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Macroeconomic Strategies and Policies Impacting the Decarburization of Economies in the Member Countries of the European Union

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ABSTRACT
In the context of the strategic development objectives of the European Union for the next strategic cycle until 2030, a priority issue is the decarburization of the economy, oriented towards the design and monitoring of strategies in order to achieve the objectives regarding climate change, the simultaneous stimulation of economic growth and ensuring social cohesion. A special place belongs to the progress of climate change, which requires progressive steps in the implementation of strategies and policies for all member countries of the EU. We propose in this article to focus on the application of decarburization strategies and policies in the countries of the European Union with an emphasis on Romania, with a necessary approach to social inclusion issues. The development of proposals for efficient strategies for the decarburization of economies in EU, the comparative analysis between the diversification of macroeconomic policies and instruments with different evaluation criteria, having as an essential support - the digitalization tools, which will accelerate the process of decarburization of the countries' economy EU. We propose the development of decarburization strategies based on a mix of policies focused on establishing emission prices; standards and regulations; the implementation of capital, labor and innovation reallocation policies.

Key words: *Decarburization of the economy, strategies and policies, digitalization, innovation*

1. Introduction

The current problems that are from the local level to the global order related to carbon emissions, climate change, the deterioration of the quality of the environment, the problem of fossil fuels, the development of the circular economy, the increase in energy demand and the increase in the prices of petroleum products directly inspire us all. Towards the decarburization of the economy and the global energy system (Bodislav, Radulescu et al., 2020). Achieving climate objectives and sustainable development cannot be solved without the joint efforts of all countries and governments through the development of viable and operational strategies and policies for the decarburization of economies.

In 2019, the EU revised its energy policy framework (Clean energy for all Europeans package) to help we are moving from fossil fuels to cleaner energy, and we are on our way to meeting the commitments of the Paris Agreement to reduce greenhouse gas emissions. The agreement on the new framework of energy rules - Clean Energy package for all Europeans, is an important step for the implementation of the energy union strategy,

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published in 2015. The EU countries must transpose the new directives into national legislation in a relatively short period of 1-2 years.
Energy performance in buildings. Buildings represent about 40% of energy consumption, 36% of CO2 emissions in the EU, the construction of new energy efficient buildings, the EU will be able to meet the energy and climate objectives, more effectively. The directive on the energy performance of buildings ((EU 2018/844) provides special operative measures for the construction branch, updates the rules of the previous version. (Directive 2010/31/EU). Renewable energy. Regarding renewable energies, the EU has set the objective - 32% renewable sources in the EU's energy mix by 2030. The revised Renewable Energy Directive (2018/2001/EU) with this commitment entered into force in December 2018.
Energy efficiency must be in the first place, it is a priority objective, because energy savings represent the simplest way to reduce emissions with the greenhouse effect. The EU has set mandatory targets to increase energy efficiency by at least 32.5% by 2030 in the Energy Efficiency Directive ((EU) 2018/2002), from December 2018. Another important issue is Government Regulation. The package includes the governance system for the Energy Union, the EU's plan for a fundamental transformation of Europe's energy system. Within this strategy, each EU country must establish concrete, integrated national energy and climate plans for 10 years 2021-2030. Respectively, the EU countries will achieve the respective objectives in all 5 dimensions of the energy union, including in the medium and long term.

2. Bibliographic study

Over the past two decades, governments have adopted decarburization policies to transition economies away from high-emission growth paths. The prevailing approach included two areas of policy interest: the expansion of renewable energy in electricity production through policy support schemes, the reduction of technological costs, spread throughout the world, activities to improve the efficiency of energy use. In the context of the current decarburization transformations of the economy, CO2 emissions will decrease by approximately 45%, compared to the level from 2010 to 2030, reaching "zero" closer to 2050". This is in line with the objectives of the Paris Agreement (UNFCCC, 2016). Accordingly, there are two implications of the prevailing decarburization approach adopted so far for countries' net zero ambitions: because electricity production comprises the largest single source of CO2 emissions, issuers' past earnings, the reductions were achieved by replacing fossil fuels with renewable sources of electricity. Although the Governments are moving towards electrification based on renewable sources of economic sectors, there is evidence that direct electrification could, for technical reasons, not be realized in practice. It has been estimated that about half of the industry's CO2 emissions come from the production of steel, cement, ammonia, and ethylene. About 45% of the emissions of these sectors result from raw materials; another 35% comes from burning fossil fuels to generate high-temperature heat; the remaining 20% comes according to other energy requirements (medium and low temperature heat). Measuring the effects of policies on emissions reductions IFCMA will develop and apply consistent methodology for assessing the effects of carbon reduction policies and policy packages on emissions

reductions at the country level (Bodislav et al., 2019). According to Misztal et al. (2021), the decarburization process provides for the reduction of greenhouse gas emissions, to limit climate change and global warming (Mogos et al., 2021). Macroeconomic stabilization is fundamental for ecological actions (Alpopi et al., 2018). The authors analyze the ways in which macroeconomic stabilization can support small and medium-sized companies as well as large companies, institutions, and countries to act through strategies and policies for decarburization. It is presented what the impact of macroeconomic stabilization components can be on decarburization, energy efficiency in the largest emitters of greenhouse gases in the European Union in the evolution of the period 1990 - 2020.
Vrontisi et al. (2020) claim that the European Union has established a clean energy policy framework for all Europeans. The macroeconomic impact for the consolidated economy of the EU28 is estimated, if we consider the alternative levels of climate actions for large emitters outside the EU area. Koutsandreas et al., (2021), in accordance with European Union legislation, Greece presented its final 10-year energy and climate plan in December 2019, setting ambitious energy and climate change targets compared to those initially proposed. In addition to the penetration of renewable energy sources (RES), the final NECP envisages zero carbon use in power generation by 2030. Le Treut et al., (2021), support the development of the method of integrating the complete energy pathways in a multispectral CGE model. The evaluation of the economic impacts on different levels of deep decarburization is carried out in Argentina. GDP and welfare implications are limited. A significant net investment effort is required. Essential changes have been made due to sectoral added value and job creation in upstream industries (Burlacu, Georgescu et al., 2022). They discussed and addressed enabling conditions and sticking points as guidance for decision makers. In energy industries, value added, and employment are shifting from fossil fuel to low carbon energy industries. The aggregate impact on GDP, on well-being is limited, the incremental investments are considerable at the macroeconomic level, with indirect and induced effects in the economy. It includes net job creation in upstream industries providing low carbon infrastructure, but also risks of job losses in exposed sectors. Mayer et al., (2019) argue that current estimates of technology costs imply policy support for achieving cost competitiveness. The increase in employment induced by change requires considerable support for climate policies (Nica et al. 2023). The effectiveness of the decarburization of the industry requires increasing the capacity volume of renewable sources, moderating the risk of regional deficit in EU countries. We found that the costs of the industry transition are moderate, however, they can be a barrier to implementation, because the generation deciding on low-carbon technologies bears the (macro) economic costs, benefits from them. The macroeconomic evaluation presented by the authors indicates that the anticipated bottom-up estimates of the additional need for electricity from renewable sources tend to be overestimated. The relative price changes in the economy induce the substitution of electricity, the increase in electricity imports is triggered. The relocation of the carbon sector is a risk (Bodislav, Buzoianu et al., 2020), which requires a series of actions, on the part of private and public actors, universities, and research centers in the field. Barker et al. (2006) shows us how endogenous economic growth, technological change were introduced into a global econometric model. It explains how further technological change can be induced by mitigation policies to reduce greenhouse gas emissions to stabilize atmospheric concentrations. Bataille et al. (2016),

support international climate policy discussions, which have changed with the fifteenth Conference of the Parties (COP 15) in Copenhagen. The debate was organized around short-term, incremental actions, common differentiated responsibility (CBDR) was interpreted as the responsibility of action on developed countries. International negotiations have evolved under great pressure from scientific evidence of the negative impact on development of the factors, outcomes of climate change (air pollution from coal burning, sea level rise) of stringent mitigation requirements for climate stabilization (Bran et al., 2020). Bachner et al. (2020) argue that Paris 2015 climate targets make deep decarburization of consumer industries crucial energy and emissions intensive. Policymakers, monitoring the macroeconomic consequences of such decarburization paths, rely on integrated modeling studies. The assumptions, the multiple uncertainties, underlie the modeling remain unquestioned or invisible, although they may govern the results of the models. For the case of a zero-process emission pathway of the European steel industry, the authors demonstrated how different assumptions on uncertainty influence the results. The authors showed that the effects depend heavily on the choice of technology, the prevailing macroeconomic states, and regional advantages/disadvantages. Antosiewicz et al. (2020) in their study, presented the results of the simulations of the model that reflects the macroeconomic effects of the implementation of the priority climate change mitigation policies in Chile, with the objective of the simulation results of the model that reflects the macroeconomic effects of the climate change mitigation policies implemented in Chile, at reducing CO2eq emissions in line with the latest Chilean NDCs, reducing CO2 emissions target by 2050. Emenekwe et al. (2022), argue that: "Global concerns regarding the increase in carbon emissions, climate change, the decrease in environmental quality, the limited and uneven reserves of fossil fuels, as well as the increase in energy demand, volatile oil prices have moved the need to decarbonize the global energy system".

3. Methodology approach

The objective and contribution of author (Emenekwe, et al., 2022) is the systematic review to analyze the detailed evaluation of the literature in the field of decarburization in the Global South, to be able to understand the economic implications on several levels, of achieving net zero emissions in the Global South. In the evaluation, four priority themes are considered: (1) investment costs, (2) the impact on the workforce, (3) economic growth (4) the related macroeconomic impact (consumption, debt level, net savings, income and welfare and the balance commercial, among others). Overall, the assessment finds that the decarburization of the energy system requires substantial investment**.**

Authors (Ciobanu, et al., 2020) argue that in recent decades the concepts of "digital economy", "green investments," "green energy". The concepts of green economy, green growth and green society were triggered on the international agenda by the financial and economic crises of 2008-2009. The authors (Burlacu, Profiroiu et al., 2019) addressed the issue of the impact of digitization on sustainable development, on the green economy and the possible correlations of implementation and the gates of the circular economy with the support of digitization. Equally important is the question of digitization in the rural

environment, and how the development of the green economy correlates in close correlation with digital transformations (Burlacu, Stoica et al., 2022).
Ciobanu, G. et al. (2018) pay special attention to innovation as a way to develop sustainable solutions. The concepts of sustainable production and eco-innovation are also often encountered by policy makers to facilitate a more radical and system-wide improvement of processes and products (Alpopi et al., 2022). Production and environmental performance of companies are in direct correlation (Orzan et al., 2020). Eco-innovation can be understood in terms of objective, mechanism, and impact (Profiroiu et al., 2020). Achieving the energy union requires fundamental transformation of Europe's energy system. Renewable energy - essential for transformation, contributes to the objectives of the Energy Union: ensures security of supply, the transition towards a sustainable energy system, with low gas emissions and with a greenhouse effect, leads to job growth (Rădulescu, Angheluta et al., 2022). A European policy framework contributes to supporting the development and integration of renewable energy sources based on quantified objectives, regulatory clarity, and market-based investment incentives, compatible with state aid rules, in force since 2009. The Renewable Energy Directive with the EU's legally binding 20% target. The percentage target for the use of renewable energy in transport and the mandatory national targets for 2020 are an integral part of the EU's energy policy. The European renewable energy industry today employs 1.15 million people. By also promoting the development and innovation aspects of renewable energy technologies, the directive and its objectives for renewable energy are an integrated element of a European strategy for growth, industrial innovation, technological leadership and competitiveness, as well as for reducing emissions. As required by the Renewable Energy Directive, the report provides an interim assessment of the progress of the EU and its Member States towards the 2020 renewable energy targets and includes an assessment of the feasibility of 10% renewable energy.

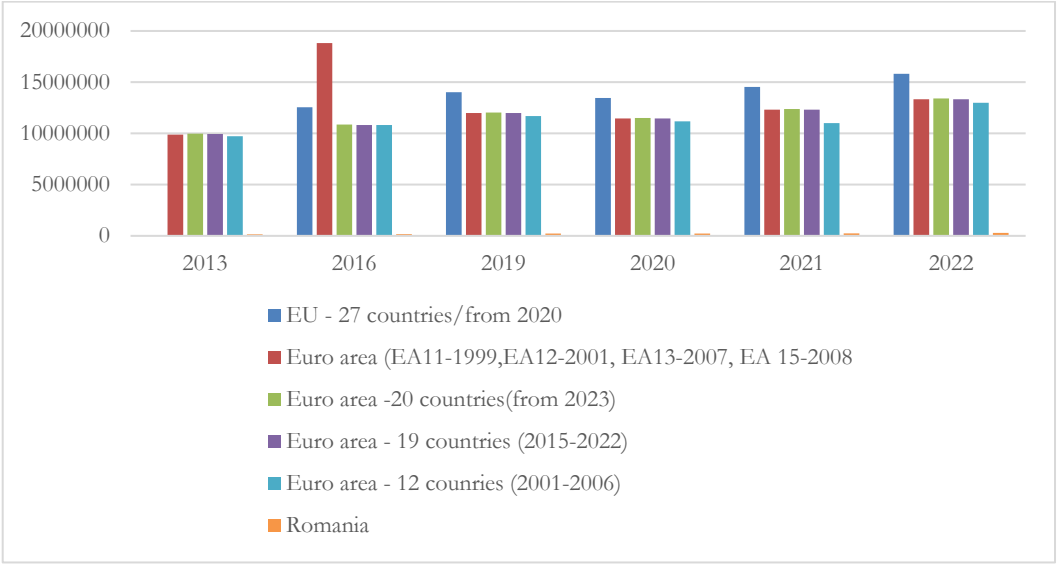

Figure 1. GDP and main components (output, expenditure and income) (online data code: NAMA_10_GDP)

Source: GDP and main components (output, expenditure and income) (online data code: NAMA_10_GDP), Source of data: Eurostat

3.1. Evolution of Romanian industry and the perspective of macroeconomic decarburization policies and the development of the circular economy

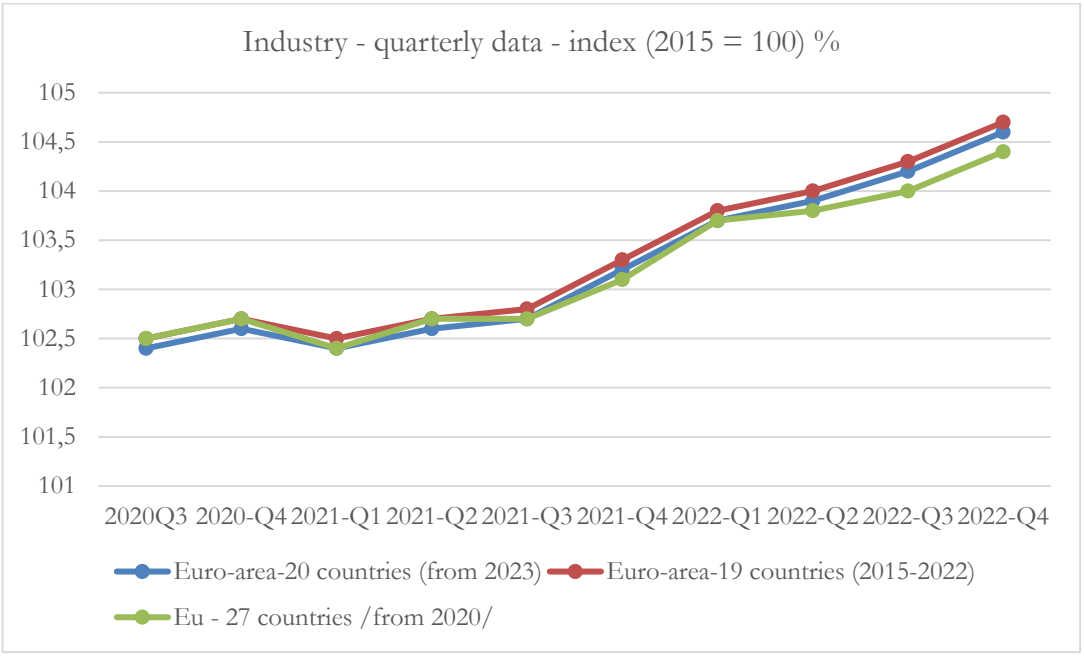

Figure 2: Industry - quarterly data - index (2015 = 100) %
Suorce: Industry - quarterly data - index (2015 = 100) (NACE Rev. 2) (online data code: EI_ISIND_Q), Source of data: Eurostat. Graphic 2.

By the normative act Decision for the approval of the National Strategy regarding the circular economy (OUG no. 57/2019) envisages the approval of the National Circular Economy Strategy, sets priority objectives to achieve the maximum circularity potential of 7 economic sectors and provides policy directions for their fulfillment. The directions and objectives formulated in this Strategy will form the basis for an Action Plan that will contain concrete measures to maximize the circularity potential of these economic sectors (Burlacu, Bran et al., 2022). In Romania they are: 1. Prioritizing local production over imported products and materials; 2. Strengthening economic and workforce competitiveness; 3. Responsible and sustainable supply of raw materials; 4. Priority promotion of innovation and research in the field of circular economy; 5. Preservation, conservation and sustainable use of natural resources; 6. Prevention of waste generation and sustainable waste management; 7. Promoting responsible consumption and environmental education; 8. Protection of the ecosystem and the health of citizens. To develop the Circular Economy in Romania, based on the key objectives, the following directions must be pursued, through the elaboration of policies, which will be addressed through regulations, economic incentives and measures that will be introduced in detail in

the Action Plan: I. Reducing the consumption of virgin raw materials through more sustainable extraction of raw materials and through recycling and recovery activities. II. Reducing the consumption of consumer goods by extending the life of products: o applying circular design and material efficiency; o promoting dematerialization; III. Reducing the impact of production activities on the environment by: o applying more innovative and greener technologies and processes; o promoting digitization; o favoring renewable energies at the expense of fossil fuels; o exploiting the potential of industrial symbiosis; IV. Reducing the impact of waste and wastewater management and disposal activities on the environment by: o promoting waste prevention; o improving the waste management system and infrastructure; o promoting waste sorting and treatment activities; o limiting waste storage to a minimum. V. Improving policy coherence and governance, communication, and collaboration between local, regional, and national authorities. To contribute to the EC transition process, an EC governance structure will be established in Romania that will clearly define the roles and responsibilities of the institutions involved. The general description of the estimated benefits and costs because of the entry into force of the normative act. By decoupling economic development from the use of natural resources and environmental degradation, a resilient system will be built that will benefit businesses, people, and the environment, resistant to the effects of climate change or global supply chain disruptions. Macroeconomic impact. The normative act aims to create the premises to reduce the use of natural resources, rational and sustainable exploitation and increase the positive impact of the measures of the Action Plan on the environment, while contributing to the increase of the population's well-being

3.2. Applying the circular economy

Gross Domestic Product (GDP) by a further 0.5% by 2030 and create around 700,000 new jobs through additional labor demand from recycling plants and repair services. The impact on the economy and on the main macroeconomic indicators. By applying the principles. The impact on the competitive environment and the field. The implementation of the Strategy with a maximum yield, involves substantial investments in the latest generation technology, high-performance equipment, research and development of products and solutions, the training of competent human resources, generating economic changes and 7 average state aid through the approach a new paradigm. The impact on the environment. The circular economy replaces the linear approach, based on the exploitation of resources, unsustainable production, and consumption with a sustainable circular approach with benefits for economic, social and environmental capital (Rădulescu et al., 2022).

3.3. Perspective of innovation and digitization

One of SNEC's objectives is to promote innovation and research in the circular economy. Transition to the circular economy, offers many opportunities for economic growth and job creation and innovation. Evaluation of costs and benefits from the perspective of sustainable development (Burlacu, Popescu et al., 2021). The application of the normative act will support the implementation of EC principles that are closely related to the Sustainable Development Goals of the 8 benefits from the perspective of sustainable development UN and can contribute directly or indirectly to the achievement

of several targets of the National Strategy of Sustainable Development of Romania 2030. Global energy-related CO2 emissions increased by 0.9% in 2022, peaking at over 36.8 Gt. After two years of swings in energy consumption and emissions.
In this complicated period, both epidemiologically and geopolitically with great economic, energetic and social consequences, being marked by energy price shocks, high inflation, disruptions to traditional fuel flows, global emissions growth was lower than forecast, the switch from gas to coal in many countries. The specific challenges of 2022 contributed to the increase in emissions.
In 2022, CO2 grew much below the global GDP growth of 3.2%, returns to the trend of decoupling emissions from economic growth, for a decade, interrupted by the sudden return of emissions in 2021.

Natural gas emissions registered a decrease of 1.6%, following the tightening of supply, caused by Russia's war with Ukraine. Reduction of gas emissions in Europe (-13.5%). In the Asia Pacific region there were reductions of (-1.8%). Increases in coal emissions more than offset natural gas reductions. Due to the switch from gas to coal caused by the global energy crisis, CO2 emissions from coal increased by 1.6%. Oil emissions increased by 2.5%. In 2022, the sectoral increase in emissions came from the production of electricity and heat, whose emissions registered an increase of 1.8%.
Renewables accounted for 90% of the global increase in electricity compared to last year. Solar photovoltaic and wind production was increasing by approximately 275 TWh, a new annual record. Emissions from industry decreased by 1.7% compared to last year.
Emissions from the building sector have dropped considerably, thanks to the mild climate. Although emissions from the energy sector increased by 3.4%, the use of coal was not high, as expected. Electricity production from combined wind and solar PV has surpassed that of gas or nuclear. US emissions rose 0.8%
The biggest increase in emissions registered the building sector, which was determined by extreme temperatures. The main reduction in emissions came from the generation of electricity and heat, due to the increase in solar photovoltaic energy, wind energy and coal. Climate changes and transformations. In all countries, support for climate policies depends on three key factors: perceived effectiveness of emission reduction policies, perceived distributional impact on lower household incomes, and own household gains and losses. The authors argue: (1) Limiting the increase in average temperature to less than 2°C above the pre-industrial level, requires the reduction of global emissions until 2050 (IPCC 2021). Imperative seriously: more than 100 countries have declared carbon neutrality targets by mid-century. (2) Climate policies have been difficult to adopt, implement, even in situations when the objective of limiting global warming is accepted. The international survey by large-scale authors in 20 countries shows that at least three-quarters of respondents in each country agree that "climate change is an important thing," and that their country "should take action to combat it; (3) Support for climate action within and within countries. Support for climate policies in countries and respondents. A complicating factor is that a particular policy may generate different levels of support than policy packages.
Answers to questions about the funding sources that respondents would consider suitable for public investment in green infrastructure are important. Banning (production of) fuel-engine cars when alternatives are available, 28% lower for simply.

Banning combustion-engine cars with no specified alternatives. Carbon taxes. Carbon taxes. Particularly fossil fuel taxes, appear to be among the least popular policies. Fossil fuel taxes.
Cross-country comparisons in support for climate action, bearing in mind that we must be cautious when comparative analysis of the absolute levels of mutual support between high-income and middle-income countries, considering the sampling differences highlighted Individual characteristics that are correlated with support for climate policies.
To summarize the support of climate policies, it is necessary to build an index of support for the main climate policies based on the main policies: economic policies, environmental policies and social policies in close correlation with energy, industrial, monetary and financial policies, agriculture, energy, transport, construction and telecommunications.
Importance of lifestyle and energy use factors. Access to public transport is a strong correlation in supporting climate policies; Condition of access to public transport, living in a large agglomeration, has a significantly positive.
Correlation with policy support, for example in Denmark, the United Kingdom, the United States, but not in most countries. Can we explain political opinions through socioeconomic and lifestyle characteristics? How much, from the variation in political opinions we can predict, using observable socioeconomic and energy use characteristics. Reasoning about climate policies is important.
Perceived distributional, efficiency effects across countries. Sociological research is welcome to ask questions about what the respondents/population think/achieve. How respondents think about the effects of the three main policies/in high-, middle-, and low-income countries.
The reason is the basis of support for climate policies. To be able to determine which beliefs are correlated with support for climate policy, support for each of the three main climate policies, based on respondents' socioeconomic characteristics and a set of standardized variables and indices measuring beliefs about climate change and climate policies. Economic effects, perceived as complex and extensive processes, concerns about the impact of climate change in general, are not so strongly correlated with policy support. It is necessary that this mechanism of collaboration and cooperation be supported in order to create a social force that will generate real, viable and functional long-term development support.
Climate change knowledge is a weak predictor of favoring climate policies, although there is a small, important effect of deep understanding that climate change is human caused. The results of the last 20 countries confirm some of the models specific to each country, in which the importance of fairness understood by humans, effectiveness and individual (personal) interest was highlighted.
The support needed to implement climate policies, the willingness of people to change behavior, are not determined by the same beliefs. The effects of informational education, video, television, and pedagogic education, confirm the experimentally emerged correlations. The treatment of the impact on the climate has the smallest effects on the support for the promoted public policies.
In November 2016, the European Commission presented its suggestion for a new package of energy measures for preserving EU competitiveness in the transition towards clean energy. Measures presented in this package aim to enable the continuation of energy sector

reform, according to the mandatory framework for electricity market, energy efficiency, energy efficiency in buildings, eco design and energy labelling, renewable energy sources and sustainable use of bioenergy, and Energy Union management. All directives and decrees are being discussed in Council working groups now and their harmonization is in process.
This paper will present the progress being made concerning the most important legislation proposals and basic ideas concerning renewable energy sources, energy efficiency, electricity market design and Energy Union management.

4. Conclusions

Familiarizing and preparing the population in the field of decarburization to become more concerned about climate change is a good thing, but it still does not bring great results in the implementation of effective strategies in promoting decarburization policies and climate change.
Several socioeconomic and lifestyle factors are identified, such as education, the use of cars, machinery and the availability of public transport. The study of public opinions regarding these lifestyle developments that can be correlated with public policies in each field.
The reasoning and beliefs of the population in the field of climate policies, correlated with the country's strategies and policies.
The coordination, monitoring and application of policies in these fields of activity at the level of the European Union, at the level of each country, regional and local level in a close correlation with the application and development of digital networks that will make managerial activity more efficient and will also bring much faster results in combating global warming and will contribute to the EU's long-term strategy to achieve carbon neutrality by 2050.
Today humanity must be much more concerned and involved in the process of decarburization transformations at the global level, at the level of each country, at the levels of local and regional development, microeconomic and macroeconomic through the development of strategies, policies, managerial activities, marketing and education and of decarburization corporate culture.
It is necessary to identify several socioeconomic and lifestyle factors - in particular education, the activity of non-governmental organizations, but also the involvement of local, regional, sand national public politics, the use of machinery, cars, the availability of public transport - all these factors need to be significantly correlated with political opinions, reasoning, and general beliefs about climate policies. It is not simple to predict public beliefs or opinions based on these characteristics alone.
The new policies to decarbonize the economy and priority development branches will bring considerable benefits to consumers, the environment, and the economy.
Prudential macroeconomic coordination having as support and objection well-defined, analyzed and tested strategies, laws and policies in this field both at the EU level and at the level of each EU member country will contribute effectively to combating global warming and make an important contribution to the strategy on EU's long-term goal of achieving carbon neutrality (net zero emissions) by 2050.

High-quality, consistent, and objective insights into the effects of policies and policy packages on emission reductions will contribute to an understanding of the effects of mitigation policies on emission reductions in all countries, support progress towards countries' emission reduction targets.
Sociological research was analyzed on respondents' understanding of climate policies how they perceive policy effectiveness, economic effects, distributional consequences, and impacts on themselves. Such a study is also necessary for the other countries that tend to decarbonize the industrial, energy, transport, and construction sectors.
These can help inform and improve benchmarking of mitigation policy impact estimates of policy packages on carbon reduction as part of country reporting under the UNFCCC Enhanced Transparency
The Clean Energy Package for all European citizens, adopted in 2019, will contribute to decarburization. The energy system of the European Union will be configured and adapted to the requirements and rigors in accordance with the objectives of the European Green Deal.

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