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THE IMPACT OF CLIMATE CHANGE CAUSED BY GREENHOUSE EFFECT GASES

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Abstract: *This article succinctly discusses a globally actual topic, namely climate change and the adaptation of society to the effects it produces. The work analyzes the impact of climate change caused by greenhouse effect gases over the economic environment in Romania. The segments which we are discussing are the energy sector, agriculture and individual households. Also, we have researched the impact of consumption and production of energy, the main generator which influences climate change on a global level. Achieving climate neutrality, a neutral economy, an objective of the European Union, was also the object of this study.*

Key words: *climate change, greenhouse effect gases, energy, agriculture.*

1. Introduction

Although many of us are aware of the major issues mankind faces: on one hand, the need to significantly reduce greenhouse effects gases short term and, on the other hand, the need to adapt to the visible effects of climate change, because its effects are already visible and inevitable, still many of the skeptical ones remain indifferent. In this work, we emphasized climate changes which are a major issue for mankind, as it is the main objective which undermines the capacity of all countries to achieve sustainable development in the economic sector. The objective of having a neutral economy is one of the main goals of the European Union. The last period is marked by a significant growth of demand for energy and resources, which explains the European measures for the use of regenerable sources as a sustainable alternative to climate change. Considering the increasing preoccupation for climate change and the need to transition to a greener economy (Viziniuc, 2021), the European Union established certain objectives.

Approaching climate change is one of the greatest challenges of modern economy these days. The European Green Deal, passed in 2019, sets the European path towards an economy based on 0 emissions (Baicu et al., 2022).

During the last years, energy and climate change are tow domains seen as complementary in the European Union. Member states, by common approach,

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elaborate strategies to fight the effects of climate change over economies. Romania manifests its support for strengthening the role of world leader of the Union in fighting climate change by reducing greenhouse effect gases on a community level with 20% by 2020 (StopCO2, 2010). In 2008, the National Strategy for the Sustainable Development of Romania, Horizons 2013-2020-2030 (National Strategy for the Sustainable Development of Romania, Horizons 2013-2020-2030, Bucharest 2008) was elaborated. To contribute to the fight against climate change, EU stablished ambitious objectives for reducing greenhouse effect gases. The first initiative of the European Union took place when member states agreed, at the Spring European Council, on a mandatory target for the whole Union – a 20% reduction of greenhouse effect gases until 2020 as opposed to 1990. Another mandatory objective was also decided at that time: a 20% contribution from regenerable resources out of the total energy consumption of the European Union until 2020 (Tătaru, 2015).

The European Union led the global energetic transition by fulfilling the objective stated in the Paris agreement for climate change, which entails supplying clean energy throughout the entire European Union. To fulfill this goal, the European Union established clear objectives regarding energy and climate for the year 2030. Regarding sustainable energy, the European Commission recommended that Romania increase its ambition for 2030, by reaching 34% energy from regenerable sources. (National Integrated Plan for Energy and Climate Change 2021 – 2030 April 2020, page 30). In accordance with the 2030 Agenda of the Paris Agreement, but also from the perspective of European Green Deal, EU must find solutions to the energy, climate and environment issues and achieve climate neutrality by 2050. Transforming the energy system of the Union plays an essential role, as the production and use of energy represents over 75% of the greenhouse effect gases (EU Regulation, 2018; EC, 2019). Also, EU has progressively increased the extent of regenerable sources of energy and, until 2030, it is expected to reach 42,5 % (Directive, 2023).

Until 2050 the latest we must ensure equilibrium between emission and absorption of greenhouse effect gases which are regulated in the EU law, so as to reach 0 net emission until this date.

The EU launched certain initiatives for reaching these objectives. THE EUROPEAN GREEN DEAL, READY FOR 55 UE works on revising the law on climate, energy and transportation within the so called “Ready for 55” program, to align present laws to the climate objectives of the EU for 2030 and 2050 (Dancau, 2023; Ene, 2024).

Undoubtedly, climate change is a certainty.

The general tendency to reduce greenhouse effect gases in the EU and in Romania underlines the efficiency of the measures implemented and the permanent objective of fighting climate change and improving the quality of air. It has become a certainty for everyone that climate change is directly proportional with lowering greenhouse effect gases. Romania undertook substantial efforts to reduce CO2 emissions by passing the needed national strategies (for example, subventions granted to producers of regenerable energy, reducing national taxes for cars who do not pollute excessively, acquiring public transportation vehicles with regenerable energy and hydrogen, thus aligning to the European direction for the use of regenerable energy and adopting

efficient policies for waste management (Ciupagea et al., 2006; Neacșa, 2017). The greatest source of anthropic energy of CO2 is burning fossil fuels to produce electricity and heat, in transportation and industry (Hrestic, 2019).

Also, in 2022, developed countries faced the rapid increase of inflation, an unprecedented energy crisis in Europe and work force deficit in different sectors. The status of European economy has suddenly deteriorated once the Ukraine war started; among the consequences, we note chain of supply for petrol and gas which was interrupted, the increases cost of energy.

Even if, statistically, Romania does not seem to have economic difficulty owed to climate change, there are still negative effects over different sectors of national economy, such as agriculture (Sima et al., 2015; Istudor et al., 2019; Prăvălie et al., 2020), energy (Zamfir et al., 2015) or tourism (Surugiu et al., 2011). Also, of significant importance is monitoring the impact of climate change in priority sectors, as defined by the ministry of environment, namely energy sector, transportation, industry and agriculture (Romania's National Strategy for climate change 2013 – 2020).

2. The Connection of National Policies and Strategies regarding Climate Change and Agriculture

The effects of climate change in individual households and agriculture:

In the National Strategy, reducing greenhouse effect gases has established a series of indicators which must be achieved by 2030 and 2050, considering the economic growth of our country. Thus, the economic sectors with the highest greenhouse gas emissions were identified along with the measures which must adopted. For the agricultural sector, the most important measures are the reconstruction and development of the irrigation and drainage system; adopting technical measures for the reuse of irrigation water, identifying the erosion vulnerable zones or areas affected by other negative processes, enforcement of the plans to improve territory (Neacșa, 2017). In the following decades, the implications of global warming in industrial economy, water supply, agriculture, biodiversity will become more and more obvious. The causes which lead to this phenomenon pertain to climate, as well as human intervention, especially the improper use of land, water resources and agricultural practices (Mateescu, 2023).

Socio-economic activities will be affected by predictable climate changes, especially in areas with high risk for extreme weather conditions and reduced potential for adaptation and resilience (Mateescu et al, 2017). The formation of tornadoes was identified in the last years including in our country, in certain areas of risk and vegetation fire (Bojariu et al., 2015; Sfetcu, 2018). The most efficient plan for adaptation and resilience to climate change will involve both human capital as well as physical capital; many of those investments will improve climate in the following years (EEA, 2021). The degree of growth of resilience to climate change depends on each region, sector or country's capacity to adapt (for example, agriculture and food production, water resources, health, the urban sector, energy, transport, industry).

Climate change affects all Europe, with significant effects over the entire society but also the environment. "Climate change is a reality all over the world and its extent is

larger by the day, as well as the rate of growth which becomes more and more obvious. This means that each component of the economy, industry, households must adapt and reduce greenhouse effect gases" (McGlade, J.M., 2012).

In rural regions of Romania, households face different risks pertaining to the lack of income, but also the aging of population.

Poor households are vulnerable to climate change as a low income can't ensure a satisfying degree of access to the services needed in protection against climate change. Energetic poverty, in which a household is not capable to access energy services on a necessary level, (Bouzarovski et al., 2012) is a challenge for more than 30 million EU citizens. Agriculture is one of the most affected sectors, as extreme weather phenomena which Romania faced during recent years, such as drought, flooding, landslides considerably reduce productivity of cultures and affects the income of farmers. These climate changes lead to the decrease of soil quality, water quality by forcing farmers to invest in new technologies and new solutions to protect their cultures (Cuculeanu et al., 1999). In conclusion, we notice that the effects of climate change over agriculture inevitably produce consequences in poor households, as the farmers are those who undertake the greatest losses (Călin, A.M., 2011; Popescu, G, 2011).

3. The Connection of National Policies and Strategies regarding Climate Change and Energy

The effects of climate change over the energy sector:

During the last years, in Romania, there were numerous attempts to establish a strategy for the development of the energy sector.

The National Strategy considers the fulfillment of all commitments contained in the European Union Strategy regarding adaptation to the effects of climate change for the year 2030, which entails a 40% reduction of greenhouse effect gases as opposed to 1990 and the increase in economy efficiency with 27%. By studying the situation in Romania, we reached the conclusion that the energy sector is the most polluting sector of our economy (Dinca et al., 2007).

Considering the present context of adapting to climate change, the use of regenerable sources of energy seems to be the most appropriate solution for the world energy sector, as it considers all three dimensions: economic, social and environmental (Chirescu, 2022).

Romania is aligned with the EU objective for 2020, that of ensuring 24% of the country's energy consumption from regenerable sources. This number was already at 23,9% in 2018, as Romania was placed on the 10th place out of 27 member states in this domain (Marinescu, 2020). Also, the EU has progressively raised the influence of regenerable sources of energy in the basic consumption of energy. If, in 2009, the target for 2020 was of 20% (Directive, 2009), in 2018 it was increased to 32 % (Directive, 2018) and is expected to reach 42,5% until 2030 (Directive, 2023).

The high prices of energy are a challenge for the competitivity of industries which are major energy consumers, and which can't exceed the cost of energy because of foreign competition and the decreasing demand (Cartalis et al., 2024).

The energy sector is one in which the lowering of emissions can have the greatest impact short-term. It is a real concern that the high prices of energy will cause poverty throughout the EU. In the context of the negative scenario of increasing global warming, the economic situation of the country, under the impact of climate change, has deteriorated significantly (Chitu et al., 2022).

Based on the opinion (Bianco et al, 2014), once Romania became a member state of the EU, it had to reach three essential points in order for it to become an active participant on the regional energy market: a real issue were aged heating systems, the development of interconnections over the border who were likely to increase energy efficiency and the impact of the energy reform policy by investing in technology modernization (Haar, Marinescu, 2011).

To reach these objectives a structured improvement of several energy sectors was needed, namely: production, transport, industry, distribution of energy, but also the need to attract foreign and domestic investments. The energy sector is maybe the most affected sector by the challenges of climate change, which can influence the demand for energy (WORLD BANK ECA ECONOMIC UPDATE SPRING (2024), Unleashing the Power of the Private Sector), although Romania made considerable progress in economic performance and convergence with EU, it still faces the challenges of maintaining a sustainable economic and environmental growth. The challenges include regional issues, weak institutions, lack of specialized work force, poor connectivity, vulnerability to climate change and natural hazard.

3. Conclusions

Actions of the Union and member states regarding climate change aim to protect the planet and the population's health, the food industry, the integrity of eco systems, biodiversity and the threat of climate change, in the context of the 2030 Agenda for sustainable development to reach the objectives set by the Paris Agreement.

The EU objective aims to transform an equitable and prosperous society, to improve the quality of life both for present generations, but also for future generations, with a modern, competitive and efficient economy, in which there are no greenhouse effect gases until 2050. We believe we should introduce, in the primary energy mix, the appropriate local sources of energy. Biomass, agro biomass, solid municipal waste are energy resources which are not properly regulated by law or properly funded. Thus, our suggestion is combining the Ministry of Energy with the Ministry for the Environment and identifying new paths of collaboration between the newly created institution and the Ministry for Agriculture and Transportation, as transport is the second largest consumer of energy from the primary mix with 29%.

In the last ten years, Romania brought upon major changes in the evolution of regenerable energy policy and the energy sector to ensure increased stability in case of crisis of a certain type of fuel and to respond to EU objectives. Another issue which represents a vulnerability of the energy sector is work force on every level. Thus, we believe that programs should be created, but also a legislative background appropriate to train professionals in the IT&C industry. Improving the quality of life for all segments

of the population, especially communities which live in polluted areas but also in buildings which are inefficient in the long term.

By considering the important role of public authorities in identifying and enforcing measure to fight climate change, it is deemed necessary to increase the level of awareness of the authorities and the public and subsequently change the behaviors of economic agents, companies, institutions and the population by elaborating new strategies. (Nistor et al., 2018; Dutu-Buzura, 2023). The frequent changes of laws in these areas, without and adequate study of their impact, without proper consultation of those involved in the regenerable energy market has led to lack of trust in the producers.

Also, a change of the rules of the game during the game within a highly competitive international environment was a weak signal for investors who were interested in placing goods in the Romanian energy sector.

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