

European strategy for achieving climate neutrality and analysis of legal instruments for its implementation

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Abstract. Given the intensification of human industrial activity in the twenty-first century, the issue of climate neutrality is becoming increasingly relevant, especially for the European continent, where environmental security is a key element of political interaction. The study aimed to examine the peculiarities of the European policy on climate balance by analysing various initiatives in the context of their implementation results. The main methods used were the statistical method, which assessed quantitative indicators in the field of climate protection in several countries, and the method of system analysis, which was used to consider the key elements of the European policy of environmental protection. The study determined that the problem of climate preservation and neutralisation of the consequences of human industrial activity is the main task for which European countries have modernised and updated the regulatory framework and adapted legal mechanisms and legislative instruments. A rational and balanced approach to the protection of the population – both at the national and regional levels, as well as at the universal level – has been a key component of achieving the sustainable development goals for the next fifty years. Reducing emissions and greenhouse gases, switching to environmentally friendly energy sources, using energy-efficient technologies, and increasing taxes on the use of fossil fuels, according to the European Green Development Strategy, were the main points of achieving

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climate neutrality. Through the prism of analysing various regulations and legislative documents at the level of the European Union (EU), the main positive and negative aspects of their implementation in practice were identified and summarised. In the context of the ongoing Russian-Ukrainian war, the author emphasises the need to update several existing climate strategies to minimise their environmental impact. The results and conclusions of the study can be used as a practical basis for the development and implementation of new climate neutrality and green energy strategies

Keywords: climate neutrality; sustainable development; green transition; European Green Deal; energy efficiency; decarbonisation; green energy

Introduction

Every year, the environmental situation on the planet is becoming more and more threatening: rapid melting of glaciers, thinning of the ozone layer, and extinction of flora and fauna. These and other factors are partly or entirely caused by the destructive activities of humans, who have intensified their industrial and production capacities over the past thirty years. Climate change poses challenges for humanity, and the international community is therefore trying to develop certain strategies and tools, including legal ones, to create a solid foundation for further sustainable development of states. One of them is climate neutrality, which helps transform the negative effects of climate change mitigation measures into positive dynamic economic and social development for all. Climate neutrality is a doctrinal, political, and legal concept developed as a result of the adoption and application of the Paris Agreement and European Union (EU) energy and climate legislation. Since then, the concept has been shaping the global legal and political agenda and defining the main directions of the national legislative process of various countries on the path to sustainable development and the green transition. Since the EU countries are the most active in the process of implementing climate goals, the study of ways to achieve climate neutrality at the level of European states through the introduction of modern regulatory elements and indicators is relevant and timely today. Currently, uncontrolled use of natural resources and neglect of the consequences for nature and the environment is approaching a critical point when it will be extremely difficult to normalise the situation and reduce risks (Sharyi, 2023). As climate crises aggravate due to aggressive human intervention in the third millennium, effective legal work should become a way to resolve conflicting issues and unresolved aspects in the context of achieving climate neutrality.

The problem of updating the main vectors and areas of legal cooperation between EU Member States through the prism of preserving environmental balance and achieving climate neutrality, which has become a key task in the period of rapid geopolitical changes and transformations in the production sector of economic activity, is at the forefront of discussions in the government circles of the world. The resolution of controversial issues and unresolved aspects of social and financial impact on climate protection activities is attracting increased attention from both the authorities and the public (Getman *et al.*, 2021). This issue has become especially relevant during the period of military conflicts on the continent, which have slowed down or stopped many environmental projects and initiatives due to the negative consequences. Therefore, it is crucial to carefully analyse the specifics of the EU's activities through its participation in various environmental programmes, as well as through the implementation of various sectoral strategies and plans in national legislation. Given the varying levels of efficiency and effectiveness of the implementation of legal instruments

in several European countries, it is possible to predict that the issue of qualitative analysis of the need to comply with climate policy will remain urgent and important.

According to V. Hutsaliuk (2024), the EU, through the large-scale European Green Deal project, is trying to gain a foothold as a regional and global player both in the minds of its citizens and internationally. However, the author believes that this is rather due to the pursuit of their goals by certain groups in Brussels' power circles. According to V. Bondarenko *et al.* (2023), this can currently only be addressed through the clear implementation of action plans and strategies within the European communities. However, the levers of influence should remain at the level of national legislation, and regional monitoring structures are practically not considered.

The European Green Deal is an effective mechanism for achieving climate neutrality on the continent, which, according to V. Dankevych *et al.* (2021), can minimise the damage caused by global warming and restore natural balance and equilibrium. O. Ivasechko and B. Melnyk (2021) argued that the legal aspects of the green strategy are practical and relevant, although they have several shortcomings, such as inconsistency with some national regulations. However, the impact of this strategy on other continents and regions has not been studied due to the different historical conditions of their development. The need for a regulatory update of Ukrainian legislation and its adaptation to EU law, according to I. Maksymova (2023), is a priority task on the way to the European integration of the state. The author believes that the environmental component of Ukraine's future activities in the Union should become the main strength of Kyiv's strategic planning shortly.

According to A. Hedberg and S. Šipka (2022), the EU faces the need to resolve the issue of climate catastrophe, to come closer to the most successful and most feasible options for saving the natural balance. This can be done, first and foremost, by developing appropriate legal mechanisms and legislative instruments that will define common standards and norms for all member states. At the same time, the authors believed that Brussels' experience and influence would be crucial for solving similar problems on other continents of the planet.

Given the current global trends (military conflicts, humanitarian, and economic crises), the creation of a set political strategy and its consistent implementation, according to I. Perissi and A. Jones (2022), is problematic, especially concerning the environmental aspect of state development. Currently, EU legislative practice is characterised by some heterogeneity and fragmentation due to the intensification of demoralising factors in the region. However, experts predicted that regulation at the level of national governments would have a greater chance of having a positive effect in the context of implementing the components of the European Green Deal.

The study aimed to outline the characteristic features of European countries' policies in the context of maintaining climate neutrality by considering their key elements and components.

Materials and methods

The main methods used in the study were the statistical method, the historical method, the method of comparison and system analysis. The statistical method was used to determine the key quantitative and qualitative indicators of the effectiveness of the implementation of certain European initiatives and plans in the context of maintaining environmental stability and minimising the risks of climate change. The method was also used to examine the dynamics of economic financing in some European and global countries. The historical method was used to examine the stages of development of European policy aimed at climate protection and the formation of common principles, standards, and norms for the use of harmful components in domestic production.

The system analysis was used to identify the key essence of the topic under study – climate balance and environmental neutrality – namely the main basic elements, components of national and international strategies, and common and distinctive features of policies at different levels of responsibility. The method of comparison was used to compare various structural elements of the environmental direction of national strategies in some countries, such as the amount of public funding, investment flows, and tax charges.

To conduct a more detailed study on the peculiarities of the European policy on climate neutrality and to summarise the specific features of several policy initiatives and projects of European countries in the context of reducing harmful gas emissions and transition to renewable energy sources were considered regulatory acts (Resolution of the United Nations General Assembly No. 70/1, 2015), European Climate Law (2021) and Law of Ukraine No. 2697-VIII (2019). Also was analysed European Green Deal Investment Plan (2020). Reports of international organisations were used: official reports of state bodies and non-governmental organisations (European Green Deal, 2021), press release on “A new industrial strategy for a globally competitive, green and digital Europe” (2020). International ratings were also studied (The climate change performance index..., 2023; The climate change performance index..., 2024). Information sources, that was used in the study is: “Recommendations for 2040 targets to reach climate neutrality by 2050” (2024), “Plan to rapidly reduce dependence on Russian fossil fuels and rapidly advance the green transition” (2022) and more. These materials were used to analyse the essence and content of European strategies in the context of combating rapid climate change from the perspective of overcoming the negative effects on the environmental situation on the continent.

Results

Environmental problems at the present stage and the concept of climate neutrality. During the twentieth century, discussions on the relevance of environmental protection and climate neutrality were few and did not have a mass character. Most efforts were focused on finding new energy sources to use for human benefit (Hutsaliuk, 2024). Near the beginning of the twenty-first century, the situation began to change rapidly: the negative effects of uncontrolled use of natural resources and the lack of monitoring

of harmful emissions led to a serious deterioration in the environmental situation, which in turn caused a drastic climate change in different regions of the planet: for example, over the past thirty years, the average temperature increase has reached about 1.5°C, and experts predict that this number will double between the 2030s and 2040s, which will be a global catastrophe.

The uncontrolled transformation of the climate situation directly affects the stability of the economic system, the main components of which are agriculture, hydro and thermal power, which are the most climate change-dependent industries (Ivasechko & Melnyk, 2021; Przyborowicz, 2022). Countries are experiencing financial losses due to catastrophic trends in these areas, so governments in most developed countries have stepped up their efforts to address these and similar negative phenomena. However, it is worth noting that on the European continent, the need to fundamentally change the basic approach to addressing environmental issues, climate change and the overall harmonious development of humanity is not because most EU member states are already experiencing the negative effects of environmental damage caused by human activity, but rather due to the realisation that shortly the situation in Europe could become catastrophic and turn into a global crisis, which would then require the involvement of all countries on the continent or even the entire planet.

United Europe gradually started to acknowledge the full extent of the danger and, after assessing the prospects of possible risk, started adapting to the conditions that emerged in the twenty-first century, while adjusting its joint actions in the context of minimising the effects of factors such as global warming due to rapid and uncontrolled climate change, deterioration of air quality due to unregulated industrial and production activities, humanitarian and food crises caused by a dramatic change in natural conditions and, as a result, a significant transformation of the usual agricultural infrastructures and directions in the world's poorest countries. In particular, the number of innovation-oriented enterprises in the EU has rapidly increased, i.e. those whose main aspect of activity is based on the use of exclusively environmentally friendly means and methods of operation (Hedberg & Šipka, 2022). Thus, according to the Boston Consulting Group, the number of innovation-oriented industries in Europe in 2022 was more than 60,000, and in 2023 this figure increased to 90,000. The top positions are held by companies from Germany and Switzerland, which received almost 7,000 patents for inventions in 2023 (Ranked: The most..., 2023).

Environmental projects are financed within the EU at the level of governing bodies in different areas and on an ongoing basis (Fig. 1); the priority areas for investment, as well as the legal mechanisms and legislative instruments that are mandatory, are defined by several regulatory documents, among which the Paris Agreement (2015), the European Climate Act (2021), and sectoral strategies and plans are the most important (Perissi & Jones, 2022; Schlacke *et al.*, 2022). In addition, regulatory and legal regulation of this area is based on the peculiarities and specifics of the national legislation of the EU member states, which, in turn, is formed based on specific circumstances, historical background and the current situation in the context of the dynamics of industrial innovation and digitalisation in specific European countries.

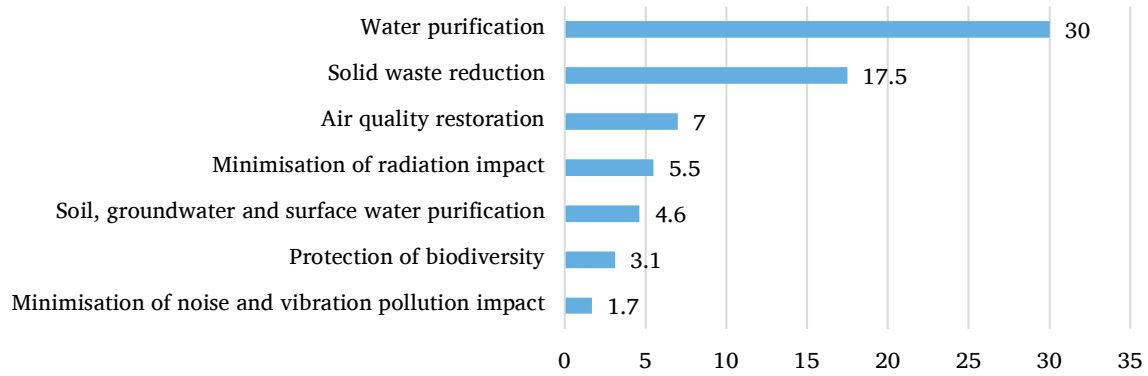


Figure 1. EU investments in environmental protection by sector of implementation in 2022, billion dollars

Source: compiled by the authors based on S. Schlacke *et al.* (2022) and “Environmental protection services: €69 billion invested” (2023)

The priorities and areas of investment are determined separately each year, but sectors such as water purification, minimisation of hazardous household waste, and improvement of air quality and cleanliness always remain on the agenda in the context of the importance and need for support from regulators, national legislation, and central leadership in Brussels.

Climate neutrality is a concept created in response to the threats posed by rapid climate change and refers to a range of measures required to reduce anthropogenic greenhouse gas emissions and increase the capacity to absorb them, which requires a qualitative and rapid economic transition in areas such as energy, industry, infrastructure, transport, land use, agriculture, and forestry. Climate neutrality recreates the conditions under which greenhouse gas emissions and their removal from the atmosphere are well balanced. Climate neutrality does not imply zero emissions, but only their neutralisation using traditional and modern methods.

Although the Paris Agreement (2015), developed under the United Nations Framework Convention on Climate Change, does not mention the concept of climate neutrality in its text, it defines its key elements, such as achieving a global peak in greenhouse gas emissions and a balance between anthropogenic emissions by sources and removals by sinks, as well as the main practical implementation tools, such as nationally determined contributions and long-term low-carbon development strategies. In addition, EU legislation and national laws of different countries have detailed these instruments, introducing various mechanisms to achieve climate neutrality by regulating the use of energy-saving technologies, alternative energy sources, energy

efficiency, emissions trading, carbon adjustment of imports, geoengineering, carbon taxes, hydrogen technologies.

The European Union Green Deal policy as part of the environmental strategy. Successful sustainable transformation of modern society is based on strategic planning in all areas of state and social development, compliance with legal mechanisms and strict application of legislative instruments, especially for the European Green Deal programme as part of the EU’s climate policy.

On 12 December 2015, the “Paris Agreement” was adopted, which introduced regulatory measures to reduce harmful emissions starting from 2020 (Szyrski, 2023), and on 25 September 2015, Resolution No. 70/1 of the United Nations General Assembly “Transforming our world: The 2030 agenda for sustainable development” (2015). Based on these two documents, the European Green Deal (EGD) plan was developed and presented to the European Parliament on 11 December 2019. The document is a key tool for transforming the Union into an efficient, effective, and sustainable body capable of fully transitioning to a state of neutrality in the use of natural resources and minimising further harmful environmental impact (Table 1). The EGD project plans to transform the economies of the European continent to the level of climate neutrality by 2050, in particular, it is planned to stimulate the development of the system through the comprehensive development of healthcare, medicine, industry, and agriculture through the active use of both innovative technological solutions and strict control over production activities in each EU country (Falduto & Rocha, 2020).

Table 1. A conceptual map of the European Green Deal for the sectors of implementation

Sector (program/initiative*)	Goals	Expected result	Possible negative outcomes
Climate policy (Targeted climate change plan for the period up to 2030, 2020)	Revision of the Energy Taxation Directive; introduction of a carbon adjustment mechanism for imports; update of the EU Climate Change Adaptation Strategy	Reduction of the level of carbon misuse	Economic losses for some developed countries. Unequal competition in product markets
Energy sector (EU Strategy for the Integration of Energy Systems and Hydrogen, 2020)	Access to energy sources; reduction of greenhouse gas emissions	Energy accessibility infrastructure; smart infrastructure; decarbonisation of the energy sector; decarbonisation of the gas sector; energy taxation (for consumers); new energy market	Unequal competition between countries due to different levels of hydrogen technology development

Table 1, Continued

Sector (program/initiative*)	Goals	Expected result	Possible negative outcomes
Industry (European Industrial Strategy, 2020)	Development of a circular economy action plan; securing sustainable raw materials; updating sectoral strategies	Waste reduction; implementation of the EU system-wide coordination standard; green digital transformation; rental and repair of control systems	Insufficient legal and regulatory framework for implementing changes
Smart construction (EU Fit for 55 packages, 2021)	Development of a general project regulation; support for energy efficiency; implementation of a renovation initiative	Creation of platforms for stakeholders; direct investment in innovative projects	Lack of a common European strategy at the level of national plans
Mobility (EU Taxonomy for Sustainable Activities, 2020)	Expansion of opportunities for urban mobility; ending fossil fuel subsidies. Introduction of transport pricing; increase in biofuel stocks; air quality control near airports	Transportation digitalisation	The uneven development of the sector at the level of individual EU countries
Food (EU Farm to Table Strategy, 2020)	Introduction of public awareness practices; introduction of security principles in the sector; development of national strategic plans. Reformation of fisheries and agricultural policies	Reduction of food and nutrition shortages	The uneven development of the sector at the level of individual EU countries
Biodiversity (EU Biodiversity Strategy 2030, 2021)	Implementation of a sustainable blue economy; implementation of a biodiversity strategy. Development of “green” European cities (increasing urban biodiversity)	Implementation of the Forest Strategy; expansion of the marine protected area	Lack of political will in some countries; imperfect regulatory framework
Pollution (EU Chemicals Strategy for Sustainable Development Towards a Toxics-Free Environment, 2020)	Restoration of surface waters. Development of Chemical Strategy	Implementation of air quality standards by the World Health Organisation; implementation of the Zero Pollution Action Plan	Discussions on the registration, evaluation, authorisation, and restriction of chemicals

Note: * – refers to one of many key programmes/initiatives

Source: compiled by the authors based on S. Paleari (2022), J. Hereu-Morales *et al.* (2023), X. Suna *et al.* (2023)

The vast majority of countries (193 UN member states) have committed themselves to the 17 strategic goals for sustainable development outlined in the EGD, which has become one of the principles of legal regulation in this area (Huang &

Zhai, 2021). Today, the strategic goals serve as the basis for the development of national climate policy strategies in individual countries, the effectiveness of which is a significant factor in restoring ecological balance in the world (Table 2).

Table 2. EU climate change policy effectiveness index in different sectors of production by country in 2022-2023

Country (place in the global ranking in 2023)	Greenhouse gas emissions (%)*	Renewable energy (%)*	Energy consumption (%)*	Climate policy (%)*	Global ranking in 2022
Denmark (4)	31.42	14.76	13.43	20	4
Sweden (5)	34.48	15.96	9.97	12.89	5
Estonia (9)	30.55	11.91	14.88	7.8	32
Norway (10)	26.422	19.35	8.98	9.72	6
Netherlands (13)	24.6	9.69	13.07	14.87	19
Portugal (14)	26.14	8.91	13.73	12.77	16
Finland (15)	29.23	12.89	5.75	13.38	14
Germany (16)	27.36	6.82	13.76	13.17	13
Luxembourg (17)	26.76	10.88	11.68	11.44	18
Malta (18)	28.67	8.82	15.31	7.62	12
Lithuania (21)	25.57	9.56	12.86	11.21	11
Switzerland (22)	26.6	7.73	13.99	10.28	15

Table 2, Continued

Country (place in the global ranking in 2023)	Greenhouse gas emissions (%)*	Renewable energy (%)*	Energy consumption (%)*	Climate policy (%)*	Global ranking in 2022
Spain (23)	25.97	7.38	13.84	11.38	34
Greece (24)	25.3	7.57	15.71	8.93	24
Latvia (25)	21.56	13.07	12.24	9.95	26
Ukraine (-)**	-	-	-	-	20

Note: * – index based on the sum of four indicators whose reforms and activities are aimed at achieving climate neutrality. The index includes the following indices: greenhouse gas emissions (maximum 40% of the total index), renewable energy (maximum 20% of the total index), energy consumption (maximum 20% of the total index), climate policy (maximum 20% of the total index); ** – Ukraine did not participate in the study due to the ongoing Russian-Ukrainian war

Source: compiled by the authors based on The climate change performance index 2022 (2023), The climate change performance index 2023 (2024), I. Pelsa and S. Balina (2022)

In early 2020, immediately after the presentation of the EGD, several EU countries adopted their first climate strategies and plans and began to actively fund research in areas that are close to restoring ecological balance and minimising the effects of climate change, both by governments and private investors. Projects to develop new mechanisms for the transition to safe production have become strategically important priorities on the agenda of the EU Member States. For instance, in the summer of 2020, Germany presented its national hydrogen strategy, the key objective of which is to increase the intensity of hydrogen technologies to accelerate the complete phase-out of coal. In addition, it is planned to build 10 GW capacity for the hydrogen industry by 2030. The Polish government announced its intention to develop 2 GW of electrolysis-based hydrogen production capacity, which was achieved in 2023 (Dankevych *et al.*, 2021). In 2020, the European Commission issued a Communication on a Hydrogen Strategy for a Climate-Neutral Europe with the aim to help to achieve climate neutrality by 2050 and meet the goals of the Paris Agreement. The Strategy is aimed at stimulating investments, increasing demand and expanding production, developing a favourable and supportive infrastructure, promoting research and innovation in this field.

The EGD formed the basis for the development of sectoral documents and initiatives at the EU level, thus outlining the strategic goals and aspirations of all member states. The following new regulatory documents were introduced to support the published strategy: “Just Transition Mechanism” (EGD: Just Transition..., 2021), European “Green Deal Investment Plan” (2020), as well as adapted some sectoral plans, in particular, “European Industrial Strategy” (Making Europe’s businesses..., 2020), “Hydrogen Strategy”, “Sustainable Development Strategy for the Chemical Industry”. In addition, the process of updating the existing European legislation in line with the goals set out in the EGD has begun, and the basic document was the “European Climate Law” (2021), which outlined the main stages and tasks for achieving climate neutrality in Europe by 2050 and formed the legislative norms for further regulatory adaptation.

The EGD introduced a new plan to increase the EU’s greenhouse gas emissions reduction target by 2030 and to review and update all relevant climate-related policy instruments. This short-term target, along with the longer-term goal of achieving climate neutrality by 2050, was enshrined in the European Climate Law (2021), making them a legal obligation for the EU and its Member States. The European Climate Law proclaimed the EU’s short-term climate goal (to

reduce emissions by 55% by 2030) and obliged the Union institutions to set a medium-term goal by 2040 (European Climate Law, 2021). The European Commission was also given additional powers to review any legislative proposals within the EU for compliance with the climate neutrality goal, as well as to assess the compliance of any short- and medium-term goals with this goal. To implement the EGD and the European Climate Act (2021) within the EU, a package of legislative proposals called “Fit for 55” was approved, which aims to make the EU “fit” to meet the short-term climate goal of reducing emissions by 55% by 2030. The proposals are aimed at bringing about the necessary changes in the economy, society, and industry to enable a green transition. The package strengthens some existing pieces of EU legislation and introduces several new legislative initiatives in several areas, such as energy, transport, land use, forestry, and construction. These changes in one way or another relate to the main mechanisms for achieving climate neutrality and provide for effective regulation of the use of energy-saving technologies, alternative energy sources, energy efficiency, emissions trading, carbon adjustment of imports, application of geoengineering methods, introduction of carbon taxes, use of hydrogen technologies.

In early 2020, the COVID-19 coronavirus infection spread rapidly across European countries, significantly slowing down or even stopping many climate projects and initiatives (Abaikyzy *et al.*, 2020). Due to significant financial and social losses, the European Commission called in the summer of 2020 for a one-year pause in the implementation of the “Green Deal” to develop effective mechanisms to counter the effects of the pandemic, including through the prism of the EU’s environmental strategy (Bäckstrand, 2022). This resulted in the implementation of such initiatives and programmes as the European Social Fund, CRII, CRII+, REACT-EU. With the help of these projects, the Union has developed several mechanisms to support regional development in the post-pandemic period, accelerate the “green transition”, and increase investment in environmental areas to minimise the risks caused by prolonged social and economic isolation (Dupont & Torney, 2021). At the end of 2020, the European Commission’s analytical commission published the “Green Recovery Act”, which included all the points of the previous document, the European Green Deal (2021), and focused on the task of reducing the use of fossil fuels (Oberthür & von Homeyer, 2022). However, after a series of discussions in EU government circles, the 2020 act was recognised as a copy of the previous EU Green Deal document and concerns were

raised that the funds allocated under the new document could be misused (Hereu-Morales *et al.*, 2023). At present, no such facts have been recorded, and the Union's climate policy is generally functioning harmoniously based on previously adopted regulations (as evidenced by the general recommendations on the 2040 targets for achieving climate neutrality by 2050 adopted in January 2024) (Recommendations for 2040..., 2024). However, it is worth noting that with rapid fluctuations in the political and economic situation in the world, military confrontations and conflicts over social contradictions, the situation regarding the further development and formation of climate neutrality policy in Europe is under some threat. New challenges and complexities in the region require a refocusing of attention to new situations, pushing the issue of maintaining environmental balance to the background.

Considering the overall situation in the field of climate policy in the EU, it is possible to conclude that there are both positive and negative components of this activity. In general, national governments and the central leadership in Brussels are aware of all the risks and act following the requirements and requests. To summarise, there are general practical recommendations for improving the efficiency of decision-making in some sectors of the EU's activities to accelerate the achievement of climate neutrality. First and foremost, it is necessary to fully implement all the provisions of the previously adopted regulations, mainly at the level of individual countries, and to conduct clear monitoring in the context of understanding the scope of work done and the need to reform and update certain areas of the industry. It is also necessary to continue the policy of decarbonising production, using all available sources (wind, water, solar energy), and financially motivating producers to get involved in this business. In addition, it is necessary to conduct active social work in the context of households' transition to environmentally friendly energy sources, such as solar panels, heat pumps. Specific policies on social justice should be introduced through the prism of the possibilities of using the latest tools in the field of environmental restoration: introduce a system of fines for violations, taxation mechanisms for involved entrepreneurs, and preferential tariffs for the most vulnerable segments of the population. Most importantly, it is necessary to maintain effective communication with all stakeholders in this area of policy activity to respond quickly to new difficulties and challenges.

Ukraine and the Climate Neutrality Policy. Given Ukraine's European integration aspirations declared in several regulations and international treaties (primarily in the EU-Ukraine Association Agreement (2014) and in connection with obtaining the status of an EU candidate) and its goal of becoming a member of the Union, environmental policy and preservation of climate balance are among the key goals of the country's sustainable development in the short term (Maksymova, 2023). The legislative instruments for this policy area, defined by the updated regulatory framework, are sufficiently complete and effective. Ukraine regulates its legal activities and fulfils its international environmental obligations following the UN Framework Convention on Climate Change (1992), the Kyoto Protocol (1997), the Paris Agreement (2015), as well as acting within national documents – Law of Ukraine No. 2697-VIII (2019), the Concept of Ukraine's Transition to Green Energy by 2050 (2020). In addition, relevant legislation

has been adopted to monitor, report, and verify greenhouse gas emissions.

The main tasks of Ukraine under the above acts are to create an efficient economy in which the principles of decarbonisation and transfer to a green economy are key; transition to energy-saving technologies and energy-efficient systems and mechanisms; achieve a low-carbon level of production; scale up the use of renewable and alternative energy sources; and development of effective tools to overcome climate change (Orfanova, 2023). Following the ratification of the Paris Agreement in 2016, Ukraine submitted its first nationally determined contribution to the Secretariat of the United Nations Framework Convention on Climate Change, under which Ukraine set a goal of not exceeding 60% of 1990 greenhouse gas emissions by 2030. As this goal was not ambitious enough, in 2021 Ukraine's contribution was adjusted so that it now commits to a 65% reduction in greenhouse gas emissions by 2030 compared to 1990 levels and to achieve climate neutrality no later than 2060. By the way, Ukraine became one of the first countries to develop and submit its low-carbon development strategy to the Convention Secretariat (in 2018).

Since the Russian full-scale invasion of Ukraine, many environmental projects and climate initiatives were halted, and several innovative enterprises in the sector were destroyed or ended up in the occupied territories, thus terminating operations (Yefimenko *et al.*, 2023). Therefore, the Government of Ukraine, to minimise the consequences of this catastrophic situation (increased harmful emissions into the atmosphere due to numerous fires, rocket explosions), together with the European Commission, has developed the REPowerEU Recovery Plan, which provides for strengthening energy saving, energy efficiency, environmental monitoring, establishing communication between different industry stakeholders, as well as diversifying energy sources and a complete transition to green energy (REPowerEU: Plan to..., 2022). The plan also envisages that Ukraine will become the main transit route for hydrogen transportation to European countries.

Given the commitment to join the EU, enter the European economic, political and innovation space, and comply with European standards and norms in terms of achieving climate neutrality, Ukraine should consider the following recommendations. In particular, the relevant ministries (primarily the Ministry of Economy and the Ministry of Finance) need to improve communication by developing and implementing a green monitoring system that would facilitate the active dissemination of all relevant information to environmental policy stakeholders, mainly potential investors. European systems (e.g., the World Bank's methodological materials, the German government's guidelines for green implementation) could serve as an example of this development.

The Ministry of Communities, Territories, and Infrastructure Development of Ukraine, in the context of restoring damaged infrastructure in the territories liberated from the occupiers, needs to develop clear roadmaps and plans and implement measures to restore infrastructure. The experience of European countries can be used as an example (the launch of the Flood Relief Fund (Germany), and the Green Climate Fund (UK) (Bondarenko *et al.*, 2023). It is also necessary to attract private investment from national and foreign donors.

Discussion

Studying the formation and development of the EU climate policy in the context of fulfilling the tasks set out in the European Green Deal, which was developed as a practical response to rapid climate change, and environmental degradation and as an effective tool for Europe's transition to a green development path, several conclusions were summarised. The issue of minimising the harmful impact on nature and humans from production and industrial activities is currently an extremely important and relevant aspect of discussions at various levels of government and public debate. Analysing the scientific achievements of specialists related to the topic of this paper – climatologists, economists, sociologists, medical experts, and representatives of other fields – it is possible to state that in recent years, interest in studying ways and means of overcoming the environmental crisis has increased significantly. The demand for such research is currently very high, as society strives to live and develop in a stable environmental situation and a sustainable economic system, which cannot be guaranteed in the face of uncontrolled changes in natural phenomena. Ukrainian scientists focused mainly on policy research in the context of the “green transition” and the creation of an environmentally neutral economic system in Ukraine, following the example of developed EU countries (Danylyshyn & Koval, 2023). Experts from European countries (Poland, Italy, the United Kingdom), as well as from the United States and China, focused their research on identifying priority tasks for achieving climate neutrality through the prism of analysing legal instruments in national innovation systems. In summary, the results and conclusions of scientists support the fact that the situation in the environmental sector is still extremely difficult, and the events of recent years (the outbreak of the COVID-19 coronavirus infection, the Russian-Ukrainian war) have made the situation threatening and explosive, requiring urgent resolution.

This study suggested that the EU should become the main actor and play, if not the main, then at least a decisive role in overcoming the global environmental crisis, namely, in ensuring and accelerating the transition to a more sustainable, “green” transformation of the economy and production. The same idea was previously voiced by A. Hedberg and S. Šipka (2022), emphasising the fact that the Union can do this as a developer of norms and standards for compliance with climate rules and principles, as well as a powerful producer and consumer of environmentally neutral and carbon-independent products with a clean source of origin. The concept of carbon neutrality envisaged by the European Green Deal is emphasised in the Paris Agreement, which became the basis for further transformation of sectoral legislation in the EU. This opinion, which was substantiated in this paper, confirms the conclusions of M.T. Huang and P.M. Zhai (2021) regarding the goals of achieving zero emissions and a carbon-neutral economy based on environmental policy and compliance with European rules and regulations. However, achieving the above goals requires the joint mobilisation of the entire society, which is a complex and practically impossible task in the current environment, according to experts.

The development of long-term strategies, plans, roadmaps, and scenarios for planning and implementing certain tasks in various spheres of life is the only way to achieve the goals set. This statement is also true for environmental policy within the EU, where the functions of monitoring and controlling the level of air, water, and food quality

are assigned to the relevant regulatory authorities, which are enshrined in specific regulations. C. Falduto and M. Rocha (2020) share a similar opinion, believing that long-term strategies can significantly influence the short- and medium-term priorities, policies, and investment channels of the Member States, leading to significant cost savings in the long run. To implement the priority goals of the EU's Green Deal, it is necessary to introduce several measures to modernise the existing structure of the industry, this paper analyses the example of updating existing documents after the outbreak of the COVID-19 coronavirus infection. S. Schlacke *et al.* (2022) also have a similar opinion and insist that to achieve the set goals, the system should be reformed exclusively in terms of increased control and monitoring, fines, and increased taxation. The authors did not consider the options of weakening supervision and introducing a system of benefits and incentives approved at the legislative level, due to the low efficiency of such actions.

The study outlined the conditions under which the EU's climate policy has been changing, strengthening, and becoming more institutionalised and centralised. This applies to the most catastrophic events on the planet – wars, global environmental disasters (floods, droughts), food crises (famine), epidemics. S. Oberthür and I. von Homeyer (2022) also considered these factors as driving forces in the process of reforming the political strategies of European countries, not only in terms of environmental issues and climate protection but also for other sectors of the economy. At the same time, experts argued that although the European Green Deal is unique and effective, it is not universal and cannot be fully applied to countries from other regions or continents. A free and legal transition to a sustainable and climate-neutral society is based on the principles of gradual phase-out of fossil energy sources, increased use of carbon-neutral technologies and systems, energy-saving consumption, and environmental management. This thesis was voiced in the presented study and coincides with the proposals of J. Hereu-Morales *et al.* (2023) on conducting a pan-European assessment of the effectiveness of the tasks set out in the European Climate Act, which were previously emphasised in the European Green Deal. However, according to the authors, the practical relevance of the above documents is still not sufficiently substantiated due to the lack of full agreement on certain components.

In the process of studying the topic of climate neutrality on the European continent by analysing the relevant areas and spheres of implementation of this task in the national practices of the EU member states, the following was determined. By reviewing the works of some industry experts, in particular, economists and sociologists, the need to update the available information on the subject matter of this paper was identified in the context of the growing demand for detailed results and conclusions. The main factor that stimulated the development of various green strategies and plans was a significant increase in the overall number of negative trends in the natural environment, directly or indirectly caused by the consequences of human activity. European countries have agreed on the urgency of addressing the climate crisis, but due to different approaches to certain components of this policy area, as well as the multi-level political and economic systems and structures operating in the Union, it is difficult to approach the issue of environmental balance in a joint and organised manner. This also applies to

Ukraine, which, although it had good indicators of achieving climate neutrality in the early 2020s, lost many of its achievements as a result of the Russian invasion. However, despite all the difficulties, the climate neutrality strategy announced following the European Green Deal is the only right solution to establish ecological balance and preserve natural biodiversity on the planet. For a more thorough consideration of the problems of preserving the ecological balance on the planet and guaranteeing climate neutrality on the European continent, it is advisable to analyse the future development and updating of the EU's environmental legislation after the end of the Russian-Ukrainian war.

Conclusions

Considering the peculiarities of the European policy on achieving climate neutrality in the context of the rapid growth of new challenges and threats to global security in the context of climate change due to active human activity, several conclusions have been drawn. The topic of regulatory and legislative regulation of pan-European activities to preserve ecological balance at the beginning of the 21st century is extremely important and relevant in many countries, as evidenced by the development of national sectoral strategies and green transition plans. Certain aspects, such as the outbreak of the COVID-19 coronavirus infection and military actions in the region, have negatively affected the implementation of the European Green Deal, but through joint efforts, EU member states have mobilised their resources and built an updated strategy for the near future. Certain European regulations contain both positive components (e.g., the task of significantly reducing harmful gas emissions, the introduction of innovative standards for carbon-free production) and certain ambiguous elements for some EU members (development of a unified system of fines and sanctions for those states that violate environmental norms and standards, without taking into account national peculiarities,

geographical conditions), which makes the process of their implementation quite complex and time-consuming. Ukraine, through the prism of its European integration aspirations, also follows the path of achieving climate balance and reducing harmful emissions into the atmosphere. However, the ongoing Russian-Ukrainian war has negated Ukraine's achievements in this area in recent years and made the goal of a "green transition" much more difficult.

Considering the statistical data in the context of analysing the dynamics of environmental initiatives and launching relevant green projects, the most relevant and widespread programmes are those in the areas of water purification systems, algorithms for reducing solid waste and transition to zero waste production, and computer programmes for air quality restoration. The legal mechanisms and legislative instruments of the European Green Deal form multi-level areas and spheres for which highly specialised sectoral regulations and documents have been developed, such as the European Industrial Strategy for Safe Production, the EU Chemicals Strategy to minimise harmful emissions into the environment.

Further research on expanding the range of legal instruments to achieve climate neutrality in the context of implementing the main objectives of the European Green Deal programme seems quite promising and will be of significant practical importance for many industrial sectors in most countries of the world. This is primarily due to the ever-increasing pace of transformation of the natural balance, namely, the usual climatic conditions, environmental standards, which, in turn, requires the expansion of scientific research to stabilise the situation and solve these problems.

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Conflict of interest

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Анотація. У зв'язку з інтенсифікацією промислової діяльності людини у XXI столітті, питання кліматичної нейтральності стає вкрай важливим, особливо для європейського континенту, для якого екологічна безпека є ключовим елементом політичної взаємодії. Мета полягала у розгляді особливостей європейської політики зі збереження кліматичної рівноваги через призму аналізу різних ініціатив в контексті результатів від їх впровадження. Основними методами були статистичний, за допомогою якого оцінені кількісні показники у сфері збереження клімату у ряді країн світу, та метод системного аналізу, використовуючи який розглянуті ключові елементи європейської політики забезпечення захисту довкілля. З'ясовано, що проблема збереження клімату та нейтралізація наслідків промислової діяльності людини є головним завданням, на вирішення якого європейські країни модернізували та оновлювали нормативну базу, адаптували правові механізми та законодавчі інструменти. Рациональне та зважене ставлення до захисту власного населення – як на національному та регіональному, а також універсальному рівнях – було головною складовою для досягнення цілей сталого розвитку на найближчі п'ятдесят років. Зниження рівня шкідливих викидів та парникових газів, перехід на екологічно безпечні джерела енергії, використання енергоефективних технологій, збільшення податків на застосування викопних копалин, за європейською стратегією “зеленого” розвитку, виступали головними пунктами досягнення кліматичної нейтральності. Через призму аналізу різних нормативних актів та законодавчих документів на рівні Європейського Союзу (ЄС) були виокремлені та підсумовані головні позитивні та негативні аспекти від їх реалізації на практиці. В контексті триваючої нині російсько-української війни акцентовано на необхідності актуалізації та оновлення ряду існуючих кліматичних стратегій з метою мінімізації їх наслідків на природу. Результати та висновки роботи можуть використовуватися в якості практичної бази для розробки та впровадження нових стратегій кліматичної нейтральності та зеленої енергетики

Ключові слова: кліматична нейтральність; сталий розвиток; “зелений перехід”; European Green Deal; енергоефективність; декарбонізація; зелена енергетика