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REDUCING GREENHOUSE GASES-TARGET TO ACHIEVE CLIMATE AND ENERGY OBJECTIVES IN THE EU

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Abstract: Greenhouse gas (GHG) emissions are the main cause of the world's current climate crisis. For suitable management of these emissions at the level of the EU member states, it is necessary to understand how these gases are generated, how they affect us, and what solutions must be found to reduce their effect. The progress registered by the EU member states regarding the reduction of GHG emissions in the period 2020-2023 has shown that by 2030 a 48% reduction of these net emissions will be reached, compared to the levels of 1990, keeping a gap of 7 % compared to the targeted target for 2030. For this gap to be reduced and for the EU to become the first climate-neutral continent by 2050, a periodic assessment of the progress made by the EU member states regarding the reduction of GHG emissions and energy consumption, as well as the implementation of an integrated energy system, based especially on renewable energy sources. To achieve these objectives, additional measures are necessary that the EU and the member states must adopt through a collective effort based on the European Climate Law.

Keywords: greenhouse gas emissions, climate neutrality, renewable energies, Fit for 55, final energy consumption.

1 INTRODUCTION

Today, climate change has become a reality, as a result of GHG emissions, which have global warming as a consequence, a threat to all of humanity. These gases appear in the atmosphere, naturally, modifying the climate of the planet, contributing to the increase in temperature, changes in snowfall and rain, to the occurrence of extreme events, such as floods and excessive heat. Global warming was caused by human activities, mainly through (GHG) emissions, with the global surface temperature increasing by 1.1°C in the period 2011-2020 compared to the period 1850-1900. The increase in global GHG emissions is due to unsustainable energy use, lifestyles and patterns of consumption and production, and land use change, within countries (Kulovesi and Oberthür, 2020; Koper et al., 2021; Minx et al., 2021).

Climate change is caused by human activities, which pollute the atmosphere by producing GHGs, especially carbon dioxide, methane, and nitrous oxide (Mhatre, 2022).

These gases, released in ever greater quantities, affect the natural balance, thus leading to the accumulation of heat in the atmosphere, thus causing global warming of the entire planet (UNFCCC, 2020).

The two major problems that this global warming involves refer to the need to reduce the emissions of these gases, for a stabilization of the level of GHG concentrations in the atmosphere, thus preventing the anthropic influence on the climate, but also the need to adapt to the effects of these climate changes (Meinshausen et al., 2015; Capros et al., 2019).

Even if there are global efforts to reduce GHGs, in the coming period, the average temperature will continue to rise, which implies the need to take urgent measures to adapt to these changes. In this regard, the Intergovernmental Panel on Climate Change (IPCC), a United Nations body that evaluates the sciences related to climate change, has prepared a series of assessment reports on the state of knowledge, risks, and future impacts regarding these climate change, but also options to help reduce the pace of these changes. The latest report (AR6) refers to the contribution of the Working Groups on Climate Change Impacts, Adaptation and Vulnerability (February 2022), Climate Change Mitigation (April 2022), and a Synthesis Report (March 2023) (Climate Change, 2023).

Slowing down this global warming requires reducing CO2 concentrations, which can be achieved by reducing energy consumption and using energy produced from renewable sources (Navigant, 2018).

Among the main sources of GHG emissions are oil and oil products, responsible for 40% of the emissions produced by fossil fuels, coal, considered to be a catastrophe for the climate, if it is used in an uncontrolled way, and natural gas, considered a clean form of fossil fuel (Fragkos et al., 2017). To these is the destruction of tropical forests, which contributed about a fifth to the emissions of CO2, methane, industrial gases, and nitrogen dioxide (Capros et al., 2019).

GHGs in the atmosphere, but which are also generated by human activities, are (Widiyawati, 2020):

-carbon dioxide (CO2), which led to temperature increases on average with 0.8°C [0.5 to 1.2]°C;

-methane (CH4), which led to temperature increases on average with 0.5°C [0.3 to 0.8]°C;

-nitrous oxide (N2O), which led to temperature increases on average with 0.1°C [0.0 to 0.2]°C.

Added to these are F-gases (fluorinated greenhouse gases - which have led to temperature increases on average with 0.1°C [0.0 to 0.2]°C), which are artificial and have a potential raised by global warming, being used in industry and stronger than CO2 several thousand times (Rogelj et al., 2018). This category includes hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF6), and nitrogen trifluoride (NF3). F-gases account for approximately 2.5% of EU GHG emissions and have a global warming effect up to 25,000 times greater than CO2 (Fragkos et al., 2017; IPCC, 2023).

About 58% of net accumulated CO2 emissions occurred between 1850 and 1989 and 42% between 1990 and 2019. These global net GHG emissions were estimated in 2019 to be about 12% higher than in 2010 and 54% higher than in 1990. By 2019, the largest increase in gross emissions was in CO2 from fossil fuels and industry, followed by methane (IPCC, 2023).

CO2 is produced by biomass degradation, by animals during respiration, by burning fossil fuels, from chemical reactions, and by being removed from the atmosphere by plants in photosynthesis.

Methane is a colorless gas that results from the production of coal, natural gas, and oil, the degradation of municipal organic waste, livestock, agriculture, forestry, and fishing (Alvarez et al., 2018; Hmiel et al., 2020).

Nitrous oxide is a gas emitted in agricultural and industrial activities, from treating

wastewater, burning fossil fuels, and waste, in the chemical industry (van Soest et al., 2021).

As a result of the different global warming potential of GHGs, the impact of these gases is transformed into CO2 equivalent, to make possible comparisons. Regarding the GHG emissions resulting from human activities carried out at the EU level, it can be stated that they have been, in 2021, at 3.6 billion tons of CO2 equivalent, which means 22% less than in 2008, CO2 representing 80% of the total GHG emissions in the EU, in the same year, followed by methane with 12% and fluorinated gases, which represent approximately 2.5% of these emissions at EU level (EEA, 2022).

This study presents how EU member states face the challenges of reaching the climate and energy objectives for 2030 through a series of measures necessary to reach the climate neutrality target until 2050, based on the evolution of GHG emissions recorded in the EU member states, in the period 1990-2021 and the progress recorded by them, in the period 2020-2022, to reduce these emissions, but also to reduce energy consumption, simultaneously with the increase in the share of renewable energies in the final gross energy consumption.

The paper is divided into the following sections, as follows: literature review in section 2; Materials and methods in section 3; Data collection and interpretation 4, and conclusions.

2 LITERATURE REVIEW

Starting from the mandatory target of reducing GHG emissions by at least 40% by 2030 compared to 1990, and considering the long-term decarbonization objectives, with deep implications, both on the energy system and the economic and political systems, the EU member states have several options that they must take into account (increasing the share of renewable sources, improving energy efficiency, introducing clean technologies, etc.), which will lead to reaching climate neutrality in 2050 (Fragkos et al., 2017).

On the way to a climate-neutral Europe, decisive measures are needed to help mitigate the consequences of climate change (Gheuens and Oberthür, 2021).

The concept of "climate neutrality", as defined by Capros et al. (2019), or the net elimination of all GHG emissions, is equivalent to "GHG neutrality", a term more specific than climate neutrality. Another, similar term used is "carbon neutrality", which refers only to CO2 emissions. The climate neutrality of a fuel means zero net GHG emissions throughout its life cycle (Höhne et al., 2015).

Achieving climate neutrality is an objective that requires overcoming serious challenges for which incentives, appropriate instruments, and support, public and private investments are needed for this transition to be cost-effective, socially balanced, and fair for all EU member states. To achieve climate neutrality, EU legislation and policies must be combined in such a way as to maintain EU competitiveness, by developing effective measures to combat the risk of carbon emissions relocation (Nevens and Roorda, 2014; Torney and O'Gorman, 2020).

Considering the growing concern of the EU member states for climate change and its impact, they have set significantly more aggressive GHG emissions reduction targets (Hertwich et al., 2018; Delbeke and Vis, 2019).

Even if in the EU, these net GHG emissions have been reduced, in the last decades, by almost a third, efforts must be further intensified, to increase the share of renewable energy consumption (renewable sources having an estimated share of at least 42, 5% by 2030) (Planul REPowerEU, 2022).

According to the EEA (2021), total GHG emissions (results from land use, land change and forestry (LULUCF), as well as indirect CO_2 emissions and those from international aviation) have registered fluctuations, being, in general, on a downward trend.

Also regarding GHG emissions, for 2022, most EU member states (except countries such as Denmark, Hungary, Ireland, Cyprus, Malta, Italy, Romania, Croatia, and Lithuania) managed to stay below the threshold set for emissions annuals that were allocated to them (EEA, 2023).

This meant a decrease in net GHG emissions by 2% compared to 2021, and 31% compared to 1990 (EEA, 2021). However, there were also sectors, such as buildings, where the GHG reduction was by 9%, due to lower energy consumption, and much higher prices, induced by the Russian invasion. Another sector in which there was a significant decrease in GHG was the industrial sector, where production was reduced in large industries, due to the very high prices of energy (EEA, 2023). In the energy supply sector, due to high natural gas prices, GHG emissions in some EU member states increased in 2022 by 3% compared to 2021 (Trends and projections in Europe, 2023; EEA, 2023).

Even if the decrease in GHG emissions, in the EU, was slower in areas such as transport, agriculture, and buildings, efforts were made to expand the share of renewable energy consumption, these renewable sources having a share, in 2022, of 22.5 %, tending to reach 45% in 2030 and which led to the reduction of primary energy by 16%, in 2022 (Trends and projections in Europe, 2023).

Despite the progress made to reduce GHGs, which must be at least 55% by 2030, compared to 1990 levels, it is necessary to accelerate the EU's efforts, by establishing specific benchmarks to identify solutions, which lead to the achievement of climate neutrality in 2050. This meant, for the European states, the adoption and implementation of measures and policies, for all economic sectors, to reach the objectives related to climate and energy until 2030. Through all the adopted policies, the EU member states are designed to achieve a common reduction in net GHG levels of 43% by 2030, compared to 1990. Looking beyond 2030, it is estimated that, based on the adopted and planned measures, regarding the aggregate emissions of the EU countries, they will decrease by 60% in 2040 and respectively by 64% in 2050 compared to the levels of 1990 (EEA, 2023; Trends and projections in Europe, 2023).

On a more thorough research of the various sectors, it appears that efforts must be increased regarding improving the capacity to eliminate CO2, to achieve the climate objectives (Trends and projections in Europe, 2023).

Even if most EU member countries have aligned themselves with the 2022 climate trajectories, to close the gap by 2030, it is necessary to take additional measures.

From 2022 to 2023, the EU climate and energy objectives were revised according to the "Fit for 55" scenario. For each EU member state, during this period, the climate objectives have been brought into line with the European ones, which aim at the targets for 2030, but also about the annual emission limits, which have become stricter starting from 2023 (William et al., 2022). More than that, until June 2023, the member states presented the national energy and climate plans (NECP), with revised climate and energy objectives (Trends and projections in Europe, 2023).

Regarding renewable energy, the year 2022 has been noted by the increase in the share of renewable energy sources in most EU member states, compared to 2021, except the states of Italy, Slovenia, Cyprus, Romania, Estonia, and Hungary. This meant an increase in the share of renewable energy use, at the EU level, from 21.8% in 2021 to 22.55% in 2022 (EEA, 2023).

Energy efficiency for 2022, meant a reduction in final energy consumption for eighteen states compared to 2021, and a reduction in primary energy consumption for fifteen states compared to the same year, with energy consumption recording a reduction of approximately 4% (EEA, 2023).

This pace of progress, regarding the reduction of GHG emissions, the increase in the share of renewable energy sources and the

increase in energy efficiency, recorded by the member states, in 2022, without specifically taking into account the targeted target of 55% for 2030, highlights the obligation of a substantial effort to achieve the objectives for 2030 (Dobbs et al., 2021; Davies et al., 2021).

As for 2023, in the third quarter, GHG emissions from the EU economy have been estimated at 787 million tons of CO2-eq, which means a decrease, compared to the same quarter of 2022 (by -7.1%), and which means 847 million tons of CO2-eq, while in the last quarter of the same year, GHG emissions have been estimated at 897 million tons of CO2-eq, which means a decrease of 4.0% compared to the same quarter of 2022 (935 million tons of CO2-eq) (Eurostat, 2024).

In parallel with the promotion of GHG emission reduction objectives, the EU has developed the legislative framework, including an Emissions Trading System (ETS) for the energy and industrial sectors, as well as the sharing of efforts between EU Member States for the non-ETS and renewable energy (Gheuens and Oberthür, 2021).

3 MATERIALS AND METHODS

The first step in this research has required the identification of specialized literature by finding databases that refer to GHG emissions and how they influence climate change, as well as the informational resources available on the Internet. For this, a systematic review of the most used databases where the most appropriate collections of e-books, journals, research resources, and scientific periodicals can be found, i.e. Web of Science and Scopus, was carried out.

Following the research objective, several keywords have been selected which are "reduction of GHG emissions", "energy consumption", "renewable energy", "energy efficiency", "EU climate objectives", "proposed measures and actions by EU member states", "achieving climate neutrality", resulting in a large number of open access articles that refer to the basic aspects of this research.

In the second stage, in the process of selecting the necessary data for this study, all the EU member countries have been chosen for which there are statistical data on total GHG emissions (resulting from land use, land change, and forestry (LULUCF), as well as indirect CO2 emissions and those from international aviation), in the period 1990-2021, the progress that these countries have been registered in the period 2020-2022 regarding the reduction of these GHG emissions, the reduction of energy consumption, but also the progress recorded regarding the increase in the share renewable energies in the final gross energy consumption.

The main data sources used in this study were:

- European Court of Auditors, based on data provided by Eurostat;
- The European Commission;
- European Environment Agency (EEA);
- The interim report on EU climate action for 2021;
- The 2022 report on the achievement of the objectives for 2020 regarding energy from renewable sources;
- The 2022 report on the achievement of energy efficiency objectives for 2020;
- Eurostat 2024;
- Web of Science.

4 DATA COLLECTION AND INTERPRETATION

The EU has already provided clear directions, by the European Green Pact, for the reduction of GHG emissions for member countries. Also, the Parliament and the European Council have established mandatory collective objectives, and the necessary resources have been allocated. What remains to be done to reach the climate neutrality target by 2050, is to establish how to implement the

decisions and use the right technologies in many sectors (EC, 2019).

Given each sector of activity, it can be stated that each is faced with an increase in efforts, and a rapid implementation of the measures adopted by the EU is necessary, with the establishment of additional policies, to support those areas that need more effort. For example, in the building sector, to reduce GHG emissions by 2030, and increase energy performance renovations are required, while in the industrial sector, innovations are required by granting financial incentives, thus opening the way to the set target of climate neutrality by in 2050 (UNFCCC, 2020).

Total GHG emissions (resulting from land use, land change, and forestry (LULUCF), as well as indirect CO_2 emissions and those from international aviation), in the period 1990-2021, at the EU level, have had a downward trend, in general, so that, at the level of 2021, they have reached 3,311 million tons of CO_2 equivalent (CO_2 -eq), which means 30% less (-1,401 million tons of CO_2 -eq), compared to the level reached in 1990 (4,712 million tonnes of CO_2 equivalent) (Fig.1).

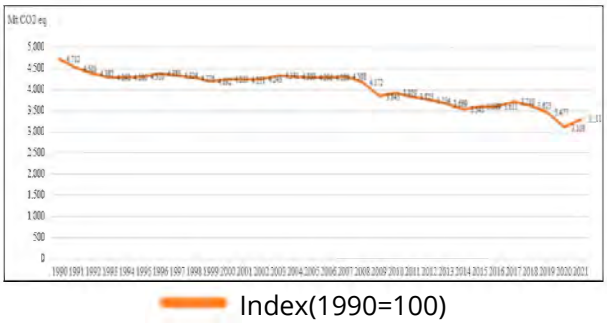

Figure 1. Total GHG emissions (including LULUCF and those from international aviation, in the EU, trend 1990-2021 (EEA, 2022)

*Mt CO2 eq - the unit of measure used to be able to make comparisons between the emissions of different GHGs, based on their global warming potential. This is done by converting quantities of gases into equivalent amounts of CO2, i.e. the amount of CO2 that would lead to the same level of warming.

Regarding the various sectors of activity, they improved their capacity to eliminate CO2, in 2022, compared to 2005, considering the targeted targets, according to the scenario entitled "Fit for 55" (Fig. 2).

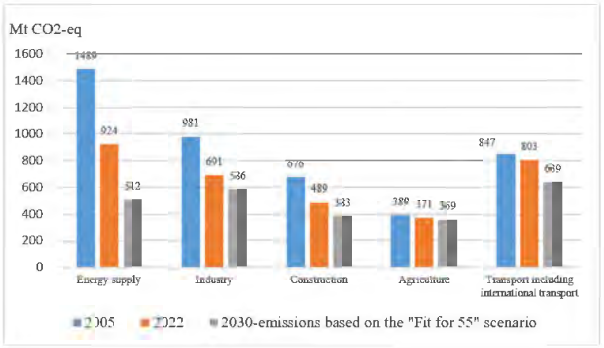

Figure 2. Progress recorded by different activity sectors and targets regarding the reduction of GHG emissions for 2030 (EEA, 2023)

Note: "2030-emissions based on the scenario entitled "Fit for 55"-refers to the energy and climate packages of laws regarding the EU's plan to reduce GHG emissions by 55% by 2030 and achieve climate neutrality by 2050.

Thus, the energy supply sector had mitigation in GHG emissions by 38% (from 1489 million tons of CO2 equivalent to 924), in 2022 compared to 2005, while the industry and construction sectors had mitigation in GHG emissions by 29.5% and 27.6% respectively. In the agriculture and transport sectors, the mitigation of GHG emissions was lower, by 4.6% and 5% respectively. To reach the targets in 2030, additional collective efforts will have to be made, in all sectors, based on planned policies.

The progress registered by EU member states in reaching the climate and energy targets for 2030 is presented in Figure 3. As can be seen from the figure, the target for GHG emissions for 2030 is 2,121 million tons of CO2 equivalent (which means a 55% reduction compared to the level recorded in 1990), while for the final energy consumption, this target is 763 million tons of oil equivalent, while for the share of renewable

energies in the gross final energy consumption, the target is 42.5%. Regarding the reduction of GHG emissions, at the EU level, this meant a 24% reduction in 2022 compared to 2005, with the final energy consumption registering a decrease of only 8%, while the share of renewable energies in the final energy consumption increased by 12.3%.

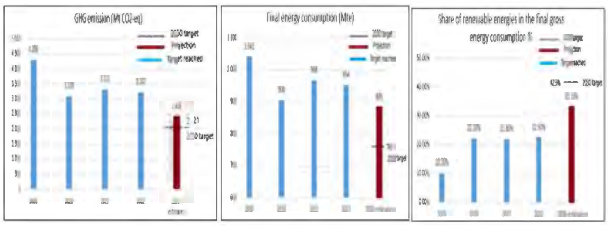

Figure 3. The progress registered by the EU member states in reaching the climate and energy targets for 2030 (Eurostat, 2024)

*MTpe – million tonnes of oil equivalent – is a standardized unit of measurement for measuring the consumption of energy produced from several types of fuels

Note: GHG emissions are net emissions, which include international aviation emissions for all years. The 2030 projection for GHG emissions, with additional measures taken, was obtained by aggregating the reported national projections. The energy consumption and the contributions to renewable energy for 2030 were calculated as the sum of the contributions of the member states mentioned at the end of the NECP.

Regarding the historical and future trends of net GHG emissions (including international aviation) for the EU member states, as well as the targeted objectives for 2030 and 2050, they are presented in Figure 4.

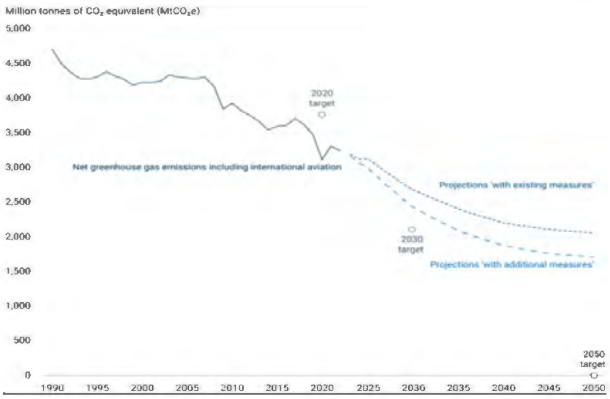

Figure 4. The progress registered by the EU member states to achieve the climate objectives (EEA, 2023)

Slowing down the rate of global warming, simultaneously mitigating its impact on the environment and human health, implies a substantial reduction of GHG emissions. The EU member states established, through the European Climate Law, as a mandatory objective to achieve climate neutrality, by 2050 at the latest. This implies a decrease of these net GHG emissions, compared to 1990 by at least 55% in 2030, including emissions from international aviation, as well as those from LULUCF, which means a tripling of the average annual rate of absolute reductions of GHG emissions. According to the forecasts of EU member states, the policies and measures adopted so far would lead to a 43% reduction in net GHG emission levels by 2030, taking 1990 as a reference. This reduction could reach, however, 48%, if the planned additional measures are taken into account, which means a gap of 7%, compared to the objective set for 2030. To achieve this objective, regarding the reduction of GHG emissions, the EU has launched various initiatives. One of these initiatives is the "Effort Sharing Regulation", which assigns each member state a more ambitious national objective of reducing GHG emissions by 40% by 2030, compared to 2005, for construction, small industries, maritime transport, and road, agriculture.

By updating the NECP (in June 2024), it is aimed that all sectors will be addressed through consolidated policies and measures, leading to the reduction of the existing deficit regarding the achievement of the target objective of reducing GHG emissions by 55% in 2030.

Along with the reduction of these emissions in the last two decades, there has also been the consolidation of policies aimed at reducing them, this being attributed, in particular, to the changes produced in the way of energy production, namely the significant decrease in the use of coal and the increase in the share of renewable energy.

Regarding the evolution of primary and final energy consumption in the EU member states, it can be seen (Figure 5) that final energy consumption shows a reduction of 2.8% in 2022 compared to 2021, while the primary one shows a 4% discount. However, despite this progress and as a result of the general mitigation of energy consumption from 2005 to 2022 (by 16% for primary energy consumption and by 9.7% for final energy consumption), it is unlikely to meet the objectives of EU energy efficiency for 2030 (992.5 million tons of oil equivalent for primary consumption and 763 million tons of oil equivalent for final energy consumption). To reach these targets, immediate actions are needed to reduce energy consumption.

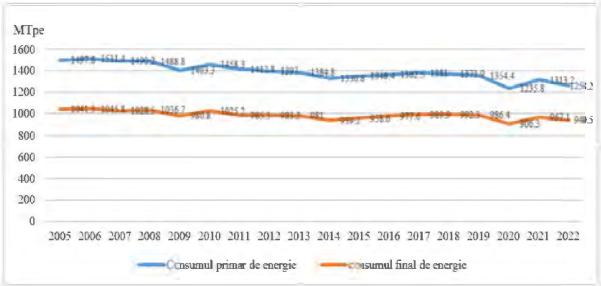

Figure 5. Evolution of primary and final energy consumption in Europe during 2005-2022 (EEA, 2023; Eurostat, 2024)

The reduction of energy consumption, as foreseen by the European Parliament, in 2023, can be achieved through a collective effort of the member states (through renovation strategies, new buildings in the EU to produce zero emissions starting from 2030, the installation of solar panels), which to lead to a reduction of at least 11.7% at EU level by 2030, which implies annual energy savings of 1.5% on average per year until the end of 2030 (European Parliament, 2023).

Regarding the share of energy consumption from renewable sources in Europe, it is presented in Figure 6. As can be seen from Figure 6, it can be seen that the share of energy consumed from renewable sources in the final gross energy consumption in the EU was 23% in 2022, compared to 21.9% in 2021. This increase was determined, in particular, by the increase in solar energy and as a result of the reduction in non-renewable energy consumption, due to the high price of energy (Eurostat, 2024).

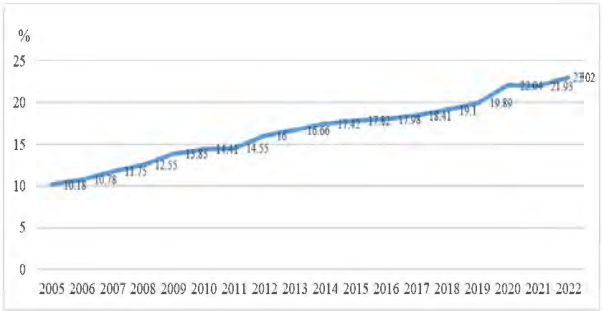

Figure 6. Share of energy consumption from renewable sources in the gross final energy consumption in Europa (EEA, 2023; Eurostat, 2024)

Since 2011, the global share of energy from renewable sources has increased, on average, by 0.8 percentage points annually, thus registering, in the period 2019-2020, an increase of more than 2.2 percentage points.

Among the additional measures that the EU and the member states must adopt to achieve the goal of climate neutrality by 2050, considering the Paris Agreement, measures that are included in the Fit for 55 program, include (Progress Report Climate Action, 2023):

- Establishing a ceiling for total emissions, within which quotas are distributed by auction, thus generating revenues for the budgets of EU member states to support climate and energy transformation actions;
- The creation of a separate carbon pricing system (emissions trading) (ETS2) to be applied to the combustion of fuels, in road transport, construction and low-emissions sectors, to stimulate the reduction of GHG emissions by 62% compared to 2005 in all these sectors; the ETS2 system differs from the existing ETS by placing the regulatory focus on those entities that have to pay energy excise duties (fuel suppliers) and not on the final fuel consumers (EC, 2023);
- Mobilizing more resources to support decarbonization in ETS sectors. All ETS revenues must be used for energy transformation and climate action;
- A new regulation on the LULUCF sector, which envisages, at the EU level, a general objective of 310 Mt CO_2 equivalent from net eliminations in this sector in 2030;
- A Social Climate Fund to accompany the new separate carbon pricing system ETS2, created to address the impact of carbon pricing across sectors and support micro-enterprises and transport users;
- An Innovation Fund at the EU level, which has the role of bringing solutions for the decarbonization of the European economy, while promoting its competitiveness and thus supporting the transition to climate neutrality, being the key tool for the EU to be able to develop the green industrial strategy;
- A regulation on the "zero net" industry that aims to expand the production of clean technologies at the EU level, i.e. increasing the production capacity of technologies that generate GHG emissions at a level equal to zero or negative. This regulation boosts the competitiveness of the EU's net-zero technology industry, creates jobs, accelerates CO_2 storage capacity, and supports the EU's efforts to become energy-independent. One of the technologies with zero net emissions is hydrogen, the promotion of renewable hydrogen to replace fossil fuels is a key element of the industrial decarbonization strategy;
- Eliminating fossil fuel subsidies to create an enabling environment for energy efficiency and renewable energy;
- The inclusion by each EU member state of up-to-date policies and measures in the national energy and climate plans (NECPs) to meet the climate and energy objectives;
- The establishment by each EU member state of some objectives that contribute to increasing the net absorption of GHGs in the LULUCF sector, to reach net absorptions of 310 million tons of CO2 equivalent by 2030, at the EU level.

5 CONCLUSIONS

Human activities generate GHG emissions, which have gradually led to global warming. These emissions, globally, have been continuously increasing, with uneven contributions, due to unsustainable energy use, consumption and production patterns, land use change, etc. The further increase in GHG emissions will lead to an increase in global warming, by intensifying the dangers arising

from this. That is why the rapid and sustained reduction of these emissions is necessary, which would have the effect of a visible slowdown of the global warming phenomenon. In this sense, the EU has made efforts to reduce net GHG emissions by almost a third, in recent decades, through additional measures and planned policies. These policies aim to accelerate this process, by stimulating the use of renewable energy sources and increasing energy efficiency, being the main factors that influence the reduction of GHG emissions.

The current projections of the EU member states, regarding the reduction of GHG emissions, indicate that by 2030 a 48% reduction of these net emissions will be reached, compared to the levels of 1990. This means a gap of 7% compared to the targeted target for 2030, an aspect that will need to be addressed quickly for the necessary reductions to occur. These projections are an important guide for decarbonization, allowing the assessment of progress made by EU member states towards the goal of climate neutrality.

An important step in this direction is the reduction of GHG emissions in different sectors, such as agriculture, industry, transport, and construction. Thus, the energy supply sector had a reduction in GHG emissions by 38%, in 2022 compared to 2005, while the industry and construction sectors had reductions in GHG emissions by 29.5% and 27.6% respectively. Agriculture and transport recorded a reduction of GHG emissions by 4.6% and 5%, respectively.

As a result of the COVID-19 pandemic, an important decrease in GHG emissions (11%) occurred between 2019 and 2020.

The progress registered by the EU member states regarding the share of renewable energies in the final gross energy consumption, increased by 12.3% in 2022, compared to 2005. Therefore, energy from renewable sources becomes a key element in the fight EU member states against climate and environmental challenges. Thus, reducing net GHG emissions by at least 55% by 2030, compared to 1990, and making Europe the first climate-neutral continent by 2050, are two ambitious goals that can only be achieved through an integrated energy system, based in particular on renewable energy sources. Energy from renewable sources is becoming essential, both for guaranteeing the security of energy supply and achieving climate objectives.

From the analysis of the evolution of primary and final energy consumption in the EU, there was a decrease in 2022, compared to 2005, by 16% for primary consumption and 9.7% respectively for final energy consumption.

As a result of the expansion of the regulatory and incentive framework, based on the European Climate Law of 2021, in which clear objectives were imposed regarding the reduction of net GHG emissions by 55% by 2030, Europe has taken significant steps, so that reach the level of net zero GHG emissions by 2050.

To ensure the achievement of the objective of climate neutrality by the EU member states, the periodic evaluation of the progress registered by them regarding reducing GHG emissions, energy consumption, and increasing the share of renewable energies in the final gross energy consumption is essential.

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