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SHAPING CIRCULARECONOMY IN ROMANIA IN THE CONTEXT OF GREEN DEAL

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Abstract

This paper is an overview of comparison of bioeconomy indicators, in Romania and European Union, related to Green Deal Pact of the EU..The so called European Green Deal, is a set of proposals adopted by European Commission in order to reduce the climate change by 2050.Official statistical data related to green transition were retrieved from Eurostat database. Specific indicators taken into consideration were circular material use rate, raw material consumption, valued added at factor cost and environmental protection expenditure. Comparison of the dynamics of these indicators for Romania vs other European Union member states, for latest available data, was plotted. When analyzing the data it can be observed that steps are being taken in each state towards fulfilling the objectives of green transition. However, Romania's bioeconomy is still underdeveloped as compared to most of the EU's member states.In order to support the Green Deal targets we need a national strategy and action plan towards green and just transition of our economy.

Key words**:** *bioeconomy, sustainable development, Romania,Green Deal*

INTRODUCTION

One of the most ambitious plans that European Union has ever released is The European Green Deal, which represent a growth strategy focused to transform EU's economy to become more competitive while being resource-efficient. Therefore, it is foreseen the climate neutrality by 2050, in the context of greening the economy, turning the industry and transportation into sustainable sectors and reducing pollution.
European Commission has defined in the policy area of Green Deal eight areas [7]:
- more action in order to adapt and combat the climate changes;
-energy production: clean, accessible and safe;
- targeting the industry to a clean and circular economy;
- efficient buildings in terms of energy and resources;
-creating new sustainable and intelligent mobility systems;
- biodiversity and ecosystems conservation;
- sustainable food chains (from farm to fork strategy);
- zero pollution and no toxic substances for the environments.
One of the main objectives of the European bioeconomy strategy is to create a sustainable and circular bioeconomy, in order to provide a wide range of products and services, without affecting natural resources and ecosystems. This strategy is focused on four key areas: research and innovation, the market expansion, sustainable production along with and sustainable consumptionand last but nor least, governance.
It also includes initiatives to promote the use of renewable resources, reduce food waste, and promote sustainable agriculture. It is considered that the bioeconomy can contribute to achieving the objectives of the Green Deal, by:
-Increasing Europe's economic competitiveness and ensuring a just transition.
-Producing materials from renewable resources for a climate-neutral economy.
-Improving environmental protection and protecting ecosystems [19].
This is evidenced by the general acceptteddefinition of the bioeconomy, which

proposes sustainable models of production and consumption of resources, while respecting planetary limits and moving away from a linear economy based on the large-scale use of fossil and mineral resources [6].

For example, the sequestration of carbon in the soil, or its storage in wood products, together with the replacement of materials produced from non-renewable raw materials (plastics, energy, textiles), generates significant carbon savings [4] and lead to the achievement of the objective of increasing climate action and the -55% target by 2030.

The use in the transport sector of cellulosic ethanol obtained from agricultural residues such as wheat straw, sunflower stalks [2] can generate emissions savings of up to 95% compared to fossil fuels, improving mobility systems [14].

The bioeconomy can ensure the achievement of just transition goals by creating 400,000 new jobs in ecological sectors by 2035, especially in rural and coastal areas, if supported and implemented through regional and national strategies [1].

In this study we have analyzed one-decade dynamics of several official statistics indicators related to green and just transition included in Green Deal targets. All indicators are included in circular bioeconomy concept, as an emerging sustainable economic growth pathway.

MATERIALS AND METHODS

Official data were extracted from Eurostat database for a ten years period. The graphics are presented for latest available data which depend on the specific indicator.Data reported for Romania were compared to EU-27 data.

Raw material consumption is a measure of how much of a given raw material is being used by a particular industry or group of industries. This consumption is calculated by taking into consideration theraw material used in the production of marketed goods and services.

The sustainability of resource use is measured by involving a composite indicator called the Circular Material Use Rate (CMUR) developed by the European Union's Statistical Office, calculated as follows:

$$CMUR = QT/GDP$$

where:

QT is the total material consumption

GDP is gross domestic product.

This indicator is used formeasuringthe efficiency of resources utilisation and for making comparisons across EU's various regions.

A measure of goods and services value of produced in an economy, excluding taxes and subsidies, is value added at the cost of the production factors. Its calculation is made by subtracting from the production value the cost of intermediate inputs and dividing the resulted value by the number of employeesfrom the production process.

The environmental protection expenditure by institutional sectorincludes expenditure on air pollution control, water pollution control, waste management, nature protection, and other environmental protection activities.

RESULTS AND DISCUSSIONS

When analyzing the European Bioeconomy strategies already in place, it can be observed that the economic sectors included in the sphere of the bioeconomy are different, depending on the available resources and the results generated by the research and development field.Thus, the differences between approaches, priorities and key objectives are explained.

As the bioeconomy became a widespread concept in strategic documents with European coverage, and implicitly in the funding priorities of the various existing programs, national strategies became broader, covering a wide range of sectors, product generators and innovative processes. A special emphasis is placed on the transition from research-development to research-development-innovation. Therefore, it can be stated that the key element of the leap of knowledge and implicitly of the transformation of the economic system is innovation.

All in one, the bioeconomy strategy focuses on four main areas: research and innovation,

market development, sustainable production and consumption, and governance.

Thus, although through varied approaches and various mechanisms, a collective European vision of a climate-neutral economy has emerged. Moreover, there are several other strategies and action plans supporting the transition to the bioeconomy, which have been launched recently, aimed, among other things, at managing the problems arising from the health crisis caused by COVID 19.

Still, the bioeconomy (according to the European Commission) can contribute to economic recovery from the COVID-19 crisis by aligning the economy with the resources of the biosphere. Although, there is limited data of the pandemic impact on the bioeconomy and the link between those two (bioeconomy and post-COVID-19 recovery) is still being discussed by experts, not only in light of the impacts, but also of the possible responses [21].

The passing from an extractive economy type to a regenerative one is built on a set of principles, processes and practices [15] based on the integrated approach of production and consumption cycles [5, 17].

Setting up dedicated policies and involving specialised organizations for bioeconomy on a nationaland international scale [16]is a cornerstone in the paradigm shift from the linear economy to the sustainable economy [13].

Such strategies can only rely on proper data analysis related to available resources and to consumption patterns [18]. The consumption data are needed for targeting further industrial development, for identifying research gaps and for directing the innovation practices for advancing of new technologies[3].

When we speak about circularity and the need to avoid resource depletion the key indicator is the **consumption of raw material**, which is a measure of the amount of raw materials used in a given period of time. It is an important indicator of economic activity, as it reflects the demand for goods and services.

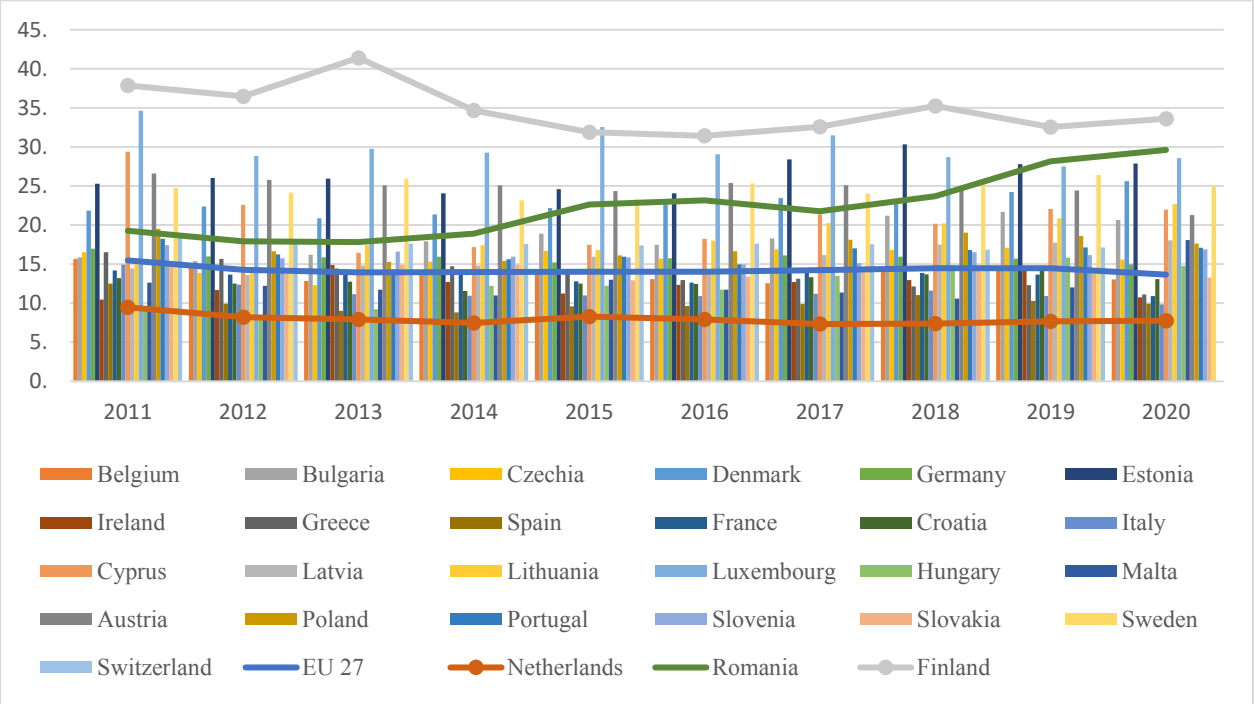

Fig. 1. Raw material consumption across EU (tonnes per capita)
Source: Own design based on the data from Eurostat [8].

Examples of bioeconomy materials include biomass, bioplastics, biofuels, biochemicals, biopolymers, and bioproducts. The flow of these materials is driven by the demand for sustainable products and services, and the need to reduce the environmental impact of production and consumption [20]. Bioeconomy material flow is the movement of

materials, energy, and information within the bioeconomy. It comprises various stages of the production cycle such as extracting the raw materials, processing, transportation and use of the secondary products of the biological resources.

While in European Union the raw material consumption has slowly decreased in the last 10 years (with 11% from 2011 to 2020), in Romania it has increased significantly (with over 53% from almost 20 tonnes per capita (19,269) in 2011 to almost 30 tonnes (29,616) per capita in 2020 (Figure 1).

However, the country with the highest increase in raw material consumption was Hungary, reaching a 63 % more in 2020 than in 2011.

Although with a decreasing trend, the country with highest values for material consumption over the studied period was Finland and the one with lowest values was Netherlands.

The variety of approaches to defining and implementing bioeconomy principles creates conflicting opinions. On the one hand, there are concerns related to the over-exploitation of natural resources and biodiversity loss. On the other hand, there is a positive projection of the development and benefits of a bioeconomy, especially in terms of reducing greenhouse gas emissions and reducing human waste through recycling and reusing recovered material.

The circular material use rates indicator, which shows the share of materials used in the production process that come from recycled or reused streams is used for monitoring progress towards resource efficiency targets.

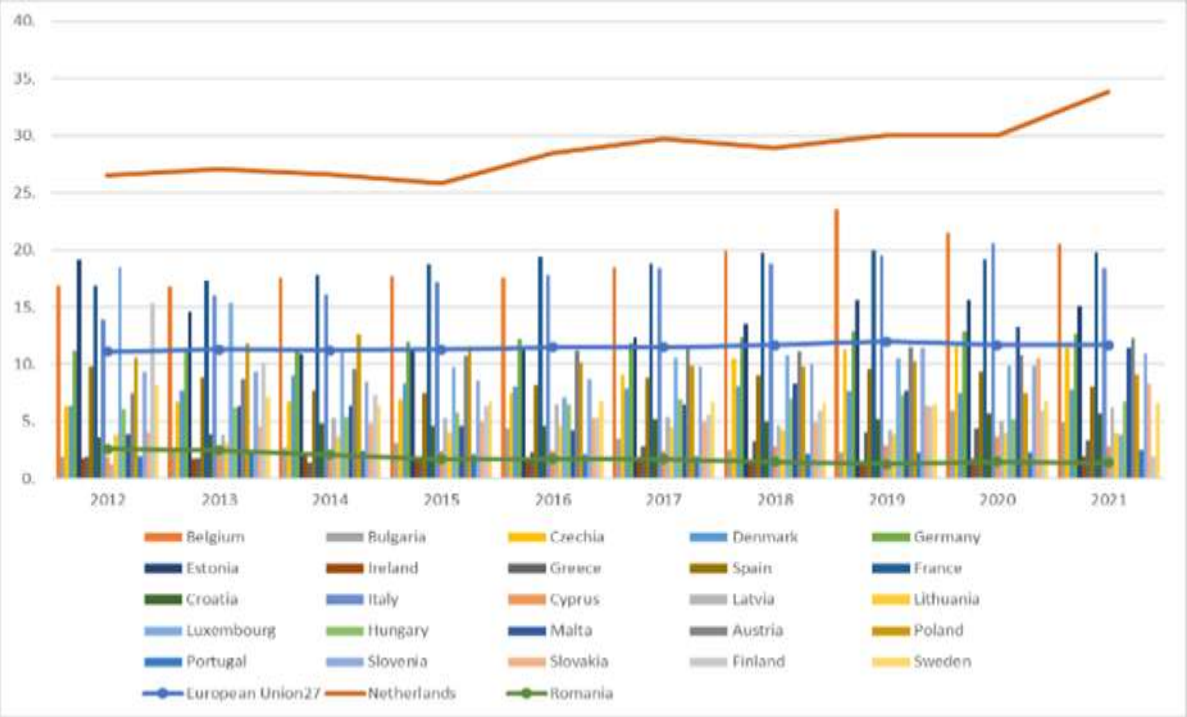

Fig. 2. Circular material use rate (%)
Source: Own design based on the data from Eurostat [9].

This approach seeks to use renewable resources and biotechnology to create products, energy, and materials that can be reused, recycled, and repurposed. It also seeks to reduce waste and emissions while promoting economic growth through the development of new markets and industries. This strategy can be applied to a wide range of materials, from food and timber to plastics and textiles. By utilizing renewable resources and biotechnology, we can create an efficient and sustainable circular bioeconomy that conserves resources and supports economic growth. Although there were released many strategies on circular economy, and countries put an effort into waste reduction, the circularity rate in EU during the last ten years

was almost constant, with a very low increase rate (Figure 2).

In Romania, the use rate of circular material has decreased by 46.15% in 2021 compared with 2012. Unfortunately, in 2021, our country had the lowest circularity rate in EU. (Figure 3).

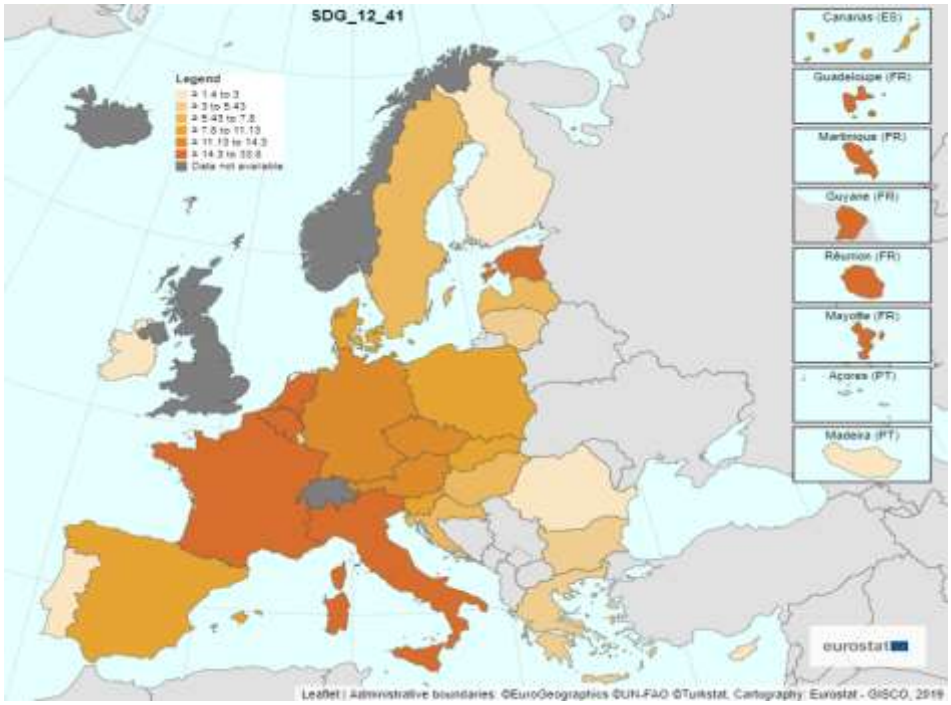

Fig. 3. Material flows for circular economy across EU, 2021
Source: Own design based on the data from Eurostat [10].

At this moment, as entire society (from producers, entrepreneurs, decision makers, and citizens) becomesmore and more aware of the need of its sustainable development, material flows in Europe's circular economy are changing.

Considering that the core principleof circular economy is closing the loop by optimizing resource use and reducing waste, the material flows indicator is reflecting the level of development of circular economy of a specific region. As this system involves reusing, recycling, and upcycling materials and products to create a more efficient and sustainable economy, it can be stated that any circular process in economy will contribute to achieving at least one target of the latest green transition strategies across nations.

In Europe, there are a number of initiatives that are being implemented to promote circular economy practices, and this is reflected in the values of the material flows from official statistics (Figure 3). These initiatives span across all sectors and include government initiatives, private sector initiatives, and citizen initiatives.

One example of a European initiative is the European Commission's Circular Economy Action Plan. This plan outlines five key areas of focus, including resource efficiency, waste prevention, reuse and repair, recycling, and bio-based products. The plan also lays out targets for each area and provides resources for implementing these initiatives. Another example of a European initiative is the European Union's Circular Economy Package. This package of measures includes rules and actions to reduce the quantities of waste and at the same time increase the reuse of materials and resources. It provides provide real support to businesses for the R&D of new practices for the circular economy.

In addition to these initiatives, each EU Member State developed its own national projects and initiatives towards circular economy processes and technologies.

For example, in Germany, the Circular Economy Promotion Act provides incentives for businesses to reduce waste and increase

the reuse of materials and resources. In France, the Initiative for a Circular Economy has been launched to create a network of public and private actors to promote sustainable practices.

Overall, the movement towards a circular economy across Europe is gaining momentum. As more businesses, governments, and consumers become aware of the importance of circular economy practices, the material flows across Europe are changing to become more sustainable and efficient.

Another way to evaluate the bioeconomy development towards fulfilling the Green Deal targets is related to**competitiveness and innovation capacity**. This index can be used to compare the performance of different countries or regions in the bioeconomy, and to identify areas where further investment and innovation are needed.Value added at factor cost is a key indicator of economic growth, as it measures the contribution of circular economy to the overall economy. Anyway, due to the fact that several EU states treat these data as being confidential, the average data are estimated and their reliability decreases. However, available data show that there is an increasing trend of this indicator for Romania starting with 2014 (Figure4).

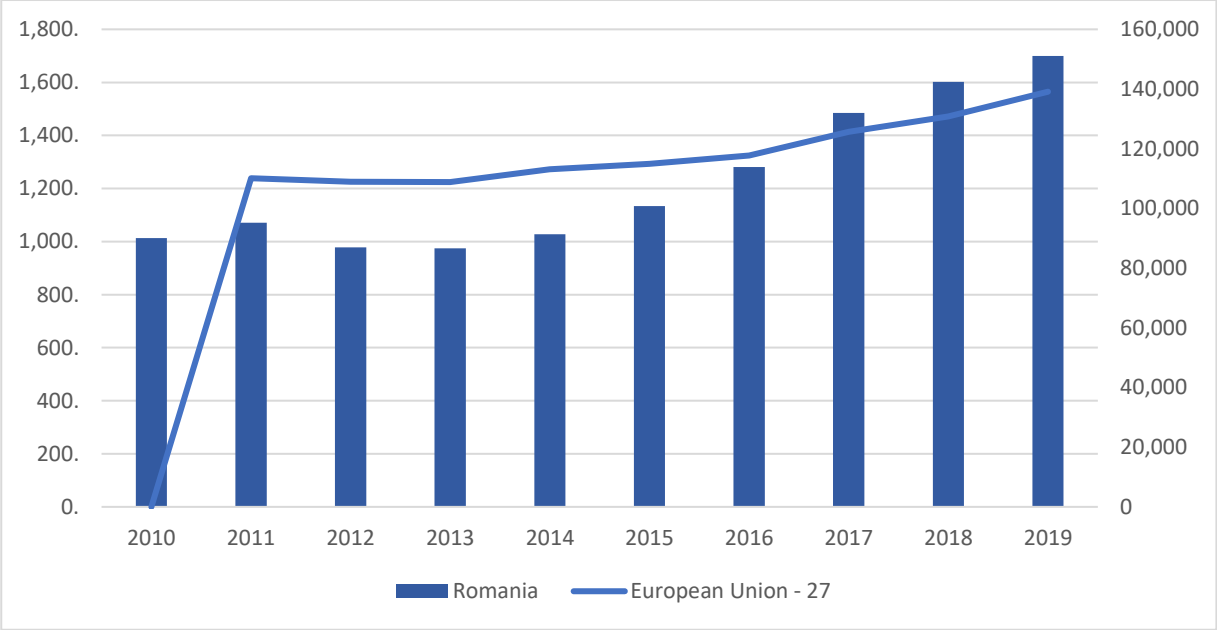

Fig. 4. Value added at factor cost for Romania as compared to EU average (million EUR)
Source: Own design based on the data from Eurostat [11].

National expenditure on environmental protection by institutional sector, includes the total amount of money spent on environmental protection, expenditure by sector (energy, transport, water, waste management, etc.) and by type of activity (prevention, restoration, etc.

The values for this indicator in Romania are plotted in Figure 5. The average environmental protection expenditure in EU, was around 2% of GDP for the last decade. In Romania, the value was below 1.6 in the period 2012-2019, with lowest value being spent in 2017.

It is obvious that EU has serious concerns for environmental protection and related issues, and therefore significant funds will be invested for this.

The European Green Deal allocation for circular economy and just transition will reach a thousand billion euros in the next ten years, bringing together citizens, businesses and local authorities to work towards a sustainable and inclusive future.

Environmental protection expenditure related to the bioeconomy typically involves investing in new technologies and research to create sustainable ways of producing food, energy, and materials that reduce the negative environmental impact of traditional economic activities. This can involve investing in renewable energy sources, sustainable

agriculture and forestry, and energy efficiency measures. Governments may also invest in waste management and water pollution control measures, as well as in the development of biobased products. In addition, public funding may be used to encourage the uptake of green technologies, such as electric and hybrid vehicles, and biofuels.

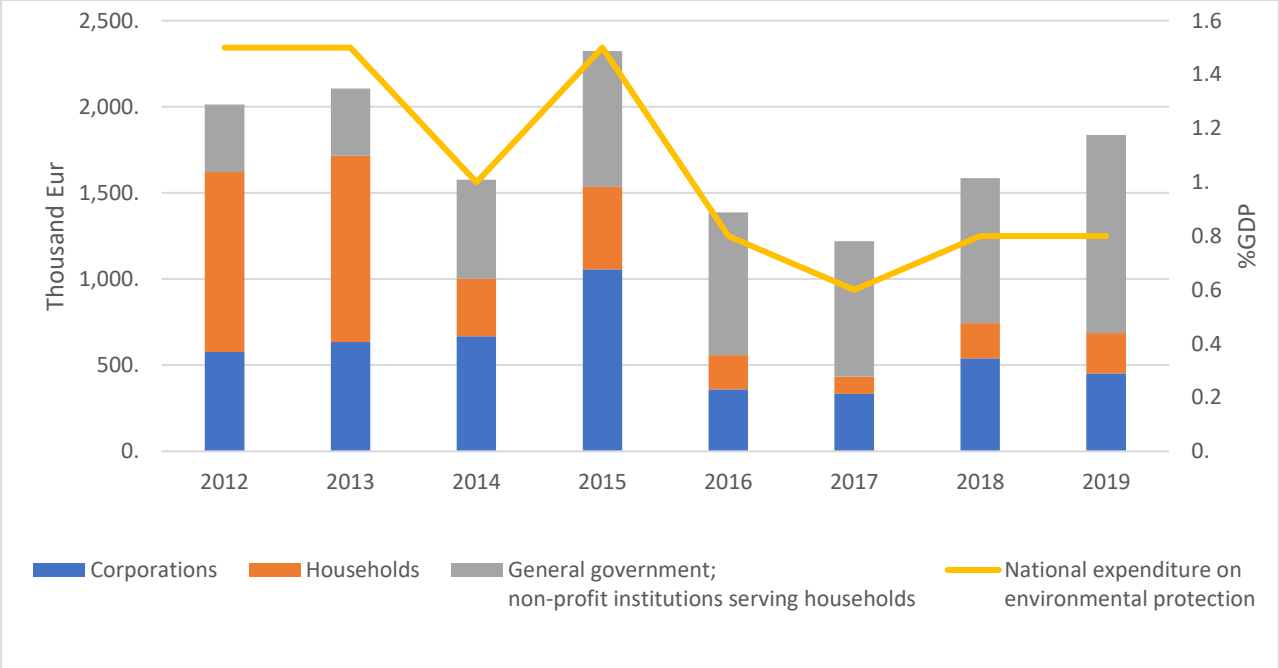

Fig. 5. National expenditures on environmental protection by institutional sector and percentage of gross domestic product.
Source: Own design based on the data from Eurostat [12].

CONCLUSIONS

The bioeconomy sector is considered an engine of change necessary for the implementation of the action plan included in the Green Pact, addressing economic, social and environmental aspects. It is a rapidly growing sector, and the material flow associated with it is becoming increasingly complex. This complexity is driven by the need to develop new technologies and processes to meet the needs of a growing global population.

Proposed by the European Commission and adopted in 2019, the European Green Deal, aims to bring climate neutrality in Europe by the next 30 years. The Bioeconomy strategy, included in this set of initiatives, aims to create a circular and sustainable bioeconomy for delivering goods and services to European citizens, while preserving resources and ecosystems.

It also includes initiatives to promote the use of renewable resources, reduce food waste, and promote sustainable practices. Steps are being taken in each state towards fulfilling the objectives of green transition. However, when analyzing the data,it can be observed that Romania's bioeconomy is still underdeveloped as compared to most of the EU's member states. A national strategy and action plan towards green and just transition of Romanian economy is definitely needed for supporting Green Deal targets.

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