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The circular economy in Romania and in the EU Member States

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Abstract. *The transition to a circular economy could bring many benefits, such as: Reducing the pressure on the environment, improving the security of supply of raw materials, increasing the competitiveness of businesses, stimulating innovation, boosting economic growth and not least creating new jobs. The aim of the work is to highlight the situation of Romania compared to the Member States of the European Union as regards indicators specific to the circular economy. To achieve this aim, the following indicators have been analyzed: Trade in recyclable raw materials, circular use rate of material, municipal recycling rate, and private investment in circular economy sectors, both at Romanian level and across all EU Member States, in the period 2010-2020. The countries with the largest amounts of recycled raw materials are Germany and the Netherlands with more than 1,5 million tons in 2020 and the country-wide extra-EU trade in recyclable raw materials was 25,2 thousand. The Netherlands, Belgium and France are the leading figures for the use rate of recyclable metals. However, the highest recycling rate was registered by Germany with 67%, with Romania among the last countries.*

Keywords: Circular economy, circularity indicators, recyclable raw materials, circular material use rate, municipal recycling rate.

Introduction

The European Commission defines the circular economy as: ‚A production and consumption model that involves sharing, re-using, repairing, renovating and recycling existing materials and products as much as possible. In this way, the life cycle of products is extended.'(European Commission, 2018).

The policy areas of the European Union (EU) in relation to the circular economy were identified in the Action Plan launched by the European Commission in 2015, at the time of the

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adoption of certain proposals for waste directives, packaging, electrical, electronic and landfill installations. In the 2015 Action Plan for the transition to a circular economy, the European Commission defined the circular economy as the economy where the value of products, materials and resources remains in the economy in the long term and the generation of waste is minimized. (Paccurariu et al, 2021, 102-111; Busu C and Busu M, 2018, 554-564)

According to reports published by the European Commission, the transition to a circular economy could bring many benefits, such as: Reducing the pressure on the environment, improving the security of supply of raw materials, increasing the competitiveness of enterprises, stimulating innovation, stimulating economic growth and, last but not least, creating new jobs (580.000 jobs in the EU only). Consumers will also be able to benefit from more sustainable and innovative products that will increase the quality of life in the long term. (European Parliament, 2018)

In line with the European Union's objective of achieving climate neutrality by 2050 under the Green Pact, the European Commission has proposed a new action plan for the circular economy. It focuses on waste prevention and management and aims to boost economic growth, competitiveness and the preservation of the Union's leading position in this area. (European Parliament, 2021)

In this context, Romania needs to adopt EU legislation on the circular economy, but statistical data shows that our country is at the bottom of the list of Community countries on the implementation of the circular economy. (Paccurariu et al, 2021)

Nowadays, Romania is experiencing poor resource rationalization given that resource efficiency, after resource productivity, was the lowest in the European Union in 2015, at EUR 0,31/kg compared to the EU average of EUR 2,0/kg. This is due to the very high consumption of resources, which were not validated by specific processes of reintroduction into the production chain. (E.g. sorting procedures, recycling for plastic, paper and glass packaging services) (Busu C and Busu M, 2018, 554-564)

Literature review

As the industry needs to sell more products, it needs more input (traditionally, the production function covers: materials, labor and capital investment), but contemporary materials are artificially produced by chemical processes, this being the linear model, which is based on “extraction - use - production of waste”, this model stimulates extensive growth by exploring more and more natural resources. In this context, the concept of Circular Economy appeared, in response to the actions carried out for a sustainable development regarding the overproduction and excessive consumption of natural resources. (Sterev, 2019, 511-523)

The concept of circular economy in developed countries such as the US, UK and European Union countries focuses mainly on the 3 Rs, reducing, reusing, recycling resources, waste management and reducing the environmental impact for sustainable development. While developed countries in Asian regions, such as South Korea and Japan, focus mainly on raising public awareness of consumer responsibility for the use of materials and waste. China, on the other hand, has adopted the EC concept to promote urban development and achieve balanced growth in both rural and urban development. (Ngan et al., 2019, 314-331)

The Ellen MacArthur Foundation (EMF, 2013) defines the circular economy as "an economic closed-loop system in which raw materials, components and products retain quality and value for as long as possible and the systems are powered by renewable energy sources". This alternative model of production and consumption aims to decouple the economic development of linear dynamics of extraction, use and disposal of finite resources. (Velasco-Muñoz et al., 2021)

Circular economy has been developed to eliminate unsustainable patterns of development and create long-term prosperity. The circular economy can also be associated with the green economy as an important way to change the growth model and achieve coordination between the economy, resources and the environment. Deep exploration of the theory of the circular economy and the promotion to a large extent of the establishment and improvement of the underlying mechanism are important tasks for the development of the circular economy. (Fitch-Roy et al., 2019, 983–1003; Xin, 2013, 725-730)

The circular economy is a promising way to achieve sustainability by decoupling economic growth from resource extraction and environmental losses. Environmental challenges, especially in the form of resource depletion, pollution and greenhouse gas emissions, are very important challenges for socio-economic development. For this reason, the concept of the circular economy has been developed and is implemented in different areas. (Genovese et al., 2017, 344–357; Paradowska, 2017, 245-269)

The term circular economy is very specific and emerging as it is a concept that relates to a number of subjects, such as sustainability, engineering, ecology, cleaner production, eco-efficiency, closed loop economy, zero waste. In the socio-economic context of business development, the circular economy is considered an important approach to achieving economic and environmental sustainability. (Ruiz-Reale, 2018, 2699)

Being perceived in recent years as a 'political vision around the world', circular econimy is being promoted as a 'new path to sustainable development defined by the concept of a triple core line which achieves economic performance simultaneously, Social inclusion and environmental resilience for the benefit of present and future generations". (Jurgilevich et al, 2016, 69)

Kanda et al (2021, 2814-2829) States that an ecosystem-based perspective can support innovation and entrepreneurship in the context of the circular economy, which aims to minimize resource inputs, waste and exit emissions of the economy and its organizational subsystems.

In his paper, Calzolari et al (2022) argue that greater circularity in the use of materials should provide organizations with a variety of economic benefits, including: reduced costs of raw materials and materials, higher value extraction from resources, and greater resilience, as well as a positive contribution to the environment and society as a whole. Thanks to these benefits, companies have placed more emphasis on achieving sustainable production, moving from simple mitigation actions to a focus on environmental damage prevention, based on lifecycle assessment and integrated environmental strategies and management.

Economic circularity involves different dimensions and can be assessed by several indicators. The most relevant EC principles highlighted in the literature correspond to the principles of the circular economy proposed by EMF (2015). The first of the proposed principles involves “waste and pollution design”, in which the efficiency of the system is stimulated by identifying and eliminating these negative externalities (EMF, 2015). In order to assess whether the principles of the circular economy lead to significant changes, it is necessary to develop a measurement system that uses indicators that have the capacity to summarize, concentrate and condense the complexity of the environment into a manageable amount of significant information. (Cayzer et al., 2017, 289-298).

Decision makers need tools to assess the adoption of circular economy practices and to operate profitable, efficient, circular and sustainable supply chains. Decision support tools use many circularity indicators to take into account a variety of cross-border impacts on each dimension of sustainability (economic, environmental and social). From the perspective of Vinante et al. (2021), circular economy indicators consist of single or multiple metrics, which can be defined as “the best level of granularity for the means of evaluation”.

Church and Rogers (2006, 151) define indicators as "means of measuring change" so that they can be used to manage the transition to the circular economy. The high values of circularity indicators are to increase resource efficiency and the high capacity to transform waste into a secondary raw material, which is essential in a circular economy. (Paccurariu et al, 2021, 102-111)

Most indicators focus on the conservation of materials. Strategies that focus on materials, especially recycling, are well-developed actions, but they are some of the existing options for promoting the EC: recycling, while essential for the economy, is not the only aspect of a sustainable EC. According to the European Economic and Social Committee (EESC, 2018), all indicators in the "EC monitoring framework" are "highly waste-focused" due to waste reliability and lack of other options. (Moraga et al., 2019, 452-461; Lohan& Kylä-Harakka-Ruonala, 2018)

Methodology

In the first part of the study, a systematic review of the literature was used to identify the key contributions of research on circular economy indicators. In the second part of the paper we focused on the analysis of statistical data provided by the European Commission on circularity indicators for the period 2010-2020 at Community level.

The following indicators of the circular economy were analyzed: Trade in recyclable raw materials, Circular rate of use of materials (%), Municipal recycling rate (%), Private investment in circular sectors (million euros), and Amount of waste generated per inhabitant (kg / inhabitant).

The research method used consisted in the quantitative and qualitative analysis of statistical data to highlight the evolution of the circularity indicators analyzed in the research. The comparative method was also used to be able to rank the countries according to the values of the analyzed indicators.

Results and discussions

Table 1 shows trade in recyclable raw materials across all European Union countries in the period 2010-2020. This indicator shall represent the total quantities of waste and by-products (plastic, paper and cardboard, precious metals, iron and steel; copper, Aluminum and nickel) which are transmitted to European Union (intra-EU) Member countries.

Tabel nr. 1. Trade in recyclable raw materials at EU Member State level, 2010-2020 (thousand tons)

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2020/2010
Germany	1,655.7	1,754.5	1,752.2	1,664.2	1,606.8	1,621.2	1,686.0	1,776.3	1,745.7	1,646.9	1,586.9	-4%
Netherlands	891.0	977.5	928.6	814.7	940.6	1,049.9	1,173.8	1,312.8	1,223.8	1,338.9	1,294.4	45%
Spain	2,138.9	1,812.1	1,680.7	2,131.4	2,155.6	2,319.9	1,669.8	1,666.8	1,477.5	1,455.3	1,107.9	-48%
Italy	819.2	1,056.5	621.5	786.5	623.7	683.9	569.6	678.9	745.2	620.2	666.4	-19%
Greece	511.5	427.0	213.7	122.7	156.3	222.0	496.7	506.2	624.8	723.7	636.3	24%
Belgium	436.7	413.5	352.7	452.2	365.7	289.5	433.3	487.0	649.8	601.2	598.3	37%
Portugal	324.2	452.9	504.5	675.8	648.2	653.7	604.0	709.4	579.2	466.8	543.4	68%
France	774.2	882.7	942.1	735.5	711.1	643.5	546.2	586.0	470.4	414.1	453.2	-41%
Sweden	985.1	885.8	779.1	622.1	633.3	674.3	632.7	572.2	663.3	597.9	390.8	-60%
Austria	216.3	220.5	207.5	198.2	232.4	224.8	227.7	240.7	227.3	239.6	230.3	6%
Bulgaria	56.4	141.0	92.2	71.6	78.7	88.1	101.2	129.7	101.8	114.4	123.2	119%
Denmark	86.2	76.3	85.4	181.8	116.7	116.3	109.1	136.6	187.5	178.2	114.9	33%
Slovenia	175.6	173.8	157.7	148.6	133.0	110.3	116.0	129.1	142.0	99.3	86.4	-51%
Poland	42.1	81.9	65.8	86.9	50.0	236.0	124.7	103.7	79.2	105.2	85.7	103%
Croatia	70.5	90.9	65.3	74.0	89.4	70.7	55.8	50.9	74.5	77.7	83.6	19%
Lithuania	23.9	31.2	45.9	41.6	31.3	35.2	28.0	24.4	57.7	63.9	69.0	189%
Latvia	149.0	88.3	376.4	107.6	61.2	29.2	11.8	17.7	33.2	34.3	57.1	-62%
Hungary	10.6	6.6	20.0	27.9	29.1	41.3	38.6	46.6	31.0	30.7	41.2	291%
Romania	11.5	19.3	48.9	31.6	22.6	27.1	19.8	19.6	27.0	24.9	25.2	119%
Ireland	21.5	22.5	21.2	20.3	31.2	40.2	25.3	38.8	30.9	33.8	22.3	4%
Estonia	18.6	8.4	1.6	2.7	4.2	4.1	5.2	12.4	16.1	22.4	21.5	16%

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2020/2010
Luxembourg	33.3	40.1	40.7	32.8	22.3	23.5	16.4	15.9	29.6	16.6	11.6	-65%
Slovakia	3.3	1.7	7.9	3.1	6.6	9.0	7.0	10.0	9.8	13.5	11.3	237%
Finland	128.0	149.4	51.6	35.4	32.9	17.4	25.9	36.2	36.0	28.4	10.7	-92%
Czechia	2.0	3.4	4.8	5.4	5.2	3.3	5.1	4.9	6.0	7.9	7.5	269%
Malta	0.5	0.3	0.3	0.2	0.1	0.1	0.1	3.4	1.9	1.1	2.8	484%
Cyprus	0.3	0.1	0.0	0.1	0.1	0.2	0.1	0.1	0.3	0.0	0.3	13%

Source: Eurostat, accessed on 01.02.2022.

It can be noted that the countries with the largest quantities of recyclable raw materials marketed are Germany with more than 1,5 million tons in 2020 and the Netherlands with around 1,3 million tons, whereas, Last-place countries such as Malta and Cyprus with an externally traded recyclable raw materials of 2,8 thousand tons of resspective 0,3 thousand tons. (Table no. 1)

At national level, extra-EU trade in recyclable raw materials was 25,2 thousand tons in 2020, up by 119% compared to 2010. Historically, trade in the largest amount of recyclable raw materials was in 2012, around 48,9 thousand tons. (Fig. No 1)

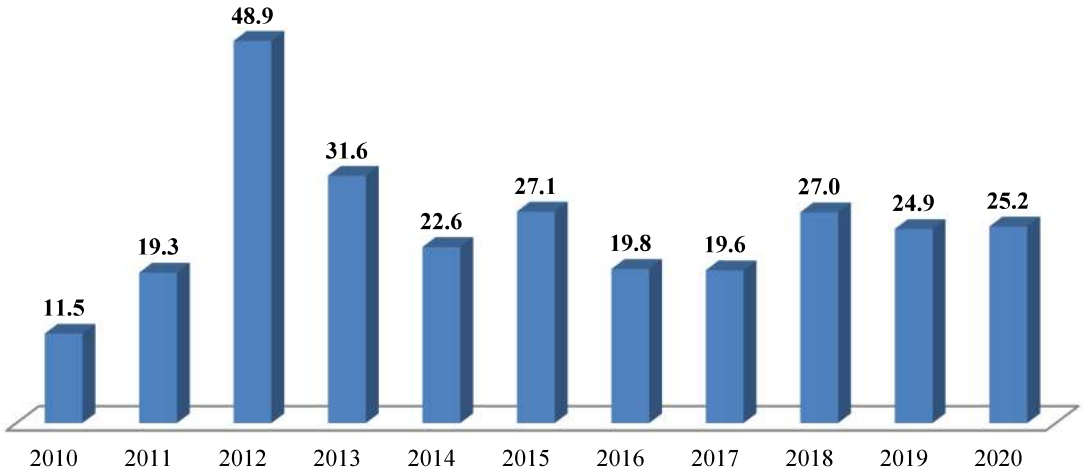


Figure 1. Trade in recyclable raw materials in Romania from 2010-2020 (thousand tons)
Source: Processing based on Eurostat data.

Table 2 analyzed the use rate of recyclable metals at the level of all Member States of the European Union in the period 2010-2020. This indicator actually shows the share of recycled materials returned to the economy, thus contributing to a decrease in raw material consumption.

The circular rate of use of the material known as the circularity rate is in fact the ratio of the circular use of the materials to the total materials used.

According to Eurostat data, in 2020 the top ranking in terms of the circulation rate of materials was the Netherlands, with 30,9%, followed by Belgium and France with 23% and 22,2%, and Romania was the last with 1,3%. (Table no. 2)

A higher value of the circular rate of use of materials shows that a higher amount of secondary materials replaces primary materials, thus contributing to reducing environmental impact. Significant increases in this indicator are recorded in Latvia, which in 2020 reached 4,2%, 250% more compared to the reference year 2010. In Croatia, the circular use rate of materials also increases from 1,6% in 2010 to 5,1 in 2020, representing an increase of 219%. (Table no.2) Luxembourg and Finland have seen significant decreases in the circulation rate of materials, with a decrease of 24,1 and 13,5% respectively in 2010, reaching 13,6 and 6,2% respectively, representing a decrease of 44% and 54% respectively. (Table no.2)

Table No 2. Circular rate of material use (%) at EU Member State level in 2010-2020

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2020/2010
Netherlands	25.3	25	26.5	27.1	26.6	25.8	28.5	29.7	28.9	30	30.9	22%
Belgium	13	14	16.9	16.8	17.6	17.7	17.6	18.5	19.9	23.5	23	77%
France	17.5	16.8	16.9	17.3	17.8	18.7	19.4	18.8	19.7	20	22.2	27%
Italy	11.5	11.6	13.9	16	16.1	17.2	17.8	18.4	18.8	19.5	21.6	88%
Estonia	8.8	14.2	19.1	14.6	10.9	11.3	11.6	12.4	13.5	15.6	17.3	97%
Luxembourg	24.1	20.7	18.5	15.4	11.3	9.7	7.1	10.6	10.8	10.5	13.6	-44%
Czechia	5.3	5.4	6.3	6.7	6.8	6.9	7.5	9.1	10.5	11.3	13.4	153%
Germany	11.4	10.8	11.2	11.3	11.3	12	12.2	11.8	12.4	12.9	13.4	18%
Slovenia	5.9	7.6	9.3	9.3	8.5	8.6	8.7	9.8	10	11.4	12.3	108%
Austria	6.6	6.8	7.5	8.7	9.6	10.7	11.2	11.4	11.1	11.5	12	82%
Spain	10.4	9.8	9.8	8.9	7.7	7.5	8.2	8.8	9	9.6	11.2	8%
Poland	10.8	9.2	10.6	11.8	12.6	11.6	10.2	9.9	9.8	10.3	9.9	-8%
Hungary	5.3	5.4	6.1	6.2	5.4	5.8	6.5	6.9	7	7.3	8.7	64%
Malta	5.3	4.5	3.9	6.3	6.4	4.6	4.2	6.5	8.3	7.7	7.9	49%
Denmark	8	7	6.4	7.7	9	8.3	8	7.9	8.1	7.6	7.7	-4%
Sweden	7.2	7.6	8.2	7.2	6.4	6.7	6.8	6.7	6.6	6.5	7.1	-1%
Slovakia	5.1	4.8	4.1	4.6	4.8	5.1	5.3	5	4.9	6.4	6.4	25%
Finland	13.5	14	15.3	10.1	7.3	6.4	5.3	5.6	5.9	6.3	6.2	-54%
Greece	2.7	2.2	1.9	1.8	1.4	1.9	2.3	2.8	3.3	4.1	5.4	100%
Croatia	1.6	2.4	3.6	3.9	4.8	4.6	4.6	5.2	5	5.2	5.1	219%
Lithuania	3.9	3.6	3.8	3.1	3.7	4.1	4.6	4.5	4.3	3.9	4.4	13%
Latvia	1.2	2.9	1.3	3.8	5.3	5.3	6.5	5.4	4.7	4.3	4.2	250%
Cyprus	2	1.9	2	2.4	2.2	2.4	2.4	2.4	2.8	2.9	3.4	70%
Bulgaria	2.1	1.8	1.9	2.5	2.7	3.1	4.4	3.5	2.5	2.3	2.6	24%
Portugal	1.8	1.7	2	2.5	2.4	2.1	2.1	2	2.2	2.3	2.2	22%
Ireland	1.7	2.1	1.8	1.7	2	1.9	1.7	1.7	1.6	1.6	1.8	6%
Romania	3.5	2.5	2.6	2.5	2.1	1.7	1.7	1.7	1.5	1.3	1.3	-63%

Source: Eurostat, accessed on 01.02.2022.

Romania is placed in the last position of the EU Member States, with a drop in the circulation rate of material use from 3,5% in 2010 to 1,3% in 2020, a decrease of 63%. Trend line y = -0.191x + 3,187, indicates a decrease of about 19,1%. It is also noted that there is a very strong link between the two variables (correlation ratio Rx/y = 0,937); the variation in the circulation rate of waste is 87,8 % influenced by the time period considered, The remaining 12,2% being the influence of other factors not included in the model.(Fig. No. 2)

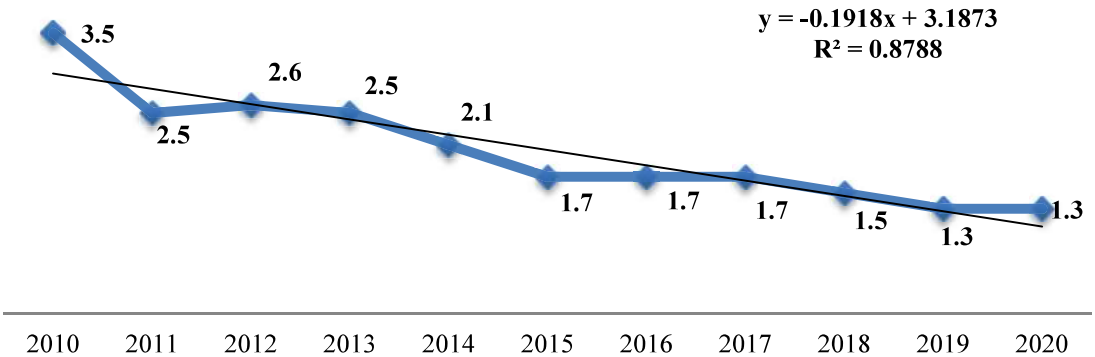


Figure 2. Circular rate of use of the material in Romania during the period 2010-2020 (%)

Source: Processing based on Eurostat data.

One of the objectives of the new Circular economy Action Plan is to reduce the consumption footprint and double the circular use rate of materials, while taking account of

economic growth. According to the European Commission, the application of fair and ambitious measures on the transition to a circular economy can help to increase gross domestic product by more than 0,5% by 2030. (European Commission, 2020)

Table No. 3. Municipal recycling rate at European Union level (%)

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2020/2010
Germany	62.5	63.0	65.2	63.8	65.6	66.7	67.1	67.2	67.1	66.7	67.0	7%
Slovenia	22.4	35.6	41.9	34.8	36.0	54.1	55.6	57.8	58.9	59.2	59.3	165%
Netherlands	49.2	49.1	49.4	49.8	50.9	51.8	53.5	54.6	55.9	56.9	56.8	15%
Belgium	54.8	54.4	53.4	52.8	53.8	53.5	53.5	53.9	54.4	54.7	54.2	-1%
Denmark	-	42.4	42.5	43.3	45.4	47.4	48.3	47.6	49.9	51.5	53.9	-
Luxembourg	46.5	46.4	47.4	46.6	47.7	47.4	49.2	48.7	49.0	48.9	52.8	14%
Lithuania	4.9	19.9	23.5	27.8	30.5	33.1	48.0	48.1	52.5	49.7	45.1	820%
France	36.0	36.8	37.7	38.7	39.7	40.7	42.9	44.1	45.1	43.9	42.2	17%
Slovakia	9.1	10.8	13.4	10.8	10.3	14.9	23.0	29.8	36.3	38.5	42.2	364%
Finland	32.8	34.8	33.3	32.5	32.5	40.6	42.0	40.5	42.3	43.5	41.6	27%
Ireland	35.7	36.1	36.6	-	39.8	-	40.7	40.4	37.6	37.4	40.4	13%
Latvia	9.4	9.7	14.7	25.9	27.0	28.7	25.2	24.8	25.2	41.0	39.6	321%
Poland	16.3	11.4	12.0	15.1	26.5	32.5	34.8	33.8	34.3	34.1	38.7	137%
Sweden	47.8	47.0	46.9	48.2	49.3	47.5	48.4	46.8	45.8	46.6	38.3	-20%
Spain	29.2	26.7	29.8	32.5	30.8	30.0	33.9	36.1	34.8	39.3	36.4	25%
Croatia	4.0	8.3	14.7	14.9	16.5	18.0	21.0	23.6	25.3	30.2	34.3	758%
Czechia	15.8	17.0	23.2	24.2	25.4	29.7	33.6	32.0	32.2	33.3	33.8	114%
Hungary	19.6	22.0	25.5	26.4	30.5	32.2	34.7	35.0	37.4	35.9	33.0	68%
Portugal	18.7	20.1	26.1	25.8	30.4	29.8	30.9	29.1	29.1	28.9	26.5	42%
Cyprus	10.9	11.0	12.5	13.9	14.8	16.6	16.1	16.2	16.5	16.3	16.4	50%
Romania	12.8	11.7	14.8	13.2	13.1	13.2	13.4	14.0	11.1	11.5	13.7	7%
Malta	8.9	15.4	14.4	12.5	11.7	10.9	12.7	11.5	10.4	9.1	10.5	18%
Bulgaria	24.5	26.2	25.0	28.5	23.1	29.4	31.8	34.6	31.5	-	-	-
Estonia	18.2	23.3	19.1	17.9	31.3	28.3	28.1	28.4	28.0	30.8	-	-
Greece	17.1	17.8	17.0	15.8	15.4	15.8	17.2	18.9	20.1	21.0	-	-
Italy	31.0	35.5	38.4	39.4	41.6	44.3	45.9	47.8	49.8	51.4	-	-
Austria	59.4	56.7	57.7	57.7	56.3	56.9	57.6	57.7	57.7	58.2	-	-

Source: Eurostat, accessed on 01.02.202.

The municipal recycling rate shows the share of recycled waste in total municipal waste at country level.

At EU level, the highest recycling rate in 2020 was registered by Germany by 67%, up by 7,2% compared to 2010 (62,5%).

In 2, Slovenia ranks at 59,3%, followed by the Netherlands with 56,8%, Belgium and Denmark. The bottom is Cyprus with a recycling rate of 16,4%, Romania with 13,7% and Bulgaria with 10,7%.

There are significant increases in 2020 compared to 2010 in Lithuania (920,41%), Croatia (857,5) and Slovakia (463,74%). In the case of Belgium, the municipal recycling rate also shows a decrease of -1,09% in 2020 (54,2%) compared to 2010 (54,8%). For Sweden, the municipal recycling rate decreases in 2020 (19,87%) by 19,87% compared to the recycling rate recorded in 2010 (47,8%) (Table no. 3)

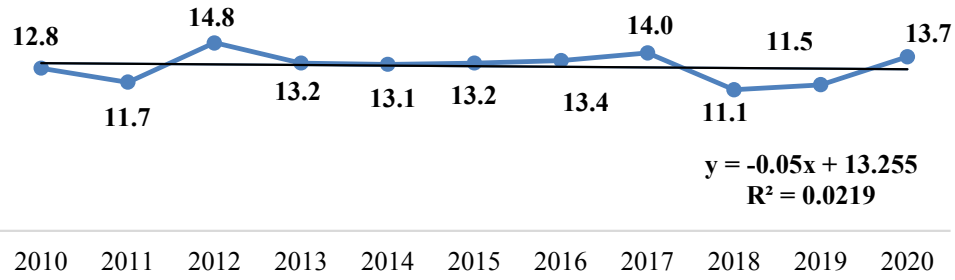


Fig. No. 3. Municipal recycling rate at the Romanian level (%)

Source: Processing based on Eurostat data.

In Romania, the rate of municipal waste recycling varies between 2010 and 2020.Thus, in 2010 Romania showed a recycling rate of 12,8%, reaching 13,7% in 2020, with an increase of 9%. 2017 is marked at a rate of 14%, with the highest rate of municipal recycling recorded in Romania during the analysis period (Fig. No 3).

This growth can be attributed to European initiatives on urban development. The "smart cities – a challenge" and the initiative to promote the circular economy in cities and regions will contribute to the essential development of urban areas. The "Green cities Agreement" States that one of its objectives is to make progress on the circular economy in order to improve the municipal waste management system.

Trend line y = -0.05x + 13,25, indicates a decrease of about 0,05%. It is also noted that there is a poor link between the two variables (correlation Rex/y ratio == 0,144); The variation in the municipal waste recycling rate being 0,21% influenced by the time period considered, the remaining 79% being the influence of other factors not included in the model.(Fig.no. 3)

Table No. 4. Private investment in circular economy sectors (million euro)

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average
Germany	-	-	-	27,235	26,676	26,334	28,363	28,628	31,246	32,080	34,800	29,420
France	-	18,940	20,474	21,220	20,737	21,228	21,590	21,316	19,466	22,397	22,205	20,957
Italy	17,438	14,522	17,032	17,328	17,436	16,987	17,531	17,757	18,020	18,633	19,457	17,467
Spain	10,812	9,452	10,255	9,612	9,318	10,795	10,653	11,038	11,464	12,304	12,981	10,789
Netherlands	-	5,174	5,375	6,003	5,691	5,229	5,348	5,207	5,614	6,213	6,654	5,651
Poland	4,769	3,493	4,053	4,307	4,232	4,232	4,662	4,743	4,830	5,200	4,967	4,499
Sweden	3,583	2,937	3,468	3,945	4,079	4,909	4,075	4,103	4,110	4,220	4,143	3,961
Austria	2,742	2,680	2,840	2,905	2,986	3,175	3,453	3,535	3,706	4,145	3,765	3,266
Belgium	-	2,293	2,569	-	2,772	2,706	2,685	2,844	2,926	3,042	3,023	2,762
Denmark	2,158	1,904	1,992	2,121	2,147	2,016	2,204	2,301	2,320	2,384	2,464	2,183
Hungary	803	745	825	856	782	763	874	856	1,040	1,225	1,692	951
Portugal	1,374	1,363	1,394	1,285	1,202	1,184	1,255	1,356	1,413	1,548	1,680	1,368
Romania	1,427	1,013	1,013	1,071	979	974	1,028	1,134	1,281	1,485	1,602	1,182
Croatia	-	-	601	529	503	518	524	552	568	623	811	581
Slovakia	473	360	698	789	834	587	505	587	624	669	752	625
Greece	-	-	-	963	-	713	618	638	617	645	651	692
Bulgaria	502	352	441	453	459	441	487	521	539	637	628	496
Slovenia	414	357	445	458	476	459	494	506	530	560	579	480
Lithuania	317	205	223	289	316	325	346	355	407	475	525	344
Latvia	292	227	216	199	252	231	241	240	251	293	281	248
Cyprus	146	149	155	147	143	-	-	144	162	198	221	163
Finland	1,644	1,541	1,773	-	-	-	1,943	2,034	2,026	1,985	-	1,849
Estonia	188	-	-	175	-	-	-	-	240	-	-	201

Source: Eurostat, accessed on 01.02.2022.

SMEs make a key contribution to the circular economy, which are very active in the area of recycling, repair and innovation. At EU level, Germany has the largest private investment in circular economy sectors, with an average of €29.420 million. This is followed by France and Italy, with an average period of EUR 20.957 million and EUR 17.467 million respectively.

On the other hand, with the lowest private investment in value terms, Estonia and Cyprus are, with EUR 201 million and EUR 163 million respectively. (Table no.4)

Table No. 5. Amount of waste generated per capita (kg / capita)

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average
Denmark	862	806	813	808	822	830	820	814	844	845	826
Luxembourg	666	652	616	626	607	815	798	803	791	790	716
Switzerland	692	697	706	733	728	723	709	706	709	706	711
Malta	622	612	602	628	641	642	666	672	697	643	643
Germany	626	619	615	631	632	633	627	606	609	632	623
Cyprus	676	664	618	602	620	633	625	646	648	609	634
Finland	505	506	493	482	500	504	510	551	566	596	521
Ireland	616	585	-	562	-	581	576	598	625	555	587
France	534	527	520	517	516	530	535	535	556	537	531
Netherlands	568	549	526	527	523	520	513	511	508	534	528
Portugal	490	453	440	453	460	474	486	507	513	513	479
Czechia	320	308	307	310	316	339	489	494	500	507	389
Slovenia	415	362	414	432	449	457	471	486	502	487	448
Lithuania	442	445	433	433	448	444	455	464	472	483	452
Latvia	350	323	350	364	404	410	411	407	439	478	394
Spain	485	468	454	448	456	463	473	475	472	455	465
Slovakia	311	306	304	320	329	348	378	414	421	433	356
Sweden	453	454	455	443	451	447	452	434	449	431	447
Croatia	384	391	404	387	393	403	416	432	445	418	407
Belgium	455	445	436	425	412	419	411	409	416	416	424
Hungary	382	402	378	385	377	379	385	381	387	364	382
Poland	319	317	297	272	286	307	315	329	336	346	312
Romania	259	251	254	249	247	261	272	272	280	287	263
Bulgaria	508	460	432	442	419	404	435	407	-	-	438
Estonia	301	280	293	357	359	376	390	405	369	-	348
Greece	503	495	482	488	488	498	504	515	524	-	500
Italy	529	504	491	488	486	497	488	499	503	-	498
Austria	573	579	578	565	560	564	570	579	588	-	573

Source: Eurostat, accessed on 01.02.2022.

Analyzing the amount of waste generated per capita, in 2020 Germany produces the largest amount of waste per capita with 854 kilograms / inhabitant, followed by Luxembourg with 790 kilograms / inhabitant and Switzerland with 706 kilograms / inhabitant.

Romania is among the last countries in terms of the amount of waste generated, in 2020 there were 287 kilograms / inhabitant, increasing by over 10% compared to the amount in 2010 (259 kilograms / inhabitant) (Table no. 5).

Conclusion

The research carried out shows that Romania is off-track in terms of both the circular rate of use of recycled materials and the municipal waste recycling rate.

Although the amount of municipal waste generated per capita is well below the EU average, the trend is not decreasing, as it is at European level, with the actual decoupling of waste generation from economic growth still requiring efforts throughout the process.

Sustainable development changes the very nature of the economic and business environment. A radical rethink by authorities, consumers and investors is needed to make corporations a catalyst for tackling this challenge, from climate change to social change.

Integrated components of the concept of sustainable development, the circular economy and the green economy, as formulated by the Brundland Commission (1987), i.e. "meeting today's needs without sacrificing the ability of future generations to meet their own needs", are becoming, both through strategic European planning and economic impact, targets with a pressing deadline for achievement.

Investment in innovation, the transfer of green technologies and products, the promotion of sustainable and responsible behavior by producers and consumers, and sustained efforts to raise awareness and civic involvement are essential in this respect.

Without a series of national voluntary compliance measures coupled with the identification of economic instruments and the financing of the necessary investments, by 2030 the conditions for ensuring the conditions for achieving the sustainable development goals will be long overdue beyond the planned European scale.

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