The Impact of Policies and Measures on Climate Changes at Global and National Level

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Abstract

The climate crisis we are confronted with has worsened substantially compared to 15, 20, or 30 years ago, when the first assessments related to climate change were presented to the world's governments. This crisis, with its severe repercussions on the frequency and intensity of extreme weather phenomena, natural ecosystems, and imbalances in every country's economies and people's lives, demands immediate attention. To halt the continuous degradation of the environment, we must identify the effects and serious phenomena that are affecting the planet due to the emissions of gases in the atmosphere, where this decline started, and how fast it has been expanding. Climate models are an appropriate tool to study the influence exerted by the effects of increasing GHG levels and disturbance factors. This paper not only examines current environmental policies but also proposes alternative strategies for the future, instilling hope and empowerment in the face of these urgent priorities for humanity.

Key words: environmental policy, global warming, natural ecosystem, climatic neutrality
J.E.L. classification: Q54, Q56, Q57

1. Introduction

Humanity, through its actions, has significantly and continues to harm the Earth's climate system, leading to irreversible changes that demand a tangible, realistic assessment of this planet's future. This realization should serve as a powerful motivator for us to take immediate and effective action, as we are the primary cause of these changes. Our actions have consequences, and it's time we acknowledge and take responsibility for the damage we've caused.

Over 97% of the research conducted between 1991 and 2013 has unequivocally pointed to human activities as the primary cause of environmental deterioration. The expert opinions in the field further solidify these research findings, highlighting the need for immediate policy changes (Andrews, 2018).

2. Theoretical background

According to Ms. Valérie Masson-Delmotte, a leading figure in the IPCC, the climate began to shift decades before our current century, largely due to human activities. However, new reports are optimistic, suggesting that it is high time for significant changes to be implemented to curb the destructive effect on the environment (Ceppi, 2017), (Gregory, 2017).

António Guterres (UN Secretary-General) made an appeal as clear as possible: He advocates changing the behavior of both governments and people because an ambitious and solidary joint effort would be of great help in protecting and saving humanity.

Surely the opinions of specialists Lynas, Houlton & Perry (Lynas et al, 2021), supported in the year 2021, regarding the disastrous situation humanity is facing are also related to the reality that humans are responsible for climate change. They conclude that it is necessary to urgently find viable solutions to remedy the urgent problems related to greenhouse emissions that have caused

changes in the natural environment and that their devastating effects will affect the economy of countries, businesses, and the economy as a whole.

Scientists' claims must determine authorities make urgent decisions and realize that all these human-induced changes have had a catastrophic impact on the climate, causing heat waves like the one recorded in Canada, where temperatures have reached about 50 °C (Collins, M, et al, 2013).

In the last century, the planet's rapid warming has been affected by both the growth of GHGs and natural factors such as the intensification of volcanic activity and solar radiation.

After studying the conclusions offered by scientists and highlighted in specialized literature, regarding greenhouse gas (GHG) emissions, I can state that the main cause of modern climate change remains man, although there is no conclusive scientific debate issued by experts to certify whether man causes climate change. Some scientific works reject the hypotheses issued by the IPC AR5," it is very likely that human influence was the dominant cause of the warming observed in the middle of the 20th century" (Comyn-Platt E et al., 2018).

The conclusions offered by the IPC AR6," it is unequivocal that human influence has warmed the atmosphere, the ocean and the earth (Gasser T, et al. 2018)."

Each of us has a role in raising awareness of the seriousness of our situation and informing humanity that to mitigate the devastating effect of global warming, collective efforts must be made to reduce the burning of fossil fuels and other sources of anthropogenic emissions of greenhouse gases (Lowe and Bernie, 2018).

3. Research methodology

This research aims to evaluate the feasibility and challenges of limiting global temperature rise to 1.5°C, with a focus on Romania's strategies within the IPCC guidelines and the 2030 United Nations Agenda for Sustainable Development. A mixed-methods approach will be used, incorporating both qualitative and quantitative data to comprehensively understand the subject.

Data collection will involve a thorough literature review of relevant documents, analysis of key policy documents, and scrutiny of official statistics. Semi-structured interviews with policymakers, experts, and stakeholders, along with detailed case studies of specific sectors, will provide deeper insights into the implementation challenges and socio-economic impacts of the proposed strategies.

Quantitative data will be statistically analyzed to evaluate trends in GHG emissions and energy consumption, while qualitative data will be thematically analyzed to identify common themes and best practices. Comparative analysis will benchmark Romania's progress against other EU countries.

To ensure the reliability of findings, triangulation, expert review, and sensitivity analysis will be employed. Ethical considerations will be strictly adhered to, ensuring confidentiality and informed consent.

This comprehensive methodology aims to provide a detailed assessment of Romania's climate change mitigation efforts. It will contribute valuable insights into sustainable development and climate resilience and help achieve the global temperature target of 1.5°C.

4. Findings

The IPCC's decision (IPCC, 2013, 2018, 2021) to prepare the report on the impact of the increase in the global average temperature by 1.5°C took into account the fact that the assessment must be carried out by considering the implementation strategies to be able to understand the favorable conditions and the challenges necessary for such transformation, those being qualified in the context of sustainable development, in particular, in the 2030 United Nations Agenda for Sustainable Development (UN, 2015b). The feasibility of staying within the range of 1.5°C, and identifying the technology and political levers needed to accelerate the pace of transformation, depends on a series of favorable conditions, geophysical elements, environmental elements, ecological, technological, economic, socio-cultural and institutional dimensions, focusing on three main directions: sustainable development, resilience and transformation.

Reducing global warming consists of accelerating the disconnecting of economic growth from GHG emissions, since climate change constraints possible development paths, there are synergies and trade-offs between climate responses and socio-economic contexts, and opportunities for favorable climate responses overlap with opportunities for sustainable development, many of the existing societal models of consumption being unsustainable.

As a result of the Kyoto Protocol, an important step has been taken against global warming because it contains mandatory and quantified objectives for limiting and reducing GHG emissions, specifically holding the commitments of industrialized countries to reduce these gas emissions that are responsible for global warming. The GHGs on which there are numerous discussions and controversies - carbon dioxide (CO2); methane (CH4); nitrogen oxide (N2O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); sulfur hexafluoride (SF6) - are determined by the irradiative force of the gas, its concentration in the atmosphere and its stagnation time in the atmosphere, the index is called Global Warming Potential (GWP), i.e. the combined effect of the time in which they remain in the atmosphere and the efficiency in absorbing infrared radiation emitted by the Earth.

However, there is a wide range of other GHGs that are released into the atmosphere, such as halocarbons, the best-known being chlorofluorocarbons (CFCs) and other substances in whose molecules there are chlorine and fluorine atoms, their emissions being regulated by the Montreal Protocol. Halogen gases are emitted in much smaller quantities than CO2, CH4, and N2O, having very low concentrations in the atmosphere, but a very long lifespan and a strong irradiative forcing effect, from 3,000 to 13,000 times greater than CO2.

Governments have begun to negotiate the achievement of an international agreement that would emphasize those solutions aimed at each country's atmospheric emissions depending on the economic status and production of each one. In the case of a less developed country, it will be allowed to emit more GHGs to enable it to grow economically, and developed countries, which have a high GDP, will be asked to reduce their gas emissions because they have a greater responsibility than other countries in terms of greenhouse gas emissions.

One step towards solving the problems is acknowledging their dimensions, in this sense, each country, depending on its economy, will have to reduce gas emissions compared to the levels reached in 1990, which was considered to be the "reference year" for tabulation of GHG emissions. European Union established "Romania's Long-Term Strategy" (STL), which includes three important scenarios that must be taken into account: the reference scenario, the average scenario, and the Neutral Romania scenario, which aims to achieve climate neutrality by 2050 by reducing emissions net value with a percentage of 99% until that date, which would ensure that the production of food is not endangered and sustainable economic development can be continued without problems.

Starting from 1990, as the reference year, Romania succeeded in the decarbonization process to reduce GHG emissions by 62% compared to the reference year. The efforts undertaken by Romania also envisage a reduction of net gas emissions by 78% by 2030 so that the climate neutrality threshold is reached in 2050, reducing GHGs by 99% compared to the reference year.

Romania's Long-Term Strategy (Cătuți, Miu, and Postoiu, 2022) requires paying more attention to national targets and, to the same extent, to sectoral targets that are based on the energy and climate model, which must take into account the contribution of all economic fields whose effects are reflected in the energy sector, while influencing the environment at the same time. Achievement of the targets proposed in the STL must not ignore any of the activity sectors - the energy sector, the industry sector, the agriculture sector, the transport sector, and the waste sector, for each of them, specific measures must be approved, but all should be aimed at the same goal, namely the reduction of GHG emissions.

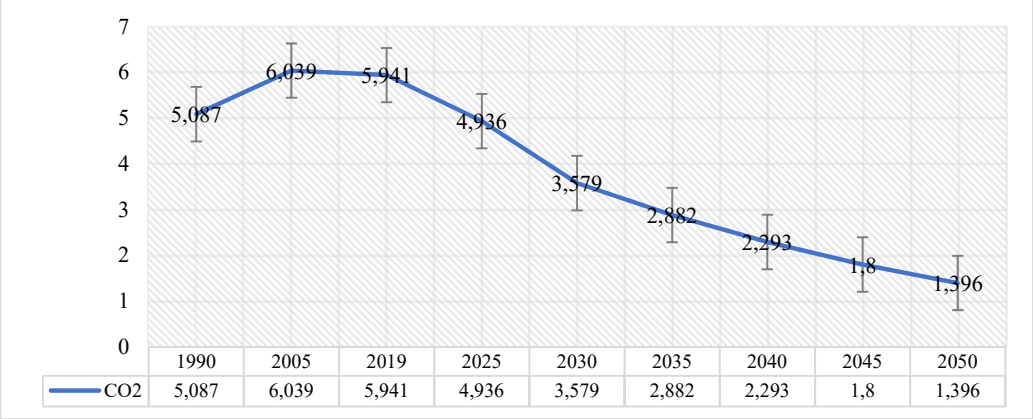
Figure 1 shows the efforts made and those expected "to reduce net emissions until 2050, in the waste sector through measures aimed at:

- reducing the amount of household waste by 10% by 2025;
- reducing the amount of residual waste by 10% by 2035;
- recycling food and garden waste by 50% in 2030 and 60% in 2050;
- recycling wood waste by 25% in 2025, 30% in 2030 and 50% in 2050;
- paper and textile recycling by 80% in 2050;

- approximately 60% of methane emissions produced by non-recyclable waste will be eliminated by 2050;
- bans on the storage of recyclable materials (plastics, metals, glass, paper, cardboard);
- bans on the storage of biodegradable waste until 2025, and the total elimination of waste storage will be attempted until 2030;
- an increase in the waste recycling rate for packaging will be attempted - 60% by 2020, 70% by 2025, and up to 80% by 2030" (Romania's Long-Term Strategy for the Reduction of Greenhouse Gas Emissions)

Although the proposed target for the waste sector was to reduce GHG by 73% by 2050 compared to the reference year, an unwanted increase in emissions by 19% was observed between 1990 and 2005. Still, from 2019, the situation began to return to normal, with a decrease in them, which must be stimulated for our country to fall within the reach of the sectoral target set for the year 2050.

Figure no. 1 Reduction of CO2 net emissions until 2050 for Neutral Romania scenario

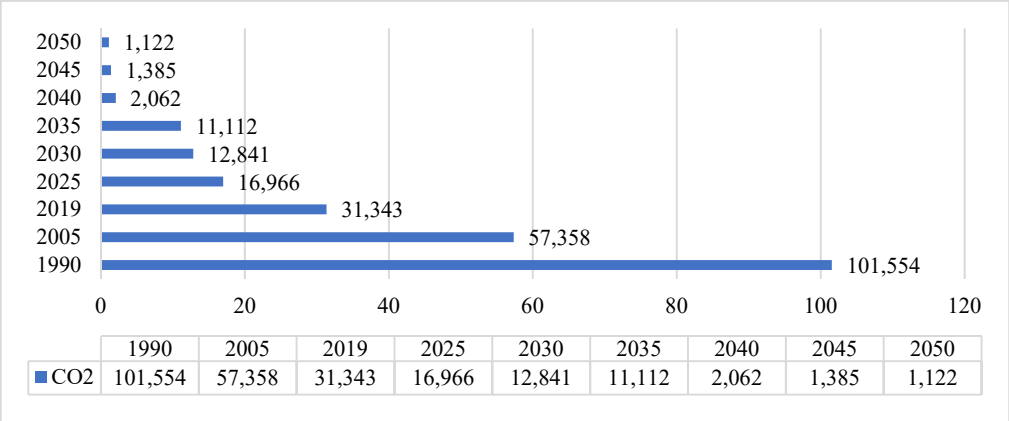


Source: Own processing using data (Eurostat)

Taking a look at the energy sector and its decarbonization, we can say that the main objective of reducing GHG can be achieved by 2050 because a percentage of 69% has already been reached in 2019, and it is expected to reach a percentage of 98% of the proposed objective by 2035 through measures aimed at:

- decommissioning the sources of energy production used for heating/cooling based on biomass, coal, lignite, and oil, with heat pumps by 25% by the year 2050;
- elimination of fossil fuels (natural gas and coal) by using other renewable energy sources such as electricity, waste with high calorific value, and hydrogen;
- finding appropriate solutions for carbon capture, storage, and use (CCUS) in the non-metallic minerals industry to reach the proposed target of 50% captured emissions by 2050;
- high energy efficiency as a result of the use of technologies at the most advanced standards found in the Primes model.

Figure no. 2 Decarbonization of the energy sector by 2050 according to the Neutral Romania scenario



	1990	2005	2019	2025	2030	2035	2040	2045	2050
CO2	101,554	57,358	31,343	16,966	12,841	11,112	2,062	1,385	1,122

Source: Own processing using data (Eurostat)

The decarbonization objective imposed by the EU on Romania will be achieved through the use of the EU-ETS Scheme (EU GHG Emissions Trading Scheme), which helps to achieve the annual emissions tasks for the non-ETS sectors as a result of the 44% decrease in GHG emissions until 2030.

Romania is confronted with challenges regarding the decarbonization process as the country still relies significantly on fossil fuels. The percentage of use of fossil fuels, i.e., oil, coal, and gas, showed an increase in the year 2021 compared to 2020, reaching an important share of 72% in 2021, while the energy obtained from the use of renewable sources recorded a smaller percentage, only 20%. The studies carried out show us that Romania ranks second in the EU in terms of gas production which is used, in particular, on the domestic market. In Romania, the efforts should be channeled on the more efficient use of energy, and here we recall the fact that there has been an increase in the gross final consumption of energy from renewable sources in the field of electricity, transport as well as in the heating and cooling sector. An increase in electricity production through the use of wind and solar power plants as well as hydrogen power plants will cause an increase in the volume of RSE (renewable sources of energy) in the energy production sector by approximately 107.5% as a result of the fact that a part of the energy produced from RSE will not be used directly but it will be directed to hydrogen production, which means that the share of production from RSE will be higher than the gross consumption of energy from renewable sources. Under these conditions, Romania could benefit from substantial support to achieve the objectives proposed and requested by the EU for the year 2030 and, in perspective, for the year 2050, to successfully implement the European Ecological Plan 2050.

5. Conclusions

Romania has important energy resources: oil, natural gas, coal, hydropower potential, and uranium reserves. It can invest in and support the reorientation towards other energy sources, such as wind energy, solar energy, and energy produced in micro-hydropower plants.

According to the PNNR commitment, by 2023, all energy production that currently uses resources such as coal and lignite must be replaced with energy from renewable sources. However, because of existing blockages in the network, energy from renewable sources cannot be used.

We have to admit that the energy sector is crucial for Romania's economic development since it can transform our country into an energy supplier. We have the necessary resources to achieve this goal, and the transition from solid fuels to natural gas and renewable sources can be achieved with little effort on everyone's part.

The involvement of the Ministry of Economy, Energy, and Business Environment using a balanced approach in the national energy sector could be able to expedite the fulfillment of the major objectives of the RES 2020-2030 that it proposed regarding:

- the energy governance system that requires a change, respectively, a modernization for optimal use of green, clean energy,

- the increase in the benefits brought by the energy system both in regional and European markets,
- Romania's participation in the energy market as a regional provider of energy security,
- the urgent measures to protect vulnerable consumers,
- the access of all citizens to electricity and thermal energy,
- the elimination as much as possible of the energy poverty currently faced by a good part of the population, and
- the human resource (let's not forget the most important part) who must be stimulated by continuous training within a qualitative education system.

We believe that investments in the production of energy with low GHG emissions, replacing coal with natural gas and other options from renewable sources such as the potential of hydrogen and new gases, wind and photovoltaic energy, energy produced in offshore wind farms, increasing nuclear energy capacities, the introduction of digitization and smart grid networks, are in a position to make an energetic transition as realistic and sustainable as possible in the field of climate change by eliminating carbon emissions, proving in this way that the desired global climate neutrality is feasible and desirable.

This desire and necessity to reach climate neutrality will bring unexpected opportunities and far-reaching social and economic transformations only if they are supported by a government determined to overcome the challenges that have arisen at the national and global levels.

Our future is possible as long as we realize that climate change has a strong impact on our daily lives and that this climate change and its consequences are the biggest challenge for the century we are in, because many of the changes already observed in the climate system, including increased frequency and intensity of temperature extremes - heat waves, heavy precipitation, drought, loss of Arctic Sea ice, snow, and permafrost, will become more intense as global warming increases.

Global warming will continue to intensify the global water cycle, including its variability and the severity of wet and dry phenomena. Each half degree of global warming causes a perceptible increase in the frequency and duration of extreme temperatures (heat waves), the intensity of heavy precipitation, and drought in certain regions of the planet.

Ulterior climate warming is expected to further amplify permafrost thaw and loss of seasonal snowpack, land ice, and Arctic sea ice, with Antarctica potentially ice-free in September (at least the annual minimum), at least once before 2050 in all emission scenarios, with more frequent events for higher levels of warming.

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