

## **The economic efficiency of waste management policies**

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**Abstract.** *Waste management represents a new trend in the economic market. On the one hand, it is important to protect the natural environment in which everyday society carries out its activities, which is obviously a concern of the European Union. On the other hand, waste management processes represent a new business, a new opportunity to achieve efficiency processes in the use of products consumed as waste in the local market. In both cases, it is important to delimit the conceptual framework in order to recognize, on the one hand, the need for concrete and up-to-date directives that establish strict rules for waste management and, on the other hand, to allow economic operators to comply with current legislation without causing harm even without the possibility of an alternative. The aim of the present work is to analyze the nature of this area of activity and to delineate the importance, the need and the necessary measures to create an economically efficient framework that promotes the sustainable way of doing business. On the other hand, the need for awareness is equally important, because the decisive factor in maintaining normality is the individual in society. In order to comply with all the rules imposed by current legislation, it is necessary to establish clear legal rules prescribing certain behavior. Instruments such as the guarantee fee for the packaging of end-user products or the transfer of responsibility are crucial factors for good management of waste management processes.*

**Keywords:** waste management, recycling, energy economy, sustainability, profitability.

**JEL Classification:** Q30, Q20, Q28, Q53, Q51.

## 1. Introduction

The modern economic paradigm takes environmental concerns into account more than ever. Both on the renewable energy side and on the waste side, economic policy decisions are currently largely based on good resource management. The ultimate goal of all decisions and governance systems aimed at protecting the environment is to reduce waste, increase the level of reuse of resources and well manage the waste generated by daily activities (Derraik, 2002). Economic policymakers have several attributes and a wide range of tools with which to achieve these goals, be it the tax system, the introduction of environmental laws or the granting of monetary benefits that encourage environmentally friendly activities. Among the most important problems facing society today are those related to the environment (Bogmans et al., 2018).

They arise from the exploitation by individuals of natural resources, fossil fuels and minerals, which are increasingly used in recurring economic activities, and from the exploitation, which is unsustainable over long periods of time, of vital resources of society such as water or soil and other components, which change the main production factor of all economic activities, namely land. As a result, the European economic model of economic development now also covers environmental issues (Salam et al., 2020).

The question arises of identifying opportunity costs that delineate the economic need of organic development and that of waste generation and use of resources that generate social costs that reach a certain level to cover the positive effects of economic growth (Liu et al., 2021). Therefore, it is necessary to clearly distinguish the need to achieve financial goals from the level of failure and environmental degradation (Bogmans et al., 2018). Currently, the European Union's import level is higher than its export level. It should be noted that import refers to goods and not services economies, meaning that more waste is generated locally in the EU territory than is produced. This requires a higher level of waste collection than could be integrated into economic activity. Therefore, many of the resources that are ultimately consumed in the EU are only used for a short period of time and often represent an economic loss as these waste products are stored and devalued due to lack of reuse or malmanagement (Azad et al., 2020).

The devaluation of waste automatically implies the lack of efficiency of the final product, which generates higher costs on both the social and environmental sides, which automatically leads to a reduction in the quality of resource recovery measures available to economic actors. The economy of the European Union is a mixed economy based on both services and the production of goods, representing a serial specialization of each economy, which is an integral part of the current European system (Farzipoor Saen et al., 2021). The most important goods, which represent a permanent, uninterrupted flow of resources and natural products, include crops, water, wood (in various forms, including wood), ores, energy production and electronic components. Imports account for a significant proportion of all of these resources and, consequently, an increasing demand for these products leads

to an increase in imports. Reliance on material from external sources may represent a vulnerability for local actors, especially in the context of intensifying competition for natural resources (Liu et al., 2021).

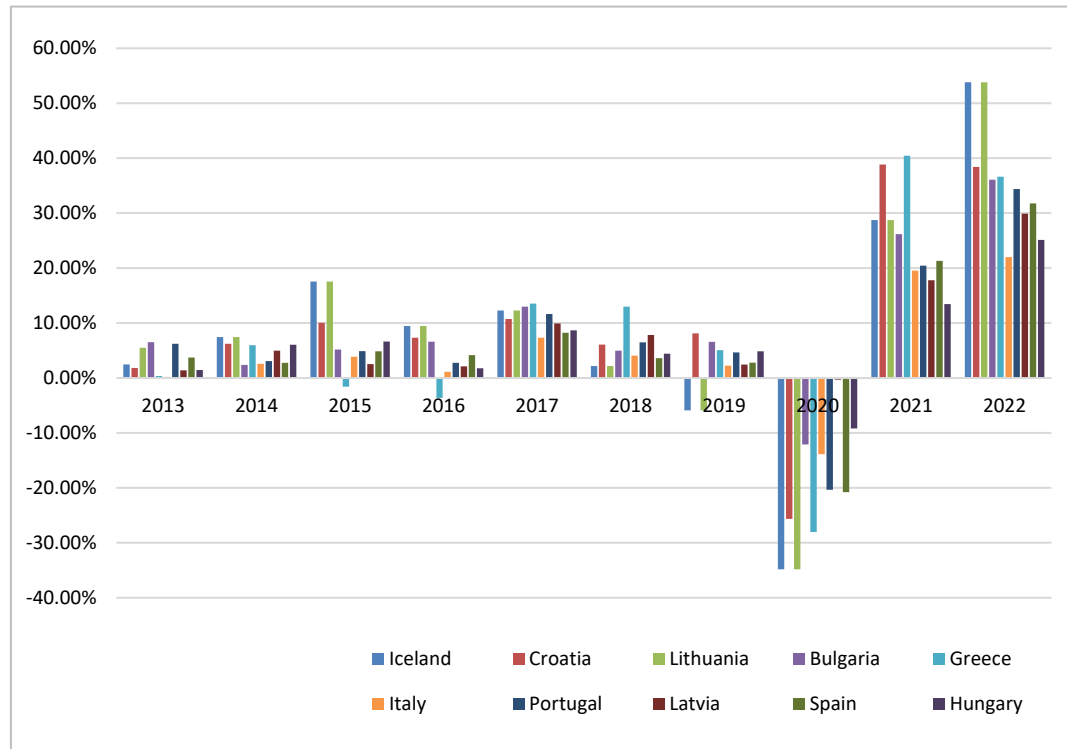
## 2. Literature review

The need to make the waste recovery process more coherent, precise and continuous has led to the emergence of the concept of circular economy. The ultimate goal of this approach is to align economic processes with assets that aim to amortize the value that products can bring after their use (Azad et al., 2020). Fundamentally, the circular economy offers an overview in which the utility of a good is given not only by the marginal effects of consumption, but also by the residues it leaves behind, which can become an integral part of future activities. Looking at production from a circular perspective, the value added of a product is directly proportional to the number of economic processes in which it can participate.

Relevant circular economy policies have extensively addressed resource use, production and consumption of residual waste. The concepts and principles aim to close the loop of the materials used by integrating as much as possible the goods considered as waste in the economy, that is, the value of products and materials that are considered specific resources. The process and policies aim to improve the impact of waste generation and automatically consume less and less raw materials, activities that over time would lead to a reduction in the social pressures associated with production (Bogmans et al., 2018). The use of raw materials leads to environmental pollution due to the processes to which they are exposed. Most often these are activities related to the extraction, production, use and management of waste.

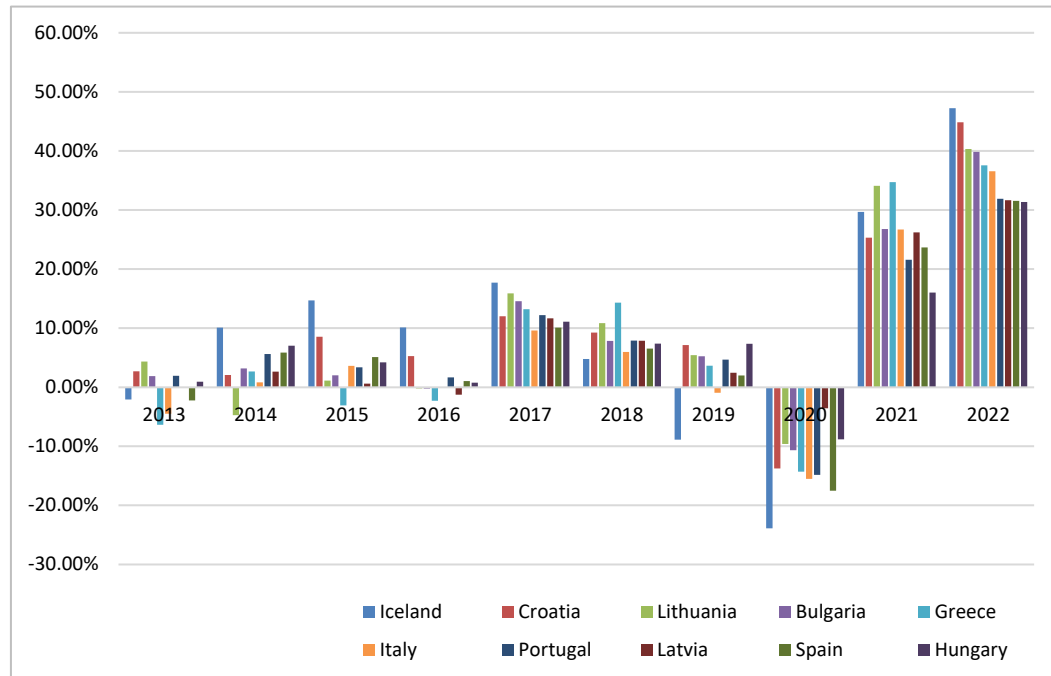
Therefore, some goals of environmental economic policy are to reduce the amounts of materials used in economic activity. The result would be more efficient use of resources, waste treatment, the creation of residues introduced into economic activity, the reduction of waste generation and the transformation of all these goods considered as waste into value-added resources.

To conceptually illustrate the importance of import and export levels, the trade balance data of the ten largest economies were extracted according to their import levels in 2022. The data collected from the Eurostat database was in millions of euros and for the graphical representation the percentage change compared to the previous year was calculated ( $n/n-1$ ). Fig. 1 is representative of the export levels of the economies and Fig. 2 is representative of the import levels. The significant deviation in 2020 is due to restrictions caused by the Covid-19 pandemic. From the graphic representation it can be clearly seen that the level of material imports has increased significantly, and at the moment it is not only about the recovery of international economic relations and trade, but also about the strengthening and development of economic activities of an intra-European nature.

**Figure 1.** *Top 10 countries by trade balance (Exports)*

**Source:** Authors own processing of data from OECD.

However, the approach of large companies has changed and continues to be influenced by the economic situation. The development trend, economic conditions, monetary situation as well as the macroeconomic stability of the development level are key factors in creating a business environment that can adopt the already existing best practices for good resource management. Over the last decade, there has been a decline in resource consumption at EU level, mainly due to trends in economic development and structural changes in the economy that have occurred as a result of disruptions in the social system resulting from crises. Currently, resource consumption varies greatly from country to country. The elements that lead to such discrepancies are the national regulations of individual economies, the lack of clear guidelines at a centralized European level and the pressure from deliberate trading as an independent part of some savings for local consumption as well as the security of supply of critical raw materials. In addition, compared to traditional methods, current processes mean waste management and the generation of as little waste as possible.

**Figure 2.** Top 10 countries by trade balance (Imports)

**Source:** Authors own processing of data from OECD.

Waste generation trends are currently relatively stable, and the current trend is to separate economic development from the reconstruction generation process. At the same time, leftover goods are increasingly perceived as a valuable resource for the economy. However, the differences between the Member States of the European Union are still large, so there are points where the accumulation of waste leads to economic losses for the EU and also entails a higher risk of dependence on resources coming from the territories be imported origin. All of these aspects require a clear delineation of attributes, norms and legislation at the European level, which must be implemented unilaterally by all member states (Farzipoor Saen et al., 2021). However, this must be implemented gradually or differentiated for each economy, because different levels of development lead to the formation of special characteristics that create different needs for each country in order to be able to develop fairly and not equally. Therefore, UU legislation for the proper management of waste and waste materials is an important factor for the proper management of the economy (Saidani et al., 2021).

### 3. Data analysis

This paper uses a systematic literature review to analyze the effectiveness of some waste management policies and regulations from an economic perspective. A complex analysis of progress reports, policy reports and evolving literature was carried out to identify the studies most relevant to the topic proposed in the article in order to provide a starting point

and initiate a critical approach to waste management. The works constituting the literature and the analysis of the work were selected, synthesized and evaluated based on well-defined criteria, such as: B. Accuracy of research methods, empirical evidence, relevance to the proposed topic, and the quality of the institution that issued and continues to issue standing regulations. The findings in this article are summarized to identify common future themes, trends for future research, and gaps in the current literature.

#### 4. Finding

Current European legislation aims to identify gaps and inefficiencies in the use of essential resources to achieve environmental goals. In summary, environmental objectives at EU level are limited to protecting, preserving and improving the flow of raw materials used in economic activity; Reducing carbon dioxide factors and increasing electricity consumption to eliminate polluting and unsustainable consumers, as well as protecting biomass to reduce the risk of disease or hazard formation and improve risks (Wu et al., 2020).

The objectives proposed in the European Union legislative package are supported by specific policy instruments. The formation of a competitive framework that enables efficient use of resources as well as secondary resources from waste processing are essential factors of waste management processes (Khatib & McDonald, 2020). The European Union's operational plan for waste management envisages addressing the different paradigms of the circular economy and realizing them through the implementation of concrete measures. With regard to resource efficiency, there are two projects called “roadmaps” which consist of (1) increasing resource efficiency and (2) transitioning to a low-carbon economy (Hoorweg et al., 2013). The measures taken by the authorities aim to update and transform the linear growth model of the waste type “acceptance, processing, production, consumption, waste” by integrating the unrecovered value of the waste generated. As outlined in the EU Circular Economy Action Plan, this requires changes along supply chains, in particular in product design, business models, consumption decisions and waste prevention and management. Of the legislative package discussed, which is intended to be amended and adapted to the new needs of the market, the area of management of processes with harmful effects on the environment and with high potential for waste reduction is one of the main vectors. The EU's areas of action include waste storage, the disposal of batteries and accumulators (for the toxic substances they contain), the disposal of end-of-life vehicles and cars, and the storage of electronic and electrical equipment. In addition to these aspects aimed at good management of recyclable waste, there are also legislative packages and concerns related to municipal waste, packaging and household waste arising from collection within households (Bogmans et al., 2018). One of the goals set at the European Union level is to halve the amount of household waste by 2030 compared to 2020 (Saidani et al., 2021).

Another work regulation to be introduced is the disposal of hazardous waste, which poses a biological hazard and is generated mainly by companies that produce goods, but also by households, which have the highest frequency of this waste. Most often these are various

containers for medicines or packaging for the transparent storage of chemicals such as industrial detergents or other derivatives (Hoorweg et al., 2013). They have a different working regime and must be collected separately and managed individually at collection points. Otherwise, a lack of coordination could have various consequences, including environmental pollution from the incineration of waste, contamination of raw materials from disposal with contaminated materials and a reduction in the quality of future production. One of the proposed solutions is the extended producer responsibility system. This instrument imposes a certain behavior on the producers of such materials by imposing the obligation to check and control the entire process, the entire material cycle (Derraik, 2002). Therefore, for all products that they intend to sell on the market, manufacturers are obliged to ensure the visibility, collection and recovery of materials that can be put back into use or that must be destroyed at the end of the consumption process (packaging). (Goulder & Parry, 2008).

Therefore, in order to achieve the objectives set at European level, it is necessary to develop clear rules and laws that establish the level of responsibility and the measures that each economic operator in the supply chain must take, as well as the attitude that they must adhere to in contributing to waste consumption afford. Waste management policies are the main factor in maintaining a sustainable environment (Azad et al., 2020). The instruments that the EU wants to develop must focus on reducing the waste of basic goods, increasing the recycling rate of used materials, improving the cost-effectiveness ratio of products manufactured on EU territory, as well as Waste management of products from the EU territory concentrate non-Euro area (Goulder & Parry, 2008). As a result, waste management policies act as key tools in addressing local challenges related to increasing waste accumulation and its harmful effects on the environment, as well as reducing the efficiency of production activities. These tools include a very wide range of strategies aimed at minimizing waste generation and achieving the objectives described above (Koushki & Behzadian, 2020).

As with any other policy, its effectiveness is not based solely on its formulation, but rather on its implementation and continuous adaptation of these instruments to the needs of society. At the heart of this policy is a stable legal framework that regulates the legal basis for economic activities whose main purpose is waste management. The law regulates standards for the treatment, disposal and recycling of waste. In addition, in addition to the waste treatment, disposal and recycling standards, this provision also establishes the corresponding penalties for non-compliance with the required standards and clearly establishes the degree of responsibility of all parties involved in the recycling process. The main frameworks underlying the development of the waste management package are the Stockholm and Basel Conventions. The documents drawn up following the two events set out the basic principles on which the current law is being developed, which aims to reconcile economic activities with the need for environmental protection and automatic demarcation through a cost-benefit analysis (Koushki & Behzadian, 2020). The measures regulating economic activity play a key role in the operational processes of waste management policy by providing specific standards that allow individuals to orient

themselves and deal with waste in a proper and authorized manner. The working methods covered by the laws include permits for waste treatment plants, limits on emissions from incineration imposed on companies, and regulations on landfilling to protect the environment. These practices provide strong incentives to promote waste reduction and recycling and subsequently internalize the costs associated with environmental pollution (Nabavi-Pelesaraei et al., 2020). The most visible and understandable examples are, on the one hand, the introduction of landfill fees for waste generated, practical payment systems when disposing of products, the provision of financial rewards when recycling, as well as bundles of laws that, on the one hand, change the calculation of the cost-benefit analysis for companies, but also for consumers.

Although this approach is currently the most efficient process for controlling and managing residues, it is not enough. Measures aimed only at improving the pollution process are effective because they reduce the amount of waste generated. On the other hand, however, the problem of managing these resources remains, which remain inactive and unused in the market. The complementary approach should be to promote the phenomenon of technical development, industrial modernization and investment in the necessary infrastructure as well as in producing economic operators, with the aim of changing the traditional production model and making room for new resources through the space is reintroduced into economic activity. Technological innovations are therefore indispensable tools for the waste management strategy (Nabavi-Pelesaraei et al., 2020). They enable the development of more efficient processes for sorting, treating and recycling waste. Advances such as automated sorting systems, anaerobic digestion, treatment systems, pyrolysis and plastic recycling increase the production activity and efficiency of the end products. New technological trends can also be used to modernize the work system, as new systems such as artificial intelligence and blockchain systems facilitate the transparency and traceability of waste management supply systems and help optimize resource allocation, reducing illegal waste trafficking.

Another aspect of policies aimed at good waste management consists of public awareness campaigns and public education as social tools to involve the end user in the recycling process. Community engagement is often the most effective method, but also the most difficult to engage (Zaman et al., 2020). Waste management policies would be directly applicable if the end user was aware of all aspects related to the environment, which requires a high level of transparency from companies. However, the social impact has long-term consequences, as it is a matter of making the consumer aware of all these aspects over a long period of time. As a result, there has been a need at the European Union level to increase the level of participation and awareness in a shorter time, since the impact of waste management has recently become one of the fundamental priorities that require the immediate attention of the authorities. For this, a tax was levied based on a circulation system (Fullerton & Kinnaman., 1996). Basically, a certain amount is added to the product cost, which serves as a guarantee that the product can be recycled. The amount of money will be returned to the consumer in various forms when the product arrives at official collection points. In this functioning system, the cost-benefit analysis determines the level



of this guarantee. The quantification depends on both the predicted amount of waste and the amount of packaging recovered, with cumulation based on products either important from other countries or manufactured within the European Union. The fee system works on the same principle as the specific pollution system, namely “the polluter pays”. This controls the entire flow by taking responsibility for recycling, which is represented by a certain amount of money. This amount is considered an environmental tax, which theoretically represents the cost of improving pollution (Zaman et al., 2020).

## 5. Discussion

The instruments used as waste management policy include a multilateral approach that aims to integrate legal, economic, technological and educational regulations in order to create an environment conducive to compliance with environmental safety standards. Policymakers can use these diverse toolkits to address the complexity of the waste management system. As environmental pressures increase, effective implementation of waste management policies emerges as a key imperative to protect biomass health. Recent analyzes show that economic policy plays a key role in shaping management outcomes and brings significant changes in the rationalization of economic processes. It has been demonstrated (Hoornweg et al., 2013) that landfill fees and incineration tariffs reduce the extent of waste disposal and encourage a shift towards more environmentally friendly, economically and socially efficient options (Fullerton & Kinnaman, 1996). Likewise, “deposit refund” systems for end-use containers such as beverages or individually packaged foods have proven effective in increasing recycling rates and automatically reducing consumption waste. However, the development of regularly updated policies is the main mechanism for changing the behavior of economic actors. Therefore, for example, the level of taxation and the mechanisms of application and distribution of revenue are fundamental elements that determine the success or failure of taxes collected at waste collection points (Salam et al., 2020). Therefore, constant monitoring and coordination of the institutions representative of these phenomena is necessary to ensure a coherent process that achieves a certain efficiency and thus achieves the essential points.

## 6. Conclusion

In conclusion, the present study aims to highlight the importance of developing economically efficient economic policies for better waste management in order to achieve more sustainable production activities for resource conservation. While economic instruments can provide opportunities to internalize external costs of waste generation, their effectiveness depends largely on external factors such as the quality of policies and their quantifiability. Future analyzes should aim to fill gaps and knowledge gaps while refining policy strategy to make waste management processes more efficient. In this way, economic distortions and social inequality can be significantly reduced, since environmental elements, by virtue of their economic activity, have the possibility of alleviating economic problems or inequalities at the microeconomic level, be it at the level

of a household or at the macro level, in this In this case it is about the development of an entire area of activity. While economic instruments offer promising opportunities to internalize the external costs of waste generation, their effectiveness will largely depend on how environmental policies are designed, but especially on how they are implemented in practice.

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