

TRENDS IN ACHIEVING CLIMATE NEUTRALITY AT THE EU LEVEL

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Abstract. *Climate change is having a growing impact not only on our health and food system, but also on the ecosystems and biodiversity of our planet. In order to achieve long-term climate neutrality, significant emission reductions will have to be made. At EU level, current measures and policies to collectively meet the objective of climate neutrality are insufficient to achieve the new climate and energy targets. For the EU economy, it is important that the climate neutrality target be achieved in a way that preserves the EU's competitiveness. The EU aims to lead and strengthen global action on climate change through international agreements and diplomacy by setting high standards and working with other nations to influence global climate policies and encourage wider international engagement. The transition to renewable energy sources and the improvement of energy efficiency, investments in clean energy infrastructure, technological innovation and energy efficient practices are essential to achieve the objective of climate neutrality.*

Key-words: *climate neutrality, green energy, transition, climate policies*

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Introduction. Climate neutrality, defined as the balancing of greenhouse gas (GHG) emissions through measures to reduce and absorb greenhouse gases, has become a central global target, in particular in the European Union (EU), which aims to achieve climate neutrality by 2050. The EU plays a leading role in tackling global climate change, setting clear targets and adopting concrete policies in this regard. Current trends in achieving this goal involve the transition to renewable energy, such as solar and wind energy, reducing fossil fuel consumption, and, promoting the circular economy and developing carbon capture and storage technologies. At the same time, the strategies include citizen engagement, massive investments in green infrastructure and economic adjustments for a just and sustainable transition. Climate neutrality has become a major goal for governments, companies and organizations around the world, reflecting the urgent need to combat climate change. Increasing investment in green innovations and international partnerships are also vital to accelerating the transition to a low-emission and sustainable economy.

The objective of climate neutrality at EU level is to achieve zero net greenhouse gas emissions by 2050, according to the European Green Pact ("European Green

Deal"). This means that the EU aims to reduce GHG emissions as close to zero as possible and balance any residual emissions through carbon absorption measures, such as reforestation or carbon capture and storage technologies. To achieve this goal, the EU has set a crucial intermediate step: to reduce emissions by at least 55% by 2030 compared to 1990 levels, through legislative initiatives and investments in the transition to a green economy, the promotion of renewable energies, energy efficiency and electrification of transport. The European climate law, adopted in 2021, makes this objective legally binding, underlining the EU's strong commitment to tackling climate change.

Literature review. Climate neutrality is a central concept in climate change discussions and sustainable development. Overall, climate neutrality involves striking a balance between greenhouse gas emissions and the ability to remove them from the atmosphere. In the literature we have identified several definitions and interpretations:

1. *Carbon neutrality vs. climate neutrality.* Carbon neutrality is a commonly used term and refers to a specific balance for carbon dioxide (CO₂). According to Anderson and Peters (2016), carbon neutrality focuses only on CO₂ emissions and measures to eliminate them, by methods such as carbon capture and storage (CCS) or by compensation measures (e.g., reforestation). Climate neutrality, by contrast, is a broader concept that includes all greenhouse gases (not just CO₂), such as methane (CH₄) and nitric oxide (N₂O). Authors such as Rockstrom et al. (2017) believe that climate neutrality is a more ambitious goal, which involves not only reducing CO₂ emissions, but also managing all GHG sources.

2. *The equilibrium between emissions and absorption.* The IPCC (2018) (Intergovernmental Panel on Climate Change) defines climate neutrality as the situation where net GHG emissions are reduced to zero, or by the complete elimination of emissions, either by increasing the natural or technological carbon absorption capacity in the atmosphere. In Steffen et al. view (2018), climate neutrality implies that any amount of GHG emitted must be compensated by capture processes or other mechanisms of absorption, such as forests, soils or innovative technologies (such as carbon capture from the atmosphere).

3. *Compensation and capture.* Smith et al. (2016) explains that climate neutrality is often associated with the use of carbon credits or compensation schemes (compensation) to balance unavoidable emissions. In this respect, companies or countries that cannot completely reduce emissions to zero can invest in projects that remove GHG from the atmosphere, such as a forestation, etc., biodiversity conservation or carbon capture technologies.

4. *Neutrality in the context of sustainable development.* Some authors, such as Meadowcroft (2009), point out that climate neutrality must be seen in the broader context of sustainable development, not just as a matter of technology and emissions, but also as part of a broader social and economic transformation. Thus, achieving climate neutrality also involves social justice, intergenerational equity and equitable distribution of the costs of the transition to a low-emission economy.

5. *Climate neutrality and climate resilience.* The authors Biermann and Pattberg (2012) propose that climate neutrality should not only be about reducing emissions, but also about increasing resilience to the impacts of climate change. Achieving neutrality should be accompanied by measures to adapt economies and societies to the inevitable effects of climate change, such as extreme events, sea level rise or disruptions to agriculture.

6. *Associated terms: zero emissions.* Climate neutrality is often equated to the term "zero net emissions". According to Masson-Delmotte et al. (2018), this means that an equivalent amount of greenhouse gases emitted is eliminated or compensated, although the term "zero net" stresses that residual emissions may exist as long as they are balanced by equivalent removals.

7. *Climate neutrality and technological innovation.* Fuss et al. (2014) discusses that climate neutrality will not only be possible by reducing emissions, but also by technological innovations that allow the removal of carbon from the atmosphere. Thus, technologies such as carbon capture and storage bioenergy or direct capture of carbon from the air play an important role in achieving this goal.

8. *Critics and challenges.* Some authors, such as Anderson and Peters (2016), criticize the over-relaxed use of the concept of climate neutrality. They argue that it can be used to perpetuate the industrial status quo, providing an excuse for real inactivity in reducing emissions through offsetting measures or technologies that are not yet scalable.

In conclusion, the key concept is to strike a balance between greenhouse gas emissions and the ability to remove them from the atmosphere through a combination of mitigation measures, compensation and absorption.

Main trends in achieving climate neutrality within the EU. *The European Green Pact ("European Green Deal").* Adopted in 2019, the European Green Deal is the EU's key plan to make the European economy sustainable. The European Green Pact is the cornerstone of EU decarbonisation strategies. This initiative aims to transform the European economy by reducing greenhouse gas emissions, promoting renewable energies and improving energy efficiency. Strategiile adoptate includ măsuri concrete pentru fiecare sector economic, cum ar fi energie, transport și agricultură. The main objectives are:

- climate neutrality by 2050: EU aims to be the first climate neutral continent;
- emissions reduction by 55% by 2030: a key intermediate target to keep the course towards 2050;
- circular economy: reducing waste and promoting the reuse and recycling of resources;
- development of renewable energies: supporting the transition from fossil fuels to renewable sources such as solar and wind energy.

Legislation for climate. In March 2021, the EU adopted the European climate law, which makes legally binding emission targets set in the Green Deal. It reinforces member states' commitments to contribute to the common objectives by implementing appropriate national measures.

Border carbon adjustment mechanism. It is an important instrument introduced by the EU as part of efforts to achieve climate neutrality by 2050 and to protect the competitiveness of European industry. The main purpose of border carbon adjustment mechanism is to prevent „relocation of carbon emissions” („carbon leakage”) – a phenomenon in which companies move their production to countries with less stringent climate regulations for avoid the costs of reducing emissions imposed in the EU.

Border carbon adjustment mechanism aims to reduce global carbon emissions and encourage a green and fair transition, both within and outside the EU. This mechanism will make goods imported into the EU subject to the same climatic requirements as goods produced within the Union. The importers from the EU will be required to purchase border carbon adjustment mechanism allowances corresponding to the amount of carbon dioxide incorporated in imported goods. These certificates will reflect the price that European producers pay for their emissions through the EU Emissions Trading System (ETS). If the country of origin of the products has an equivalent carbon pricing system, importers will be able to deduct those costs from the total due by border carbon adjustment mechanism.

Border carbon adjustment mechanism, in a first phase, will cover industries with a high level of emissions and resettlement risks, including steel and iron, cement, fertilizers, aluminum, electricity. These sectors are responsible for much of global carbon emissions and are most vulnerable to international competition from countries with less rigorous climate standards. Border carbon adjustment mechanism will be implemented in stages, with a transition period starting in 2023 and by 2026 the mechanism is expected to become fully operational, with strict reporting and purchasing obligations of carbon credits for all covered goods.

Sustainable funding. The EU has developed various financial instruments to support the green transition:

- Just transition fund: this fund is intended for the regions and economic sectors that will be most affected by the green transition;
- Invest EU and Next Generation EU: these initiatives provide massive financial support for green and innovative projects, including investments in renewable energy, energy efficiency and sustainable infrastructure.

Renewable energy and energy efficiency. The EU aims to increase the share of renewable energies in its energy mix. Through programs such as “Fit for 55”, the focus is on reducing energy consumption through energy efficiency, increasing investment in solar and wind energy, and electrifying some sectors, including, such as transport and industry. In 2021, renewable energy sources overtook fossil fuels as the EU's main source of electricity, marking a turning point in the energy transition. In addition, green hydrogen is seen as a key technology for decarbonising the industrial and transport sectors, which are harder to electrify. The EU has launched an ambitious hydrogen utilization strategy that provides for investment in the necessary infrastructure and incentives for the production and use of green hydrogen.

Green transport. Another priority area is to reduce emissions from the transport sector. The transport sector is one of the largest emitters of greenhouse gases. Green

transport is an essential solution to the climate and environmental challenges of the XXI century. Investing in clean technologies, infrastructure and effective policies will help reduce carbon emissions and improve the quality of life in cities. As technologies advance and transport becomes more sustainable, these measures will play a crucial role in the global transition to a low-emission economy and a sustainable future. The EU is promoting the transition to electric vehicles, the expansion of charging infrastructure and rail transport, and the decarbonisation of air and sea transport through alternative fuels. The EU encourages the use of public transport, electric vehicles and alternative mobility solutions. Initiatives such as the development of bicycle infrastructure and the improvement of rail transport are crucial to reducing emissions from the sector.

Citizens' involvement and the just transition. To support the green transition, the EU has increased access to finance for green projects. The Just Transition Fund and other financial initiatives provide essential resources to help regions and sectors most affected by the transition to a low-emission economy. In order to ensure the support of the general public, the EU is focusing on citizen engagement and an intensive social dialogue with the industries and communities that will be affected by these changes. Reskilling and upskilling programs are aimed at workers from traditional sectors to facilitate the transition to green jobs. The EU encourages the participation of citizens and local authorities in green initiatives, promoting local projects that can significantly contribute to climate neutrality objectives. Through this fund, financial support and training are provided for the affected workers, as well as investments in infrastructure and local economic development. For example, in coal-dependent regions, the Just Transition Fund will support economic diversification, green jobs and the retraining of workers.

Biodiversity and sustainable agriculture. Biodiversity and sustainable agriculture are interdependent and essential for a sustainable future. Biodiversity conservation is crucial to maintaining resilient agricultural systems and long-term productivity. At the same time, the shift to sustainable farming practices provides solutions to reduce the negative impact of intensive agriculture on biodiversity and contribute to achieving global climate goals. Promoting agriculture that works in harmony with nature will support not only the protection of biodiversity, but also the well-being of future generations. Protecting biodiversity and reducing the impact of agriculture are crucial to achieving climate neutrality. The EU pursues policies that reduce the use of pesticides, promote organic farming and ensure sustainable forest management.

International cooperation. The EU is working with other countries and international organizations to combat climate change globally. International agreements and partnerships to exchange best practices are crucial to maximize the impact of efforts to combat climate change. The Paris Agreement is an example of cooperation in which the EU plays a key role.

These measures and trends reflect the EU's strong commitment to climate neutrality by 2050, even if there are significant challenges, such as industrial transition and avoiding negative social impacts on certain regions.

Conclusions. Achieving climate neutrality at EU level is possible, but requires close coordination between member states, massive investment in innovation and green infrastructure, and, as well as measures to ensure the social fairness and sustainability of this transition.

A major challenge of the climate transition is to ensure a fair transition that does not disproportionately affect fossil fuel-dependent regions and industries. The EU has understood this problem and created the Just Transition Fund, which will help the regions and communities most affected by the transition, such as coal mining or high-emission industries.

Climate neutrality at EU level is not only an environmental objective, but a complex economic, technological and social project with profound implications for all sectors of the economy and for the lives of citizens. A combination of ambitious policies, investments in innovative technologies and green infrastructure, as well as a fair and socially just transition, can ensure the success of this endeavour. The EU aims to be a global leader in combating climate change, and its efforts will shape not only the future of Europe but also of the world economy.

Digitalisation and technological innovations are playing an increasingly important role in emissions monitoring and resource optimisation. Artificial intelligence (AI) and big data analysis (Big Data) are used to improve energy efficiency in various sectors by optimizing energy networks, managing demand and efficiently monitoring energy consumption.

At the same time, the EU is taking on the role of a climate diplomacy promoter, supporting climate policies in developing countries and providing financial support for their sustainable development. Through initiatives such as the Sustainable Development Mechanism and the International Climate Agreements, the EU supports the global transition to a green and sustainable economy.

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