

Assessing the Energy State of the EU under Green Deal Objectives

PAUL CALANTER

Project Writing Department, Institute for World Economy

Romanian Academy

ROMANIA

paul.calanter@yahoo.com

Abstract: EU energy policies focus on energy security, the integration of Member States' energy markets and the transition to a carbon-free energy system. This article aims to analyse the energy state of the European Union, considering the Green Deal objectives. Therefore, in the first part of the article, the general objectives of the Green Deal will be exposed while in the second part of the article we will analyse the energy mix of the European Union, the energy production, the energy imports dependence, the energy consumption, the electricity production and prices. In the last part of the article, we will examine the elements regarding the energy-climate relationship, namely greenhouse gases emissions, energy efficiency and renewable energy.

Keywords: Green Deal, greenhouse gases emissions, policies, energy efficiency

JEL Classification: Q21, Q42, Q43, Q48

1. Introduction

The Green Deal is a long-term strategy adopted by EU since 2019 aiming to ensure that the carbon neutrality in Europe is achieved by 2050. The European Green Deal has the potential to transform the EU into a modern, competitive and resource-efficient economy (Igliński et al., 2022). In 2019, the European Commission estimated that meeting the Green Deal objectives would require significant investments. Thus, at that time, it was estimated that achieving the 2030 climate and energy targets will require 260 EUR billion of additional annual investment, representing around 1.5% of 2018 GDP at EU level (EC, 2019).

The EU has introduced the Just Transition Mechanism to provide financial and technical support to the regions that are most affected by the shift to a low-carbon economy. This mechanism will help mobilise at least 65-75 EUR billion over the period 2021-2027 to support people and communities, businesses, Member States and regions. With a total budget of EUR 17.5 billion, the Just Transition Fund is the first pillar of the mechanism, and on June 7th, 2021, the Council adopted the regulation establishing this fund. The Fund provides tailored support to reduce the social and economic costs of the green transition for fossil fuel-dependent regions and high-emission industries.

Green Deal represents a true roadmap to ensure the sustainability of the EU economy by turning climate and environmental challenges into opportunities in all policy areas and by guaranteeing a transition that is fair and inclusive to all. The measures proposed by the Green Deal are intended to encourage resource efficiency by shifting the core EU policies to the objective of the clean circular economy and to limit climate change, to reverse biodiversity loss and to reduce pollution (Hainsch et al., 2022).

Green Deal presents the necessary investments and the available financing instruments and explains how a just and inclusive transition will be ensured (Hafner et al., 2020). The European Green Deal covers all sectors of the economy, with actions focusing on areas such as transport, energy, agriculture, environment and oceans, climate, industry, research and innovation (Tutak et al., 2021).

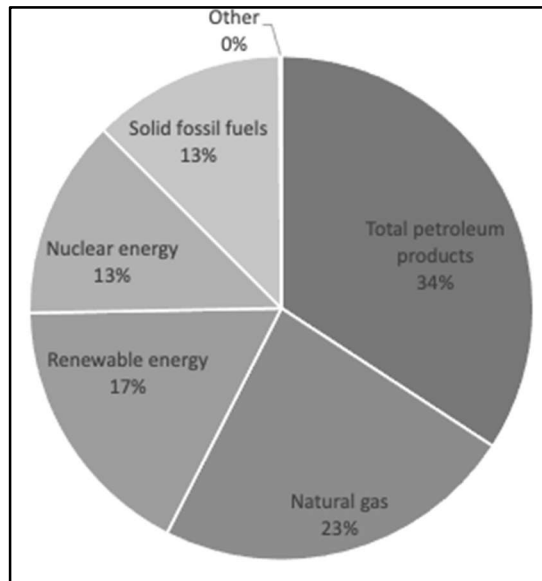
2. Energy situation of the EU

2.1. Energy mix

The energy available in the European Union comes from energy produced in the EU and from energy imported from third countries. Therefore, to get a good overview of the total energy available in the EU, energy production should always be correlated with imports. In 2021 (latest available data), the European Union produced approximately 44 percent of its own energy, while 56 percent was imported (Eurostat, 2023). In 2021,

the European Union’s energy mix (the range of available energy sources) consisted mainly of five sources (Figure 1): solid fossil fuels (12%), nuclear energy (13%), renewable energy (17%), natural gas (23%), and crude oil and petroleum products (34%).

Figure 1: Share of energy products in total energy available, 2021 (%)



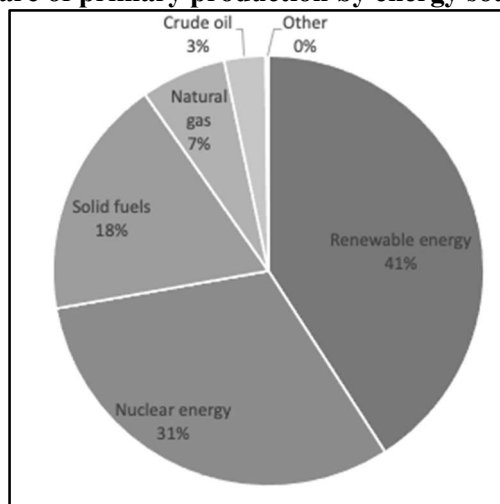
Source: Author according to the Eurostat database, 2023.

The share of different energy sources in the available energy mix varies significantly between Member States. In 2021, the share of petroleum products in available energy is highest in Cyprus (86%), Malta (85%) and Luxembourg (61%), while natural gas is an important source of energy in Italy (40%), the Netherlands (35 %) and Hungary (34%). Renewable energy sources have the largest share in Sweden (48%) and Denmark (41%), while nuclear energy accounts for 41% of available energy in France and 25% in Sweden. The share of solid fossil fuels is highest in Estonia (56%) and Poland (43%).

2.2. Energy production in EU

Energy production in the EU is distributed across several different energy sources: solid fuels, natural gas, crude oil, nuclear and renewable energy (hydro, wind and solar). According to Figure 2, renewable energy sources (41% of total EU energy supply) were the largest contributor to EU energy supply in 2021 (latest available data). On the second place we find the nuclear energy (31%) followed by solid fuels (18%), natural gas (6%) and oil (3%).

Figure 2: Share of primary production by energy source, 2021 (%)



Source: Author according to the Eurostat database, 2023.

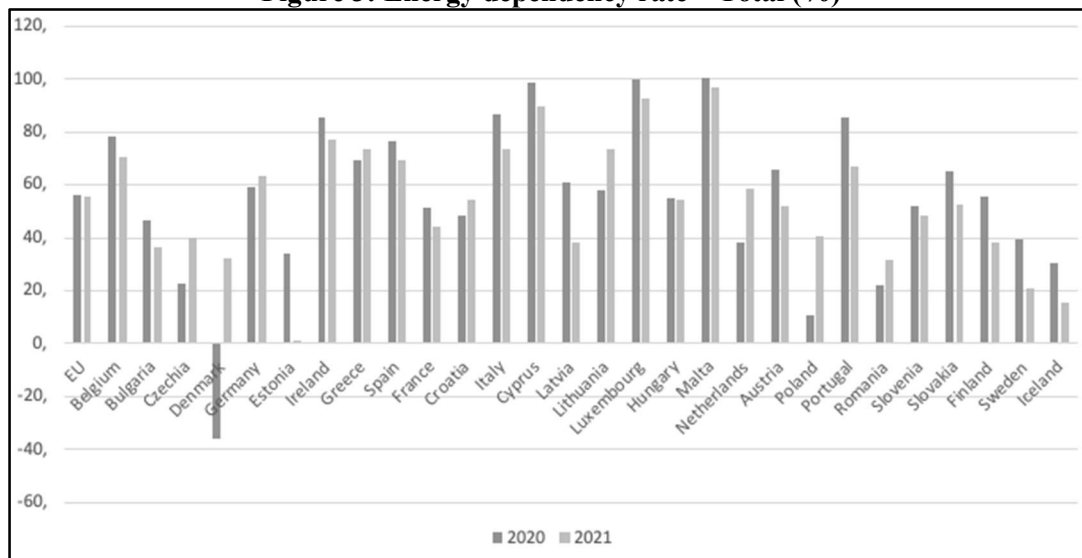
The energy production is different from one country to another. In 2021, renewable energy was Malta's primary basis for primary production (in other words, Malta did not produce another type of energy) and was the main source in other countries. The shares of Latvia, Portugal and Cyprus were more than 95%. The efficiency of nuclear energy was high in France (76% of total national energy resources), Belgium (70%) and Slovakia (60%). In Poland (72%), Estonia (56%) and the Czech Republic (45%) the solid fuels were the main sources of energy. The Netherlands (58%) and Ireland (42%) have the highest share, while the share of oil was the highest in Denmark (35%).

2.3. Energy imports and dependence

For self-consumption, the European Union needs also the energy that is imported from third countries. In 2021 the main energy product that was imported was the petroleum products (including crude oil, which is the main component) which accounted for almost two-thirds of EU energy imports (64 %), followed by natural gas (25 %) and solid fuels (6 %).

By 2021, more than half of the extra-EU oil imports came from five countries, with Russia (28 %), US and Norway (9 % each) being the top three providers. The comparative analysis shows that almost three-quarters of the EU's natural gas imports come from Russia (44 %), Norway (16 %) and Algeria (12 %), while more than half of the EU's fossil fuel imports (mainly coal) come from Russia (52 %), followed by Australia (17%) and the US (15%). Starting with 2022 the sanctions imposed as a consequence of the Russian aggression against Ukraine, triggered a significant change in EU's energy trade.

Figure 3: Energy dependency rate – Total (%)



Source: Author according to the Eurostat database, 2023.

The energy dependence rate indicates the extent to which the economy relies on imports to meet its energy needs. It is measured as net imports (imports minus exports) of gross domestic energy consumed (i.e. energy produced plus net imports). According to figure 3, in 2021, the level of import dependency in the EU was 56%, meaning that half of the energy needed by the EU was satisfied by net imports. However, the dependency had levels in Europe. In Malta, Luxembourg and Cyprus were 90% or more and in Estonia around 1%.

2.4. Energy consumption

About two-thirds of the total energy available in the EU is consumed by final consumers (final energy consumption) for example, EU citizens, industry, transport. The difference, about a third is lost mainly in the production and distribution of electricity, which is used to support energy processes or for non-energy uses (e.g. asphalt). In 2021 (latest available data), in the European Union the petroleum products (e.g. heating oil which represented 35% in the final consumption), were the most consumed. Electricity and gas ranked on the second place with 23% each, followed by solar heating, geothermal or biogas for space heating or hot water production (12 %), heat (5%) and solid fossil fuels (mainly coal) (3%). The real consumption of renewable energy is bigger that 12 % because of the hydropower, wind power and or photovoltaic solariums, which are included in the electricity sector.

The pattern of final energy consumption varies significantly across EU member states. In 2021, petroleum products accounted for more than 55% of final energy consumption in Luxembourg and Cyprus. In Malta and Sweden, the electricity was more than 30%, and in the Netherlands, Hungary, Belgium and Italy gas was more than 30%. Renewable energy sources account for more than 25 % of final energy consumption in Finland, Sweden and Latvia.

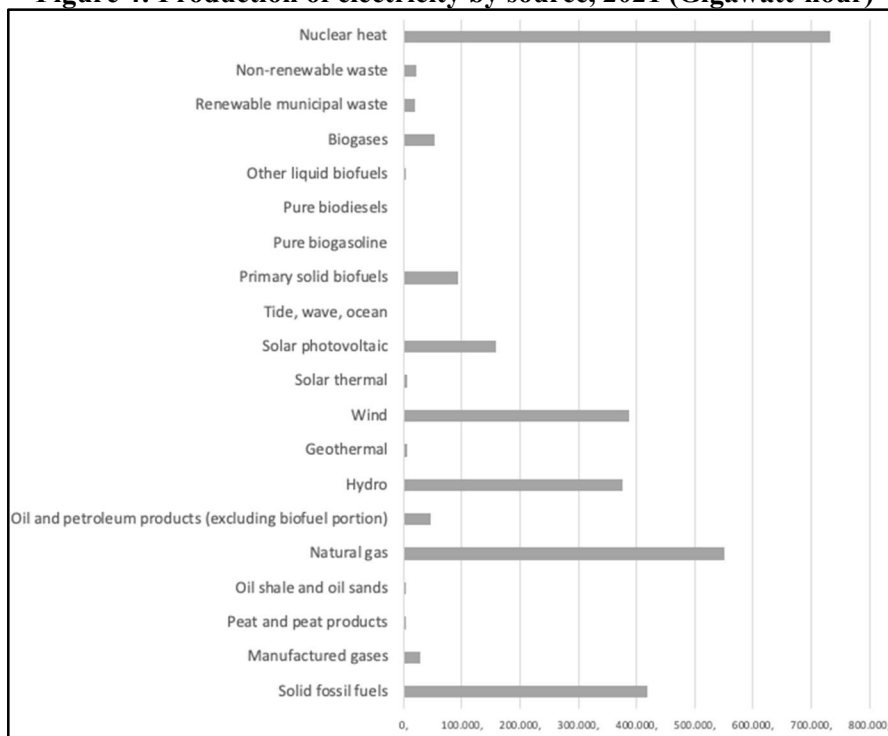
Energy is consumed in different sectors of the economy: household (energy consumed in citizens' homes), transport (rail, road, domestic aviation or domestic transport), industry, services (including trade and public services), agriculture and forestry. Looking at which sectors consume the most energy in the EU, the transport industry (29% of final energy consumption) consumed the most energy in 2021. It is followed by households (28 %), industry (26 %), services (14 %), agriculture and forestry (3 %).

To properly understand energy statistics, it is necessary to distinguish between primary and secondary energy products. A primary energy product is extracted or captured directly from natural resources, such as crude oil, firewood, natural gas or coal. This process is called primary production. Secondary energy products (such as electricity or motor gasoline) are obtained because of a transformation process, either from a primary or from a different secondary energy product. Final consumers can use primary (for example natural gas for heating) or secondary energy products (such as motor gasoline to fill up the car tank).

2.5. Electricity production

About 24% of the final energy is represented by electricity and comes from different sources. In 2021, renewables were the main source of electricity generation in the European Union (38 percent), ahead of fossil fuels (36 percent) and nuclear (25 percent). Most of the renewable energy comes from wind and hydro (both 13%), biofuels and solar (both 6%).

Figure 4: Production of electricity by source, 2021 (Gigawatt-hour)



Source: Author according to the Eurostat database, 2023.

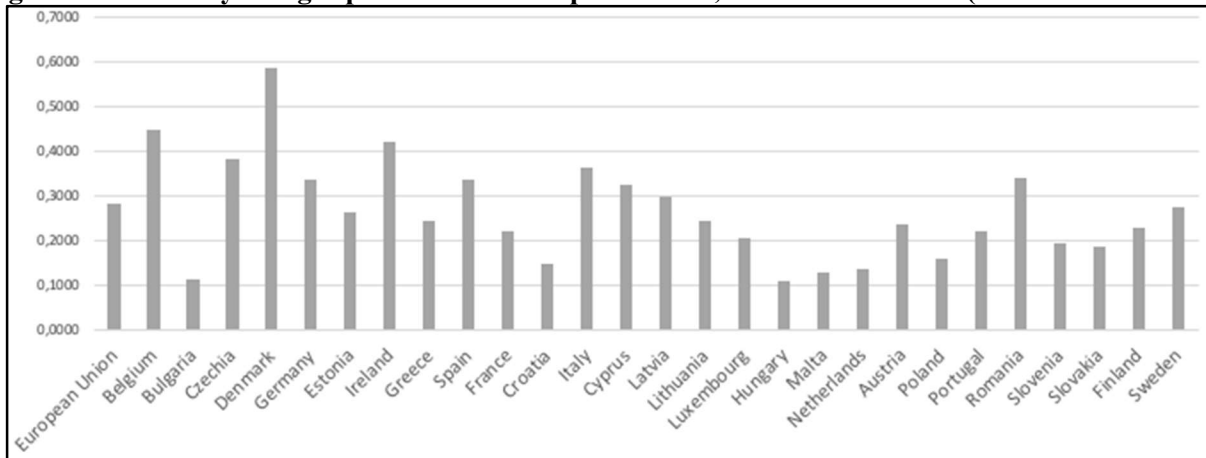
Electricity sources vary between the member countries. According to Figure 4, in 2021 (latest available data), around half (49 %) of Denmark's electricity generation came from wind. In Austria, 60% of electricity production comes from hydro. In Poland, Cyprus and Malta more than 80% of electricity generation comes from fossil fuels. However, in France almost 70% of electricity comes from nuclear while in Slovakia and Belgium around 50% came also from nuclear power plants.

2.6. Electricity and gas prices

In the second half of 2022, household electricity prices, including taxes and tariffs, were highest in Denmark, Belgium and Ireland while the lowest prices were recorded in the Bulgaria and Hungary (Figure 5).

Denmark had the highest share of taxes and levies in electricity prices (48 %) followed by Germany (42 %). The Netherlands had the lowest taxes and levies, the value being negative (-4 %). The next places were occupied by Latvia and Greece. Natural gas prices for household consumers, including taxes, are highest in Sweden and Denmark, and lowest in Hungary and Croatia.

Figure 5: Electricity and gas prices in the European Union, 2nd semester 2022 (euro/ Kilowatt-hour)



Source: Author according to the Eurostat database, 2023.

The share of taxes and levies in natural gas prices was the highest in the Netherlands (51%), and the lowest in Bulgaria, Greece and Latvia, being in this case negative.

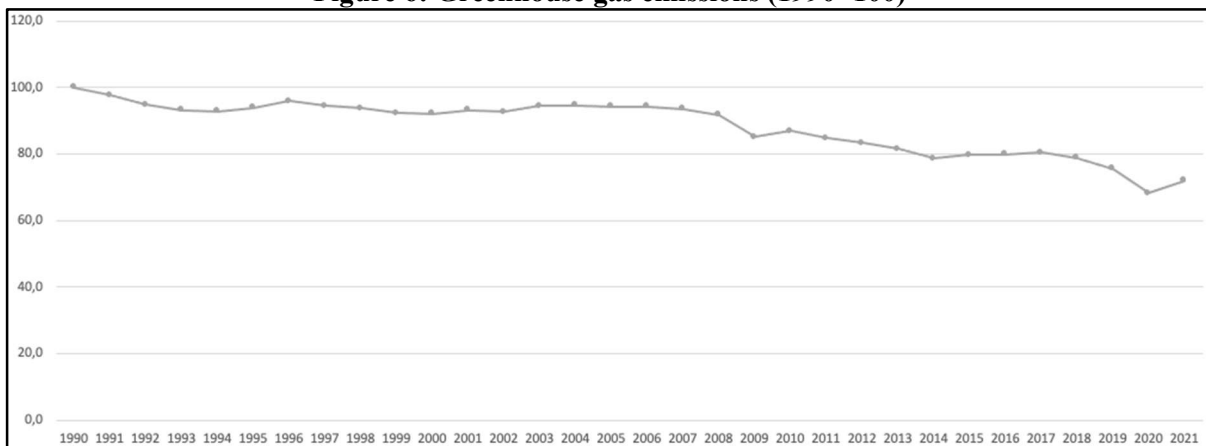
3. Energy and the environment

3.1. Greenhouse gas emissions

Climate change is a threat to sustainable development. After years of extensive research, the scientific community agrees that human-made greenhouse gas (GHG) emissions are the main cause of the rise in Earth's average temperature over the past 250 years. Agriculture and waste are also sources of manufacturing GHG emissions. According to Figure 6, the European Union greenhouse gas emissions fell from 2010 to 2014, rose from 2015 to 2017 and fell again in 2018-2020. In 2020 (latest available data), GHG emissions fell more than 10% in comparison to 2019. This is the strongest decline since 1990.

In 2020, the volume of greenhouse gas emissions in the EU was more than 1.5 billion tonnes of CO2 equivalent compared to 1990. This corresponds to a reduction of 32% in comparison to 1990 levels. The new objective is to reduce greenhouse gas emissions by 55% compared to 1990. Greenhouse gas emissions were below 1990 levels in 25 of the EU countries. The largest reductions were recorded in Estonia, Latvia, Lithuania and Romania.

Figure 6: Greenhouse gas emissions (1990=100)

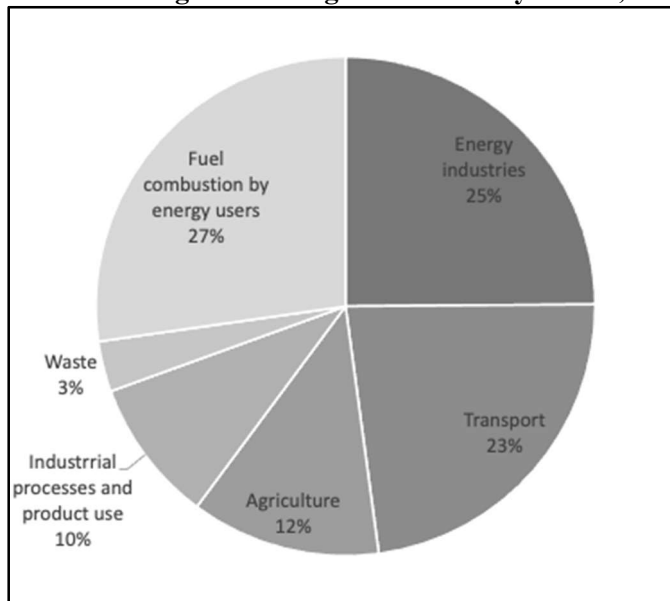


Source: Author according to the Eurostat database, 2023.

According to Figure 7, by 2020, fuel combustion accounted for the largest share of total consumer greenhouse gas emissions (28 %), surpassed only by the energy industry (25 %). Compared to 1990, the share

fell for all sectors except transportation. Here, it rose from 15% in 1990 to 23% in 2020. Also, it has been a slight increase in agriculture from 10% to 11%.

Figure 7: Share of greenhouse gas emissions by source, 2020 (%)



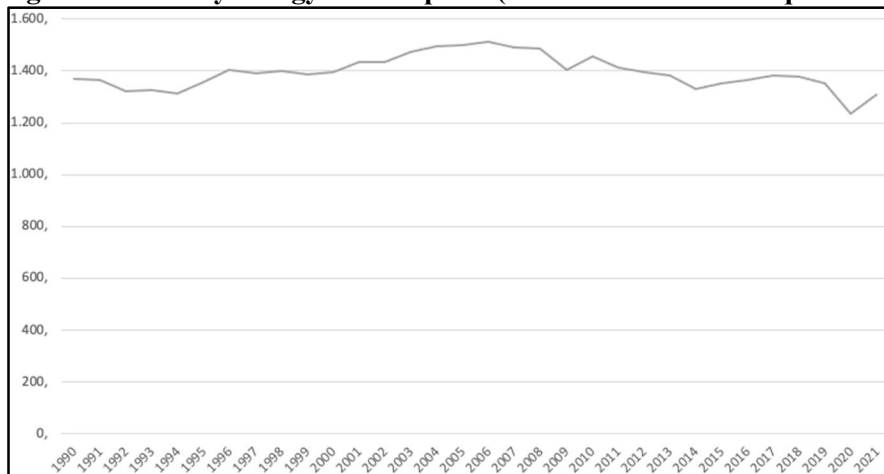
Source: Author according to the Eurostat database, 2023.

3.2. Energy efficiency

One of the priorities of the Energy Union strategy is to improve energy efficiency, mainly by reducing the total energy consumption in the EU and reducing the costs of energy management. Improving energy efficiency contributes to protecting the environment, mitigating climate change and reducing the EU's dependence on foreign oil and gas suppliers.

According to figure 8, in 2021, the primary energy consumption reached 1,309 million tons of oil equivalent (mtoe). This is an increase of 5.9% compared to 2020. At the time, consumption was at its lowest level due to the impact of the pandemic, but it is still the second lowest level since 1990 (the first year for which data is available). The level from 2021 is 16.1% lower than the EU 2030 target.

Figure 8: Primary energy consumption (Million tonnes of oil equivalent)



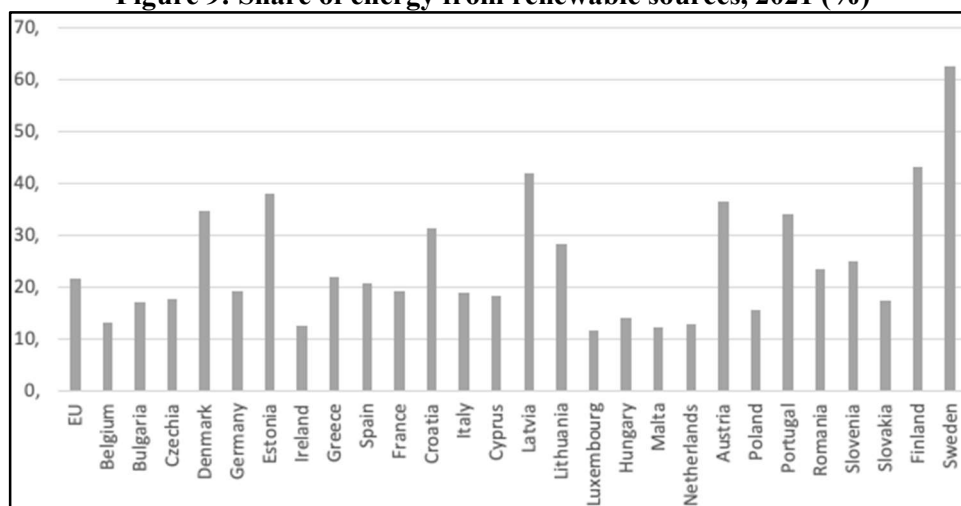
Source: Author according to the Eurostat database, 2023.

Final energy consumption increased sharply in 2021 (up to 968 Mtoe, +6.8 percent in comparison to 2020), but it was with 1,8% lower in comparison to 2019. The level in 2021 is 14.4 %, higher compared with the 2030 target.

3.3. Renewable energy

The share of renewable energy consumption in 2021 reached 21.8 % (Figure 9). This is a slight decrease compared with 2020 and the first decrease ever recorded.

Figure 9: Share of energy from renewable sources, 2021 (%)



Source: Author according to the Eurostat database, 2023.

In 2021, Sweden had the highest share of renewables (62.6 %), followed by Finland (43.1 %) and Latvia (42.1 %): the lowest level of renewables were recorded in Luxembourg (11.7 %), Malta (12.2 %), Netherlands (12.3%) and Ireland (12.5%). The difference is recorded due to the variations in the endowment of natural resources, especially in the potential for the construction of hydroelectric plants and the availability of biomass.

4. Conclusion

The energy policy is a shared competence between the EU and its Member States. Under the Treaties, the EU has a responsibility to ensure security of supply, while the Member States are responsible for establishing the structure of their energy supply and the choice of energy sources. EU legislation on the energy sector is linked to strengthening a single energy market, improving energy efficiency and promoting renewables to decarbonise the economy and meet the objectives of the Paris Agreement (Papież, et al., 2021).

The EU will retain a key role in monitoring security of supply during the energy transition from the old, centralised generation system, where fossil fuels predominate in national markets, to a new system characterised by a high share of renewable energy, more localised production and cross-border markets (Giampietro, et al., 2022). The Energy Union Strategy has placed an important focus on the proper functioning of the Single Market, as well as on the promotion of renewable energy and energy efficiency systems, which increase energy security by reducing dependence on imported fossil fuels (EC, 2015).

Our main finding is that ensuring a well-functioning energy system requires a continuous effort on the part of the EU and its Member States, involving increased vigilance as regards the reliability of suppliers in third countries, assessing how new supply routes (or closing old ones) could affect energy security, and determining whether energy agreements with third countries are in line with EU objectives.

References:

- [1] European Commission, 2019, Communication From The Commission To The European Parliament, The European Council, The Council, The European Economic And Social Committee And The Committee Of The Regions: The European Green Deal. Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF
- [2] European Commission, 2015, Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee, The Committee Of The Regions And The European Investment Bank A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2015:80:FIN>
- [3] Eurostat, 2023, Shedding light on energy - 2023 edition. Available at: <https://ec.europa.eu/eurostat/web/interactive-publications/energy-2023#expandable-example-content>
- [4] Giampietro, M., & Bukkens, S. G. (2022). Knowledge claims in European Union energy policies: Unknown knowns and uncomfortable awareness. *Energy Research & Social Science*, 91, 102739.
- [5] Hainsch, K., Löffler, K., Burandt, T., Auer, H., del Granado, P. C., Piscicella, P., & Zwickl-Bernhard, S., 2022, Energy transition scenarios: What policies, societal attitudes, and technology developments will realize the EU Green Deal?. *Energy*, 239, 122067.

- [6] Hafner, M., & Raimondi, P. P., 2020,. Priorities and challenges of the EU energy transition: From the European Green Package to the new Green Deal. *Russian Journal of Economics*, 6(4), 374-389.
- [7] Igliński, B., Pietrzak, M. B., Kiełkowska, U., Skrzatek, M., Gajdos, A., Zyadin, A., & Natarajan, K., 2022, How to Meet the Green Deal Objectives—Is It Possible to Obtain 100% RES at the Regional Level in the EU?. *Energies*, 15(6), 2296.
- [8] Papież, M., Śmiech, S., & Frodyma, K., 2021, The role of energy policy on the decoupling processes in the European Union countries. *Journal of Cleaner Production*, 318, 128484.
- [9] Tutak, M., Brodny, J., & Bindzár, P., 2021, Assessing the Level of Energy and Climate Sustainability in the European Union Countries in the Context of the European Green Deal Strategy and Agenda 2030. *Energies*, 14(6), 1767.