

TOWARDS A SUSTAINABLE FUTURE: EXPLORING THE EUROPEAN DIMENSIONS OF ECOLOGICAL BALANCE AND SOCIAL EQUITY

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Abstract. Sustainable development is essential for building a prosperous and resilient future for Europe. This article explores the various dimensions of sustainable development in Europe, including environmental, social, and economic sustainability. We used theoretical and empirical research methods in this article. Theoretical methods are analysis, synthesis, generalization and comparison of literary sources. Empirical research methods in this article are observation and measurement. Environmental sustainability in Europe faces challenges such as climate change, biodiversity loss, and pollution. However, there are many successful initiatives being implemented, such as the EU Green Deal, to transform the EU economy into a sustainable one. Social sustainability faces issues such as inequality, poverty, and social exclusion, which require policies that promote social cohesion and address these challenges. Economic sustainability involves promoting inclusive and sustainable economic growth, particularly in the face of global challenges such as climate change and technological disruption. To achieve long-term sustainable development in Europe, it is crucial to integrate environmental, social, and economic considerations into decision-making processes. This requires promoting sustainability in all sectors of society, including businesses, governments, and individuals. For the first time, a comparison of three components of sustainable development based on climate change, innovative technologies, and circular economy is offered. The principles of sustainable development of ecological, economic and social components are improved. Environmental knowledge and competence regarding the implementation of sustainable development in economic and entrepreneurial activities are developed. The article concludes by calling for continued efforts towards sustainable development in Europe, highlighting the importance of addressing environmental degradation, reducing social inequalities, and promoting inclusive and sustainable economic growth.

DOI: 10.24263/EDSD-2023-5-21

Introduction. Sustainable development refers to the idea of meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. It encompasses three dimensions: environmental, social, and economic sustainability. Sustainable development is of great importance in Europe, where a balance between economic growth and environmental and social concerns is critical for the well-being of current and future generations. The purpose of this article is to explore the various dimensions of sustainable development in Europe, highlighting the challenges and opportunities that exist, as well as successful initiatives that have been implemented to promote sustainability.

In this article, we will examine the current state of environmental, social, and economic sustainability in Europe, and identify the key challenges and opportunities for improving sustainability in each of these areas. We will also discuss the importance of integrating the three

dimensions of sustainability for long-term success and highlight successful examples of integrated sustainable development initiatives in Europe.

The scientific novelty of this article. For the first time, a comparison of three components of sustainable development based on climate change, innovative technologies, and circular economy offered. The principles of sustainable development of ecological, economic and social components improved. Environmental knowledge and competence regarding the implementation of sustainable development in economic and entrepreneurial activities developed.

Environmental Sustainability in Europe. Let's consider the issue of Environmental Sustainability in Europe. Environmental sustainability is critical for ensuring a healthy planet and the well-being of all living beings. In Europe, the current state of environmental sustainability varies across different countries and regions. While some areas have made significant progress in reducing greenhouse gas emissions and promoting renewable energy, others continue to struggle with issues such as air and water pollution, deforestation, and loss of biodiversity.

One of the key challenges for improving environmental sustainability in Europe is the need to transition towards a low-carbon economy while simultaneously addressing social and economic concerns. This requires developing innovative technologies, investing in renewable energy, and promoting sustainable land use practices.

Research scientists who research environmental technologies include Tsapko et al [1], Ghofur et al [2], Mislyuk et al [3], Gurgenidze [4], Yatskov et al [5], and Kurbatska et al [6] and other.

In the study [1], the effect of high temperature on the properties of a cable with flame retardant coating investigated. It found that the coating swells and forms a layer of solid particles on the surface of the sample upon heating. This leads to the formation of a barrier to heat penetration, as evidenced by the temperature measurements on the surface and inner side of the sample. Based on the experimental data and established dependencies, the coefficients of thermal conductivity and heat conductivity of wood were calculated, which are equal to $214.4 \cdot 10^{-6} \text{ m}^2/\text{s}$ and $0.62 \text{ W}/(\text{m} \cdot \text{K})$, respectively. This indicates that the swelling of the coating leads to the formation of a heat-insulating layer. The maximum possible temperature penetration through the thickness of the coating also assessed. It found that at a temperature on the surface of the sample, which significantly exceeds the ignition temperature of the polymer sheath of the cable; the temperature on the non-heated surface does not exceed 160°C . In conclusion, the results of the study suggest the possibility of targeted adjustment of the fire protection processes of electrical cables by using coatings capable of forming a protective layer on the surface of the material that slows down the rate of heat transfer.

The study showed, in [2], that peat soil-activated carbon is a promising adsorbent for reducing air pollution from motorized vehicles. It is abundant, easy to make, and effective at reducing CO and HC emissions.

Total, despite these challenges, many successful environmental sustainability initiatives have been implement in Europe. For example, the European Union's circular economy strategy aims to reduce waste and promote resource efficiency, while the EU Biodiversity Strategy seeks to protect and restore Europe's biodiversity. Other initiatives include the Green City Accord, which aims to make cities more sustainable and livable, and the Zero Pollution Action Plan, which aims to reduce pollution across various sectors.

Overall, while there is still much work to be do to improve environmental sustainability in Europe, there are many positive steps be taking towards a more sustainable future.

Social Sustainability in Europe. Let us consider the issue of Social Sustainability in Europe. Ensuring that every member of society has access to basic needs such as healthcare, education, and housing, and can participate in decision-making processes that affect their lives, is crucial for achieving social sustainability. However, the current state of social sustainability in Europe varies across different countries and regions. Some areas have made progress in reducing poverty and promoting social inclusion, while others are still grappling with issues like income inequality, discrimination, and exclusion.

To improve social sustainability in Europe, addressing demographic changes like an aging population and migration is a key challenge. This calls for policies that promote social integration and cohesion, and investments in education, healthcare, and social protection. Despite these challenges, there have been many successful social sustainability initiatives implemented in Europe, such as the European Pillar of Social Rights, which aims to ensure fair working conditions, social protection, and equal opportunities for all Europeans.

Other initiatives include the EU Youth Strategy, which seeks to empower young people and promote their participation in society, and the EU Disability Strategy, which aims to promote the rights and inclusion of people with disabilities. Although significant challenges still need addressed, there are many positive steps implemented towards improving social sustainability in Europe.

The scientists who research society are Dunayev et al [7], Artomova et al [8], Skydan et al [9], Kiran et al [10], and Kunytska-Iliash [11] and other.

For example, authors [7] describe that the object of this study is the factors of implementation of the concept of government as a platform. The study solved the problem of identifying factors and choosing a model for analyzing the conditions for building a socio-technological model of interaction between society and the state. The concept of government as a platform presented in the form of interrelated entities, components of technological infrastructure and digital assets. A feature of the described structure is the consideration of social value, which explained by the principles of the concept under study. The factors of implementation of the concept include professional and personal characteristics of civil servants; organizational structure of the government; legal regulation; financial mechanisms; use of digital technologies of Industry 4.0; digital opportunities of the population and businesses; digital engagement. The identified factors take into account the need to take into account the needs and requirements of citizens, technological readiness, and competence of the government. It established that during 2022 there was a global trend towards an increase in the level of development of e-government. The results of the analysis of user experience on interaction with electronic public services confirm the need to focus on consumers. A theoretical model for adopting the state digital platform developed. The model consists of six independent variables, three intermediate variables, and one dependent variable. In the model, independent variables include tangible ease of use, uncertainty in technology, social pressure, efficiency of work with computer equipment, technical capabilities. Intermediate variables include attitude to use, tangible utility, user satisfaction, and intent to use. The dependent variable is the actual use of technology.

Economic Sustainability in Europe. Let's consider the issue of Economic Sustainability in Europe. In Europe, achieving long-term economic growth while also promoting social and environmental well-being known as economic sustainability. However, the current state of economic sustainability across different countries and regions in Europe varies. While some areas have strong economies with high levels of innovation and competitiveness, others face challenges like high unemployment and low productivity. Promoting inclusive and sustainable growth is one of the key

challenges for improving economic sustainability in Europe, particularly in the face of global challenges such as climate change and technological disruption. This requires investing in education and training, research and innovation, and promoting entrepreneurship and small businesses.

Several research scientists study economic processes, including Barseghyan et al [12], Miller et al [13], Biliavska et al [14], John et al [15], and Ratmono et al [16] and other.

For example, authors [12] describe that the relevance of the subject conditioned upon the fact that large park plantations have a great positive impact on the climate of Mediterranean cities, which increases the comfort of living in them. Such weather conditions as abnormal heat are increasingly manifesting in Mediterranean cities due to global warming and other causes. In addition, there is air pollution in cities with solid particles and other impurities harmful to human health. The analysis of scientific literature has demonstrated that in the cities of the Mediterranean, these problems solved through urban park plantings and other types of landscaping. The purpose of this study is to assess the effectiveness of the costs of maintaining large urban park spaces in Barcelona. The leading method to explore this problem is the empirical method, namely, the study of urban landscaping programs and budget expenditures. The research examines the sources of financing the costs of maintaining urban park spaces and considers urban programs for the development of landscaping, and their financing. In addition, the influence of green spaces on the comfort of living in the city of Barcelona explored. Because of the study, it found that landscaping in the city of Barcelona financed for the most part from the city budget, while spending increases annually. It has been identified that the city of Barcelona receives a significant positive effect from investments in green spaces, namely, air pollution decreases, its temperature decreases, people get places for hiking, sports, and other types of activity, the psychological and physiological health of the population improves, the urban environment becomes more comfortable to live in. It is the large park plantings. This park is allow reducing the air temperature, which improves the quality of life in the city.

Regardless of these hindrances, there have been successful economic sustainability initiatives implementing in Europe. For instance, the European Green Deal aims to transform the EU economy into a sustainable one, while the EU Digital Agenda promotes the digital transformation of European businesses and public services. Additionally, the European Investment Plan aims to mobilize public and private investment to support sustainable growth and job creation. In summary, although there is still much work to be done to improve economic sustainability in Europe, many positive steps are being taken towards a more sustainable and inclusive economic future.

Integrating the Three Dimensions of Sustainable Development in Europe. Environmental, social, and economic sustainability are all interconnected and interdependent. Therefore, integrating these three dimensions is crucial for achieving long-term sustainable development in Europe. In this section, we will explore the importance of integrating sustainability and highlight some successful examples of integrated sustainable development initiatives in Europe.

Integrating sustainability means that environmental, social, and economic considerations are taking into account when making decisions and developing policies. For example, promoting renewable energy not only helps to reduce greenhouse gas emissions and protect the environment but also creates jobs and stimulates economic growth.

There are many successful examples of integrated sustainable development initiatives in Europe. For instance, the Nordic countries have implemented various policies and practices that promote sustainable development, such as the Nordic Swan Ecolabel, which promotes environmentally friendly products, and the Nordic Council of Ministers, which promotes cross-border

cooperation on environmental and social issues. Another successful example is the EU's Horizon 2020 program [17], which promotes research and innovation that addresses societal challenges such as climate change, energy, and health. The program includes a range of sustainability-focused initiatives such as promoting clean energy, sustainable mobility, and resource-efficient cities.

Looking forward, there is a need for continued efforts towards sustainable development in Europe. This includes promoting sustainability in all sectors of society, including businesses, governments, and individuals. It also requires addressing issues such as inequality, poverty, and environmental degradation. Overall, by integrating environmental, social, and economic sustainability, Europe can build a more resilient and sustainable future. Consider comparative tables 1-3.

Table 1

Comparison of three components according to the «Climate change» feature

Comparison sign	Ecological component	Social component	Economic component	In summary
Climate change	• Melting glaciers • Rising sea levels • Severe weather events • Loss of biodiversity and destruction of habitats • Impact on natural resources • Impact on economic sustainability	• Increasing social inequality • Uncomfortable working conditions • Poor health of employees	• Affects the productivity of agriculture • Increases production costs • Creates new business risks • The tourism industry is suffering	Climate change has wide-ranging impacts on ecological, social, and economic sustainability. Addressing it requires integrated approaches across all components. Neglecting climate change poses threats to sustainability and future generations' well-being

Table 2

Comparison of three components according to the "New technologies" feature

Comparison sign	Ecological component	Social component	Economic component	In summary
New technologies	• Reducing carbon emissions • Improving resource efficiency • Clean energy sources • Smart grids • Production and disposal of electronic devices generate toxic waste	• Information and services to create new jobs • Growing inequality and social isolation • New competencies for their effective use	• Job creation • Productivity • Innovation • New industries • Business models • Increase efficiency and reduce costs, particularly in manufacturing and services	New technologies can lead to job displacement, particularly in manual labor sectors, negatively impacting certain regions and social groups. Therefore, it's crucial to ensure equitable sharing of benefits

Table 3

Comparison of three components according to the "Circular Economy" feature

Comparison sign	Ecological component	Social component	Economic component	In summary
Circular economy	• Waste sorting • Efficient use of resources • Minimization of waste and greenhouse gas emissions • Recycling and secondary use of materials reduce environmental pollution • Protection of natural resources	• Enterprises that process waste can create jobs • New jobs • Promoting social inclusion for social sustainability	• Improve the company's profits • Stimulate economic growth • Waste repurposing • Development of new business models based on cyclical principles	The circular economy can benefit all three components of sustainability by reducing waste and promoting resource efficiency for ecological sustainability, creating jobs and promoting social inclusion for social sustainability, and creating economic value and promoting innovation for economic sustainability

In conclusion, after analyzing tables 1-3, it is easy to see that sustainable development requires a comprehensive and integrated approach that addresses the ecological, social, and economic dimensions of sustainability. Neglecting any of these components can have negative impacts on the others, leading to environmental degradation, social inequality, and economic instability. To achieve sustainable development, we need to balance these components and ensure that the benefits shared equitably across society.

Consider Figure 1 to analyze the relationships between the three components of sustainable development.

As can be seen from Figure 1, the three components of sustainable development - ecological, social, and economic – are interconnect and dependent on each other. The signs of sustainable development, such as climate change, new technologies, and circular economy, can impact all three components simultaneously. Climate change can affect the ecological component, while also having social and economic implications. New technologies can bring both positive and negative impacts on the environment and society, as well as on the economy. The circular economy can create economic value, provide social benefits, and contribute to ecological sustainability. In general, the sustainable development components and signs intertwined and considered holistically for achieving long-term sustainability.

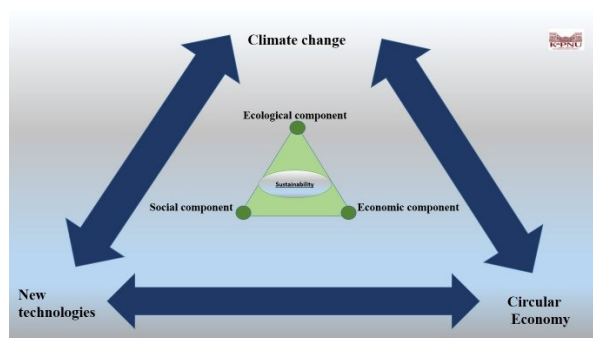


Fig 1. Interrelationship of signs and components of sustainable development

We chose "Climate change", "New technologies", and "Circular economy" as priority areas of sustainable development due to their crucial roles in promoting ecological, social, and economic sustainability. Climate change poses a significant threat to the environment and human well-being, while new technologies offer opportunities for more efficient and sustainable production and consumption patterns. The circular economy promotes resource efficiency and reduces waste, while also creating economic opportunities and promoting social equity. By prioritizing these areas, we can foster a more sustainable and resilient future for both people and the planet.

Conclusion. To recap, we have seen that Europe faces significant challenges in promoting sustainable development, such as addressing environmental degradation, reducing social inequalities, and promoting inclusive and sustainable economic growth. However, there are many positive steps be taken towards sustainable development, such as the EU Green Deal [18], the European Pillar of Social Rights [19], and the Horizon 2020 program [17].

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