

THE CIRCULAR ECONOMY AND SUSTAINABLE DEVELOPMENT OF RURAL AREAS: BETWEEN NECESSITY AND OPPORTUNITY

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Abstract: *In the current context of ecological, economic, and social crises, the circular economy is emerging as an essential solution for promoting sustainable development, particularly in rural areas. This economic model, based on waste reduction, resource reuse, and the regeneration of natural systems, responds to the urgent need to optimize the use of local resources and to reduce dependence on linear consumption models. At the same time, the circular economy offers concrete opportunities for the revitalization of rural communities by stimulating local entrepreneurship, creating green jobs, and strengthening economic resilience. This study analyzes the potential of integrating circular economy principles into rural development strategies, emphasizing the balance between the necessity of ecological transition and the opportunities for innovation and social cohesion. The present study highlights the growing importance of the circular economy as a strategic instrument in the process of sustainable development in rural areas. Through a mixed-methods approach, it was possible to shape an integrated perspective on how the principles of the circular economy are perceived, understood, and, in some cases, applied within rural communities. In conclusion, the circular economy should not be seen only as a necessity imposed by the global context, but also as a real opportunity for the revitalization of the Romanian rural space. Its integration into local development strategies could accelerate the transition toward more sustainable, inclusive, and resilient rural communities in the face of future challenges.*

Key words: *circular economy, rural development, sustainable development, local communities, resilience*

INTRODUCTION

In recent decades, concerns about environmental degradation, resource depletion and global socio-economic imbalances have led to the formulation and adoption of new paradigms of sustainable thinking and action. At the heart of these is the concept of sustainable development, defined as a development process that meets the needs of the present without compromising the ability of future generations to meet their own needs. [8,15]. This approach requires a balance between economic growth, social inclusion and environmental protection.

In the current context of the global climate crisis, the depletion of natural resources and the increasing pressure on ecosystems, the circular economy appears as a viable solution for the transition to a sustainable development model. Unlike the linear economy, the circular economy promotes resource efficiency, the elimination of waste by design and the extension of the product life cycle [3,10]. This approach is increasingly integrated into European strategies, as demonstrated by the Circular Economy Action Plan adopted by the European Commission [11,13].

In recent decades, the accelerated growth of global production and consumption has generated alarming levels of waste in all sectors of the economy: food, energy, textiles, construction materials, etc. [4] This waste is not only a symptom of the inefficiency of the linear economy, but also a major obstacle to the transition to sustainable development. According to the Food and Agriculture Organization of the United Nations, approximately

30% of the food produced annually globally is wasted, while over 800 million people suffer from malnutrition.

In this context, the circular economy offers a systemic model to replace the current "extract-produce-consume-discard" pattern with a regenerative one, in which waste is eliminated or reintegrated into the economic circuit [6,12]. The purpose of this article is to analyze the relationship between waste and the circular economy, exploring how reducing waste is becoming a central objective of modern sustainability [2].

The circular economy has become, in recent decades, an essential pillar of global sustainable development strategies. In contrast to the linear economic model, based on "extract-produce-consume-dispose", the circular economy aims to conserve resources through reuse, recycling and regeneration. [1,12]. In rural areas, which play a fundamental role in preserving biodiversity and producing food, applying circular economy principles is not only an opportunity, but a necessity in the context of climate change, the migration of the young population and the pressure on natural resources.

The concept of sustainable development, enshrined in the Brundtland Report [15], represented a fundamental shift in economic and social thinking, proposing a model in which economic progress is no longer achieved at the expense of the environment or social equity. Against the backdrop of the limitations of the linear economic model – "extract-produce-consume-dispose" – the concept of the circular economy was developed, which brings a systemic approach to resource use and waste management [3,7].

The circular economy is not a simple alternative to the traditional economy, but a transformative strategy that acts on all three pillars of sustainable development: economic, ecological and social. [5,9] From this perspective, circular economy is considered a functional condition and a fundamental causal mechanism in achieving sustainable goals.

MATERIALS AND METHODS

The purpose of this article is to analyze the relationship between the circular economy and sustainable development through the lens of resource waste, by exploring existing initiatives, untapped potential, and the challenges encountered in implementing these concepts. The research used a qualitative methodology based on documentary analysis of European and international reports, case studies and relevant scientific articles published between 2010–2024, as well as a statistical analysis of existing data on resource waste.

RESEARCH RESULTS

The traditional economic model, of the "extract-produce-consume-throw" type, has generated an alarming level of waste in all sectors: food, energy, water, materials. Waste is the expression of the inefficiency of modern economic systems and constitutes a major obstacle to sustainability. Thus, global and European statistics indicate a disastrous situation, approximately 30% of the food produced globally is wasted (FAO, 2022), and at the European Union level, only 12% of the materials used come from recycling (Eurostat, 2023), while energy waste in buildings and transport contributes significantly to GHG emissions.

The impact of waste is multiple. On the ecological level, waste contributes to greenhouse gas emissions, the overuse of natural resources and pollution. On the economic level, it generates hidden costs and undermines competitiveness. And from a social point of view, waste accentuates inequality in access to resources.

Thus, combating waste becomes a cross-cutting objective, essential for both EC and DD.

For the circular economy, waste is not only a problem, but also an opportunity. For example, food waste can be transformed into compost or biogas; textile waste into recycled fibers; wastewater into a renewable resource. This revalorization of waste leads to: reducing dependence on primary resources, reducing environmental impact (GHG emissions, water and soil pollution) and generating green jobs and stimulating local innovation [13].

At the same time, reducing waste is an essential condition for achieving the Sustainable Development Goals (SDGs), especially SDG 12 – “Responsible Consumption and Production” and SDG 13 – “Climate Action”.

This article provides an overview of waste generation and treatment in the European Union (EU) and several non-EU countries. It is based exclusively on data collected in accordance with Regulation (EC) No 2150/2002 of the European Parliament and of the Council on waste statistics.

Waste, defined by Directive 2008/98/EC Article 3(1) as ‘any substance or object which the holder discards or intends or is required to discard’, potentially represents an enormous loss of resources, both in the form of materials and energy. In addition, the management and disposal of waste can have serious impacts on the environment. Landfilling, for example, takes up land and can cause air, water and soil pollution, while incineration can lead to emissions of air pollutants.

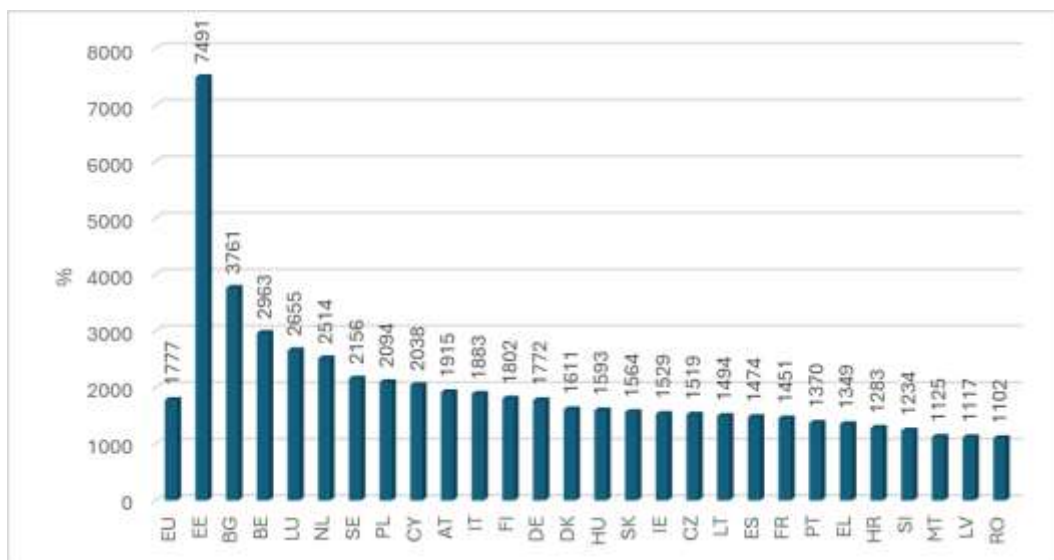


Figura 1. Waste generation, excluding major mineral waste, 2022

Source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics, [14]

EU waste management policies therefore aim to reduce the impact of waste on the environment and health and to improve resource efficiency in the EU. The long-term aim of these policies is to reduce the amount of waste generated and, where waste generation is unavoidable, to promote it as a resource and to achieve higher levels of recycling and safe disposal of waste.

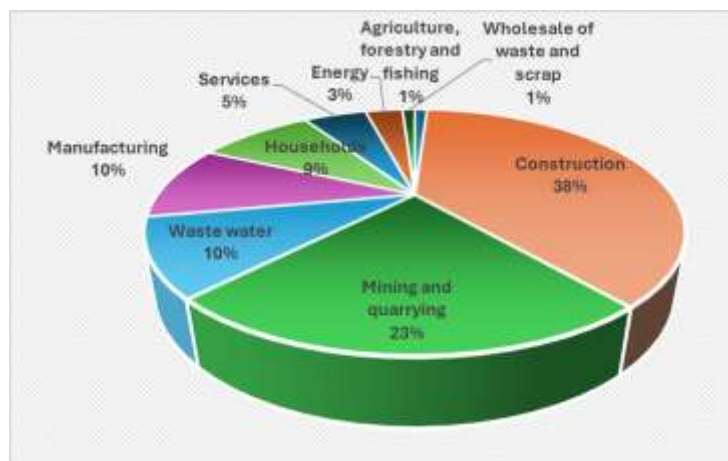


Figure 2. Waste generation by economic activities and households in EU, 2022

Source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics, [14]

According to data provided by Eurostat, in 2022, 2,233 million tonnes of waste were generated in the European Union, an average of 4,991 kg per capita. Each economic activity produced different amounts of waste, figure 2, with the highest value generated in construction (38.4%), followed by the mining and extractive industries (22.7%). Households generated an average of 8.9% of the total waste recorded at the Union level.

Regarding the material reuse rate in the European Union, it has reached 11.5%, which means that 11.5% of the material resources used in the EU come from recycled waste.

Between 2010 and 2022, the recycling rate increased significantly by 0.8 percentage points, from 10.7% to 11.5%. For 2021, the recycling rate increased by 0.1%. At the European Union level, the recycling rate records different values, with the highest values being recorded in the Netherlands 27.5%, Belgium 22.2% and France 19.3%.

Between 2010 and 2022, the rate increased by 0.8 pp, from 10.7% to 11.5%, but the highest shares were observed in 2018 and 2020: 11.6%. These differences result not only from the amount of waste recycled by each country, but also on structural factors in the national economies.

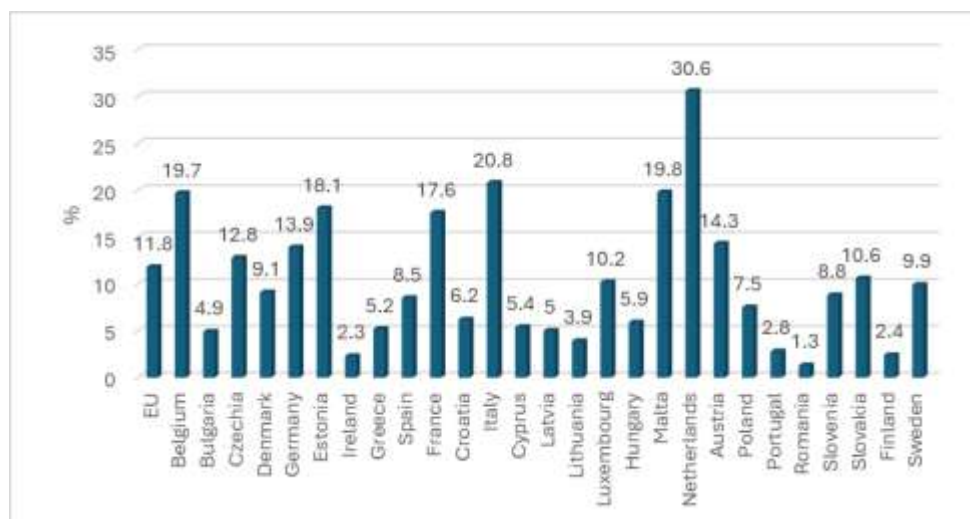


Figure 3. Circularity rate, 2023

Source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics, [14]

In 2023, the Netherlands had the highest circularity rate, 30.6%, followed by Italy (20.8%) and Malta (19.8%). The lowest rates were recorded in Finland (2.4%), Ireland (2.3%) and Romania (1.3%).

The differences in recycling rates across EU countries are due to both the amount of waste recycled in each country and the structural factors in the national economies. The higher the amount of waste recycled, the higher the circularity rate. The circularity rate can also increase when domestic material consumption is low.

In Romania, the potential for the circular economy is high, especially in rural areas, which occupy approximately 87% of the territory and are home to almost 45% of the population. These regions are characterized by a strong interdependence between economic activities and natural resources, being affected by chronic problems such as depopulation, poverty, poor infrastructure and limited access to quality public services.

These challenges transform the circular economy into an opportunity for economic and social regeneration. Composting initiatives, the transformation of agricultural waste into biomass or the development of social entrepreneurship around ecological practices can create jobs and revitalize rural communities. This article aims to investigate how the circular economy can contribute to the sustainable development of rural areas in Romania, through an analysis of the population's perception, the degree of implementation and the obstacles encountered.

CONCLUSIONS

In the context of contemporary economic, social and ecological pressures, the circular economy is no longer just a strategic option, but an imperative necessity for the sustainable revitalization of rural areas. The study results highlight that the transition to circular models in rural areas can significantly contribute to reducing resource waste, diversifying economic activities and strengthening the resilience of local communities in the face of climate and demographic challenges.

Implementing circular economy principles – such as reuse, recycling, organic waste recovery, the collaborative economy and the promotion of short supply chains – offers real opportunities for revitalizing local agriculture, developing eco-tourism and generating green jobs. At the same time, these practices contribute to preserving natural and cultural heritage, increasing the attractiveness and functionality of rural areas.

However, the realization of this potential is conditional on the existence of a coherent public policy framework, access to European funding and the strengthening of local capacities. Ecological education, the digitalization of agriculture and partnerships between authorities, entrepreneurs and civil society are essential elements for the successful operationalization of circular principles.

In conclusion, the circular economy is both a necessity in the face of resource limitations and environmental degradation, and a strategic opportunity for the sustainable development of the Romanian rural environment. The direction of the rural future should be oriented towards innovation, sustainability and social cohesion, in a framework adapted to the needs and potential of each community.

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