

Circular economy and economic instruments in the EU and Romania

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Abstract This paper aims to present and analyse some of the most relevant environmental economic instruments specific to the circular economy, focusing on waste management. Since circular economy (CE) is a related strategic objective of the European Green Deal, in the EU the most used economic instruments to promote CE are the waste management tools. The approach is meant to research the sustainability of these economic instruments in the case of the Romanian Environmental Fund. The research method used was the review of recent specific literature, the selection of the most relevant indicators and collecting statistical data corresponding to the analysed indicators. The analysis was made by processing the statistical data provided by Eurostat and the National Institute of Statistics (INSSE) with Excel software and by interpreting the results. The results of the research highlighted the current increased awareness and the occurrence of circular economy policies involving many economic instruments. Nevertheless, data analysis and the actual processing reveal a low share of revenues resulting at national level from the application of specific economic instruments for waste management. Although the value of taxes for the circular economy increased in the analysed period (2013-2023), almost 100 times (from approx. 8.000 lei to approximately 800.000 lei), their share in total taxes to the Environmental Fund decreased from over 80% in 2013 to only 11.7% in 2023. The originality of the work consists in the angle of analysis of the environmental economic and financial instruments used at national level to boost the circular economy. Also, personal conclusions and recommendations were made by the authors, based on the results of the research conducted.

Keywords: circular economy indicators; financial instruments; statistical indicators; waste management, Environmental Fund in Romania

JEL classification: H23, K32, O13, O 44

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1. Introduction

The circular economy is a complex concept with economic, environmental, and social implications. A circular economy reduces the negative environmental impacts connected with the usage of fundamental materials throughout their life cycle. In addition, the economic and social benefits are significant and necessary for countries implementing circular economy strategies.

Without any doubt, the concept of circular economy (CE) is fundamentally tied to waste treatment and recycling. As a result, research on CE policies focuses primarily on waste treatment, including waste disposal from industry. The research indicates that companies must invest in analysis, organizational reconfiguration, and employee retraining in order to minimize waste throughout the production procedure and product life cycle (Reh, 2013, Hauschild et al., 2017).

Evidence from research and best practices in several EU member states that have made significant strides in CE implementation - such as Italy, Belgium, France, and Holland—indicates that economic-financial instruments can play a pivotal role in facilitating not only the shift to a circular economy, but also sustainable development and the adaptation and mitigation of climate change.

At the EU level, there are now 82 binding targets and 84 non-binding targets in place to address socio-economic concerns that have to become operational between 2013 and 2050. Many of the aims address both the environment and the socioeconomic environment simultaneously. Achieving these complex objectives frequently necessitates the use of Market Based Instruments (MBI) in conjunction with current norms and standards. Tradeable licenses and subsidies, producer responsibility programs, tariffs, and environmental fees are among the most often utilised MBIs. Currently, there are 18 mandatory and 24 non-binding MBIs based on EU environmental legislation. The goal is to develop an appropriate policy and regulatory framework that can ensure a level playing field for circular economy business models by eliminating subsidies that reward linear behaviours and fully setting prices, including risks and externalities associated with material production and linear use. It also facilitates and accelerates capital allocation to circular investments and activities, increasing private sector financing while maximising public funding leverage. Tax-transfer programs, or environmental tax reform (ETR), are high on the political agenda, as seen by the Europe 2020 strategy. While most nations have environmental protection laws, the present implementation of environmental taxes in the countries covered by the European Environment Agency (EEA) reveals that energy and transportation taxes are by far the most often employed.

The primary goals and benefits of environmental taxes are to persuade polluters to minimise pollution and to contribute to the efficient use of natural resources. There may also be a secondary advantage, such as income generating. Government Decision no. 1172 of September 21, 2022, adopted the national strategy regarding the circular economy in Romania and the action plan. The action plan will propose and describe concrete actions to orient the Romanian economy towards circularity, building on the vision, mission, and high-level objectives for the transition process.

The main research objective of this paper is to analyse the development and sustainability of the environmental economic instruments dedicated to the circular economy in the case of the Romanian Environmental Fund, since the research hypothesis is that the use of these instruments is highly recommended. The secondary objective is to highlight the functions and mechanisms of economic instruments for waste management in the CE outlook.

Certain types of waste have a particular status, and their handling is specifically regulated through EU Directives which are fully transposed into Romanian legislation and should be managed according with national legislative texts. Among these, the authors shall discuss the economic tools that play a role in the management e-waste or WEEE management, packaging trash, and biodegradable garbage etc. Part one of this article will focus on economic instruments at the national and EU levels, while part two will examine the instruments linked to the circular economy in Romania and how they have developed in time.

2. Literature review

A survey of the leading theories and research on the efficacy and appropriateness of different policy tools for promoting recycling, resource efficiency, and the circular economy might prove fruitful.

Ekvall et al. (2016) undertakes a significant study that examines various policies aimed at increasing resource efficiency. These policies include material taxes and levies, extended producer responsibility, technical requirements, and extra policy instruments. Both the study by Hughes and Ekins (2018) and the work by Wilts and O'Brien (2019) highlight the need for policy consistency, instrument design, and synergies in order to maximise resource efficiency. In the context of the present analysis, since the focus is on the European Union, it may be subtracted from the 2015 launch of EU Action Plan for Circular Economy (European Commission, 2015) that increasing resource efficiency and downsizing the environmental stress are the main objectives of implementing circular economy (Whicher et al., 2018; Frone et al., 2015).

The shift to a circular economy is also one of the related goals of the European Green Deal. The most recent CE Action Plan has a section on "economic justification" that proposes and encourages the broader application of monetary or non-budgetary regulations and tools, such as environmental taxes (including waste taxes), grants, the removal of financial assistance for non-renewable resources, and circular public procurement. A holistic analytical approach is advocated by CE policy expert Milios (2018), who focuses on efficiency-based feedback loops and synergistic efforts across the product lifecycle. The specialised paper (Milios, 2021) lays forth a "circular economy taxation framework" that uses levies and taxes on materials, finished goods, and garbage. From the extraction and input of resources to the disposal of waste, this framework considers every step of the product life cycle.

An important previous study addressed the concepts, the purpose, the evolution and the state of the waste management and recycling in EU and in Romania, in view of a green economy (Frone et al., 2020). Nevertheless, latest in-depth research on the correlation between business models for circular economy and public policies (Constantinescu et al., 2022a, Platon et al., 2022, 2023) confirmed the importance of these circular policy areas and highlighted new areas of environmental-economy synergy, such as circular eco-innovation. Also, the study dedicated to the prospects of financial public policy for the advance of the circular economy (Platon et al., 2023b) shows that, for example, taxes on production and imports should be maintained at a moderate level to develop CE.

A very comprehensive analysis published in 2023 presents the compatibility of circular economy and economic growth issues in Europe's path towards sustainable development. The results of this research suggest that municipal garbage generation may decline because of a number of factors, including overall emissions of greenhouse gases and gross fixed capital creation, while others, such as GDP and final energy consumption, contribute to an increase in waste generation. This study indicates that implementing sustainable energy and environmental legislation along with circular economy practices can help Europe make the shift to a green economy. It also emphasizes the importance of citizen engagement, education, and collaboration between stakeholders in achieving sustainable development. The authors suggest implementing sustainable practices such as renewable energy sources, green procurement policies, and recycling of municipal waste. Overall, the paper highlights the intricate nature of the process of environmentally friendly development and the role of the circular economy and energy transition in achieving environmental and economic goals (Apostu et al., 2023).

The circular economy and the consequences of European environmental policy for businesses and industry stakeholders are covered in a recent article (Camilleri, 2020). The paper highlights the importance of the circular economy in achieving sustainable supply chains and offers suggestions for decision-makers in government and business. The authors state that the transition to the circular economy may face challenges, such as the reliance on linear economy models, difficulty in reusing and recycling materials, and lack of financial resources for green investments. In order to turn policies into effective actions, the EU must, however, get beyond these obstacles and work with stakeholders.

A paper developed by Sumrin et al. (2020) discusses the importance of eco-innovation in the packaging industry with focus on eco-friendly packaging design and its impact on waste prevention and brand attachment. It highlights the need for firms to adopt eco-innovation strategies to address environmental concerns and meet consumer demand for sustainable packaging. The paper also explores the antecedents and consequences of eco-innovation, as well as the research agenda for further study in this area (Sumrin et al., 2020).

Another document presents the impact of consumption policies on the development of circular economy EU business models. This study examines the connection between organizational development of CEBM (circular economy business models) and institutional regulations, with a

particular EU focus. The authors argue that while previous research has focused on production-oriented policies, consumption policies also significantly influence how the demand for circular economy products is shaped and how it affects the development of CEBMs. The findings of the study reveal that consumption policies have a positive, albeit diminishing, effect on the development of CEBMs. The most effective policy is shown to be regulation, which has a greater effect than production policies (Arranz et al., 2023).

A research document discusses the link between sustainability, circular economy, and economic growth, and the impact of selected indicators of a circular economy on the EU economic growth (Hysa et al., 2020). The purpose of the study is to ascertain whether the key elements of a circular economy that promote sustainability and development have a major effect on economic growth. The research uses a fixed effect panel data analysis and a generalized method of moments to analyse the data. It also discusses the different perspectives on the circular economy and its impact on the environment, society, and the economy. The analysis's findings demonstrate that every circular economy indicator—aside from trade in recyclable raw materials, which was determined to be negligible—has a favorable effect on economic growth. The environmental tax revenues and recycling rates were found to be significant at 1%, indicating their importance in promoting economic growth.

With regard to the actual influence of taxes and environmental economic instruments on the circular economy, which is the objective of this paper, some recent or ongoing studies and researches aim to clarify the specifics, extent and perspectives of this influence.

For instance, according to Mihai et al. (2018), existing environmental taxes do not influence the economy's fundamental linear structure, even though they aim to alter economic behaviour and decrease certain externalities. However, other articles (e.g., Vence et al., 2021; Frone et al., 2021) examine other environmental tax reform strategies that have the potential to bring about substantial social, economic, and ecological advantages. Waste taxes can promote circular economy methods, according to other recent research on waste management techniques (Freire-González et al., 2022; Gabor et al., 2023). Studies (Ha, 2023) for Europe and (Topliceanu et al., 2023) for Romania published remarkable results confirming the role and impact of environmental economic instruments on the circular economy. These studies used different variables and econometric models. The findings show that environmental levies and taxes have different impacts on the circular economy across Europe. Based on the sectoral performance of Romania's waste recycling and reuse, specific economic instruments and taxes are suggested.

A thorough econometric analysis (Constantinescu et al., 2022a) showed the interdependency between two factual indicators of circular economy - eco-investment and e-waste recycling. The analysis performed for a ten-year period at European level highlighted the real influence that these two indicators have on each other's evolution, specifically that even a slight increase of eco-investment would create a big improvement in e-waste recycling. Expanding this field's research, another paper (Platon et al., 2022) examines the relationship between recycling and innovation, necessary for implementing circular economy at European level. The research was focused on two particular indicators - patents and CMUR – which showed a similar trend: clustering (catching up countries, average performers and leaders) and uneven distribution among member states. The research advanced by introducing the influence of Euro Area membership on the two indicators and highlighted the positive influence arising from this analysis. Eco-innovation and circular material use were analysed from a different perspective in a recent paper (Platon et al., 2023). The paper uses a panel data regression for 27 European countries for a ten-year time frame. The outcome of this research states that reducing material footprint can be influenced by recycling and eco-innovation. All these are continuous research efforts. The authors have a long-term interest in analysing the evolution of sustainable development in European Union countries (Platon et al., 2006).

3. Methodology

This article's research approach involved several stages:

- a) the review and analysis of specific literature in order to understand the objectives, the policies and the latest trends in the circular economy theory and practice;

- b) the second section of the paper approaches the economic and financial instruments and policies currently in use for circular economy in the European Union with several examples; further provides the conceptual definitions and functions of the environmental economic and financial instruments, and their dedicated statistical indicators, as detailed in the “Policy Instruments for the Environment” (OECD PINE, 2023) database;
- c) collecting statistical data corresponding to a set of indicators specific for the main environmental economic instrument used in Romania, mainly the Romanian Environmental Fund (REF). Within the REF there are identified and analysed the economic instruments dedicated for circular economy;
- d) processing the statistical data available for the selected indicators using Excel software, enabling dynamic analysis based on graphs and tables;
- e) interpreting the results and drawing conclusions, as based on research analysis and synthesis.

It must be emphasized that the data used were those available at the National Institute for Statistical Research (INSSE) and at The National Administration of the Romanian Environmental Fund. The numbers are nominal values.

4. Economic and financial instruments for waste management

Various financial tools, including taxes or incentives, can serve the purpose of internalizing external costs based on taxation of pollution or waste resulting from the manufacture and consumption of a given product. In this respect, the following four principles should be considered to formulate policy instruments and interventions:

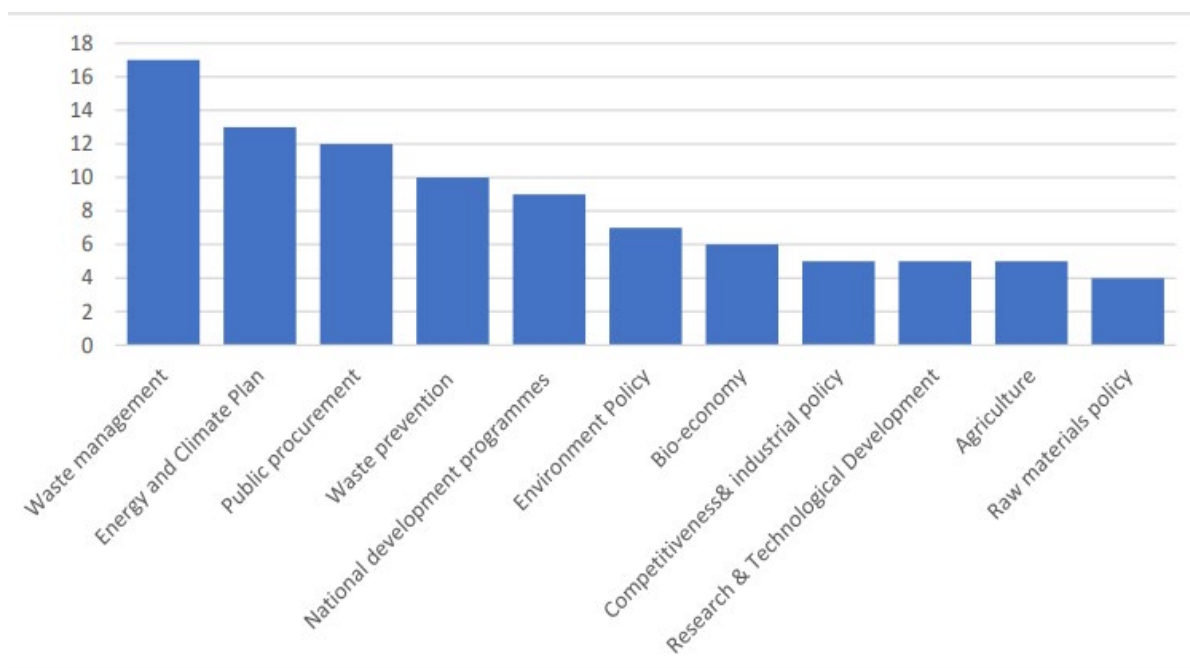
- Preservation and production of value.
- Proportionality (in relation to externality level).
- A steady dematerialization process.
- Flexibility and sensitivity to innovation.

In addition, any policy-making aimed at transition to the circular economy (QA) should reflect the principle of additionality, i.e. that new policy interventions should integrate in a sustainable manner and support consistently the implementation of economic and/or environmental policies.

4.1. Economic and financial policies and instruments for the circular economy used in the European Union

The instruments and directions for promoting CE are already integrated into many economic, financial and environmental policies of EU countries, as shown in Figure 1. Given the prevalence of these circular economy practices in many nations, the authors will take a quick look at the principles and procedures of CE as they pertain to environmental and waste prevention and management-related financial instruments.

Figure 1. EU countries with circular economy elements in different public policies (no)

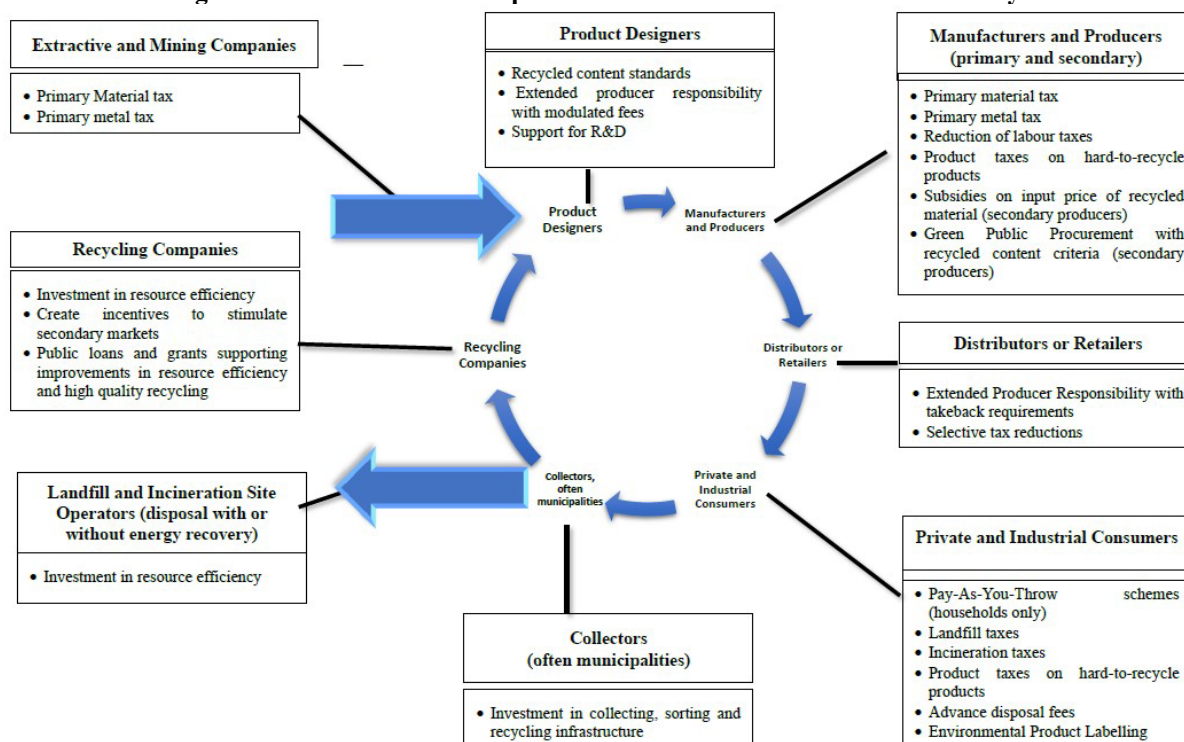


Source: European Commission, 2021.

Figure 1 shows that waste management tools are the most used to promote the circular economy, being used in most EU Member States (17 states), followed by policies and instruments dedicated to energy and climate change (in 13 Member States), circular public procurement (in 12 Member States) and waste prevention (10 states). Environmental instruments and policies are also projected as relevant to CE in 7 EU Member States. Among the most popular and effective tools for environmental policy relevant to the Circular Economy is extended producer responsibility (EPR) (EC 2021, European Environmental Bureau, 2014, OECD, 2016, 2022).

The foundation of EPR is the polluter pays principle, which pushes manufacturers to accept accountability for the environmental effect of their goods over the course of their life cycles. In order to prepare for the transition to CE, EU countries have started to broaden the scope of EPR programs to encompass a wider variety of products, such as furniture and textiles.

Furthermore, countries like France, Belgium, and the Netherlands (advanced in the CE implementation, according to Platon et. al., 2022, 2023a) are exploring improved modulation of these fees in order to penalize non-recyclable products and encourage eco-design and recycled content. Traditionally, taxes for deposit-refund systems have been set per unit or per weight. Economic tools like taxes, subsidies, and exchangeable permit programs are frequently employed to accelerate the shift to a circular economy (OECD, EEA, 2022). Levies and taxes on primary materials stimulate resource efficiency by raising the price of obtaining and utilizing raw materials and natural resources, while landfill levies are one effective way to redirect waste streams for recycling or reuse. Environmental subsidies can encourage increased resource productivity, in addition to stimulating the reuse and recycling of materials.

Figure 2. Policies and tools to promote the transition to a circular economy

Source: Self-processing OECD 2022.

Trading and capping systems are beneficial for waste management as well as payment systems proportionate to the waste generated (Pay as you throw - PAYT). Economic tools supporting the circular economy are available in a number of nations, including the France, Hungary, Netherlands, Belgium, Norway, Poland and Romania. Nevertheless, resource tax rates are typically too low to influence polluter behaviour or effectively increase resource productivity (OECD, 2016). To consistently support the transition to a resource-positive circular economy, policymakers need to adopt a life-cycle approach to cover more environmental impacts occurring throughout the life cycle of materials during extraction, processing, transport, usage and discarding of products and waste (Figure 2).

4.2. Definitions and organisational benchmarks regarding environmental economic and financial instruments

The following definitions have been compiled from the OECD PINE. A database called Policy Instruments for the Environment, or PINE, compiles comprehensive data on policy tools important to natural resource management and environmental preservation. The PINE database was first created in 1996 with a small scope and was gradually expanded. Data on more than 3900 policy instruments used in more than 130 nations worldwide are currently available in the database (OECD PINE, 2023).

The following definitions and clarifications address the most important policy instruments for the environment, most being economic or financial environmental instruments.

- *Environmental taxes and duties*

Environmental taxes are defined as any obligatory, unpaid (unrequited) tax to the government imposed on tax bases that are considered environmentally important, i.e., taxes whose tax base has a demonstrated adverse effect on the environment. Taxes are unrequited, which means that the advantages that taxpayers receive from the government typically do not match the amount they pay in taxes. This implies that a payment cannot be regarded as a tax or an obligation without a redistributive component. Regardless of the rationale for their adoption, environmental taxes and tariffs drive up the price of a polluting product or activity and so tend to deter its manufacture or consumption. In the OECD PINE database, the term environmental 'tax' is used to cover environmental taxes, duties and charges or fees.

The relevant tax bases are:

- Products related to energy.
- Transportation services and equipment.
- Pollution, which includes compounds that deplete the ozone layer, waste management, noise, and some non-point causes of water pollution. It also includes measured or estimated emissions to the air and water.
- Natural resources, including fisheries and wildlife stocks, water, land, soil, forests, mining, and quarrying.

However, there can be cases that are in the grey area; these cases are covered below. The definition of environmental taxes excludes taxes on resource rents (or any other kind of profit-related taxation) since they have no effect on relative prices; nonetheless, the proceeds from the auction of emission permits are included and designated as "taxes". Physical data and effective tax rates are not included by the database.

- *Commissions (fees or taxes)*

Commissions or fees are defined as mandatory refunded payments made to the government, which are assessed in a manner roughly proportionate to the services rendered. The phrases "fees" and "commissions" are used interchangeably in this database. Fees are charged for government services meant for a specific beneficiary, whereas taxes are used to raise money to pay general (or specialized) public expenditures. This is the primary distinction between taxes and fees. In the following situations, a fee may be deemed unrewarded or unrequited: when the payment greatly exceeds the cost of providing the service; when the levy-on does not receive the benefit; when the government does not offer a specific service in exchange for the levy it receives; or when benefits are only received by levy payers, but not always in proportion to their contributions.

- *Tradable permits*

Market-based tools that grant permission to participate in an activity are known as marketable permits. These licenses, which can be granted through a commercial mechanism, are frequently used to assign pollution rights. Trading systems can be broadly classified into two categories: reference and credit systems and cap and trade systems. A cap-and-trade system sets an upper limit on allowances and distributes permits through auction or free distribution based on predetermined standards. The terms "allowed" and "allowances" will be used interchangeably for the database's purposes.

The most popular kind of tradable permit imposes a cap on pollutant emissions. A different kind of marketable permit in the circular economy (CE) requires packaging manufacturers to reimburse a portion of the expenses associated with recovering and recycling their packaging by means of a series of certifications provided by approved reprocessors. These certificates are given out when packaging trash is recovered or recycled, and companies that are required to do so can buy them on the open market.

- *Deposit refund schemes*

Deposit refund systems are market-based tools that combine a product tax (landfill) with a reimbursement for suitable recycling or disposal (reimbursement), usually to deter inappropriate or unlawful trash disposal. They could be required by law or voluntary. Deposit reimbursement programs enable high rates of collection and high-quality materials to be gathered, hence reducing the need to exploit natural resources and enabling the use of recycled materials in place of new ones (they are useful and indicated in the circular economy). Deposit reimbursement schemes may comprise different sub-systems, depending on the subject matter or product they address. Beverage package recycling programs are among the most widely used deposit refund schemes. These programs involve taking a cash deposit from customers for sustainable container packaging at the location of sale and paying them back when the empty containers are returned to designated collection stations. There are such schemes in place for waste oil and old autos as well. This implies that delivery of old lubricating oil to designated collection locations may result in a return.

- *Subsidies for environmental protection investments*

If a subsidy for either environmental protection decreases the usage of anything, that has a demonstrated detrimental impact on the environment, directly or indirectly, it is considered ecologically driven. The database includes environment-motivated subsidies, which are government payments to

producers or favourable tax treatment meant to affect production levels, prices, or the compensation of production-related elements. Subsidies intended to increase environmental protection are: VAT exemption, direct subsidy for electric vehicles, feed-in tariffs, tax credits for investments in renewables, grants or loans to finance environmental projects.

- *Voluntary approaches*

When it comes to environmental policy, voluntary methods encompass all of the voluntary instruments that companies or industries use to make commitments to enhance their environmental performance beyond what is required by law. It's possible that a government agency and one or more private companies have environmental performance agreements in place with the goal of improving environmental performance above and beyond the obligations of regulatory duties. Furthermore, voluntary alternatives encompass industry-industry agreements regarding a specific code of conduct, which may entail external involvement in compliance oversight, as well as industry-only initiatives.

4.3. Environmental Fund of Romania – the economic and financial instrument of environmental policy in the field of special waste

In 2000, a dedicated entity called the Environmental Fund was established in Romania to oversee the national level administration of certain economic and financial instruments related to the management of special waste. This is an administrative and monetary tool created to assist and carry out environmental protection initiatives and programs in order to meet the environmental and climate change goals of the European Union in compliance with existing laws. The Environmental Fund is coordinated through the Environmental Fund Administration (hereinafter referred to as EFA) a public institution financed entirely from its own revenues, coordinated by the Ministry of Environment. EFA has the following tasks:

- a) monitors the establishment and management of the Environmental Fund;
- b) draws up the revenue and expenditure budget;
- c) analyses, selects and finances programs and projects for environmental protection;
- d) monitors and controls projects and programmes financed by the Environment Fund;
- e) financial support for initiatives to mitigate, eliminate, or otherwise lessen the impact of extreme weather on water management projects;
- f) elaborates the financing guides related to the categories of projects and programs for environmental protection, financed by the Environmental Fund;
- g) ensures that the amounts obtained from auctioning greenhouse gas emission allowances are used to finance programmes and projects in the field of environmental protection;
- h) carries out control activities at authorized economic operators in order to take over responsibility for achieving the annual collection, reuse, recycling and recovery targets for waste electrical and electronic equipment and at authorized economic operators in order to take over responsibility for achieving the annual collection, reuse, recycling and recovery targets for waste portable batteries and accumulators;
- i) carries out activities of recording taxpayers to the budget of the Environmental Fund;
- j) carries out tax inspections and unannounced controls on taxpayers/payers to the Environmental Fund;
- k) collects revenues to the budget of the Environmental Fund;
- l) provides assistance / guidance to taxpayers / payers to the budget of the Environmental Fund regarding the methodology of taxes and contributions to the Environmental Fund;
- m) prevents tax evasion in regard to taxes and contributions to the Environmental Fund;
- n) provides guidance to applicants and beneficiaries of funding from the Environmental Fund.

Economic instruments constitute the largest source of revenue for the Environmental Fund. These are set out in detail further in Section 3.

5. Analysis of economic instruments used in Romania

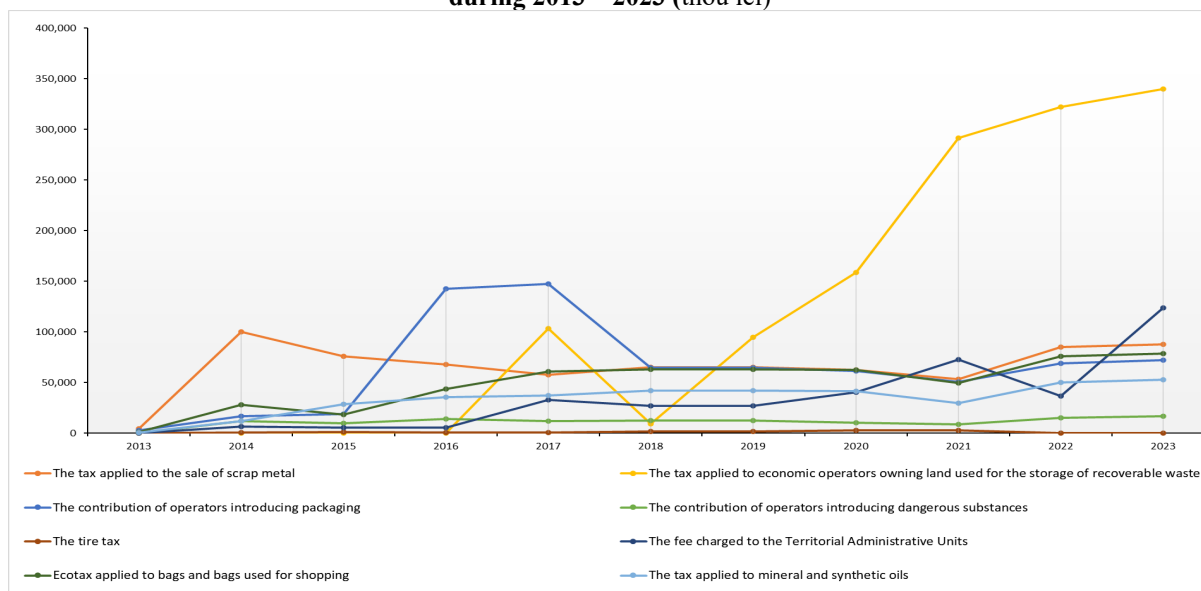
In accordance with the present Romanian legislation, the Romanian Environmental Fund collects revenues from approximately 30 sources, each of which constitutes an economic instrument for the management of special waste. Since the establishment of the Fund in 2005, these sources of income have changed in terms of percentage or time period. All changes were made through Government Decisions, part of the Romanian present legislation framework. The economic instruments that are part of the EFA portfolio can be grouped into two distinct categories: **circular economy specific instruments and other types of economic instruments**. They will be presented and further analysed, according to their mention in official documents and in the EFA budget.

5.1. Dedicated economic instruments for circular economy

An important number of economic instruments used by EFA for waste management and specific to the circular economy can be mentioned. The vast majority of these fees and contributions fall under the EPR (Extended Producer Responsibility) environmental policy system. All fees are defined in several official documents. The relative importance of each category of CE targeted incomes within the total revenue of the Environmental Fund of Romania is presented in full in Figure 3, allowing for a dynamic comparative analysis, as follows.

- i. **The tax applied to the sale of scrap metal** is defined in GEO 196/2005 as "a 3% share of the proceeds from the selling of scrap ferrous and nonferrous metal, obtained by the waste generator, natural or legal person. Economic operators engaged in garbage removal and/or recovery activities withhold the funds by stoppage at source; these operators are required to transmit the amounts to the Environmental Fund". It increased in total EFA revenues from 4300 thousand lei in 2013, reaching 65014 thousand lei in 2018. Since 2019, the percentage of this tax has decreased to 2%, but revenues have increased further, reaching 87719 thousand lei in 2023 (Figure 3).

Figure 3. The evolution of the CE targeted incomes of the Environmental Fund, by categories of income, during 2013 – 2023 (thou lei)



Source: own processing with EFA data.

- ii. **The contribution of operators introducing packaging** is defined in GEO 196/2005 as "a contribution of 2 lei / kg, payable to entrepreneurs who sell packaged goods that are sold in retail packaging for the first time on the national market. Also, the contribution is payable to business owners who professionally rent packaging in any capacity for the difference

- between the amount of packaging waste that is actually recovered or burned in energy-recovery and recovery-by-recycling facilities as opposed to the amount that is required to be recovered or burned in order to meet minimum recovery or incineration targets. As can be seen from Figure 3, these revenues had an oscillating evolution, with a maximum of 147095 thousand lei in 2017. Currently, in 2023, revenues from this tax are at the level of 72086 thousand lei, representing just over 1% of the total taxes to the Environmental Fund.
- iii. **The contribution of operators introducing dangerous substances** is stated in GEO 196/2005 as " a 2% share of the value of materials that economic operators place on the national market that are deemed environmentally hazardous by regulatory acts". This tax had an increasing evolution, the maximum being reached in 2023, namely 16430 thousand lei, below 1% of the total taxes to the Environmental Fund.
- iv. **The tax applied to economic operators owning land used for the storage of recoverable waste** includes, according to GEO 196/2005, the following two categories:
- "Fees levied on owners or, if relevant, landfill managers for non-hazardous and inert garbage that is entrusted to them for landfilling as a final disposal method", and
 - "Fees gathered from business owners who use newly developed land for the disposal of recyclable waste".

This tax had an oscillating evolution (see Figure 3), only from 2019 registering constant increases, so that in 2023 it reached 339,836 thousand lei. As of 2019, this contribution can be found in the EFA budget under the name "**circular economy contribution**" received from owners or, as the case may be, landfill managers for municipal waste, construction waste and demolition, intended to be disposed of by landfilling". As a level, in total taxes to the Environmental Fund, this tax represents approximately 5% in 2023.

- v. **The tire tax** had an upward trend, reaching in 2021 a maximum of 2649 thousand lei. Starting with 2022, there is a drastic decrease in revenues collected, of only 242 thousand lei. Its contribution to total EFA revenues in 2023 was 0.004% (Figure 3).
- vi. **The fee charged to the Territorial Administrative Units** (to stimulate the reduction of the quantities of municipal waste disposed of by landfilling). Starting with 2017, the amount of the fee decreases to 50 lei / ton, and reporting is no longer made to the total waste disposed of in the previous year, but is reported to the planned quantity. This tax has increased permanently, reaching in 2023 123,902 thousand lei, respectively 1.884% of the total taxes to the Environmental Fund (Figure 3).
- vii. **Ecotax applied to bags and bags used for shopping** defined as "ecotax", amounting to 0.1 lei / piece. Since 2019, the value of the tax has increased from 0.1 lei to 0.15 lei and the definition has changed as follows: "ecotax, amounting to 0.15 lei / piece, applied to all carrier bags, except those made of materials complying with the requirements of SR EN 13432: 2002 - 2019, 2020". In terms of value, it is constantly growing, reaching 78,275 thousand lei in 2023.
- viii. **The tax applied to mineral and synthetic oils** followed an upward trend, reaching in 2023 the value of 52799 thousand lei, respectively 0.8% of the total taxes to the Environmental Fund.
- ix. **The economic instruments** presented in Table 1 as "**Contributions**" contain several categories of income, as follows:
- a yearly payment of 2 lei/kg that authorized economic operators must make in order to assume responsibility for managing worn tires and recovering packaging waste (2018 - 2023);
 - a contribution of 2 lei/kg is applied for the discrepancy between the amounts of packaging waste, or used tires, that authorized economic operators declare as recovered in order to assume responsibility for the waste's annual management, and the amounts that the Fund Administration finds to be recovered (2015 - 2016);
 - An annual contribution of 2 lei/kg is required from the authorized economic operators for managing used tires and packaging waste, respectively. This payment covers the difference between the amounts of waste managed on behalf of the customers for whom the authorized

economic operators assumed the obligations and the actual amounts of waste corresponding to the annual objectives set by the applicable legislation (2016);

- a contribution of 2 lei/kg due by economic operators carrying out collection/recovery/sanitation activities and reporting waste to taxpayers referred to in letters v) and y), for the difference between the quantities of packaging waste, *waste electrical and electronic equipment (WEEE)*, batteries, used tires, declared as managed and the quantities of waste found by the Environmental Fund Administration to be placed on the market national (2019 - 2023);
- a contribution in the amount set out in Annex 3 of the GEO 196/2005, due by the 13,500 economic operators placing electrical and electronic equipment on the national market (2018 - 2023);
- the 4 lei/kg contribution of portable batteries and accumulators, which came from business owners who put them on the domestic market (2018 - 2023);
- a contribution in the amount specified in GEO 196/2005 Annex 3 from authorized economic operators for assuming responsibility for the yearly collection of WEEE, or a contribution of 4 lei/kg for waste portable batteries and accumulators, from authorized economic operators for assuming responsibility for the yearly collection of waste portable batteries and accumulators (2020 - 2023).

The contributions had oscillating values, without a visible trend. The lowest cumulative amount was recorded in 2020, namely 12182 thou lei, and the highest value in 2021, 17303 thou lei. Table 1 summarizes only significant economic and financial instruments from the point of view of promoting the circular economy, so that this table presents their evolution in absolute values.

Table 1. Economic instruments contributing to the promotion of the circular economy (thou lei)

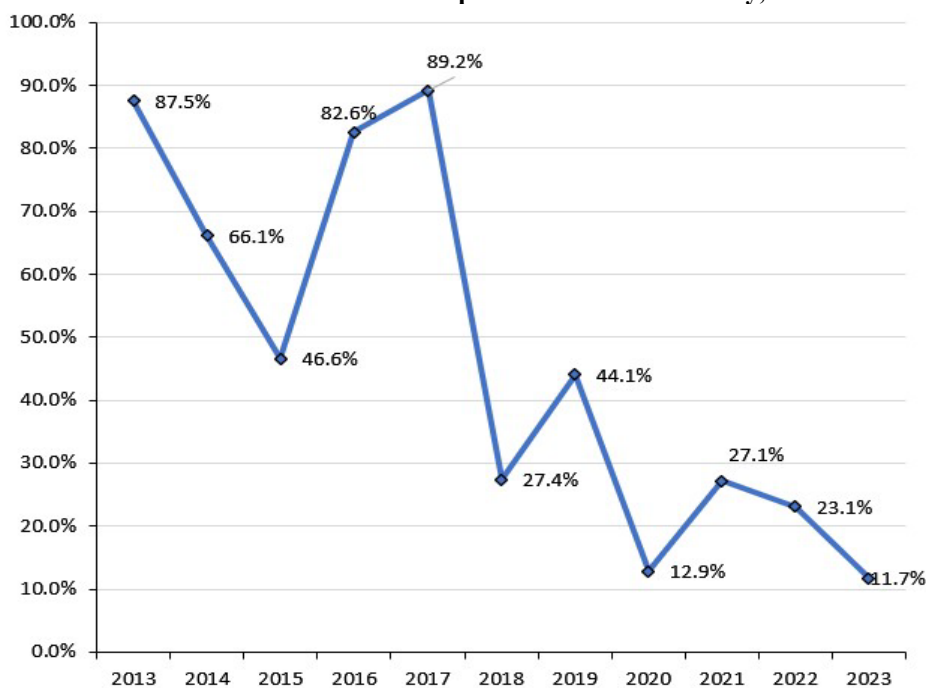
Economic instrument	2013	2015	2017	2019	2021	2023*
Tax applied on the sale of scrap metal	4100	76000	57319	65040	53404	87719
Tax applied to economic operators owning land used for the storage of recoverable waste	1	6	103268	94500	291600	339836
Contribution by operators introducing packaging	2575	19000	147095	64800	50580	72086
Contribution by operators introducing dangerous substances	250	9500	11690	12475	8534	16430
Tyre tax	50	855	572	1723	2649	242
Fee charged to TAUs	100	5225	32853	27000	72349	123902
Eco-tax applied to bags used for shopping	1100	18050	60597	62715	49627	78275
Tax applied to mineral and synthetic oils	750	28500	36862	41847	29499	52799
Contributions	0	0	0	14940	17303	16018
Total revenues from instruments related to the Circular Economy	8926	157136	450256	385040	575545	787307

*- Forecast values, Source: own processing with data from EFA.

Of particular interest for this research, from a circular economy point of view, are economic instruments for e-waste management (WEEE). Unfortunately, compared to the total instruments contributing to the EFA budget, WEEE management fees represent an insignificant percentage, below 1%. It is also important to note that their records have only been kept since 2018.

It can be noted their unbalanced contribution to the EFA budget, but also the fulminant upward evolution of some of the categories represented. Thus, the largest share in total EFA taxes has, at the level of 2023, the tax applied to economic operators who own land used for the storage of recoverable waste, namely 44%. It should also be noted that this tax registered an increase of 393,286.58% during the analysed period.

The smallest share in total EFA taxes has the tire taxes in 2023. In addition, the increase recorded during the analysed period is only 5.6%. Analyzing Figure 4, it can be found that the share in total EFA taxes of economic and financial instruments used to promote the circular economy has a general downward trend, although there are also years with sudden increases, namely 2017, 2019 or 2021.

Figure 4. Share of economic instruments used to promote circular economy, in total EFA taxes (%)

Source: own processing with data from EFA.

Circular economy taxes have also increased from almost 8.000 lei in 2013 to about 800,000 lei in 2023. However, due to the increase in revenues from the sale of allowances, their share in total fees at EFA decreased from over 80% in 2013 to only 11.7% in 2023 (Table 2).

Table 2. Value and share of Circular Economy fees in total EFA taxes (thou lei and %)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total EFA taxes	10200	265053	337155	374531	504751	103.893	840089	3414393	2056240	2832599	6575448
Circular Economy Fees	8926	175244	157136	309225	450256	299540	385040	451267	575545	667607	787307
Share of circular economy fees in total EFA taxes	87.51%	66.12%	46.61%	82.56%	89.20%	28.80%	45.83%	13.22%	27.99%	23.57%	11.97%

Source: own processing with data from EFA.

This is a consequence of the exponential growth of one of the economic instruments unrelated to the circular economy, namely Revenues from the sale of greenhouse gas emission allowances. The revenues obtained by EFA by applying this instrument increased from 18348 thousand lei in 2014 to 2100000 thousand lei in 2022, as will be shown in the next section. This revenue is expected to double (compared to the previous year) in 2023.

5.2. Other economic instruments contributing to the EFA budget

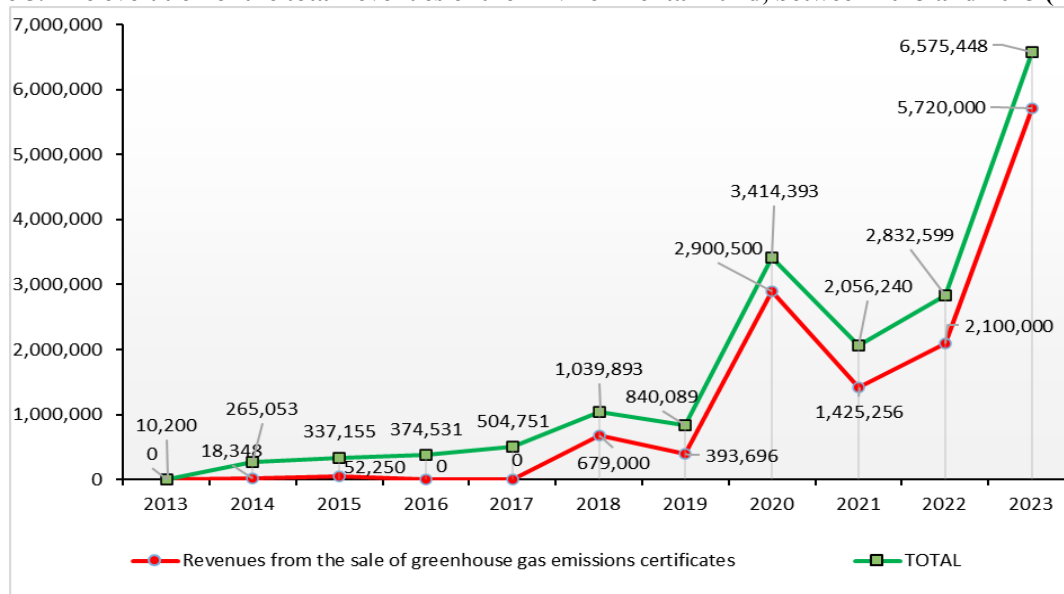
Other sources of income of the Environmental Fund (FM) are environmental economic instruments that are not directly linked to the circular economy (CE). These revenues come from:

- I. **Tax applied to emissions of pollutants into the air** (stationary sources). It had a constantly increasing evolution, reaching from 650 thousand lei in 2013 to 7 034 thousand lei in 2023.
- II. **Contribution from the sale of wood**. This tax had a constant evolution, currently representing less than 1% of the total taxes to the Environmental Fund, with a value of 59401 thousand lei in 2023.

- III. **Tax paid by hunting funds.** It had a relatively constant evolution, reaching in 2023, 1670 thousand lei, below 1% of the total taxes to the Environmental Fund.
- IV. **Fees for issuing environmental permits.** It registered a maximum of 485 thousand lei in 2016. Subsequently, its evolution was downward, reaching only 36 thousand lei in 2023, respectively 0.001% of the total taxes to the Environmental Fund.
- V. **The CO₂ tax** is defined as a penalty paid by the operator who failed to surrender the emissions of greenhouse gases allowances related to the greenhouse gas emissions produced in the previous year. The penalty is equal to 100 euros (or the equivalent of RON) for each tonne of CO₂ that was emitted. This tax registered in 2015 a maximum of 69,540 thousand lei, the values of the other analysed years being insignificant. Currently, the tax is no longer collected.
- VI. **The renewable energy tax represents** the equivalent value of unpurchased green certificates. The amounts collected on account of this tax registered a maximum of 455 thousand lei in 2018 and 2019, the values for the other years being insignificant. Currently, the tax is no longer collected.
- VII. The most significant and controversial income category is **revenue from the sale of GHG emission allowances**. In 2005, the EU Emissions Trading System (EU ETS) was introduced. GD 780/2006 updated by GD 971/2016 regulated the trading of GHG emission certificates at national level. The purpose of the GHG emissions trading system is ultimately to promote the reduction of greenhouse gas emissions in an economically efficient manner (GD 780/2006).

In order to meet the EU's target of reducing greenhouse gas emissions by at least 40% by 2030, the European Commission proposed a revision of the EU-ETS in 2017. The main measure taken was to reduce the total number of allowances by 2.2% each year from 2021 onwards. Although in this paper the objective is to analyse mainly instruments of importance for the circular economy, it should be noted that, starting with 2020 (see Figure 5), the most significant contribution to the revenues of the Environmental Fund, according to the annual budget presented on the institution's website, is nevertheless generated by the sale of greenhouse gas emission allowances.

Figure 5. The evolution of the total revenues of the Environmental Fund, between 2013 and 2023 (thou lei)



Source: own processing with data from EFA.

Thus, it can be seen that, from 52,250 thousand lei in 2015, the value of certificates sold jumped to 679,000 thousand lei in 2018. Although in the following year, 2019, the value of taxes was half, namely 393,696 thousand lei, in 2020 their value increased more than 10 times, reaching almost three million thousand lei, so that in 2021 it decreased by half (1,425,256 thousand lei). Subsequently, the

value of revenues in this category increased significantly and in 2023 the EFA budget presents a figure of 5,720,000 thousand lei. This sudden increase raises questions and requires separate in-depth analysis.

5.3 Green Stamp –a specific instrument of circular economy in Romania

According to articles 28 through 32 of GEO 5/2015, the Green Stamp (GS) is the compensation intended to cover the fees of collecting, reusing, recycling, recovering, and disposing of WEEE in an environmentally sound manner as well as consumer awareness expenses. These activities are to be funded by EEE producers. It is an important economic instrument in the EPR category with potential positive impact for the circular economy. Introduced in 2007, *the green stamp duty* is an amount applied to all electronic and electrical equipment defined in GD 448/2005 and aims to gather the necessary funds for the proper recycling of these equipment after their failure or moral wear out. Payment of the fee represents the costs of collecting and recycling waste electrical and electronic equipment.

Green stamp duty is also known as green tax, green stamp duty or eco tax and applies to WEEE (Waste Electrical and Electronic Equipment), without applying to electronic components sold separately. The fee varies depending on the category of the purchased product and is included in its sale price. The Green Stamp duty is assumed by all manufacturers and traders of electrical and electronic equipment. Green stamp duty amounts are collected by responsibility transfer operators, through a process controlled by the authorities, and are then spent on the waste management process. This process includes:

- a. collection of WEEE;
- b. handling, sorting and dismantling old equipment;
- c. their neutralization and recycling;
- d. transport of different categories of waste to customized recycling companies;
- e. the handling and recycling of different parts in accordance with the legal performance indicators and CENELEC European WEEE standards in order to recover secondary raw materials and reintroduce them into the manufacturing process.;
- f. statistics about clients;
- g. filing reports with the government.

The visible fee, paid at the time of new product purchase, supports all these functions. The current laws state that distributing stores or specifically designed centres are where electronic and electrical waste is disposed of. Compared to home garbage, waste electrical and electronic equipment (WEEE) poses a tenfold greater environmental risk. Lead, mercury, and cadmium are the three most hazardous toxic chemicals found in the numerous non-biodegradable components of WEEE's structure. Reducing the number of hazardous materials released into the air, water, or ground by collecting and processing WEEE in accordance with environmental regulations allows us to actively safeguard the environment.

Regarding WEEE, 75% of its elements are reusable and can be used again in production for a lot less money. Thus, we avoid wasting resources that are still useful and consuming raw materials needlessly by choosing to properly dispose of outdated, unwanted, or damaged items from our homes and bring them to collection centres. The organization in charge of gathering and managing the funds received from the *Green Stamp* charge is the Environmental Fund Administration. The green stamp has a comparatively low value: 3–7 lei for televisions, 15 lei for refrigerators, 3 lei for monitors, and 2 lei for laptops etc. The funds gathered through the Environmental Fund remain likewise little because of the low values.

Table 3. The amount of Green Stamp Tax collected by EFA (Thou lei)

Indicator name	Programme 2017	Programme 2018	Programme 2019	Programme 2020	Programme 2021	Programme 2022	Programme 2023*
w) Engagement of economic operators placing EEE on the national market	-	13.500	13.500	2.700	3.600	3.153	3.153

Source: EFA, 2023, https://www.EFA.ro/informatii_publice_bvc.php *estimated (updated August 2023).

From the Annual Income and Expenditure Budget of the Environmental Fund, we have access to the anticipated revenue amounts from this tax. Regretfully, it is only mentioned in the institution's 2018 budget, and only estimates are available for 2020. It should be mentioned that there are annual budget amendments that, while they did not result in major changes in 2018 and 2019, can nevertheless affect the final budget, particularly given the state of the economy at the moment (figures are expressed in thousands of lei). It is important to highlight that the sums are very small (on the order of 3 million euros annually), making it challenging to begin making investments in areas such as collection, transportation, the creation of centres for sorting and collection, dismantling, etc. (Table 3).

With the different collection efforts underway, it is optimistically assumed that citizens will throw away their WEEE in a systematic way. These campaigns are carried out by mayoralties which, however, do not have direct attributions in this area. Since 2019, EFA has periodically run campaigns to buy-back old appliances under the name Rabla (*Old equipment for home appliances*). They were initially financed with the amount of 15,796,600 lei so that, starting with 2021, the budget of the program exceeds the amount of 100 million lei annually. The Rabla program for home appliances gives the possibility to people who want to dispose of old appliances, which use a lot of electricity, to donate them and receive a voucher that they will use to buy new gadgets. This program is limited in time and usually funds run out quickly. The following values of vouchers are available to people who wish to replace their outdated appliances:

- 200 lei to buy washing machines with energy efficiency A++ and TVs with energy efficiency A and A+;
- 300 lei for the purchase of washing machines with energy efficiency A+++, dishwashers with energy efficiency A++ and refrigerators / refrigerators / freezers / freezers with energy efficiency A++;
- 400 lei will be used to buy dishwashers with an energy efficiency of A+++, AC appliance with an energy efficiency of A+++ or A++ for cooling, refrigerators, freezers, and televisions with an energy efficiency of A++ and A+++.

In 2022, the value of vouchers increased as follows:

- 400 lei for washing machines with the new energy class A, B or C;
- 400 lei for refrigerating appliances (refrigerators, refrigerators, refrigeration boxes or freezers) with the new energy class A, B, C, D or E;
- 400 lei for dishwashers that fall into the new energy efficiency class A, B, C or D;
- 500 lei for laptops;
- 300 lei for tablets;
- 400 lei for AC appliance with cooling efficiency of minimum A++ class;
- 400 lei for tumble dryers of energy class at least A++;
- 200 lei for vacuum cleaners with an energy consumption of less than 43 kWh / year;

An estimated 100,000 coupons were given out each year, which suggested a comparable number of major appliances were traded in for new, more advanced ones. The population's stock of electronic and electrical gadgets is not significantly altered by this voucher scheme.

6. Conclusions and recommendations

This study had the main objective of presenting and analysing the economic instruments used in the European Union and more specifically in Romania, from the perspective of the circular economy. The elimination of waste and pollution, two negative environmental externalities, and the decoupling of economic activity from the consumption of natural resources are key characteristics of the circular economy (CE). In reality, the fundamental goal of the circular economy is to save or lessen the loss of water and other natural resources in order to achieve long-term societal and economic prosperity. Therefore, economic tools for environmental preservation can significantly impact the growth and development of the circular economy through their role in raising awareness of and internalizing detrimental environmental externalities as well as their involvement in the budget.

Based on an examination of the relevant academic literature, the authors draw a few broad conclusions about the economic tools for a circular economy. One of these is that, while many have

hypothesised and advocated for the adoption of various environmental economic policies and tools for a circular economy, there has been inadequate research into these tools and their effects. This is a growing and developing area of study on a global and European scale. Take environmental taxes and fees as an example. New studies show that they have different effects on Europe's circular economy. In Romania, for instance, it's thought that environmental taxes will need to be sector-specific, depending on recycling results.

The first part of the paper generally refers to the main economic instruments used to promote CE in the European Union. The analysis shows that waste management tools are the most used to promote the circular economy, being used in most EU Member States (17 states), followed by policies and instruments dedicated to energy and climate change (in 13 Member States), circular public procurement (in 12 Member States) and waste prevention (10 states). Another takeaway is that EPR tools like product taxes, recycling mandates, deposit refund programmes, and disposal/landfill fees are the most popular and effective environmental economic tools that are pertinent to the circulation of goods and services. Following the polluter pays concept, they absorb the expenses of product material management until the end of life. Efforts are underway in the European Union's leading circular economy nations, such the Netherlands, Belgium, and France, to implement more specific levies and taxes that reward eco-design and recycled materials while punishing those that aren't recyclable.

In order to understand, analyse and empirically estimate the specific role and impact of each environmental economic instrument, from a circular economy perspective, it is important to further conceptually and methodologically clarify relevant indicators on environmental economic instruments. Metadata from the PINE database developed by the OECD, in cooperation with the European Environment Agency (EEA), are analyses for the following indicators of economic instruments to protect the environment: environmental taxes and levies; commissions or fees; permits that are negotiable; deposit reimbursement programs; subsidies motivated by environmental protection; voluntary approaches.

The main set of environmental economic instruments analysed from the outlook of the circular economy in Romania was related to waste recycling, which is embedded in the Environmental Fund. The economic instruments for the management of special waste, with special emphasis on electronic waste (WEEE), are coordinated in Romania by the Environmental Fund, through the Environmental Fund Administration (EFA), an institution subordinated to the Ministry of Environment. The main tasks of this institution consist in collecting and administering the revenues that make up the budget of the Environmental Fund. The economic instruments that are part of EFA's portfolio have been grouped for this analysis into two distinct categories: circular economy specific instruments and other types of economic instruments. In this paper, the instruments specific to the circular economy focusing mainly on extended producer responsibility (EPR) have been extensively presented and analysed, which include product taxes, deposit refund systems and disposal/storage fees.

The economic instruments **specific to circular economy** represented the main objective of this research paper. Their analysis has led to several conclusions. From the budgets available on the EFA website, the following developments resulted: *the tax applied to the sale of scrap metal* recorded increasing revenues, reaching 87,719 thousand lei in 2023; *the contribution of operators introducing packaging* had an oscillating evolution, with a maximum of 147,095 thousand lei in 2017, currently (2023), revenues from this tax are 72,086 thousand lei; *the contribution of operators introducing dangerous substances* had an increasing evolution, the maximum being reached in 2023, namely 16,430 thousand lei; *the tax applied to economic operators owning land used for the storage of recoverable waste* had an oscillating evolution, and in 2023 reached 339,836 thousand lei; *the tire tax* registered a drastic decrease in revenues, currently reaching 242,000 lei; *the tax charged to ATUs* has permanently increased, reaching 123,902 thousand lei in 2023; *the ecotax applied to bags and bags used for shopping* is constantly increasing, reaching 78,275 thousand lei in 2023; *The tax applied to mineral and synthetic oils* followed an upward trend, reaching in 2023 the value of 52,799 thousand lei. The amounts presented as "Contributions" contain several categories of income: contributions for the take-back of packaging, tyres, WEEE or batteries and accumulators. The contributions had oscillating values, without a visible trend. The lowest cumulative amount was recorded in 2020, namely MDL 12,182 thousand, and the highest value in 2021, MDL 17,303 thousand.

The largest share in the total EFA fees is, at the level of 2023, the tax applied to economic operators who own land used for the storage of recoverable waste, with 44%. It should also be noted that this tax registered an increase of 393,286.58% during the analysed period. The smallest share in total EFA taxes in 2023 was from tire taxes. Also, the increase recorded during the analysed period is only 5.6%. It can be noted that the share in total LFS of economic and financial instruments used to promote the circular economy has a downward trend, although there are also years with sudden increases, namely 2017, 2019 or 2021. Taxes for the circular economy have increased almost 100 times overall, from almost 8,000 thousand lei in 2013 to approximately 800,000 lei in 2023. However, due to the increase in revenues from the sale of allowances, their share in total fees at EFA decreased from over 80% in 2013 to only 11.7% in 2023.

The economic instruments **without implications in the circular economy** had the following developments: the *tax applied to emissions of pollutants into the atmosphere* had a constantly increasing evolution, reaching from 650 thousand lei in 2013 to 7,034 thousand lei in 2023; *the contribution from the revenues resulting from the sale of wood* had a constant evolution, currently representing less than 1% of the total taxes to the Environmental Fund, with a value of 59,401 thousand lei in 2023; *tax paid by hunting funds* had a relatively constant evolution, reaching 1,670 thousand lei in 2023; CO₂ tax and renewable energy tax are no longer collected.

Among the economic instruments with no impact on the circular economy, revenues from the sale of greenhouse gas emission allowances are the most significant and controversial income categories. Starting with 2020, the most significant contribution to the revenues of the Environmental Fund is generated by the sale of greenhouse gas emission certificates: from 52,250 thousand lei in 2015, the value of certificates sold jumped to 679,000 thousand lei, in 2018 and in 2023 the EFA budget presents a figure of 5,720,000 thousand lei. This sudden increase raises questions and requires separate in-depth analysis.

Some limitations of the research include the numerous changes made in the last years to the Romanian taxation system, which resulted in a lack of consistency in the conclusion that could be drawn from the analysis.

The main recommendation is that, although most of these policy instruments have proved to be quite efficient and sustainable, it is necessary to continue implementing environmental economic instruments to raise awareness and increase the circular economy in the European Union, but especially in Romania. Romania still has a long way to go in order to increase waste recycling and recovery, and ultimately to reach higher levels of circular economy (by increasing the Circular Material Use Rate). However, more and more steps are currently being done as supported by the National Circular Economy Strategy and Action Plan and our future research will better show whether these policies and instruments have become more acknowledged and effective in Romania.

Authors' contribution: *Introduction, V.P.; Literature review, S.F., A.C.; Methodology and data, V.P, S.J.; Research results and comments, V.P, G.B.; Conclusion, V.P., O.M.*

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