Parameters of Sustainability in the Context of Decarbonization and Circular Construction Sector

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Abstract. Climate change is a 21st century phenomenon and is becoming one of the major challenges of environmental policy. While the manifestations of climate change are diverse across the world and across regions, its negative consequences on socio-economic and natural systems are increasingly significant and require active resolution. To this end, many organizations, associations, and governments are approaching the introduction of new measures that will help eliminate the negative effects of human activity on the environment. To this end, for example, green (energy) taxes are introduced, the amount of waste produced is monitored more and the rate of recycling and reuse of materials is supported, thus meeting the fundamental aspects of the circular economy. The contribution provides an overview and thus comparisons of selected European countries in the field of parameters supporting sustainable development, such as green, energy taxes and revenues from their collection, waste management and waste recycling rate in the construction sector. The result of the research will be the creation of a ranking of countries, based on the punctual assessment, in income from energy tax collection and in the area of waste generation, waste recycling and waste recovery rate from construction and demolition. The declared results will subsequently constitute the basis for the development of a strategic crisis plan, which can be implemented within the individual economies of European countries.

Keywords: Sustainability · Parameter · Decarbonization · Circular construction sector

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1 Introduction

Climate change in the world is already affecting people's health and interfering with individual aspects of our lives. Climate change, global warming and the excessive opt-out of our planet are affecting all of us. For example, many people's awareness of climate change is relatively low.

Environmental changes and problems are a natural part of every planet's life. Although climate change is a natural process, it is gaining faster and more vigorous fallout due to human activity. The visible impacts of environmental change have been observed since the second half of the twentieth century. These include the threat of the use of nuclear weapons, the weakening of the ozone layer and the inevitable climate change.

Environmental problems such as loss of biological diversity, pollution of water, air and soil, depletion of natural resources and overexploitation of land are increasingly threatening the earth's livelihood systems [1]. Social expectations are not being met, for example, due to high unemployment, poor working conditions, social vulnerability, poverty, intergenerational inequality, and growing inequality [2]. Financial problems such as resource risk, problematic ownership structures, unregulated markets and dysfunctional stimulus structures are increasingly causing financial and economic instability for individual firms and entire economies [3]. To address these and other sustainable development issues, the concept of the circular economy has recently been reflected in national policy agendas [4]. This can be seen, for example, in the European Circular Economy Package.

Environmental change and the availability of resources are forcing large infrastructure companies to seek greater flexibility and efficiency in organizing, improving, and transporting large projects around the world. One of the flexible approaches is the concept of a circular economic model. The construction and engineering industry is the largest buyer of natural materials in the world. It accounts for half of the world's steel production and burns more than 3 billion large amounts of natural substances. Current resources are now being burned twice as fast as they are provided. By 2050, this could be several times higher. Competition for resources and supply disruptions now increase unpredictable material costs, making vulnerability temporary and increasing overall costs. For the construction and engineering sectors, an effective solution to prevent this disaster is to adapt the approach from both sides [5].

Efficient use of resources enables more efficient use of infrastructure, vehicles, and space in the built environment. In a built-up environment, resource owners can rent or share unused space, building and development materials, and equipment. Shared and customizable workspaces are gradually making their way into densely populated urban areas. With less space consumption and reduced resource downtime, fewer resources are expected to provide the same energy or management and therefore generate less waste. This includes welcoming more people to a more ground-level atmosphere, making continuous use of workplaces and workspaces, and sharing vehicles and offices [5].

2 Literature Review

2.1 Sustainability and Its Aspects

The concept of sustainability is increasingly resonating in individual segments of society. The generally accepted definition dates to 1987 and is found in the so-called Brundtland Report – entitled "Our Common Future" – which focuses attention on the principles of intergenerational and intragenerational justice. For the first time, the report identifies sustainability as a condition for development capable of "ensuring that the needs of the present generation are met without jeopardizing the ability of future generations to fulfill their own" [6].

Compared to the first versions of sustainability, the Treccani encyclopedia emphasizes that sustainability is a profound evolution that is based on a vision focused primarily on ecological aspects and arrives at a more global significance that, in addition to the environmental dimension, also considers the economic and social aspect. However, these three aspects were considered in a synergistic and systemic relationship and were used to varying degrees to arrive at a definition of progress and well-being that somehow goes beyond traditional GDP-based rates of wealth and economic growth. Ultimately, sustainability means constant and, as far as possible, growing (environmental, social, economic) well-being and the prospect of leaving future generations behind, with a quality of life no inferior to the current one [6].

When talking about sustainable development, we refer to the relationship we have with the natural environment on which we depend in terms of water, energy, raw materials, and food. Added to this is also the relationship we have with the global economic system in terms of the acquisition of raw materials, production, and trade of products. Sustainability refers to our interrelationships, the values of the society we live in compared to other societies. Protecting and nurturing the natural environment by maintaining clean air, clean water, fertile soil and thriving biological systems are criteria for an environmentalist's judgment. On the other hand, the business point of view can also agree, but considers the economic health of a company or a country as the last resort. Even the simplest concept of sustainability has three dimensions: environmental, social, and economical. Western democracies have experienced strong economic development based on urbanization and technological innovation, using energy and natural environmental resources to produce goods and improve health, transportation, financial and other systems. While recognizing that natural resources are limited, advocates point out that technological advances have more than offset resource depletion and there is no reason to believe that this will not be the case in the future. The economic history of developed countries shows a natural progression from early agricultural societies through industrialization and post-industrial economies, where wealth increased more rapidly than population, allowing for constant economic growth. In this way, less developed countries should emulate the Western model and seek to open their countries to Western values and global trade in resources, goods, and services. However, the concept of sustainability challenges this vision. Today, the view of nature as a resource to meet human needs ignores the needs of other life forms and future human generations [7].

The 2008 banking crisis, the failure of democracy and the rapid spread of the coronavirus in 2020 call into question the ideals of the Western free market economy. The

Earth's atmosphere is unable to absorb emissions, the natural water cycle is unable to provide the fresh water needed, and the current international competition to ensure the availability of minerals means that these too are under pressure. All human activities affect the environment in which we live. The environment has a certain capacity to cope with this and can absorb some of it without causing permanent damage [7].

In this context, the World Business Council for Sustainable Development (WBCSD), which includes 165 of the world's largest companies, has stated that it 'shares a commitment to sustainability through three pillars: economic growth, ecological balance and social development' [7]. The concept of sustainability consists of three pillars: environmental, social, and economic. The 2030 Agenda for Sustainable Development combines the ecological, economic, and social dimensions into one:

- The most discussed is environmental protection. Address reducing carbon footprint, water consumption, non-degradable packaging, and wasteful processes as part of the supply chain. The technical description of environmental sustainability comes from The Natural Step, an international non-profit organization dedicated to innovation through sustainability, which focuses on four types of reductions: reducing the extraction of natural substances from the earth's crust (metals, fossil fuels, etc.); reduce the production of chemicals and compounds (plastics, dioxins, etc.); reduce the physical degradation of nature and natural processes (marine, forest habitats, etc.); reduce barriers that prevent people from meeting basic human needs (working conditions, health, etc.). These are powerful concepts that go beyond the idea of environmental sustainability linked only to recycling, reuse and biodegradability, and lead us further to the more general idea of reducing and remodulating consumption, which the market has been supporting for decades through the creation of excess needs and still new ones.
- Social development is about treating employees fairly and ensuring responsible, ethical, and sustainable treatment of employees, stakeholders, and the community in which the company operates. It is a state that preserves the cohesion of society and its ability to support its members in working together to achieve common goals, while meeting individual needs for health and well-being, adequate nutrition and shelter, expression, and cultural identity. And political commitment.
- Economic development is probably the simplest form of sustainable development. For a business to be profitable, it needs to generate sufficient revenue to continue in the future. The challenge of this form of sustainability is to find a balance. Instead of making money at any cost, companies should strive for profit in line with other elements of sustainability [8].

The 2030 Agenda challenges complexity: since the three dimensions of development (economic, environmental, and social) are closely related, each objective cannot be considered separately, but must be pursued based on a systemic approach that considers the interrelationships and does not have a negative impact on other spheres of development. Only the integrated growth of all three components will make it possible to achieve sustainable development [9].

2.2 Sustainability of Buildings

The construction industry is one of the largest industries. As a key player in society, the construction sector is responsible for leading the way in implementing sustainable practices and limiting their impact on the environment. Green buildings will continue to grow and become the new normal, and the aim will be to do more for the long-term impact of our resources [10].

A green building refers to philosophies and processes to achieve the creation and use of a built environment that is as environmentally friendly as possible. From the design stage through construction to the operation of the finished structure, green buildings aim to reduce negative impacts on the planet and ultimately deliver positive returns. All constructions have an inevitable impact on the environment. As sustainability becomes increasingly important around the world, when constructing a new building, we want to minimize our environmental impact and ensure that the building remains sustainable in the years to come. Green buildings are the answer to this challenge and a rapidly growing aspect of the sector. Below are some of the new processes and innovations that are part of the green building movement [10].

There are countless approaches to greener building, from innovative designs that maximize the use of natural resources to the use of alternative energy sources and recycled materials, but the focus is pollution, waste generation, water saving, energy and resource efficiency [11].

The construction of green buildings requires the integration of sustainable construction methods at all stages of the project life cycle (from planning and design to operation and maintenance) to meet the necessary standards. Close cooperation between key stakeholders is essential for this. The use of environmentally friendly technologies and materials can have a high upfront cost, but in the long run it can pay off in terms of factors such as lower energy consumption costs that make the investment worthwhile [11].

Planning and design play a key role in integrating sustainable construction and green technologies into construction. From the materials used in the design itself, there are many factors that can influence the overall sustainability of construction and maintenance that need to be considered during these early stages of a construction project [11].

Materials are often the first thing that comes to mind when you're thinking about building an environmentally sustainable building. The use of organic or recycled materials is becoming increasingly popular due to their low environmental impact. In addition, some standard building materials, such as wood, require less energy to produce and are considered more sustainable than materials such as concrete and steel. When it comes to choosing green materials for work, anything from adhesives and paints to insulation and flooring can be considered. However, it is not only the type of material used that is important, but also its quality [11].

Another important aspect of sustainable architectural design is to harness the power of natural elements. For tall buildings such as skyscrapers, wind energy can also be used to power a building with natural energy. Installing solar panels that absorb sunlight is also a popular source of sustainable energy.

The power of the sun's rays is also transmitted through heat-absorbing surfaces and strategically located windows that provide additional sources of natural heat and reduce dependence on gas or electricity. The design of a passive house, which is considered one of the most advanced forms of sustainable living, is strongly based on this concept [11].

Alternative energy technologies are not the only innovations used in green buildings. The implementation of smart home technologies, energy-efficient appliances and water-saving devices will allow for a more efficient use of energy in the operation of the building, thereby significantly reducing waste and costs in the long term. Cool, reflective roofs and water-saving technologies such as rainwater collection, double pipes and grey water recycling also help reduce energy consumption [11].

In general, a large amount of waste is generated on construction sites. Using materials that are organic, biodegradable, or reusable on-site can reduce waste during the construction process. The construction site emits a lot of CO2 and other emissions during the construction process. You cannot completely avoid this, but it can be reduced by efficiency on the spot. Overall, by incorporating processes that help ensure a smoother and faster running of construction projects, you will spend less time on site and reduce the environmental impact of the project. Ensuring the efficient use of manpower and machinery can have a similar effect. Another way to reduce construction time and thus reduce waste and emissions is to invest in prefabrication in a controlled environment that produces less waste and consumes less energy than standard on-site construction [11].

Whether a construction project is small or large, we can incorporate sustainable construction and green technologies into all phases of your project. The application of these ecological changes in the construction process, from waste reduction on site to the design of buildings, will become increasingly important in the coming years, as the number of customers interested in the design of green buildings continues to grow and profitability increases [11].

2.3 Decarbonization and Its Impact on Industry

The construction sector is an energy-intensive sector, which is directly reflected and does not contribute to the promotion of environmental sustainability. As a direct consequence of this, the construction sector is gradually implementing a few practices in the process of promoting sustainability in the construction sector, despite many conflicting objectives and complex challenges. According to a recent global survey, the construction sector has made great strides in promoting sustainability and eliminating negative environmental impacts. Industry leaders in engineering and construction have made the most progress towards sustainability, especially in the design phase, stating that sustainability is their most important or primary concern. Increased regulation is forcing engineering and construction companies to look for more circular and sustainable solutions [12].

Climate change and environmental degradation are an existential crisis for Europe and the world. To tackle these challenges, Delivering will transform the European Green Deal into a modern, resource-efficient, and competitive economy. Climate change is the biggest challenge in our deal and presents an opportunity to build a new economic model. 'Delivering the European Green Deal' sets out a roadmap for this transformation: All 27 EU Member States committed to make the EU the first climate neutral continent by 2050. The main goal of the deal is to reduce emissions by at least 55% below 1990 levels by 2030. This will create new opportunities, investments, and jobs (promoting career development), reduce emissions, tackle energy poverty, reduce dependence on foreign energy and improve our health and well-being [13].

Alongside the Green Deal, the European Agreement also highlighted several organizations and associations that promote and develop sustainability in the construction sector. One of these organizations is the World Green Building Council (World GBC). World GBC is an organization whose main objective is to build a sustainable and decarbonized environment. It works with businesses, organizations, and governments to achieve the Paris Agreement and the UN Sustainable Development Goals, and its main goal is to achieve a decarbonized and sustainable construction sector by 2030, where systemic change drives market change and promotes good practice [14].

'Decarbonization' refers to the process of reducing 'carbon intensity', usually by reducing greenhouse gas emissions from the combustion of fossil fuels. Typically, this reduces the amount of carbon dioxide produced per unit of electricity generated. Reducing the amount of carbon dioxide produced by transportation and power generation is essential to meet the global temperature standards set by the Paris Agreement and the UK Government [8].

Decarbonization means increasing the importance of low-carbon energy production and consequently reducing the use of fossil fuels. This includes the use of renewable energy sources such as wind, solar and biomass. In addition to 'cleaner' technologies, the widespread use of electric vehicles can also reduce the use of coal-based electricity. By reducing the carbon intensity of the energy and transport sectors, net zero emission targets can be achieved sooner and in line with government standards [8].

Decarbonization efforts are underway in many countries, with more than 150 governments presenting plans to reduce carbon emissions by 2030. Paris has committed to ban diesel vehicles by 2040, while London has committed to electric buses and hybrid, electric and black taxis. Renewable energy sources, which now produce a third of the world's total energy capacity, are also being used more. Greenhouse gas emissions from fossil fuel power plants can be limited using carbon capture and storage (CCS) technologies. Around 20 large-scale CCS plants are currently in operation worldwide, with many more under construction [8].

More energy efficient and less carbon-intensive energy sources are part of an important pathway to decarbonization. The global transportation system runs primarily on carbon-based fuels such as diesel and oil, but the widespread use of electric vehicles will increase the contribution of the transport sector to reducing carbon emissions [8].

The UK's independent Commission on Climate Change (CCC) has stated that energy sector CO2 emissions could reach 98.3 million tons by 2050, up from 3 million tons in 2018. Carbon neutrality through decarbonization processes [8].

2.4 Circular Construction

The circular economy is a closed economic system in which raw materials, components and products lose as little value as possible when using renewable energy sources [15].

More than 100 different definitions of circular economy are used in scientific literature and in specialized journals. So many different definitions are used because the term is used by a diverse group of researchers and practitioners [16]. Academics emphasize different aspects of this concept than financial analysts. Due to the variety of definitions, it is also difficult to measure circularity. Definitions often focus on the use of raw materials or systemic changes.

Definitions that focus on resource use often follow the 3Rs approach:

- reduce - reduce (minimum use of raw materials),
- reuse - reuse (maximum reuse of products and components),
- recycle – recycling (reuse of high-quality raw materials) [15, 16].

In a circular economy, material loops are closed throughout the ecosystem. There is no waste, since all the remaining material can be used to make a new product. Toxic substances are eliminated, and residual flows are divided into biological and technical cycles. After use, manufacturers take their products back and repair them to a new life cycle [18]. Therefore, it is important in this system not only that the materials are properly recycled, but also that the products, components, and raw materials in these cycles retain high quality [17].

As with raw materials and products, energy in a circular economy will last as long as possible. The circular economy system draws its strength from renewable energy sources. Since energy is not recyclable, we are not talking about energy cycles, but about "continuous energy flows" [17]. An example is CHP.

The construction industry produces about 20% of total anthropogenic greenhouse gases worldwide [19] and uses many natural resources. For example, sand and gravel are the most mined group of materials [20] and their subsequent extraction has a very strong impact on biodiversity [21].

The construction industry is also responsible for around 50% of the waste generated in the European Union and 25% of the solid waste generated worldwide. The subsequent use of this waste has a very negative impact on our environment [22]. This waste contains approximately 75% of natural land or rock [23].

3 Research Methodology and Data

3.1 Research Aim

The research methodology consisted of analyzing and comparing selected parameters within the field of green (environmental) taxes and the generation and/or management of waste within selected European countries. As part of this research, the following parameters were analyzed and subsequently compared:

- energy taxes,
- environmental (green) tax revenues,
- energy taxes in construction sector,
- waste generation,
- municipal waste recycling rates in Europe,
- waste generation in the construction industry,
- recovery rate of construction and demolition waste.

3.2 Data Collection and Research Sample

The main obstacle to research was the availability of data. Every year, the European Union publishes, within the framework of the European Happiness System (Eurostat database), selected statistical dates for EU needs, which are statistically harmonized in all Member States. Data update and availability is slower due to the large volume of data and the complexity of evaluation. Within that database, therefore, the data available for 2020 were the most readily available. Based on the above, the analysis and evaluation of selected parameters within the European countries for the year 2020 was the subject of research.

3.3 Research Step and Methodology

To achieve the main objective of the contribution, the following procedural steps were taken:

- research of issues in the field of auctionability and its aspects - defining the concepts of sustainability, sustainable development, the concept of auctionability and basic pillars,
- addressing the issue of building sustainability – deification of the concept of green buildings, the principles of construction and use, and green buildings,
- research on decarbonization issues and its impact on industry – definition of the concept of decarbonization, overview of initiatives supporting sustainable industry,
- research on issues in the field of circular construction,
- an overview of the current state of play in the field of green and energy taxes within selected European countries,
- an overview of the current state of play in the field of waste generation, recycling of municipal waste, generation of waste in construction and the rate of recovery of construction and demolition waste. Individual countries were assigned position/ranking followed by the number of points,
- data analysis – defining evaluation criteria, compiling rankings, defining conclusions and future recommendations.

4 Results and Discussion

4.1 Green Taxes, Energy Taxes

Climate change is the greatest environmental threat that we, as humanity, wish for. For this purpose, many innovative tools and techniques are being introduced that contribute to sustainable development. Such a tool also includes green taxes. Green taxes are taxes designed to "tax behavior that is harmful to the health of the planet." The principle of taxes is based on the principle: "Those who pollute pay" [26].

According to a statistical framework developed jointly in 1997 by Eurostat, the European Commission, the Organization for Economic Co-operation and Development (OECD) and the International Energy Agency (IEA), an environmental/green tax is defined as 'a tax base composed of units of materials (or similar) that have a specific and demonstrated negative impact on the environment' [26].

Green taxes are based on the simple principle that polluters pay for pollution. Green taxes are essential to stop climate change. Climate change is the greatest environmental threat we face as humans. That is why we need to reduce greenhouse gas emissions globally, and international bodies such as the International Monetary Fund, environmental organizations and many economists have agreed that environmental taxation is a key tool in the fight against climate change [26].

The IMF has proposed to introduce a carbon tax for the countries that emit the most greenhouse gases. According to the organization, this rate should be $75/€68 per tons by 2030. From an industrial point of view, energy is the most affected by environmental taxes. According to Eurostat, energy taxes in the European Union (EU) accounted for more than three quarters of total environmental tax revenues in 2020 (77.2% in total), compared to transport taxes (19.1%) and environmental taxes and withholdings, which were significantly exceeded. (3,7%) [26].

The benefits of introducing green taxes, which demonstrably confirm the need for them and directly help to promote sustainable development, include the following aspects:

- internalization of negative externality,
- promoting energy savings and the use of renewable resources,
- discouraging anti-ecological behavior,
- motivation to implement sustainability innovations,
- generating revenue for governments (direct impact on the reduction of other taxes or the implementation of environmental projects
- protection of the environment [26].

Each country has its own design regarding green taxes. Green taxes focus primarily on the following aspects:

- emissions of nitric oxide-NO and nitric oxide-NO2, which are mainly produced by combustion vehicles,
- emissions of Sulphur dioxide – SO2, which is the main cause of acid rain (arising from the combustion of petroleum products and the combustion of coal),
- carbon dioxide emissions - CO2,
- waste management,
- noise caused by take-off and landing of aircraft,
- sources of water pollution (pesticides, fertilizers, acids, and others)
- energy products - gasoline, diesel, natural gas, coal, fuel, and electricity production - their combustion causes the creation of SO2 emissions,
- handling and extraction of soil and use of natural resources,
- ozone-depleting products,
- transport – registration, use, import and sale of polluting vehicles [26].

In 2020, revenues from energy taxes within the European Union (27 countries) amounted to EUR 231 552.11 million [27].

In that year, within the European Union (27 countries), revenues from environmental (green) taxes were also tracked, which was at the level of 5.57%, revenues from energy taxes in the construction sector were at EUR 6 737.23 million, which represented a share of about 2.91% of total energy taxes [28–30].

Based on the available information, a ranking of selected European countries was created, considering the results in the field of energy taxes, revenues from environmental (green) taxes and energy taxes in the construction sector. A position/ranking has been assigned to each country. Within the individual sections, parameters, the number, the ranking was assigned to the country with the most favorable result within that section, that is, the country that had the highest value of energy taxes, revenues from environmental (green) taxes and energy taxes in the construction sector (income in millions of euros and percentage of the total number of energetic taxes). Based on the above ranking, points were subsequently awarded to individual countries, where position number 1 was rated more favorably, i.e., 30 points.

Based on the points earned, the following ranking was created. The leader in energy, green taxes in 2020 was the Netherlands with 95 points. Denmark is in second position with 92 points, and Italy closes the top three, with 89 points. The next ranking was as follows, with Finland in fourth place (84 points), Norway in fifth place (80 points), Belgium in sixth place (78 points), Sweden in seventh place (77 points), Germany in eighth place (76 points), France in ninth place (72 points) and Bulgaria in the top 10 with 71 points. More detailed results are shown on Fig. 1. Ranking of countries in the field of green (environmental) taxes [27–30].

Data for year 2020														
	Energy taxes			Environmental (green) tax revenues			Energy taxes in construction sector			Energy taxes by paying sector - construction			Total score-points	Total score - ranking
County	Milion EUR	Ranking (explanations: 1-high value, 30-low value)	Points (30 - best, 1 - worst)	Percent - %	Ranking (explanations: 1-high value, 30-low value)	Points (30 - best, 1 - worst)	Milion EUR	Ranking (explanations: 1-high value, 30-low value)	Points (30 - best, 1 - worst)	Percent - %	Ranking (explanations: 1-high value, 30-low value)	Points (30 - best, 1 - worst)		
Belgium	7961,1	7	24	5,82	20	11	298,67	8	23	3,75	11	20	78	**6**
Bulgaria	1642,08	21	10	9,89	1	30	58,97	18	13	3,59	13	18	71	**10**
Czechia	3880,7	15	16	5,35	22	9	193,65	12	19	4,99	6	25	69	13
Denmark	5165,8	10	21	6,76	4	27	251,44	11	20	4,87	7	24	92	**2**
Germany	47642,29	1	30	4,27	29	2	1480,3	1	30	3,11	17	14	76	**8**
Estonia	601,64	26	5	7,2	9	22	30,96	23	8	5,15	5	26	61	18
Ireland	2767,86	18	13	6,04	18	13	42,94	20	11	1,55	25	6	43	24
Greece	4826	11	20	9,69	3	28	7,25	28	3	0,15	29	2	53	22
Spain	16020	4	27	4,74	27	4	417,9	5	26	2,61	20	11	68	14
France	41272	2	29	4,78	26	5	844,92	3	28	2,05	21	10	72	**9**
Croatia	1262,72	22	9	8,85	4	27	43,45	19	12	3,44	16	15	63	17
Italy	40281	3	28	7,11	12	19	1122,07	2	29	2,79	18	13	89	**3**
Cyprus	410,4	27	4	7,15	10	21	19,76	25	6	4,81	8	23	54	21
Latvia	791,67	25	6	9,82	2	29	28,39	24	7	3,59	14	17	59	20
Lithuania	859,37	23	8	6,26	17	14	13,88	26	5	1,52	26	5	32	29
Luxembourg	810,58	24	7	3,62	30	1	36,69	21	10	4,53	9	22	40	26
Hungary	2279,36	19	12	6,01	19	12	178,66	13	18	7,84	2	29	71	11
Malta	143,33	28	3	7,66	7	24	2,76	29	2	1,92	23	8	37	27
Netherland	14318	5	26	7,97	5	26	583	4	27	3,51	15	16	95	**1**
Austria	4599,4	13	18	5	24	7	125,54	26	5	2,73	19	12	42	25
Poland	11711,97	6	25	7,12	11	20	135,58	16	15	1,16	27	4	64	16
Portugal	3598,51	17	14	6,76	15	16	129,4	15	16	3,6	12	19	65	15
Romania	3878,69	16	15	7,3	8	23	75,44	17	14	1,95	22	9	61	19
Slovenia	114,46	29	2	7,84	6	25	10,46	27	4	0,94	28	3	34	28
Slovakia	1965,13	20	11	6,81	13	18	32,69	22	9	1,66	24	7	45	23
Finland	4605,14	12	19	6,52	16	15	277,3	9	22	6,02	3	28	84	**4**
Sweden	7142,91	8	23	4,73	28	3	375,97	7	24	5,26	4	27	77	**7**
Iceland	UD	UD	UD	5,56	21	10	UD	UD	UD	UD	UD	UD	UD	UD
Norway	4256,44	14	17	5,25	23	8	383,85	6	25	9,02	1	30	80	**5**
Switzerland	6278,79	9	22	4,96	25	6	263,8	10	21	4,2	10	21	70	12
Explanations: UD - unavailable data														

Fig. 1. Ranking of countries in the field of green (environmental) taxes [27–30]

In 2021, revenues from taxes and social contributions in the EU increased by €520 billion to €6,058 billion compared to 2020. This is a change compared to 2020, when there was a decrease [31].

4.2 Waste and Recycling

Environmentally friendly waste management and the use of secondary materials they contain are key pillars of the European Union's environmental policy. The main objective of EU waste policy is to contribute to the circular economy, by reusing high-quality resources from waste. The European Green Deal aims to boost growth by moving towards a modern, resource-efficient, and competitive economy. As part of this transition, several pieces of EU waste legislation will be reviewed. The Waste Framework Directive is the EU's legal framework for waste management and management in the EU. It introduces a ranking of waste management preference called the 'waste hierarchy'. Certain categories of waste require specific approaches. The EU therefore has many laws to address different types of waste in addition to an overarching legal framework [32].

The Waste Framework Directive sets out basic concepts and definitions related to waste management, including definitions of waste, recycling, and recovery. Between the basic principles of waste management include the following aspects:

- waste management without endangering human health and harming the environment,
- dealing with waste without risk to water, air, soil, plants, or animals,
- chuckling with waste without being bothered by noise or smell,
- dealing with waste without adversely affecting the landscape or places of special interest [33].

The ratio of the total amount of waste generated, excluding major mineral wastes, to the amount loaded through the recycling process remains below the total waste production for the period when data are available. In 2020, total recycling was reported at 46%. The progress made in three key waste streams (packaging, municipal waste, electrical and electronic waste) has been highlighted as progress in total recycling. This reflects the importance of strong European Union policies, including recycling targets, in supporting the improvement of waste management. However, their recycling rate is still below half of the waste generated, except for packaging, which reached 64% in 2020 [34].

Most countries in Europe have significantly increased the recycling rate of municipal waste, which clearly indicates an improvement in waste management. However, the difference in municipal waste recycling performance between the countries with the highest and lowest recycling rates is significant. In the Member States of the European Union, rates ranged from 70% (Germany) to 11% (Malta), with Kosovo, for example, registering no recycling rate. Germany, Austria, Slovenia, the Netherlands, Switzerland, Luxembourg, Belgium, and Italy performed best, achieving recycling rates of more than 50%. As many as seven countries have recycled less than 20% of municipal waste, helping to slow down improvements in waste management [34].

In 2020, the total waste generated in the EU by all economic activities and households was 2 151 million tons or 4 808 kg per capita. In terms of economic activities and households, the construction sector accounted for the largest share of waste generation and production (37.1% of the total), followed by mining and quarrying (23.4%), manufacturing (10.9%, waste and water services (10.7%) and households (9.5%); the remaining 8.4% were wastes from other economic activities, in particular services (4.5%) and energy (2.3%) [35].

Based on the available information, a ranking of selected European countries has been created, considering the results in the field of waste generation, recycling of municipal waste, generation of waste in construction and recovery rates of construction and demolition waste. Each country was assigned the position/ranking followed by the number of points. The order and number of points was assigned within each section as follows:

- In waste generation – position number 1 was assigned to the country with the lowest waste generation value, at the same time the country in position 1 received the highest number of points within that section,
- in the field of municipal waste recycling – position number 1 was assigned to the country with the highest municipal waste recycling value, at the same time the country in position 1 received the highest number of points within that section,
- in the field of waste generation in construction – position number 1 was assigned to the country with the lowest waste generation rate in construction, at the same time the country in position 1 received the highest number of points within that section,
- In recovery rate of construction and demolition waste – position number 1 was assigned to the country with the highest value of the recovery rate of construction and demolition waste, at the same time the country in position 1 received the highest number of points within that section.

Based on the points obtained, a ranking of selected European countries in the field of waste generation and management was established. Slovenia took first place with 98 points, followed by Lithuania (97 points) and Latvia closes the top 3 with 94 points. Greece (4th place - 86 points), Slovakia (5th place - 83 points), Italy (6th place - 81 points), Portugal (7th place - 79 points), Hungary (8th place - 78 points), Belgium (9th place - 76 points) and the Czech Republic closes the top 10 with 74 points. More detailed results are shown on Fig. 2. *Ranking of countries in the field of waste generation and recycling* [36–39].

County	Data for year 2020													
	Waste generation (kg per capita)			Municipal waste recycling rates in Europe by country			Waste generation in the construction industry			Recovery rate of construction and demolition waste			Total score-points	Total score - ranking
	Kg per capita	Ranking (explanations: 1- low value, 30- high value)	Points (30 - best, 1 - worst)	Percent - %	Ranking (explanations: 1- high value, 30- low value)	Points (30 - best, 1 - worst)	Percent share of total waste - %	Ranking (explanations: 1- low value, 30- high value)	Points (30 - best, 1 - worst)	Percent -%	Ranking (explanations: 1- high value, 30- low value)	Points (30 - best, 1 - worst)		
Belgium	5899	21	10	52,3	7	24	30,5	18	13	99	2	29	76	**9**
Bulgaria	16785	28	3	34,6	21	10	1,6	3	28	96	5	26	67	17
Czechia	3598	15	16	45,4	9	22	42,9	21	10	96	5	26	74	**10**
Denmark	3453	13	18	45	11	20	54,8	23	8	97	4	27	73	12
Germany	4824	19	12	69,6	1	30	56,3	24	7	94	7	24	73	13
Estonia	12171	25	6	28,9	24	7	9,8	10	21	93	8	23	57	23
Ireland	2874	11	20	40,4	16	15	13,6	14	17	UD	UD	UD	UD	UD
Greece	2295	6	25	21	26	5	1,1	2	29	97	4	27	86	**4**
Spain	2236	5	26	36,4	20	11	30,7	19	12	85	12	19	68	16
France	4657	18	13	42,7	13	18	67,6	26	5	74	15	16	52	25
Croatia	1483	1	30	29,5	23	8	23,8	16	15	89	10	21	74	11
Italy	2942	12	19	51,4	8	23	37,8	20	11	98	3	28	81	**6**
Cyprus	2488	9	22	16,6	27	4	20,5	15	16	79	14	17	59	22
Latvia	1501	2	29	39,7	17	14	9,7	9	22	99	2	29	94	**3**
Lithuania	2396	8	23	45,3	10	21	8,3	6	25	98	3	28	97	**2**
Luxembourg	14618	26	5	52,8	5	26	82,1	28	3	99	2	29	63	19
Hungary	1648	4	27	32	22	9	27,1	17	14	98	3	28	78	**8**
Malta	5823	20	11	10,5	29	2	82,7	29	2	100	1	30	45	27
Netherland	7145	22	9	56,9	4	27	65,4	25	6	100	1	30	72	14
Austria	7728	24	7	62,3	2	29	76,5	27	4	91	9	22	62	20
Poland	4492	17	14	38,7	18	23	13	13	18	74	15	16	71	15
Portugal	1612	3	28	26,5	25	6	10,7	11	20	95	6	25	79	**7**
Romania	7338	23	8	13,7	28	3	0,9	1	30	88	11	20	61	21
Slovenia	3576	14	17	59,3	3	28	6,3	5	26	97	4	27	98	**1**
Slovakia	2341	7	24	42,2	14	17	9	7	24	81	13	18	83	**5**
Finland	20993	29	2	41,6	15	16	11,8	12	19	63	17	14	51	26
Sweden	14664	27	4	38,3	19	12	9,3	8	23	74	15	16	55	24
Iceland	3667	16	15	UD	UD	UD	3,9	4	27	UD	UD	UD	UD	UD
Norway	2610	10	21	45	12	19	44,2	22	9	64	16	15	64	18
Switzerland	UD	UD	UD	52,8	6	25	UD	UD	UD	UD	UD	UD	UD	UD
Explanations: UD - unavailable data														

Fig. 2. Ranking of countries in the field of waste generation and recycling [36–39]

5 Conclusion

The concept of sustainability represents a broad political concept in public discourse and is often understood in terms of three fundamental pillars, namely the environmental, economic, and social aspects. These fundamental pillars of sustainability are increasingly reflected in individual processes and principles across all aspects of society. The company's goal is to build a sustainable society. Based on the above, many organizations, governments and associations are approaching the introduction of various mechanisms and principles that help to build a sustainable society. Within the European Union, the SDGs are agreed at the highest political level. The EU institutions and Member States, including regional and local authorities, work more closely together to ensure better coordination and monitoring of progress in the process of implementing the milestones to be met under the 2030 Agenda. Based on the mentioned aspects, aspects such as the amount of waste produced, the recycling rate of municipal waste, the quantity and rate of recovery of waste produced within individual industrial sectors, and the level of revenues from energy and green taxes within the countries of Europe are gradually being monitored within the European Union.

The research analyses the 2020 results in countries in the field of green taxes and the generation and/or management of waste. Based on the available data, their thorough analysis and considering the established criteria, the Netherlands is among the leaders in the field of energy/green taxes, followed by Denmark and Italy. Lithuania ranked last in the above ranking. In terms of waste generation, recycling of municipal waste, generation of waste in construction and recovery rates of construction and demolition waste, Slovenia ranked first in our assessment, followed by Lithuania and Latvia. It was very interesting to find that, although Lithuania was one of the worst rated countries in terms of green taxes, it was among the top 3 in terms of waste generation and packaging. Malta ranked last in the ranking (creation and feeding of waste), losing 53 points to the leader in that ranking. These results show significant differences in the priorities that each government sets itself to promote sustainability. Therefore, the initiatives of individual organizations are welcome and will greatly help to develop a strategic crisis plan, the result of which will be the elimination of the adverse effects of industry on the environment and the health of the population.

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