, it gives up and prefers to discard them as household waste, certainly contaminating waste that can be recycled.

The existence of more people in the waste-taking circuit at the generator, especially if they are also unapproved, makes it difficult to make efficient decisions in waste management.

Outsourcing the conclusion of commercial contracts with collectors by persons working in a location other than that of the generator, without physical presence at the waste generation site brings syncope and decision making without knowing the real situation in the territory.

For collectors, waste management involves high labor costs (not everyone is willing to work in this area, given the “dirty” nature of the activity, finding people with experience in the field or willing to improve being tough) and high logistics costs for non-recyclable waste in situations where the region’s landowner temporarily suspends its activity for various reasons (and these syncope are several times a year), as there are few such landfills, the most important being cement factories.

They are responsible for the collected waste, making sustained efforts on the sorting line (where possible) to minimize non-recyclable waste. If the responsibility of generators to avoid excessive mixing of generated waste and compromising recyclable waste increases, the situation of the data from the reporting of collectors would show a quantitative increase in the recycling sector compared to that of the generators, even if this means consuming resources (financial, logistical, human resources, etc.) for the collector. Most of the time it offers the best solutions to generators, in the collection, recycling/recovery line, even if they are financially unfavorable but with environmental benefit.

The challenges of the collector, especially if we are talking about those who have the logistics base necessary for the transport of waste, the collection and storage of several types of waste, come primarily from the “struggle” with the generator in awareness and education on the waste recycling field through smart sorting by material type, transparent and efficient communication and partnership for both parties.

Both collectors and recyclers/recoverers have as their main concern the recycling/recovery of waste as complete as possible in order to reintroduce secondary raw materials resulting from the economic circuit, save natural resources and reduce pollution.

#### — Competent institutions in the generator–collector circuit

Separate collecting, on which the competent institutions in the field place great emphasis, does not have the expected positive impact either.

The solution in this case, modeled on well-known EU countries, would be to apply measures including financial penalties in case of non-compliance with the hierarchy. This implies that the competent institutions know the field of activity of each economic operator, the nature of recyclable and non-recyclable waste, the types of plastic materials and, depending on their technical sheets, the operations to which they may be subjected (sorting, shredding, compaction, granulation, etc.) and from the point of view of recovery/disposal (reuse/reuse, material recycling, recovery, treatment, waste exchange, energy recovery, storage before any of the operations mentioned above) whenever they can be processed/recycled.

For efficient waste management, real data must be reported in real time. Data reporting is done by legal entities by e-mail in accordance with the timetable specified in the environmental authorization, legislation and/or

electronic information of the EPA (Environmental Protection Agency) by e-mail to the legal entity. After this stage, at a certain interval (usually a few months after the end of last year, a year or two after the end of last year) data is entered and transmitted to the APM via the SIM application (Integrated Environmental Information System), the purpose of which is to manage, process and analyze all environmental information in a unitary manner.

The quality of data and information on waste generation and management is low due to several factors, including:

- ≡ failures of the generator and/or other circuit participants in knowing how to classify the waste according to the waste list, from which, at some point, quantities of recovered waste are reported much higher than the amount generated,
- ≡ misclassification of waste generated/collected and/or erroneous code changes as a result of recovery processes,
- ≡ failure to update the list of collectors/recyclers/recoverers in direct correlation with recovery codes in environmental permits/waste code as well as information on WHOM, address, working place, etc.,
- ≡ failure to enter data if waste is submitted as a sample for testing to firms not subject to environmental authorization,
- ≡ the reporting of the data in the cycle of a year is done only at the quantities generated. What remains in stock at the collector as not being handed over for recycling/ recovery/ disposal at the end of the year, remains unanalyzed from the point of view of the generator by APM, appearing only in the data reported by the collector and the recycler/ recoverer/eliminator respectively
- ≡ the SIM application is not functional for long periods of time,
- ≡ late introduction of reporting data on WEEE, waste oils, packaging (in 2022 for 2020),
- ≡ non-synchronization and inefficient control of the data of the generators in the packaging waste line as they generate higher quantities of packaging waste than those placed on the market, reporting on the amount placed on the market,
- ≡ non-correlation between the data provided throughout the circuit (packaging generated and declared in a certain form at AFM and in an extended form in SIM).

At the level of the competent institutions, the identified aspects that are required to be improved in order to improve the efficiency of waste management are:

- ≡ the non-unitary way of working and interpreting the environmental legislation of local territorial agencies (MPA). Thus, when issuing environmental permits there is no unitary framework, they are left to the discretion of each APM, with a major impact when discussing the conclusion of commercial partnerships between the economic agents on the circuit or in the case of imports/exports of waste requiring the approval of the authorized institutions in accordance with the provisions of Regulation (EC) No 1013/2006 on shipments of waste,
- ≡ major legislative changes (case GEO no. 92/2021 on the waste regime) without further clarification/completions, as required by the legislation, on the issuance of methodological norms and reporting data in terms of the format of reports,
- ≡ the different approaches of the national environmental Guard to the MPA in terms of the documents provided for in Regulation (EC) No 1013/2006 on shipments of waste,
- ≡ there is no national database with all companies operating in the field of waste collection, treatment and recovery. Until the advent of GEO no. 92/2021 there was at the Ministry of economy the register of economic operators authorized to carry out waste recovery operations. With this, the register was abolished. The only option now is to search the internet by keywords. This creates discrimination against newly established economic agents operating in the field,
- ≡ issue until last year of environmental permits for collectors/recyclers/recoverers with class 20 codes, except codes 200202, 200304, 200306, 200133, 200134, 200135, 200136 of municipal and assimilable waste from trade, industry, institutions, including separately collected fractions and starting this year in some regions of the country, the possibility of collecting is given only for those who obtain ANRSC license in compliance with Law no. 101/2006 of the sanitation service of localities, republished. Why does this create syncope in the system? Because THE recycling/recovery companies with AM owners issued this year can no longer take over this code (especially plastic, code 20 01 39), although they have the necessary logistics for processing; there are stocks in the waste market of certain types of plastic for which there is no demand and which take time to find demand, with them being forced to be harnessed energetically additional costs appear for collectors who have a double expense (from the acquisition and from the provision of transport and energy

recovery services). At the level of public institutions there is no Directive in this regard, but new environmental permits announce the change in the near future.

- ≡ failure to transpose the European directives on the environment and waste management in line with the timetable assumed,
- ≡ failure to put the article of European directives and national legislation concerning the fact that it must be taken into account at the design stage of a product that is easy to recycle into practice
- ≡ failure to provide an optimal framework for the creation of energy-generating incineration plants that are a high-performance method of waste management, renewable energy generation or complex centers that have multiple waste management technologies on the same site,[4]
- ≡ completion and commissioning of regional centers called SMID (integrated waste management systems), some of which are started and unfinished, others are to be built. They comprise all forms of waste management, including sorting, thermo-biological treatment, recycling, etc., [4]
- ≡ building an authentic public-private partnership because legal entities know the reality on the ground best,
- ≡ although there are IT systems at the level of the competent institutions that should show the traceability of any waste introduced, the controls require documents attesting traceability (final recovery certificate).

### 3. CONCLUSION

In the last 3 years, there has been a somewhat shy improvement in the private environment in the awareness that waste is important resources that can bring profit to the generating company by making the best and most efficient decisions in terms of human resources, innovation, logistics and financial related to waste management as well as by focusing on continuous professional development in the field.

A good collaboration between all involved brings added value to the entire circuit and efficient management through optimal waste management through the conclusion of commercial sales contracts (in the case of recyclable waste) and services (in the case of non-recyclable waste) considering the best solutions for each type of waste, in terms of recovery operations and waste hierarchy.

### References

- [1] Emergency ordinance No. 92/2021 of 19 August 2021 on the waste regime
- [2] [http://mpt.upt.ro/resurse-utile/nou/pdf/cursuri/DDPM/Curs\\_DDPM.pdf](http://mpt.upt.ro/resurse-utile/nou/pdf/cursuri/DDPM/Curs_DDPM.pdf)
- [3] Waste Directive 2008/98/EC
- [4] National waste Management Plan, version 5, POCA 2014–2020, 2.11.2017
- [5] <https://op.europa.eu/webpub/eca/special-reports/environmental-accounts-16-2019/ro/>
- [6] [https://insse.ro/cms/sites/default/files/field/publicatii/conturi\\_economice\\_de\\_mediu\\_5.pdf](https://insse.ro/cms/sites/default/files/field/publicatii/conturi_economice_de_mediu_5.pdf)
- [7] <https://greenweee.ro/>
- [8] [https://ec.europa.eu/commission/presscorner/detail/ro/ip\\_21\\_5649](https://ec.europa.eu/commission/presscorner/detail/ro/ip_21_5649)
- [9] [https://ec.europa.eu/environment/resource\\_efficiency/documents/factsheet\\_ro.pdf](https://ec.europa.eu/environment/resource_efficiency/documents/factsheet_ro.pdf)
- [10] <https://www.businesspress.ro/grupul-velux-renunta-aproape-in-totalitate-la-plasticul-din-ambalajele-ferestrelor-de-mansarda/>
- [11] <https://www.zf.ro/supliment-zf-green-economy/romania-pe-harta-reciclarii-cum-inchidem-circuitul-20042698>



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